UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE PATENT TRIAL AND APPEAL BOARD

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WESTINGHOUSE AIR BRAKE TECHNOLOGIES CORPORATION
Petitioner

v.

RAILWARE, INC.
Patent Owner

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IPR2026-00134
Patent RE47,835

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**DECLARATION OF LORI KAUFMAN, Ph.D.**
**IN SUPPORT OF PETITION**
**FOR *INTER PARTES* REVIEW OF U.S. PATENT RE47,835**

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interface through which the railway traffic control apparatus communicates via a network with a user terminal,” ..... 69

4. 1[C]: “wherein execution of said one or more programs of executable instructions configures *the railway traffic control apparatus comprising* the processor to include: ..... 82

a block placing part to place a block on one or more specified track sections *in any of said plural railways constituting said railway network that is managed by centralized control operation from the railway traffic control apparatus, the railway traffic control apparatus controlling, by said centralized control operation, one or more interlocks amongst the plurality of railway traffic interlocks dispersed in said plural railways constituting said railway network, to block railway traffic to the specified track sections and thereby* to permit a railway field worker to enter the track sections [while blocking railway traffic to said track sections];” ..... 82

5. 1[D]: “a code generation part to generate a removal code, retrieve the electronic contact address of the railway field worker from the rail personnel contact database, and transmit the removal code to the electronic contact address of the railway field worker; and” ..... 88

6. 1[E]: “a block removal part to remove only upon entry of the removal code *by said centralized control operation from the railway control apparatus,* the block placed by the block placing part on said one or more track sections.” ..... 105

D. Analysis of Independent Claim 10 ..... 117

1. 10[Pre]: “A railway traffic control apparatus *configured for centralized control of traffic of a centrally controllable railway network including plural railways and a plurality of railway traffic interlocks dispersed in said plural railways constituting said railway network,* for controlling access to railway tracks, said railway traffic control apparatus comprising:” ..... 117

2. 10[A]: “a block placing part to place a block on one or more [selected] *specified* track sections *in any of said plural*



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*railways constituting said railway network that is managed by centralized control operation from the railway traffic control apparatus, the railway traffic control apparatus controlling, by said centralized control operation, one or more interlocks amongst the plurality of railway traffic interlocks dispersed in said plural railways constituting said railway network, to block railway traffic to the specified track sections and thereby* to permit a railway field worker to enter the track sections [while blocking railway traffic to said track sections];" ..... 118

3. 10[B]: "a code generation part to generate a removal code, determine an electronic contact address of the railway field worker by accessing a rail personnel contact database registering, for each railway personnel, electronic contact information of the railway personnel, and transmit the removal code to the electronic contact address of the railway field worker; and" ..... 118

4. 10[C]: "a block removal part to remove only upon entry of the removal code *by said centralized control operation from the railway traffic control apparatus*, the block placed by the block placing part on said one or more track sections for the railway field worker." ..... 118

E. Analysis of Independent Claim 19 ..... 119

1. 19[Pre]: "A method for *controlling railway access using a railway traffic control apparatus of* a centralized railway control system [to control access to railway tracks] *configured for centralized control of traffic of a centrally controllable railway network including plural railways and a plurality of railway traffic interlocks dispersed in said plural railways constituting said railway network*, the method comprising:" ..... 119

2. 19[A]: "providing a user interface [on a user terminal] *of the railway traffic control apparatus*, including a block placing part to place a block on one or more specified track sections *in any of said plural railways constituting said railway network that is managed by centralized control operation*



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*from the railway traffic control apparatus, the railway traffic control apparatus controlling, by said centralized control operation, one or more interlocks amongst the plurality of railway traffic interlocks dispersed in said plural railways constituting said railway network, to block railway traffic to the specified track sections and thereby* to permit a railway field worker to enter the track sections [while blocking railway traffic to said track sections];" ..... 119

3. 19[B]: "generating a removal code, determining an electronic contact address of the railway field worker by accessing a rail personnel contact database registering, for each railway personnel, electronic contact information of the railway personnel, and transmitting the removal code to the electronic contact address of the railway field worker; and" ..... 119

4. 19[C]: "permitting the block to said one or more track sections to be removed only upon entry of the removal code [in the centralized railway control system] *by said centralized control operation from the railway traffic control apparatus*." ..... 120

F. Analysis of Independent Claim 20 ..... 120

1. 20[Pre]: "*A railway traffic control apparatus configured for centralized control of traffic of a centrally controllable railway network including plural railways and a plurality of railway traffic interlocks dispersed in said plural railways constituting said railway network, the railway traffic control apparatus comprising a processor and configured to:*" ..... 120

2. 20[A]: "*place a block on one or more sections of railway track in any of said plural railways constituting said railway network that is managed by centralized control operation from the railway traffic control apparatus, the railway traffic control apparatus controlling, by said centralized control operation, one or more interlocks amongst the plurality of railway traffic interlocks dispersed in said plural railways constituting said railway network, to prevent trains from traversing the one or more sections of railway track;"* ..... 120



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3. 20[B]: *"generate a secret release code associated with the blocked one or more sections of railway track;"* ..... 120

4. 20[C]: "*transmit the secret release code to a user terminal via a network;"* ..... 121

5. 20[D]: *"receive the secret release code via the network; and"* ..... 121

6. 20[E]: *"responsive to receiving the secret release code from the terminal, remove the block from the one or more sections of railway track."* ..... 122

G. Analysis of Independent Claim 30 ..... 123

1. 30[Pre]: "A method for controlling railway access using a railway traffic control apparatus configured for centralized control of traffic of a centrally controllable railway network including plural railways and a plurality of railway traffic interlocks dispersed in said plural railways constituting said railway network, the method comprising:" ..... 123

2. 30[A]: *"placing a block on one or more sections of railway track in any of said plural railways constituting said railway network that is managed by centralized control operation from the railway traffic control apparatus, the railway traffic control apparatus controlling, by said centralized control operation, one or more interlocks amongst the plurality of railway traffic interlocks dispersed in said plural railways constituting said railway network, to prevent trains from traversing the one or more sections of railway track;"* ..... 123

3. 30[B]: *"generating a secret release code associated with the blocked one or more sections of railway track;"* ..... 123

4. 30[C]: *"transmitting the secret release code to a user terminal via a network;"* ..... 123

5. 30[D]: *"receiving the secret release code via the network; and"* ..... 123

6. 30[E]: *"responsive to receiving the secret release code from the terminal, removing the block from the one or more sections of railway track."* ..... 124



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H. Analysis of Independent Claim 40 ..... 124

1. 40[Pre]: *"A system comprising:"* ..... 124

2. 40[A]: *"a railway control apparatus comprising a processor and a memory device, the railway control apparatus configured to communicate with a plurality of railway traffic interlocks and a user terminal via a network and to perform centralized control of traffic of a centrally controllable railway network including plural railways and the plurality of railway traffic interlocks dispersed in said plural railways constituting said railway network, wherein the processor is configured by execution of computer program instructions to cause the railway control apparatus to:"* ..... 124

3. 40[B]: *"receive a selection of track sections to block in any of said plural railways constituting said railway network that is managed by centralized control operation from the railway control apparatus, wherein each selected track section corresponds to one or more railway traffic interlocks amongst the plurality of railway traffic interlocks dispersed in said plural railways constituting said railway network;"* ..... 124

4. 40[C]: *"responsive to receiving the selection, generate a secret code associated with the selected track sections;"* ..... 125

5. 40[D]: *"responsive to generating the secret code, save the secret code in the memory device;"* ..... 125

6. *40[E]: "associate the secret code with a remote user of the user terminal;"* ..... 125

7. 40[F]: "*transmit a block signal to the corresponding one or more railway traffic interlocks to place a block on the selected track sections; and"* ..... 125

8. 40[G]: "*transmit the secret code to the remote user of the user terminal."* ..... 126

I. Analysis of Dependent Claims 2-7, 9, 11-16, 18, 21-29, 31-39, 41 ..... 127

1. Claim 2: "The centralized railway control system of claim 1, wherein the railway traffic control apparatus further comprises: a [RTC] *railway traffic controller (RTC)* user



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interface to permit a user to specify said one or more track sections to be blocked, specify an instruction to the centralized railway control system to block the railway traffic to the specified track sections, and specify identifying information of the railway field worker to be performing work in the specified track sections.” ..... 127

Claim 11: “The railway traffic control apparatus of claim 10, further comprising: a [RTC] *railway traffic controller (RTC)* user interface to permit a user to specify [said one or more] track sections to be blocked, specify an instruction to the [centralized] railway *traffic* control [system] *apparatus* to block the railway traffic to the specified track sections, and specify identifying information of the railway field worker to be performing work in the specified track sections.” ..... 127

2. Claim 3: “The centralized railway control system of claim 1, further comprising: ..... 129

a railway control database registering block identifying information, including block limits identifying the one or more blocked track sections, along with the removal code for removing the block of the track sections.” ..... 129

Claim 12: “The railway traffic control apparatus of claim 10, wherein block identifying information, including block limits identifying the one or more blocked track sections, is registered in a railway control database, along with the removal code for removing the block of the track sections.” ..... 129

3. Claim 4: “The centralized railway control system of claim 1, further comprising: ..... 131

a railway control database registering (a) identification of the user who specified the instruction to block the track sections and (b) block identifying information, including block limits identifying the one or more blocked track sections, notes specifying reasons for the block, and date and time at which the block was placed.” ..... 131

Claim 13: “The railway traffic control apparatus of claim 10, wherein block identifying information, including block limits identifying the one or more blocked track sections, notes



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specifying reasons for the block, and date and time at which the block was placed, are registered in a railway control database, along with identification of the user who specified the instruction to block the track sections." ..... 131

4. Claim 5: "The centralized railway control system of claim 1, wherein upon placement by the block placing part of the block of railway traffic to said one or more specified track sections, the code generation part transmits the removal code to the electronic contact address of the railway field worker, and the block of railway traffic to said one or more specified track sections remains in place in the centralized railway control system until the entry of the removal code in the centralized railway control system to cause the block removal part to remove the block on said one or more track sections." ..... 133

Claim 14: "The railway traffic control apparatus of claim 10, wherein upon placement by the block placing part of the block of railway traffic to said one or more specified track sections, the code generation [code] *part* transmits the removal code to the electronic contact address of the railway field worker, and the block of railway traffic to said one or more specified track sections remains in place in the [centralized] railway *traffic* control [system] *apparatus* until the entry of the removal code in the [centralized] railway *traffic* control [system] *apparatus* to cause the block removal part to remove the block on said one or more track sections." ..... 134

5. 6[Pre]: "The centralized railway control system of claim 1, wherein the railway traffic control apparatus further comprises:" ..... 134

6[A]: "a block removal user interface to permit a user to enter the removal code to cause the block removal part to remove the block on said one or more track sections," ..... 134

6[B]: "wherein the block of railway traffic to said one or more specified track sections remains in place in the centralized railway control system until the entry of the removal code through the block removal user interface." ..... 134



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15[Pre]: “The railway traffic control apparatus of claim 10, further comprising:” ..... 134

15[A]: “a block removal user interface to permit a user to enter the removal code to cause the block removal part to remove the block on said one or more *specified* track sections,” ..... 134

15[B]: “wherein the block of railway traffic to said one or more specified track sections remains in place in the [centralized] railway *traffic* control [system] *apparatus* until the entry of the removal code through the block removal user interface.” ..... 135

6. 7[Pre]: “The centralized railway control system of claim 6, wherein the block removal user interface further requires, in addition to the entry of the removal code, the user to specify that confirmation that the track sections have been cleared has been obtained from the railway field worker associated with the block, before the block removal user interface permits the removal code to be transmitted to the block removal pail, and” ..... 135

7[A]: “the centralized railway control system further comprises a railway control database registering (a) block identifying information identifying the one or more blocked track sections, date and time at which the block was placed and identifying [information] the railway field worker associated with the block, and (b) block removal information identifying date and time at which the block was removed and identifying the user who entered the removal code and specified that confirmation that the track sections have been cleared was obtained from the railway field worker associated with the block.” ..... 135

16[Pre]: “The railway traffic control apparatus of claim 15, wherein the block removal user interface further requires, in addition to the entry of the removal code, the user to specify that confirmation that the track sections have been cleared has been obtained from the railway field worker associated with the block, before the block removal user interface permits the removal code to be transmitted to the block removal part, and”..... 135



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16[A]: "block identifying information identifying the one or more blocked track sections, date and time at which the block was placed and identifying [information] the railway field worker associated with the block is registered in a railway control database, along with block removal information identifying date and time at which the block was removed and identifying the user who entered the removal code and specified that confirmation that the track sections have been cleared was obtained from the railway field worker associated with the block." ..... 135

7. Claim 9: "The centralized railway control system of claim 1, wherein the code generation part transmits an electronic message to the electronic contact address of the railway field worker, and the electronic message transmitted to the electronic contact address of the railway field worker includes the removal code and includes an embedded link for activating a return transmission of the removal code to the block removal part of the centralized railway control system." ..... 138

Claim 18: "The railway traffic control apparatus of claim 10, wherein the code generation part transmits an electronic message to the electronic contact address of the railway field worker, and the electronic message transmitted to the electronic contact address of the railway field worker includes the removal code and includes an embedded link for activating a return transmission of the removal code to the block removal part of the [centralized] railway *traffic* control [system] *apparatus*." ..... 138

Claim 27: "*The railway traffic control apparatus of claim 20, wherein the railway traffic control apparatus is configured to transmit the secret release code to the user terminal by transmitting a message to the user terminal, the message comprising one or more embedded links."* ..... 138

Claim 28*: "The railway traffic control apparatus of claim 27, wherein the railway traffic control apparatus is configured to receive the secret release code transmitted via the network in*



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*response to selection of at least one of the one or more embedded links in the message, on the user terminal."* ..... 138

Claim 29: "*The railway traffic control apparatus of claim 27, wherein the message comprises a text message or an email."* ..... 138

Claim 37: *"The method of claim 30, wherein transmitting the secret release code comprises transmitting a message to the user terminal, the message comprising one or more embedded links."* ..... 138

Claim 38: "*The method of claim 37, wherein the secret release code is transmitted via the network in response to selection of at least one of the one or more embedded links in the message, on the user terminal, and is received by the railway traffic control apparatus."* ..... 139

Claim 39*: "The method of claim 37, wherein the message comprises a text message or an email."* ..... 139

8. Claim 21*: "The railway traffic control apparatus of claim 20, wherein the block is placed via an interlocking signal prohibiting trains from traversing the one or more sections of railway track."* ..... 141

Claim 31*: "The method of claim 30, wherein the block is placed via an interlocking signal prohibiting trains from traversing the one or more sections of railway track."* ..... 141

9. Claim 22: *"The railway traffic control apparatus of claim 20, wherein the railway traffic control apparatus is configured to place the block by causing one or more of the plurality of railway traffic interlocks to display a STOP signal."* ..... 141

Claim 32: *"The method of claim 30, wherein the railway traffic control apparatus is configured to place the block by causing one or more of the plurality of railway traffic interlocks to display a STOP signal."* ..... 141

10. Claim 23*: "The railway traffic control apparatus of claim 20, wherein only the railway traffic control apparatus and the user terminal receive the secret release code generated by the railway traffic control apparatus."* ..... 142



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Claim 33*: "The method of claim 30, wherein only the railway traffic control apparatus and the user terminal receive the secret release code generated by the railway traffic control apparatus."* ..... 142

11. Claim 24: "*The railway traffic control apparatus of claim 20, wherein the railway traffic control apparatus is further configured to: store the secret release code in a memory of the railway traffic control apparatus."* ..... 142

Claim 34*: "The method of claim 30, further comprising: storing the secret release code in a memory of the railway traffic control apparatus."* ..... 142

12. Claim 25: *"The railway traffic control apparatus of claim 20, wherein the railway traffic control apparatus is further configured to: generate and store block removal information in response to removing the block from the one or more sections of railway track."* ..... 142

Claim 35: *"The method of claim 30, further comprising: generating and storing block removal information in response to removing the block from the one or more sections of railway track."* ..... 142

13. Claim 26: "*The railway traffic control apparatus of claim 25, wherein the block removal information comprises a date and time when the block was removed and identification information of a user who entered the secret removal code."* ..... 143

Claim 36: *"The method of claim 35, wherein the block removal information comprises a date and time when the block was removed and identification information of a user who entered the secret removal code."* ..... 143

14. 41[Pre]: *"The system of claim 40, wherein the processor configured by execution of computer program instructions additionally causes the railway control apparatus to:"* ..... 144

41[A]: *"receive the secret code from the user terminal via the network;"* ..... 144



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41[B]: *"verify the secret code by comparing the secret code received from the user terminal with the secret code stored in the memory device;"* ..... 144

41[C]: *"receive an instruction to remove the block from the selected track sections, after verifying the secret code; and"* ..... 144

41[D]: *"responsive to the instruction to remove the block received after verifying the secret code, transmit a block removal signal to the corresponding railway traffic interlocks."* ..... 144

XI. GROUND 2: CLAIMS 1-8 ARE OBVIOUS OVER FRA-REPORT, KRUIJSWIJK, AND MACEY ..... 145

A. Summary of FRA-Report and Analogous Art ..... 145

B. Summary of Kruijswijk and Analogous Art ..... 145

C. Summary of Macey and Analogous Art ..... 145

D. Analysis of Independent Claim 1 ..... 148

1. 1[Pre]: "A centralized railway control system comprising:" ..... 148

2. 1[A]: "a rail personnel contact database registering, for each railway personnel, an electronic contact address of the railway personnel; and" ..... 148

3. 1[B]: "a railway traffic control apparatus *configured for centralized control of traffic of a centrally controllable railway network including plural railways and a plurality of railway traffic interlocks dispersed in said plural railways constituting said railway network,* for controlling access to railway tracks, said railway traffic control apparatus comprising a processor, a non-transitory medium storing one or more programs of executable instructions, and a network interface through which the railway traffic control apparatus communicates via a network with a user terminal," ..... 148

4. 1[C]: "wherein execution of said one or more programs of executable instructions configures *the railway traffic control apparatus comprising* the processor to include: a block placing part to place a block on one or more specified track sections *in any of said plural railways constituting said railway network that is managed by centralized control*



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*operation from the railway traffic control apparatus, the railway traffic control apparatus controlling, by said centralized control operation, one or more interlocks amongst the plurality of railway traffic interlocks dispersed in said plural railways constituting said railway network, to block railway traffic to the specified track sections and thereby* to permit a railway field worker to enter the track sections [while blocking railway traffic to said track sections];" ..... 149

5. 1[D]: "a code generation part to generate a removal code, retrieve the electronic contact address of the railway field worker from the rail personnel contact database, and transmit the removal code to the electronic contact address of the railway field worker; and" ..... 149

6. 1[E]: "a block removal part to remove only upon entry of the removal code *by said centralized control operation from the railway control apparatus*, the block placed by the block placing part on said one or more track sections." ..... 149

E. Analysis of Independent Claim 10 ..... 153

1. 10[Pre]: "A railway traffic control apparatus *configured for centralized control of traffic of a centrally controllable railway network including plural railways and a plurality of railway traffic interlocks dispersed in said plural railways constituting said railway network*, for controlling access to railway tracks, said railway traffic control apparatus comprising:" ..... 153

2. 10[A]: "a block placing part to place a block on one or more [selected] *specified* track sections *in any of said plural railways constituting said railway network that is managed by centralized control operation from the railway traffic control apparatus, the railway traffic control apparatus controlling, by said centralized control operation, one or more interlocks amongst the plurality of railway traffic interlocks dispersed in said plural railways constituting said railway network, to block railway traffic to the specified track sections and thereby* to permit a railway field worker to enter



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the track sections [while blocking railway traffic to said track sections];” ..... 153

3. 10[B]: “a code generation part to generate a removal code, determine an electronic contact address of the railway field worker by accessing a rail personnel contact database registering, for each railway personnel, electronic contact information of the railway personnel, and transmit the removal code to the electronic contact address of the railway field worker; and” ..... 154

4. 10[C]: “a block removal part to remove only upon entry of the removal code *by said centralized control operation from the railway traffic control apparatus*, the block placed by the block placing part on said one or more track sections for the railway field worker.” ..... 154

F. Analysis of Independent Claim 19 ..... 154

1. 19[Pre]: “A method for *controlling railway access using a railway traffic control apparatus of* a centralized railway control system [to control access to railway tracks] *configured for centralized control of traffic of a centrally controllable railway network including plural railways and a plurality of railway traffic interlocks dispersed in said plural railways constituting said railway network*, the method comprising:” ..... 154

2. 19[A]: “providing a user interface [on a user terminal] *of the railway traffic control apparatus*, including a block placing part to place a block on one or more specified track sections *in any of said plural railways constituting said railway network that is managed by centralized control operation from the railway traffic control apparatus, the railway traffic control apparatus controlling, by said centralized control operation, one or more interlocks amongst the plurality of railway traffic interlocks dispersed in said plural railways constituting said railway network, to block railway traffic to the specified track sections and thereby* to permit a railway field worker to enter the track sections [while blocking railway traffic to said track sections];” ..... 155



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3. 19[B]: "generating a removal code, determining an electronic contact address of the railway field worker by accessing a rail personnel contact database registering, for each railway personnel, electronic contact information of the railway personnel, and transmitting the removal code to the electronic contact address of the railway field worker; and"..... 155

4. 19[C]: "permitting the block to said one or more track sections to be removed only upon entry of the removal code [in the centralized railway control system] *by said centralized control operation from the railway traffic control apparatus*." ..... 155

G. Analysis of Independent Claim 20 ..... 156

1. 20[Pre]: "*A railway traffic control apparatus configured for centralized control of traffic of a centrally controllable railway network including plural railways and a plurality of railway traffic interlocks dispersed in said plural railways constituting said railway network, the railway traffic control apparatus comprising a processor and configured to:*" ..... 156

2. 20[A]: "*place a block on one or more sections of railway track in any of said plural railways constituting said railway network that is managed by centralized control operation from the railway traffic control apparatus, the railway traffic control apparatus controlling, by said centralized control operation, one or more interlocks amongst the plurality of railway traffic interlocks dispersed in said plural railways constituting said railway network, to prevent trains from traversing the one or more sections of railway track;"*..... 156

3. 20[B]: *"generate a secret release code associated with the blocked one or more sections of railway track;"*..... 156

4. 20[C]: "*transmit the secret release code to a user terminal via a network;"*..... 156

5. 20[D]: *"receive the secret release code via the network; and"* ..... 156



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6. 20[E]: *"responsive to receiving the secret release code from the terminal, remove the block from the one or more sections of railway track."* ..... 157

H. Analysis of Independent Claim 30 ..... 157

1. 30[Pre]: "A method for controlling railway access using a railway traffic control apparatus configured for centralized control of traffic of a centrally controllable railway network including plural railways and a plurality of railway traffic interlocks dispersed in said plural railways constituting said railway network, the method comprising:" ..... 157

2. 30[A]: *"placing a block on one or more sections of railway track in any of said plural railways constituting said railway network that is managed by centralized control operation from the railway traffic control apparatus, the railway traffic control apparatus controlling, by said centralized control operation, one or more interlocks amongst the plurality of railway traffic interlocks dispersed in said plural railways constituting said railway network, to prevent trains from traversing the one or more sections of railway track;"* ..... 157

3. 30[B]: *"generating a secret release code associated with the blocked one or more sections of railway track;"* ..... 157

4. 30[C]: *"transmitting the secret release code to a user terminal via a network;"* ..... 157

5. 30[D]: *"receiving the secret release code via the network; and"* ..... 158

6. 30[E]: *"responsive to receiving the secret release code from the terminal, removing the block from the one or more sections of railway track."* ..... 158

I. Analysis of Independent Claim 40 ..... 158

1. 40[Pre]: *"A system comprising:"* ..... 158

2. 40[A]: *"a railway control apparatus comprising a processor and a memory device, the railway control apparatus configured to communicate with a plurality of railway traffic interlocks and a user terminal via a network and to perform centralized control of traffic of a centrally controllable*



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*railway network including plural railways and the plurality of railway traffic interlocks dispersed in said plural railways constituting said railway network, wherein the processor is configured by execution of computer program instructions to cause the railway control apparatus to:"* ..... 158

3. 40[B]: *"receive a selection of track sections to block in any of said plural railways constituting said railway network that is managed by centralized control operation from the railway control apparatus, wherein each selected track section corresponds to one or more railway traffic interlocks amongst the plurality of railway traffic interlocks dispersed in said plural railways constituting said railway network;"* ..... 159

4. 40[C]: *"responsive to receiving the selection, generate a secret code associated with the selected track sections;"* ..... 159

5. 40[D]: *"responsive to generating the secret code, save the secret code in the memory device;"* ..... 159

6. *40[E]: "associate the secret code with a remote user of the user terminal;"* ..... 159

7. 40[F]: "*transmit a block signal to the corresponding one or more railway traffic interlocks to place a block on the selected track sections; and"* ..... 159

8. 40[G]: "*transmit the secret code to the remote user of the user terminal."* ..... 159

J. Analysis of Dependent Claims 2-7, 9, 11-16, 18, 21-29, 31-39, 41 ..... 160

1. Claim 2: "The centralized railway control system of claim 1, wherein the railway traffic control apparatus further comprises: a [RTC] *railway traffic controller (RTC)* user interface to permit a user to specify said one or more track sections to be blocked, specify an instruction to the centralized railway control system to block the railway traffic to the specified track sections, and specify identifying information of the railway field worker to be performing work in the specified track sections."..... 160



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Claim 11: "The railway traffic control apparatus of claim 10, further comprising: a [RTC] *railway traffic controller (RTC)* user interface to permit a user to specify [said one or more] track sections to be blocked, specify an instruction to the [centralized] railway *traffic* control [system] *apparatus* to block the railway traffic to the specified track sections, and specify identifying information of the railway field worker to be performing work in the specified track sections." ..... 160

2. Claim 3: "The centralized railway control system of claim 1, further comprising: ..... 161

a railway control database registering block identifying information, including block limits identifying the one or more blocked track sections, along with the removal code for removing the block of the track sections." ..... 161

Claim 12: "The railway traffic control apparatus of claim 10, wherein block identifying information, including block limits identifying the one or more blocked track sections, is registered in a railway control database, along with the removal code for removing the block of the track sections." ..... 161

3. Claim 4: "The centralized railway control system of claim 1, further comprising: ..... 161

a railway control database registering (a) identification of the user who specified the instruction to block the track sections and (b) block identifying information, including block limits identifying the one or more blocked track sections, notes specifying reasons for the block, and date and time at which the block was placed." ..... 161

Claim 13: "The railway traffic control apparatus of claim 10, wherein block identifying information, including block limits identifying the one or more blocked track sections, notes specifying reasons for the block, and date and time at which the block was placed, are registered in a railway control database, along with identification of the user who specified the instruction to block the track sections." ..... 161

4. Claim 5: "The centralized railway control system of claim 1, wherein upon placement by the block placing part of the block



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of railway traffic to said one or more specified track sections, the code generation part transmits the removal code to the electronic contact address of the railway field worker, and the block of railway traffic to said one or more specified track sections remains in place in the centralized railway control system until the entry of the removal code in the centralized railway control system to cause the block removal part to remove the block on said one or more track sections." ..... 162

Claim 14: "The railway traffic control apparatus of claim 10, wherein upon placement by the block placing part of the block of railway traffic to said one or more specified track sections, the code generation [code] *part* transmits the removal code to the electronic contact address of the railway field worker, and the block of railway traffic to said one or more specified track sections remains in place in the [centralized] railway *traffic* control [system] *apparatus* until the entry of the removal code in the [centralized] railway *traffic* control [system] *apparatus* to cause the block removal part to remove the block on said one or more track sections." ..... 162

5. 6[Pre]: "The centralized railway control system of claim 1, wherein the railway traffic control apparatus further comprises:" ..... 162

6[A]: "a block removal user interface to permit a user to enter the removal code to cause the block removal part to remove the block on said one or more track sections," ..... 162

6[B]: "wherein the block of railway traffic to said one or more specified track sections remains in place in the centralized railway control system until the entry of the removal code through the block removal user interface." ..... 162

15[Pre]: "The railway traffic control apparatus of claim 10, further comprising:" ..... 162

15[A]: "a block removal user interface to permit a user to enter the removal code to cause the block removal part to remove the block on said one or more *specified* track sections," ..... 163

15[B]: "wherein the block of railway traffic to said one or more specified track sections remains in place in the [centralized]



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railway *traffic* control [system] *apparatus* until the entry of the removal code through the block removal user interface." ..... 163

6. 7[Pre]: "The centralized railway control system of claim 6, wherein the block removal user interface further requires, in addition to the entry of the removal code, the user to specify that confirmation that the track sections have been cleared has been obtained from the railway field worker associated with the block, before the block removal user interface permits the removal code to be transmitted to the block removal pail, and" ..... 163

7[A]: "the centralized railway control system further comprises a railway control database registering (a) block identifying information identifying the one or more blocked track sections, date and time at which the block was placed and identifying [information] the railway field worker associated with the block, and (b) block removal information identifying date and time at which the block was removed and identifying the user who entered the removal code and specified that confirmation that the track sections have been cleared was obtained from the railway field worker associated with the block." ..... 163

16[Pre]: "The railway traffic control apparatus of claim 15, wherein the block removal user interface further requires, in addition to the entry of the removal code, the user to specify that confirmation that the track sections have been cleared has been obtained from the railway field worker associated with the block, before the block removal user interface permits the removal code to be transmitted to the block removal part, and"..... 163

16[A]: "block identifying information identifying the one or more blocked track sections, date and time at which the block was placed and identifying [information] the railway field worker associated with the block is registered in a railway control database, along with block removal information identifying date and time at which the block was removed and identifying the user who entered the removal code and specified that confirmation that the track sections have been cleared was



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obtained from the railway field worker associated with the block." ..... 164

7. Claim 9: "The centralized railway control system of claim 1, wherein the code generation part transmits an electronic message to the electronic contact address of the railway field worker, and the electronic message transmitted to the electronic contact address of the railway field worker includes the removal code and includes an embedded link for activating a return transmission of the removal code to the block removal part of the centralized railway control system." ..... 164

Claim 18: "The railway traffic control apparatus of claim 10, wherein the code generation part transmits an electronic message to the electronic contact address of the railway field worker, and the electronic message transmitted to the electronic contact address of the railway field worker includes the removal code and includes an embedded link for activating a return transmission of the removal code to the block removal part of the [centralized] railway *traffic* control [system] *apparatus*." ..... 164

Claim 27: "*The railway traffic control apparatus of claim 20, wherein the railway traffic control apparatus is configured to transmit the secret release code to the user terminal by transmitting a message to the user terminal, the message comprising one or more embedded links."* ..... 164

Claim 28*: "The railway traffic control apparatus of claim 27, wherein the railway traffic control apparatus is configured to receive the secret release code transmitted via the network in response to selection of at least one of the one or more embedded links in the message, on the user terminal."* ..... 165

Claim 29: "*The railway traffic control apparatus of claim 27, wherein the message comprises a text message or an email."* ..... 165

Claim 37: *"The method of claim 30, wherein transmitting the secret release code comprises transmitting a message to the user terminal, the message comprising one or more embedded links."* ..... 165



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Claim 38: "*The method of claim 37, wherein the secret release code is transmitted via the network in response to selection of at least one of the one or more embedded links in the message, on the user terminal, and is received by the railway traffic control apparatus."* ..... 165

Claim 39*: "The method of claim 37, wherein the message comprises a text message or an email."* ..... 165

8. Claim 21*: "The railway traffic control apparatus of claim 20, wherein the block is placed via an interlocking signal prohibiting trains from traversing the one or more sections of railway track."* ..... 165

Claim 31*: "The method of claim 30, wherein the block is placed via an interlocking signal prohibiting trains from traversing the one or more sections of railway track."* ..... 165

9. Claim 22: *"The railway traffic control apparatus of claim 20, wherein the railway traffic control apparatus is configured to place the block by causing one or more of the plurality of railway traffic interlocks to display a STOP signal."* ..... 166

Claim 32: *"The method of claim 30, wherein the railway traffic control apparatus is configured to place the block by causing one or more of the plurality of railway traffic interlocks to display a STOP signal."* ..... 166

10. Claim 23*: "The railway traffic control apparatus of claim 20, wherein only the railway traffic control apparatus and the user terminal receive the secret release code generated by the railway traffic control apparatus."* ..... 166

Claim 33*: "The method of claim 30, wherein only the railway traffic control apparatus and the user terminal receive the secret release code generated by the railway traffic control apparatus."* ..... 166

11. Claim 24: "*The railway traffic control apparatus of claim 20, wherein the railway traffic control apparatus is further configured to: store the secret release code in a memory of the railway traffic control apparatus."* ..... 166



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Claim 34*: "The method of claim 30, further comprising: storing the secret release code in a memory of the railway traffic control apparatus."* ..... 166

12. Claim 25: *"The railway traffic control apparatus of claim 20, wherein the railway traffic control apparatus is further configured to: generate and store block removal information in response to removing the block from the one or more sections of railway track."* ..... 166

Claim 35: *"The method of claim 30, further comprising: generating and storing block removal information in response to removing the block from the one or more sections of railway track."* ..... 167

13. Claim 26: "*The railway traffic control apparatus of claim 25, wherein the block removal information comprises a date and time when the block was removed and identification information of a user who entered the secret removal code."* ..... 167

Claim 36: *"The method of claim 35, wherein the block removal information comprises a date and time when the block was removed and identification information of a user who entered the secret removal code."* ..... 167

14. 41[Pre]: *"The system of claim 40, wherein the processor configured by execution of computer program instructions additionally causes the railway control apparatus to:"* ..... 167

41[A]: *"receive the secret code from the user terminal via the network;"* ..... 167

41[B]: *"verify the secret code by comparing the secret code received from the user terminal with the secret code stored in the memory device;"* ..... 167

41[C]: *"receive an instruction to remove the block from the selected track sections, after verifying the secret code; and"* ..... 167

41[D]: *"responsive to the instruction to remove the block received after verifying the secret code, transmit a block removal signal to the corresponding railway traffic interlocks."* ..... 167

XII. GROUND 3: CLAIMS 1-8 ARE OBVIOUS OVER FRA-REPORT AND SCHMITZ ..... 168



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A. Summary of FRA-Report and Analogous Art ..... 168
B. Summary of Schmitz and Analogous Art ..... 168
C. Analysis of Independent Claim 1 ..... 171
1. 1[Pre]: "A centralized railway control system comprising:" ..... 171
2. 1[A]: "a rail personnel contact database registering, for each railway personnel, an electronic contact address of the railway personnel; and" ..... 171
3. 1[B]: "a railway traffic control apparatus *configured for centralized control of traffic of a centrally controllable railway network including plural railways and a plurality of railway traffic interlocks dispersed in said plural railways constituting said railway network*, for controlling access to railway tracks, said railway traffic control apparatus comprising a processor, a non-transitory medium storing one or more programs of executable instructions, and a network interface through which the railway traffic control apparatus communicates via a network with a user terminal," ..... 171
4. 1[C]: "wherein execution of said one or more programs of executable instructions configures *the railway traffic control apparatus comprising* the processor to include: a block placing part to place a block on one or more specified track sections *in any of said plural railways constituting said railway network that is managed by centralized control operation from the railway traffic control apparatus, the railway traffic control apparatus controlling, by said centralized control operation, one or more interlocks amongst the plurality of railway traffic interlocks dispersed in said plural railways constituting said railway network, to block railway traffic to the specified track sections and thereby* to permit a railway field worker to enter the track sections [while blocking railway traffic to said track sections];" ..... 172
5. 1[D]: "a code generation part to generate a removal code, retrieve the electronic contact address of the railway field worker from the rail personnel contact database, and transmit



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the removal code to the electronic contact address of the railway field worker; and” ..... 172

6. 1[E]: “a block removal part to remove only upon entry of the removal code *by said centralized control operation from the railway control apparatus*, the block placed by the block placing part on said one or more track sections.” ..... 179

D. Analysis of Independent Claim 10 ..... 185

1. 10[Pre]: “A railway traffic control apparatus *configured for centralized control of traffic of a centrally controllable railway network including plural railways and a plurality of railway traffic interlocks dispersed in said plural railways constituting said railway network*, for controlling access to railway tracks, said railway traffic control apparatus comprising:” ..... 185

2. 10[A]: “a block placing part to place a block on one or more [selected] *specified* track sections *in any of said plural railways constituting said railway network that is managed by centralized control operation from the railway traffic control apparatus, the railway traffic control apparatus controlling, by said centralized control operation, one or more interlocks amongst the plurality of railway traffic interlocks dispersed in said plural railways constituting said railway network, to block railway traffic to the specified track sections and thereby* to permit a railway field worker to enter the track sections [while blocking railway traffic to said track sections];” ..... 185

3. 10[B]: “a code generation part to generate a removal code, determine an electronic contact address of the railway field worker by accessing a rail personnel contact database registering, for each railway personnel, electronic contact information of the railway personnel, and transmit the removal code to the electronic contact address of the railway field worker; and” ..... 185

4. 10[C]: “a block removal part to remove only upon entry of the removal code *by said centralized control operation from the railway traffic control apparatus*, the block placed by the



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block placing part on said one or more track sections for the railway field worker." ..... 186

E. Analysis of Independent Claim 19 ..... 186

1. 19[Pre]: "A method for *controlling railway access using a railway traffic control apparatus of* a centralized railway control system [to control access to railway tracks] *configured for centralized control of traffic of a centrally controllable railway network including plural railways and a plurality of railway traffic interlocks dispersed in said plural railways constituting said railway network,* the method comprising:" ..... 186

2. 19[A]: "providing a user interface [on a user terminal] *of the railway traffic control apparatus,* including a block placing part to place a block on one or more specified track sections *in any of said plural railways constituting said railway network that is managed by centralized control operation from the railway traffic control apparatus, the railway traffic control apparatus controlling, by said centralized control operation, one or more interlocks amongst the plurality of railway traffic interlocks dispersed in said plural railways constituting said railway network, to block railway traffic to the specified track sections and thereby* to permit a railway field worker to enter the track sections [while blocking railway traffic to said track sections];" ..... 186

3. 19[B]: "generating a removal code, determining an electronic contact address of the railway field worker by accessing a rail personnel contact database registering, for each railway personnel, electronic contact information of the railway personnel, and transmitting the removal code to the electronic contact address of the railway field worker; and" ..... 187

4. 19[C]: "permitting the block to said one or more track sections to be removed only upon entry of the removal code [in the centralized railway control system] *by said centralized control operation from the railway traffic control apparatus*." ..... 187

F. Analysis of Independent Claim 20 ..... 187



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1. 20[Pre]: "*A railway traffic control apparatus configured for centralized control of traffic of a centrally controllable railway network including plural railways and a plurality of railway traffic interlocks dispersed in said plural railways constituting said railway network, the railway traffic control apparatus comprising a processor and configured to:*" ..... 187

2. 20[A]: "*place a block on one or more sections of railway track in any of said plural railways constituting said railway network that is managed by centralized control operation from the railway traffic control apparatus, the railway traffic control apparatus controlling, by said centralized control operation, one or more interlocks amongst the plurality of railway traffic interlocks dispersed in said plural railways constituting said railway network, to prevent trains from traversing the one or more sections of railway track;"* ..... 187

3. 20[B]: *"generate a secret release code associated with the blocked one or more sections of railway track;"* ..... 188

4. 20[C]: "*transmit the secret release code to a user terminal via a network;"* ..... 188

5. 20[D]: *"receive the secret release code via the network; and"* ..... 188

6. 20[E]: *"responsive to receiving the secret release code from the terminal, remove the block from the one or more sections of railway track."* ..... 188

G. Analysis of Independent Claim 30 ..... 188

1. 30[Pre]: "A method for controlling railway access using a railway traffic control apparatus configured for centralized control of traffic of a centrally controllable railway network including plural railways and a plurality of railway traffic interlocks dispersed in said plural railways constituting said railway network, the method comprising:" ..... 188

2. 30[A]: *"placing a block on one or more sections of railway track in any of said plural railways constituting said railway network that is managed by centralized control operation from the railway traffic control apparatus, the railway traffic*



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*control apparatus controlling, by said centralized control operation, one or more interlocks amongst the plurality of railway traffic interlocks dispersed in said plural railways constituting said railway network, to prevent trains from traversing the one or more sections of railway track;"* ..... 189

3. 30[B]: *"generating a secret release code associated with the blocked one or more sections of railway track;"* ..... 189

4. 30[C]: *"transmitting the secret release code to a user terminal via a network;"* ..... 189

5. 30[D]: *"receiving the secret release code via the network; and"* ..... 189

6. 30[E]: *"responsive to receiving the secret release code from the terminal, removing the block from the one or more sections of railway track."* ..... 189

H. Analysis of Independent Claim 40 ..... 189

1. 40[Pre]: *"A system comprising:"* ..... 190

2. 40[A]: *"a railway control apparatus comprising a processor and a memory device, the railway control apparatus configured to communicate with a plurality of railway traffic interlocks and a user terminal via a network and to perform centralized control of traffic of a centrally controllable railway network including plural railways and the plurality of railway traffic interlocks dispersed in said plural railways constituting said railway network, wherein the processor is configured by execution of computer program instructions to cause the railway control apparatus to:"* ..... 190

3. 40[B]: *"receive a selection of track sections to block in any of said plural railways constituting said railway network that is managed by centralized control operation from the railway control apparatus, wherein each selected track section corresponds to one or more railway traffic interlocks amongst the plurality of railway traffic interlocks dispersed in said plural railways constituting said railway network;"* ..... 190

4. 40[C]: *"responsive to receiving the selection, generate a secret code associated with the selected track sections;"* ..... 190



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5. 40[D]: *"responsive to generating the secret code, save the secret code in the memory device;"* ..... 190

6. *40[E]: "associate the secret code with a remote user of the user terminal;"* ..... 191

7. 40[F]: "*transmit a block signal to the corresponding one or more railway traffic interlocks to place a block on the selected track sections; and"* ..... 191

8. 40[G]: "*transmit the secret code to the remote user of the user terminal."* ..... 191

I. Analysis of Dependent Claims 2-7, 9, 11-16, 18, 21-29, 31-39, 41 ..... 191

1. Claim 2: "The centralized railway control system of claim 1, wherein the railway traffic control apparatus further comprises: a [RTC] *railway traffic controller (RTC)* user interface to permit a user to specify said one or more track sections to be blocked, specify an instruction to the centralized railway control system to block the railway traffic to the specified track sections, and specify identifying information of the railway field worker to be performing work in the specified track sections." ..... 192

Claim 11: "The railway traffic control apparatus of claim 10, further comprising: a [RTC] *railway traffic controller (RTC)* user interface to permit a user to specify [said one or more] track sections to be blocked, specify an instruction to the [centralized] railway *traffic* control [system] *apparatus* to block the railway traffic to the specified track sections, and specify identifying information of the railway field worker to be performing work in the specified track sections." ..... 192

2. Claim 3: "The centralized railway control system of claim 1, further comprising: ..... 192

a railway control database registering block identifying information, including block limits identifying the one or more blocked track sections, along with the removal code for removing the block of the track sections." ..... 192



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Claim 12: "The railway traffic control apparatus of claim 10, wherein block identifying information, including block limits identifying the one or more blocked track sections, is registered in a railway control database, along with the removal code for removing the block of the track sections." ..... 192

3. Claim 4: "The centralized railway control system of claim 1, further comprising: ..... 193

a railway control database registering (a) identification of the user who specified the instruction to block the track sections and (b) block identifying information, including block limits identifying the one or more blocked track sections, notes specifying reasons for the block, and date and time at which the block was placed." ..... 193

Claim 13: "The railway traffic control apparatus of claim 10, wherein block identifying information, including block limits identifying the one or more blocked track sections, notes specifying reasons for the block, and date and time at which the block was placed, are registered in a railway control database, along with identification of the user who specified the instruction to block the track sections." ..... 193

4. Claim 5: "The centralized railway control system of claim 1, wherein upon placement by the block placing part of the block of railway traffic to said one or more specified track sections, the code generation part transmits the removal code to the electronic contact address of the railway field worker, and the block of railway traffic to said one or more specified track sections remains in place in the centralized railway control system until the entry of the removal code in the centralized railway control system to cause the block removal part to remove the block on said one or more track sections." ..... 194

Claim 14: "The railway traffic control apparatus of claim 10, wherein upon placement by the block placing part of the block of railway traffic to said one or more specified track sections, the code generation [code] *part* transmits the removal code to the electronic contact address of the railway field worker, and the block of railway traffic to said one or more specified track



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sections remains in place in the [centralized] railway *traffic* control [system] *apparatus* until the entry of the removal code in the [centralized] railway *traffic* control [system] *apparatus* to cause the block removal part to remove the block on said one or more track sections.” ..... 194

5. 6[Pre]: “The centralized railway control system of claim 1, wherein the railway traffic control apparatus further comprises:” ..... 194

6[A]: “a block removal user interface to permit a user to enter the removal code to cause the block removal part to remove the block on said one or more track sections,” ..... 194

6[B]: “wherein the block of railway traffic to said one or more specified track sections remains in place in the centralized railway control system until the entry of the removal code through the block removal user interface.” ..... 194

15[Pre]: “The railway traffic control apparatus of claim 10, further comprising:” ..... 194

15[A]: “a block removal user interface to permit a user to enter the removal code to cause the block removal part to remove the block on said one or more *specified* track sections,” ..... 195

15[B]: “wherein the block of railway traffic to said one or more specified track sections remains in place in the [centralized] railway *traffic* control [system] *apparatus* until the entry of the removal code through the block removal user interface.” ..... 195

6. 7[Pre]: “The centralized railway control system of claim 6, wherein the block removal user interface further requires, in addition to the entry of the removal code, the user to specify that confirmation that the track sections have been cleared has been obtained from the railway field worker associated with the block, before the block removal user interface permits the removal code to be transmitted to the block removal pail, and” ..... 195

7[A]: “the centralized railway control system further comprises a railway control database registering (a) block identifying information identifying the one or more blocked track



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sections, date and time at which the block was placed and identifying [information] the railway field worker associated with the block, and (b) block removal information identifying date and time at which the block was removed and identifying the user who entered the removal code and specified that confirmation that the track sections have been cleared was obtained from the railway field worker associated with the block." ..... 195

16[Pre]: "The railway traffic control apparatus of claim 15, wherein the block removal user interface further requires, in addition to the entry of the removal code, the user to specify that confirmation that the track sections have been cleared has been obtained from the railway field worker associated with the block, before the block removal user interface permits the removal code to be transmitted to the block removal part, and" ..... 195

16[A]: "block identifying information identifying the one or more blocked track sections, date and time at which the block was placed and identifying [information] the railway field worker associated with the block is registered in a railway control database, along with block removal information identifying date and time at which the block was removed and identifying the user who entered the removal code and specified that confirmation that the track sections have been cleared was obtained from the railway field worker associated with the block." ..... 196

7. Claim 9: "The centralized railway control system of claim 1, wherein the code generation part transmits an electronic message to the electronic contact address of the railway field worker, and the electronic message transmitted to the electronic contact address of the railway field worker includes the removal code and includes an embedded link for activating a return transmission of the removal code to the block removal part of the centralized railway control system." ..... 196

Claim 18: "The railway traffic control apparatus of claim 10, wherein the code generation part transmits an electronic



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message to the electronic contact address of the railway field worker, and the electronic message transmitted to the electronic contact address of the railway field worker includes the removal code and includes an embedded link for activating a return transmission of the removal code to the block removal part of the [centralized] railway *traffic* control [system] *apparatus*." ..... 196

Claim 27: "*The railway traffic control apparatus of claim 20, wherein the railway traffic control apparatus is configured to transmit the secret release code to the user terminal by transmitting a message to the user terminal, the message comprising one or more embedded links."* ..... 196

Claim 28*: "The railway traffic control apparatus of claim 27, wherein the railway traffic control apparatus is configured to receive the secret release code transmitted via the network in response to selection of at least one of the one or more embedded links in the message, on the user terminal."* ..... 197

Claim 29: "*The railway traffic control apparatus of claim 27, wherein the message comprises a text message or an email."* ..... 197

Claim 37: *"The method of claim 30, wherein transmitting the secret release code comprises transmitting a message to the user terminal, the message comprising one or more embedded links."* ..... 197

Claim 38: "*The method of claim 37, wherein the secret release code is transmitted via the network in response to selection of at least one of the one or more embedded links in the message, on the user terminal, and is received by the railway traffic control apparatus."* ..... 197

Claim 39*: "The method of claim 37, wherein the message comprises a text message or an email."* ..... 197

8. Claim 21*: "The railway traffic control apparatus of claim 20, wherein the block is placed via an interlocking signal prohibiting trains from traversing the one or more sections of railway track."* ..... 197



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Claim 31*: "The method of claim 30, wherein the block is placed via an interlocking signal prohibiting trains from traversing the one or more sections of railway track."* ..... 197

9. Claim 22: *"The railway traffic control apparatus of claim 20, wherein the railway traffic control apparatus is configured to place the block by causing one or more of the plurality of railway traffic interlocks to display a STOP signal."* ..... 198

Claim 32: *"The method of claim 30, wherein the railway traffic control apparatus is configured to place the block by causing one or more of the plurality of railway traffic interlocks to display a STOP signal."* ..... 198

10. Claim 23*: "The railway traffic control apparatus of claim 20, wherein only the railway traffic control apparatus and the user terminal receive the secret release code generated by the railway traffic control apparatus."* ..... 198

Claim 33*: "The method of claim 30, wherein only the railway traffic control apparatus and the user terminal receive the secret release code generated by the railway traffic control apparatus."* ..... 198

11. Claim 24: "*The railway traffic control apparatus of claim 20, wherein the railway traffic control apparatus is further configured to: store the secret release code in a memory of the railway traffic control apparatus."* ..... 198

Claim 34*: "The method of claim 30, further comprising: storing the secret release code in a memory of the railway traffic control apparatus."* ..... 198

12. Claim 25: *"The railway traffic control apparatus of claim 20, wherein the railway traffic control apparatus is further configured to: generate and store block removal information in response to removing the block from the one or more sections of railway track."* ..... 198

Claim 35: *"The method of claim 30, further comprising: generating and storing block removal information in response to removing the block from the one or more sections of railway track."* ..... 199



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13. Claim 26: "*The railway traffic control apparatus of claim 25, wherein the block removal information comprises a date and time when the block was removed and identification information of a user who entered the secret removal code."* ..... 199

Claim 36: *"The method of claim 35, wherein the block removal information comprises a date and time when the block was removed and identification information of a user who entered the secret removal code."* ..... 199

14. 41[Pre]: *"The system of claim 40, wherein the processor configured by execution of computer program instructions additionally causes the railway control apparatus to:"* ..... 199

41[A]: *"receive the secret code from the user terminal via the network;"* ..... 199

41[B]: *"verify the secret code by comparing the secret code received from the user terminal with the secret code stored in the memory device;"* ..... 199

41[C]: *"receive an instruction to remove the block from the selected track sections, after verifying the secret code; and"* ..... 199

41[D]: *"responsive to the instruction to remove the block received after verifying the secret code, transmit a block removal signal to the corresponding railway traffic interlocks."* ..... 199

XIII. GROUND 4: CLAIMS 1-8 ARE OBVIOUS OVER FRA-REPORT, BYFORD, AND MACEY ..... 200

A. Summary of FRA-Report and Analogous Art ..... 200

B. Summary of Byford and Analogous Art ..... 200

C. Summary of Macey and Analogous Art ..... 202

D. Analysis of Independent Claim 1 ..... 202

1. 1[Pre]: "A centralized railway control system comprising:" ..... 202

2. 1[A]: "a rail personnel contact database registering, for each railway personnel, an electronic contact address of the railway personnel; and" ..... 202

3. 1[B]: "a railway traffic control apparatus *configured for centralized control of traffic of a centrally controllable*



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*railway network including plural railways and a plurality of railway traffic interlocks dispersed in said plural railways constituting said railway network,* for controlling access to railway tracks, said railway traffic control apparatus comprising a processor, a non-transitory medium storing one or more programs of executable instructions, and a network interface through which the railway traffic control apparatus communicates via a network with a user terminal," ..... 203

4. 1[C]: "wherein execution of said one or more programs of executable instructions configures *the railway traffic control apparatus comprising* the processor to include: a block placing part to place a block on one or more specified track sections *in any of said plural railways constituting said railway network that is managed by centralized control operation from the railway traffic control apparatus, the railway traffic control apparatus controlling, by said centralized control operation, one or more interlocks amongst the plurality of railway traffic interlocks dispersed in said plural railways constituting said railway network, to block railway traffic to the specified track sections and thereby* to permit a railway field worker to enter the track sections [while blocking railway traffic to said track sections];" ..... 203

5. 1[D]: "a code generation part to generate a removal code, retrieve the electronic contact address of the railway field worker from the rail personnel contact database, and transmit the removal code to the electronic contact address of the railway field worker; and" ..... 203

6. 1[E]: "a block removal part to remove only upon entry of the removal code *by said centralized control operation from the railway control apparatus*, the block placed by the block placing part on said one or more track sections." ..... 210

E. Analysis of Independent Claim 10 ..... 215

1. 10[Pre]: "A railway traffic control apparatus *configured for centralized control of traffic of a centrally controllable railway network including plural railways and a plurality of*



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*railway traffic interlocks dispersed in said plural railways constituting said railway network,* for controlling access to railway tracks, said railway traffic control apparatus comprising:" ..... 215

2. 10[A]: "a block placing part to place a block on one or more [selected] *specified* track sections *in any of said plural railways constituting said railway network that is managed by centralized control operation from the railway traffic control apparatus, the railway traffic control apparatus controlling, by said centralized control operation, one or more interlocks amongst the plurality of railway traffic interlocks dispersed in said plural railways constituting said railway network, to block railway traffic to the specified track sections and thereby* to permit a railway field worker to enter the track sections [while blocking railway traffic to said track sections];" ..... 215

3. 10[B]: "a code generation part to generate a removal code, determine an electronic contact address of the railway field worker by accessing a rail personnel contact database registering, for each railway personnel, electronic contact information of the railway personnel, and transmit the removal code to the electronic contact address of the railway field worker; and" ..... 215

4. 10[C]: "a block removal part to remove only upon entry of the removal code *by said centralized control operation from the railway traffic control apparatus*, the block placed by the block placing part on said one or more track sections for the railway field worker." ..... 216

F. Analysis of Independent Claim 19 ..... 216

1. 19[Pre]: "A method for *controlling railway access using a railway traffic control apparatus of* a centralized railway control system [to control access to railway tracks] *configured for centralized control of traffic of a centrally controllable railway network including plural railways and a plurality of railway traffic interlocks dispersed in said plural*



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*railways constituting said railway network*, the method comprising:" ..... 216

2. 19[A]: "providing a user interface [on a user terminal] *of the railway traffic control apparatus*, including a block placing part to place a block on one or more specified track sections *in any of said plural railways constituting said railway network that is managed by centralized control operation from the railway traffic control apparatus, the railway traffic control apparatus controlling, by said centralized control operation, one or more interlocks amongst the plurality of railway traffic interlocks dispersed in said plural railways constituting said railway network, to block railway traffic to the specified track sections and thereby* to permit a railway field worker to enter the track sections [while blocking railway traffic to said track sections];" ..... 216

3. 19[B]: "generating a removal code, determining an electronic contact address of the railway field worker by accessing a rail personnel contact database registering, for each railway personnel, electronic contact information of the railway personnel, and transmitting the removal code to the electronic contact address of the railway field worker; and" ..... 217

4. 19[C]: "permitting the block to said one or more track sections to be removed only upon entry of the removal code [in the centralized railway control system] *by said centralized control operation from the railway traffic control apparatus*." ..... 217

G. Analysis of Independent Claim 20 ..... 217

1. 20[Pre]: "*A railway traffic control apparatus configured for centralized control of traffic of a centrally controllable railway network including plural railways and a plurality of railway traffic interlocks dispersed in said plural railways constituting said railway network, the railway traffic control apparatus comprising a processor and configured to:*" ..... 217

2. 20[A]: "*place a block on one or more sections of railway track in any of said plural railways constituting said railway network that is managed by centralized control operation*



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*from the railway traffic control apparatus, the railway traffic control apparatus controlling, by said centralized control operation, one or more interlocks amongst the plurality of railway traffic interlocks dispersed in said plural railways constituting said railway network, to prevent trains from traversing the one or more sections of railway track;"* ..... 217

3. 20[B]: *"generate a secret release code associated with the blocked one or more sections of railway track;"* ..... 218

4. 20[C]: "*transmit the secret release code to a user terminal via a network;"* ..... 218

5. 20[D]: *"receive the secret release code via the network; and"* ..... 218

6. 20[E]: *"responsive to receiving the secret release code from the terminal, remove the block from the one or more sections of railway track."* ..... 218

H. Analysis of Independent Claim 30 ..... 218

1. 30[Pre]: "A method for controlling railway access using a railway traffic control apparatus configured for centralized control of traffic of a centrally controllable railway network including plural railways and a plurality of railway traffic interlocks dispersed in said plural railways constituting said railway network, the method comprising:" ..... 218

2. 30[A]: *"placing a block on one or more sections of railway track in any of said plural railways constituting said railway network that is managed by centralized control operation from the railway traffic control apparatus, the railway traffic control apparatus controlling, by said centralized control operation, one or more interlocks amongst the plurality of railway traffic interlocks dispersed in said plural railways constituting said railway network, to prevent trains from traversing the one or more sections of railway track;"* ..... 219

3. 30[B]: *"generating a secret release code associated with the blocked one or more sections of railway track;"* ..... 219

4. 30[C]: *"transmitting the secret release code to a user terminal via a network;"* ..... 219



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5. 30[D]: *"receiving the secret release code via the network; and"* ..... 219

6. 30[E]: *"responsive to receiving the secret release code from the terminal, removing the block from the one or more sections of railway track."* ..... 219

I. Analysis of Independent Claim 40 ..... 219

1. 40[Pre]: *"A system comprising:"* ..... 220

2. 40[A]: *"a railway control apparatus comprising a processor and a memory device, the railway control apparatus configured to communicate with a plurality of railway traffic interlocks and a user terminal via a network and to perform centralized control of traffic of a centrally controllable railway network including plural railways and the plurality of railway traffic interlocks dispersed in said plural railways constituting said railway network, wherein the processor is configured by execution of computer program instructions to cause the railway control apparatus to:"* ..... 220

3. 40[B]: *"receive a selection of track sections to block in any of said plural railways constituting said railway network that is managed by centralized control operation from the railway control apparatus, wherein each selected track section corresponds to one or more railway traffic interlocks amongst the plurality of railway traffic interlocks dispersed in said plural railways constituting said railway network;"* ..... 220

4. 40[C]: *"responsive to receiving the selection, generate a secret code associated with the selected track sections;"* ..... 220

5. 40[D]: *"responsive to generating the secret code, save the secret code in the memory device;"* ..... 220

6. *40[E]: "associate the secret code with a remote user of the user terminal;"* ..... 221

7. 40[F]: "*transmit a block signal to the corresponding one or more railway traffic interlocks to place a block on the selected track sections; and"* ..... 221

8. 40[G]: "*transmit the secret code to the remote user of the user terminal."* ..... 221



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J. Analysis of Dependent Claims 2-7, 9, 11-16, 18, 21-29, 31-39, 41 ..... 221

1. Claim 2: "The centralized railway control system of claim 1, wherein the railway traffic control apparatus further comprises: a [RTC] *railway traffic controller (RTC)* user interface to permit a user to specify said one or more track sections to be blocked, specify an instruction to the centralized railway control system to block the railway traffic to the specified track sections, and specify identifying information of the railway field worker to be performing work in the specified track sections." ..... 222

Claim 11: "The railway traffic control apparatus of claim 10, further comprising: a [RTC] *railway traffic controller (RTC)* user interface to permit a user to specify [said one or more] track sections to be blocked, specify an instruction to the [centralized] railway *traffic* control [system] *apparatus* to block the railway traffic to the specified track sections, and specify identifying information of the railway field worker to be performing work in the specified track sections." ..... 222

2. Claim 3: "The centralized railway control system of claim 1, further comprising: ..... 222

a railway control database registering block identifying information, including block limits identifying the one or more blocked track sections, along with the removal code for removing the block of the track sections." ..... 222

Claim 12: "The railway traffic control apparatus of claim 10, wherein block identifying information, including block limits identifying the one or more blocked track sections, is registered in a railway control database, along with the removal code for removing the block of the track sections." ..... 222

3. Claim 4: "The centralized railway control system of claim 1, further comprising: ..... 223

a railway control database registering (a) identification of the user who specified the instruction to block the track sections and (b) block identifying information, including block limits identifying the one or more blocked track sections, notes



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specifying reasons for the block, and date and time at which the block was placed." ..... 223

Claim 13: "The railway traffic control apparatus of claim 10, wherein block identifying information, including block limits identifying the one or more blocked track sections, notes specifying reasons for the block, and date and time at which the block was placed, are registered in a railway control database, along with identification of the user who specified the instruction to block the track sections." ..... 223

4. Claim 5: "The centralized railway control system of claim 1, wherein upon placement by the block placing part of the block of railway traffic to said one or more specified track sections, the code generation part transmits the removal code to the electronic contact address of the railway field worker, and the block of railway traffic to said one or more specified track sections remains in place in the centralized railway control system until the entry of the removal code in the centralized railway control system to cause the block removal part to remove the block on said one or more track sections." ..... 223

Claim 14: "The railway traffic control apparatus of claim 10, wherein upon placement by the block placing part of the block of railway traffic to said one or more specified track sections, the code generation [code] *part* transmits the removal code to the electronic contact address of the railway field worker, and the block of railway traffic to said one or more specified track sections remains in place in the [centralized] railway *traffic* control [system] *apparatus* until the entry of the removal code in the [centralized] railway *traffic* control [system] *apparatus* to cause the block removal part to remove the block on said one or more track sections." ..... 223

5. 6[Pre]: "The centralized railway control system of claim 1, wherein the railway traffic control apparatus further comprises:" ..... 224

6[A]: "a block removal user interface to permit a user to enter the removal code to cause the block removal part to remove the block on said one or more track sections," ..... 224



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6[B]: "wherein the block of railway traffic to said one or more specified track sections remains in place in the centralized railway control system until the entry of the removal code through the block removal user interface." ..... 224

15[Pre]: "The railway traffic control apparatus of claim 10, further comprising:" ..... 224

15[A]: "a block removal user interface to permit a user to enter the removal code to cause the block removal part to remove the block on said one or more *specified* track sections," ..... 224

15[B]: "wherein the block of railway traffic to said one or more specified track sections remains in place in the [centralized] railway *traffic* control [system] *apparatus* until the entry of the removal code through the block removal user interface." ..... 224

6. 7[Pre]: "The centralized railway control system of claim 6, wherein the block removal user interface further requires, in addition to the entry of the removal code, the user to specify that confirmation that the track sections have been cleared has been obtained from the railway field worker associated with the block, before the block removal user interface permits the removal code to be transmitted to the block removal pail, and" ..... 225

7[A]: "the centralized railway control system further comprises a railway control database registering (a) block identifying information identifying the one or more blocked track sections, date and time at which the block was placed and identifying [information] the railway field worker associated with the block, and (b) block removal information identifying date and time at which the block was removed and identifying the user who entered the removal code and specified that confirmation that the track sections have been cleared was obtained from the railway field worker associated with the block." ..... 225

16[Pre]: "The railway traffic control apparatus of claim 15, wherein the block removal user interface further requires, in addition to the entry of the removal code, the user to specify that confirmation that the track sections have been cleared has



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been obtained from the railway field worker associated with the block, before the block removal user interface permits the removal code to be transmitted to the block removal part, and” ..... 225

16[A]: “block identifying information identifying the one or more blocked track sections, date and time at which the block was placed and identifying [information] the railway field worker associated with the block is registered in a railway control database, along with block removal information identifying date and time at which the block was removed and identifying the user who entered the removal code and specified that confirmation that the track sections have been cleared was obtained from the railway field worker associated with the block.” ..... 225

7. Claim 9: “The centralized railway control system of claim 1, wherein the code generation part transmits an electronic message to the electronic contact address of the railway field worker, and the electronic message transmitted to the electronic contact address of the railway field worker includes the removal code and includes an embedded link for activating a return transmission of the removal code to the block removal part of the centralized railway control system.” ..... 226

Claim 18: “The railway traffic control apparatus of claim 10, wherein the code generation part transmits an electronic message to the electronic contact address of the railway field worker, and the electronic message transmitted to the electronic contact address of the railway field worker includes the removal code and includes an embedded link for activating a return transmission of the removal code to the block removal part of the [centralized] railway *traffic* control [system] *apparatus*.” ..... 226

Claim 27: “*The railway traffic control apparatus of claim 20, wherein the railway traffic control apparatus is configured to transmit the secret release code to the user terminal by transmitting a message to the user terminal, the message comprising one or more embedded links.”* ..... 226



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Claim 28*: "The railway traffic control apparatus of claim 27, wherein the railway traffic control apparatus is configured to receive the secret release code transmitted via the network in response to selection of at least one of the one or more embedded links in the message, on the user terminal."* ..... 226

Claim 29: "*The railway traffic control apparatus of claim 27, wherein the message comprises a text message or an email."* ..... 226

Claim 37: *"The method of claim 30, wherein transmitting the secret release code comprises transmitting a message to the user terminal, the message comprising one or more embedded links."* ..... 226

Claim 38: "*The method of claim 37, wherein the secret release code is transmitted via the network in response to selection of at least one of the one or more embedded links in the message, on the user terminal, and is received by the railway traffic control apparatus."* ..... 227

Claim 39*: "The method of claim 37, wherein the message comprises a text message or an email."* ..... 227

8. Claim 21*: "The railway traffic control apparatus of claim 20, wherein the block is placed via an interlocking signal prohibiting trains from traversing the one or more sections of railway track."* ..... 227

Claim 31*: "The method of claim 30, wherein the block is placed via an interlocking signal prohibiting trains from traversing the one or more sections of railway track."* ..... 227

9. Claim 22: *"The railway traffic control apparatus of claim 20, wherein the railway traffic control apparatus is configured to place the block by causing one or more of the plurality of railway traffic interlocks to display a STOP signal."* ..... 227

Claim 32: *"The method of claim 30, wherein the railway traffic control apparatus is configured to place the block by causing one or more of the plurality of railway traffic interlocks to display a STOP signal."* ..... 227

10. Claim 23*: "The railway traffic control apparatus of claim 20, wherein only the railway traffic control apparatus and the*



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*user terminal receive the secret release code generated by the railway traffic control apparatus."* ..... 228

Claim 33*: "The method of claim 30, wherein only the railway traffic control apparatus and the user terminal receive the secret release code generated by the railway traffic control apparatus."* ..... 228

11. Claim 24: "*The railway traffic control apparatus of claim 20, wherein the railway traffic control apparatus is further configured to: store the secret release code in a memory of the railway traffic control apparatus."* ..... 228

Claim 34*: "The method of claim 30, further comprising: storing the secret release code in a memory of the railway traffic control apparatus."* ..... 228

12. Claim 25: *"The railway traffic control apparatus of claim 20, wherein the railway traffic control apparatus is further configured to: generate and store block removal information in response to removing the block from the one or more sections of railway track."* ..... 228

Claim 35: *"The method of claim 30, further comprising: generating and storing block removal information in response to removing the block from the one or more sections of railway track."* ..... 228

13. Claim 26: "*The railway traffic control apparatus of claim 25, wherein the block removal information comprises a date and time when the block was removed and identification information of a user who entered the secret removal code."* ..... 229

Claim 36: *"The method of claim 35, wherein the block removal information comprises a date and time when the block was removed and identification information of a user who entered the secret removal code."* ..... 229

14. 41[Pre]: *"The system of claim 40, wherein the processor configured by execution of computer program instructions additionally causes the railway control apparatus to:"* ..... 229

41[A]: *"receive the secret code from the user terminal via the network;"* ..... 229



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41[B]: *"verify the secret code by comparing the secret code received from the user terminal with the secret code stored in the memory device;"* ..... 229

41[C]: *"receive an instruction to remove the block from the selected track sections, after verifying the secret code; and"* ..... 229

41[D]: *"responsive to the instruction to remove the block received after verifying the secret code, transmit a block removal signal to the corresponding railway traffic interlocks."* ..... 229

XIV. CONCLUSION ..... 230



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# EXHIBIT LIST

| Exhibit Number | Description |
|---|---|
| 1001 | U.S. Patent No. RE47,835 (the "RE'835 Patent") |
| 1002 | File History of U.S. Patent No. RE47,835 |
| 1003 | Declaration of Dr. Lori Kaufman including Curriculum Vitae ("Kaufman") |
| 1004 | Vols. 1 and 2 of U.S. Department of Transportation, Federal Railroad Administration, *Supporting Railroad Roadway Worker Communications with a Wireless Handheld Computer*, Report Nos. DOT/FRA/ORD-04/13.i and DOT/FRA/ORD-04/13.ii (October 2004) ("FRA-Report") |
| 1005 | PCT Publication No. WO 2007107554 A1 to Kruijswijk *et al.* ("Kruijswijk") |
| 1006 | U.S. Patent No. 6,078,908 to Schmitz ("Schmitz") |
| 1007 | PCT Publication No. WO 2010/012040 Al to Macey ("Macey") |
| 1008 | U.S. Patent No. 6,300,873 to Kucharczyk *et al*. ("Kucharczyk") |
| 1009 | U.S. Patent No. 5,708,422 to Blonder *et al*. ("Blonder") |
| 1010 | U.S. Patent No. 8,406,943 to Brand *et al.* ("Brand") |
| 1011 | U.S. Patent No. 6,581,161 to Byford ("Byford") |
| 1012 | Federal Railroad Administration, Research Reports, available at https://web.archive.org/web/20050211025837/http://www.fra.dot.gov:80/us/content/412 |
| 1013 | Federal Railroad Administration, Research Reports, available at https://web.archive.org/web/20060922194521/http://www.fra.dot.gov/us/content/412 |

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| 1014 | Federal Railroad Administration, Research Reports, available at https://web.archive.org/web/20080212192107/http://www.fra.dot.gov:80/us/content/412 |
| 1015 | Federal Railroad Administration, Research Reports, available at https://web.archive.org/web/20090320043352/http://www.fra.dot.gov/us/content/412 |
| 1016 | Internet Archive Affidavit for URLs including EX1012-1015:<br>https://web.archive.org/web/20050211025837/http://www.fra.dot.gov:80/us/content/412<br>https://web.archive.org/web/20060922194521/http://www.fra.dot.gov/us/content/412<br>https://web.archive.org/web/20080212192107/http://www.fra.dot.gov:80/us/content/412<br>https://web.archive.org/web/20090320043352/http://www.fra.dot.gov/us/content/412 |
| 1017 | Excerpt of File History from U.S. Pat. RE49,115 |
| 1018 | Oral Argument Transcript regarding Wabtec's Motion to Quash and Railware's Motion to Compel held on March 26, 2025, before The Honorable Mark R. Hornak, Chief District Judge of the Western District of Pennsylvania. *See Railware, Inc. v. Southeastern Pennsylvania Transportation Authority*, Case No. 2:24-mc-01283-MRH, ECF No. 41 (W.D. Pa.). |
| 1019 | PCT Publication No. WO 2005/047074 A1 to Makkinga ("Makkinga") |
| 1020 | US20120176217 to Tamaribuchi *et al.* ("Tamaribuchi") |
| 1021 | U.S. Department of Transportation, Federal Railroad Administration, *Impact of Data Link Technology on Railroad Dispatcher Operations*, Report No. DOT/FRA/ORD-04/11 (October 2004) ("Malsch") |
| 1022 | U.S. Patent No. 9,403,545 |

| | |
|---|---|
| 1023 | File History of U.S. Patent No. 9,403,545 |
| 1024 | Railware's Opening Claim Construction Brief, *Railware, Inc. v. Southeastern Pennsylvania Transportation Authority*, Case No. 2:24-cv-02963-JMY, ECF No. 40 (E.D. Pa. May 9, 2025). |
| 1025 | [Redacted] Declaration of Mehdi Ahmadian, Ph.D. in Support of Railware Inc.'s Claim Construction Submissions, *Railware, Inc. v. Southeastern Pennsylvania Transportation Authority*, Case No. 2:24-cv-02963-JMY, ECF No. 40-20 (E.D. Pa.). |
| 1026 | Defendant Southeastern Pennsylvania Transportation Authority's Opening Claim Construction Brief, *Railware, Inc. v. Southeastern Pennsylvania Transportation Authority*, Case No. 2:24-cv-02963-JMY, ECF No. 39 (E.D. Pa. May 9, 2025). |
| 1027 | Excerpts from the Transcript of the March 28, 2025 Deposition of Medhi Ahmadian, Ph.D. as Part of Defendant Southeastern Pennsylvania Transportation Authority's Opening Claim Construction Brief Submission (Exhibit 1017), *Railware, Inc. v. Southeastern Pennsylvania Transportation Authority*, Case No. 2:24-cv-02963-JMY, ECF No. 39-18 (E.D. Pa.). |
| 1028 | U.S. Department of Transportation, Federal Railroad Administration, *Communication and Coordination Demands of Railroad Roadway Worker Activities and Implications for New Technology*, Report No. DOT/FRA/ORD-07/28 (November 2007) ("Roth") |
| 1029 | WO International Publication No. 2004/042663 to Wise ("Wise") |
| 1030 | *Railware v. Peninsula Corridor Joint Powers Board d/b/a Caltrain* ("Caltrain"), Case No. 5:25-cv-05725-BLF, ECF No. 1, Complaint (N.D. Cal. Jul. 8, 2025) |
| 1031 | *Railware v. Peninsula Corridor Joint Powers Board d/b/a Caltrain* ("Caltrain"), Case No. 5:25-cv-05725-BLF, ECF No. 15, Proof of Service (July 24, 2025). |

## LISTING OF CLAIMS

"heavy brackets **[ ]** appears in the original patent but forms no part of this reissue specification" and "italics indicates the additions made by reissue" EX1001, 1:4-9

| Claim Designation | Claim Language |
|---|---|
| **Claim 1** | |
| 1[Pre] | A centralized railway control system comprising: |
| 1[A] | a rail personnel contact database registering, for each railway personnel, an electronic contact address of the railway personnel; and |
| 1[B] | a railway traffic control apparatus *configured for centralized control of traffic of a centrally controllable railway network including plural railways and a plurality of railway traffic interlocks dispersed in said plural railways constituting said railway network*, for controlling access to railway tracks, said railway traffic control apparatus comprising a processor, a non-transitory medium storing one or more programs of executable instructions, and a network interface through which the railway traffic control apparatus communicates via a network with a user terminal, |
| 1[C] | wherein execution of said one or more programs of executable instructions configures *the railway traffic control apparatus comprising* the processor to include:<br><br>a block placing part to place a block on one or more specified track sections *in any of said plural railways constituting said railway network that is managed by centralized control operation from the railway traffic control apparatus, the railway traffic control apparatus controlling, by said centralized control operation, one or more interlocks amongst the plurality of railway traffic interlocks dispersed in said plural railways constituting said railway network, to block railway traffic to the specified track sections and thereby* to permit a railway field worker to enter the track sections **[**while blocking railway traffic to said track sections**]**; |
| 1[D] | a code generation part to generate a removal code, retrieve the electronic contact address of the railway field worker from the rail |



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| | personnel contact database, and transmit the removal code to the electronic contact address of the railway field worker; and |
| 1[E] | a block removal part to remove only upon entry of the removal code *by said centralized control operation from the railway control apparatus*, the block placed by the block placing part on said one or more track sections. |
| **Claim 2** | |
| [2] | The centralized railway control system of claim 1, wherein the railway traffic control apparatus further comprises: a [RTC] *railway traffic controller (RTC)* user interface to permit a user to specify said one or more track sections to be blocked, specify an instruction to the centralized railway control system to block the railway traffic to the specified track sections, and specify identifying information of the railway field worker to be performing work in the specified track sections. |
| **Claim 3** | |
| [3] | The centralized railway control system of claim 1, further comprising:<br><br>a railway control database registering block identifying information, including block limits identifying the one or more blocked track sections, along with the removal code for removing the block of the track sections. |
| **Claim 4** | |
| [4] | The centralized railway control system of claim 1, further comprising:<br><br>a railway control database registering (a) identification of the user who specified the instruction to block the track sections and (b) block identifying information, including block limits identifying the one or more blocked track sections, notes specifying reasons for the block, and date and time at which the block was placed. |
| **Claim 5** | |
| [5] | The centralized railway control system of claim 1, wherein upon placement by the block placing part of the block of railway traffic to said one or more specified track sections, the code generation part transmits the removal code to the electronic contact address of the railway field worker, and the block of railway traffic to said one or more specified track sections remains in place in the centralized railway control system until the entry of the removal code in the |

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| | centralized railway control system to cause the block removal part to remove the block on said one or more track sections. |
| **Claim 6** | |
| 6[Pre] | The centralized railway control system of claim 1, wherein the railway traffic control apparatus further comprises: |
| 6[A] | a block removal user interface to permit a user to enter the removal code to cause the block removal part to remove the block on said one or more track sections, |
| 6[B] | wherein the block of railway traffic to said one or more specified track sections remains in place in the centralized railway control system until the entry of the removal code through the block removal user interface. |
| **Claim 7** | |
| 7[Pre] | The centralized railway control system of claim 6, wherein the block removal user interface further requires, in addition to the entry of the removal code, the user to specify that confirmation that the track sections have been cleared has been obtained from the railway field worker associated with the block, before the block removal user interface permits the removal code to be transmitted to the block removal pail, and |
| 7[A] | the centralized railway control system further comprises a railway control database registering (a) block identifying information identifying the one or more blocked track sections, date and time at which the block was placed and identifying [information] the railway field worker associated with the block, and (b) block removal information identifying date and time at which the block was removed and identifying the user who entered the removal code and specified that confirmation that the track sections have been cleared was obtained from the railway field worker associated with the block. |
| **[Claim 8** | |
| [8] | The centralized railway control system of claim 1, further comprising:<br><br>a voice processing part configured to receive a voice message and extract the removal code from the voice message.] |
| **Claim 9** | |
| [9] | The centralized railway control system of claim 1, wherein the code generation part transmits an electronic message to the electronic |

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| | contact address of the railway field worker, and the electronic message transmitted to the electronic contact address of the railway field worker includes the removal code and includes an embedded link for activating a return transmission of the removal code to the block removal part of the centralized railway control system. |
| **Claim 10** | |
| 10[Pre] | A railway traffic control apparatus *configured for centralized control of traffic of a centrally controllable railway network including plural railways and a plurality of railway traffic interlocks dispersed in said plural railways constituting said railway network*, for controlling access to railway tracks, said railway traffic control apparatus comprising: |
| 10[A] | a block placing part to place a block on one or more **[**selected**]** *specified* track sections *in any of said plural railways constituting said railway network that is managed by centralized control operation from the railway traffic control apparatus, the railway traffic control apparatus controlling, by said centralized control operation, one or more interlocks amongst the plurality of railway traffic interlocks dispersed in said plural railways constituting said railway network, to block railway traffic to the specified track sections and thereby* to permit a railway field worker to enter the track sections **[**while blocking railway traffic to said track sections**]**; |
| 10[B] | a code generation part to generate a removal code, determine an electronic contact address of the railway field worker by accessing a rail personnel contact database registering, for each railway personnel, electronic contact information of the railway personnel, and transmit the removal code to the electronic contact address of the railway field worker; and |
| 10[C] | a block removal part to remove only upon entry of the removal code *by said centralized control operation from the railway traffic control apparatus*, the block placed by the block placing part on said one or more track sections for the railway field worker. |
| **Claim 11** | |
| [11] | The railway traffic control apparatus of claim 10, further comprising: a **[**RTC**]** *railway traffic controller (RTC)* user interface to permit a user to specify **[**said one or more**]** track sections to be blocked, specify |

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| | an instruction to the [centralized] railway *traffic* control [system] *apparatus* to block the railway traffic to the specified track sections, and specify identifying information of the railway field worker to be performing work in the specified track sections. |
| **Claim 12** | |
| [12] | The railway traffic control apparatus of claim 10, wherein block identifying information, including block limits identifying the one or more blocked track sections, is registered in a railway control database, along with the removal code for removing the block of the track sections. |
| **Claim 13** | |
| [13] | The railway traffic control apparatus of claim 10, wherein block identifying information, including block limits identifying the one or more blocked track sections, notes specifying reasons for the block, and date and time at which the block was placed, are registered in a railway control database, along with identification of the user who specified the instruction to block the track sections. |
| **Claim 14** | |
| [14] | The railway traffic control apparatus of claim 10, wherein upon placement by the block placing part of the block of railway traffic to said one or more specified track sections, the code generation [code] *part* transmits the removal code to the electronic contact address of the railway field worker, and the block of railway traffic to said one or more specified track sections remains in place in the [centralized] railway *traffic* control [system] *apparatus* until the entry of the removal code in the [centralized] railway *traffic* control [system] *apparatus* to cause the block removal part to remove the block on said one or more track sections. |
| **Claim 15** | |
| 15[Pre] | The railway traffic control apparatus of claim 10, further comprising: |
| 15[A] | a block removal user interface to permit a user to enter the removal code to cause the block removal part to remove the block on said one or more *specified* track sections, |
| 15[B] | wherein the block of railway traffic to said one or more specified track sections remains in place in the [centralized] railway *traffic* control |

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| | [system] *apparatus* until the entry of the removal code through the block removal user interface. |
| **Claim 16** | |
| 16[Pre] | The railway traffic control apparatus of claim 15, wherein the block removal user interface further requires, in addition to the entry of the removal code, the user to specify that confirmation that the track sections have been cleared has been obtained from the railway field worker associated with the block, before the block removal user interface permits the removal code to be transmitted to the block removal part, and |
| 16[A] | block identifying information identifying the one or more blocked track sections, date and time at which the block was placed and identifying [information] the railway field worker associated with the block is registered in a railway control database, along with block removal information identifying date and time at which the block was removed and identifying the user who entered the removal code and specified that confirmation that the track sections have been cleared was obtained from the railway field worker associated with the block. |
| **[Claim 17** | |
| [17] | The railway traffic control apparatus of claim 10, further comprising:<br><br>a voice processing part configured to receive a voice message and extract the removal code from the voice message.] |
| **Claim 18** | |
| [18] | The railway traffic control apparatus of claim 10, wherein the code generation part transmits an electronic message to the electronic contact address of the railway field worker, and the electronic message transmitted to the electronic contact address of the railway field worker includes the removal code and includes an embedded link for activating a return transmission of the removal code to the block removal part of the [centralized] railway *traffic* control [system] *apparatus*. |
| **Claim 19** | |
| 19[Pre] | A method for *controlling railway access using a railway traffic control apparatus of* a centralized railway control system [to control |

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| | access to railway tracks] *configured for centralized control of traffic of a centrally controllable railway network including plural railways and a plurality of railway traffic interlocks dispersed in said plural railways constituting said railway network*, the method comprising: |
| 19[A] | providing a user interface [on a user terminal] *of the railway traffic control apparatus*, including a block placing part to place a block on one or more specified track sections *in any of said plural railways constituting said railway network that is managed by centralized control operation from the railway traffic control apparatus, the railway traffic control apparatus controlling, by said centralized control operation, one or more interlocks amongst the plurality of railway traffic interlocks dispersed in said plural railways constituting said railway network, to block railway traffic to the specified track sections and thereby* to permit a railway field worker to enter the track sections [while blocking railway traffic to said track sections]; |
| 19[B] | generating a removal code, determining an electronic contact address of the railway field worker by accessing a rail personnel contact database registering, for each railway personnel, electronic contact information of the railway personnel, and transmitting the removal code to the electronic contact address of the railway field worker; and |
| 19[C] | permitting the block to said one or more track sections to be removed only upon entry of the removal code [in the centralized railway control system] *by said centralized control operation from the railway traffic control apparatus*. |
| **Claim 20** | |
| 20[Pre] | *A railway traffic control apparatus configured for centralized control of traffic of a centrally controllable railway network including plural railways and a plurality of railway traffic interlocks dispersed in said plural railways constituting said railway network, the railway traffic control apparatus comprising a processor and configured to:* |
| 20[A] | *place a block on one or more sections of railway track in any of said plural railways constituting said railway network that is managed by centralized control operation from the railway traffic control apparatus, the railway traffic control apparatus controlling, by said* |

| | |
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| | *centralized control operation, one or more interlocks amongst the plurality of railway traffic interlocks dispersed in said plural railways constituting said railway network, to prevent trains from traversing the one or more sections of railway track;* |
| 20[B] | *generate a secret release code associated with the blocked one or more sections of railway track;* |
| 20[C] | *transmit the secret release code to a user terminal via a network;* |
| 20[D] | *receive the secret release code via the network; and* |
| 20[E] | *responsive to receiving the secret release code from the terminal, remove the block from the one or more sections of railway track.* |
| **Claim 21** | |
| [21] | *The railway traffic control apparatus of claim 20, wherein the block is placed via an interlocking signal prohibiting trains from traversing the one or more sections of railway track.* |
| **Claim 22** | |
| [22] | *The railway traffic control apparatus of claim 20, wherein the railway traffic control apparatus is configured to place the block by causing one or more of the plurality of railway traffic interlocks to display a STOP signal.* |
| **Claim 23** | |
| [23] | *The railway traffic control apparatus of claim 20, wherein only the railway traffic control apparatus and the user terminal receive the secret release code generated by the railway traffic control apparatus.* |
| **Claim 24** | |
| [24] | *The railway traffic control apparatus of claim 20, wherein the railway traffic control apparatus is further configured to:*<br><br>*store the secret release code in a memory of the railway traffic control apparatus.* |
| **Claim 25** | |
| [25] | *The railway traffic control apparatus of claim 20, wherein the railway traffic control apparatus is further configured to:*<br><br>*generate and store block removal information in response to removing the block from the one or more sections of railway track.* |
| **Claim 26** | |
| [26] | *The railway traffic control apparatus of claim 25, wherein the block removal information comprises a date and time when the block was* |

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| | *removed and identification information of a user who entered the secret removal code.* |
| **Claim 27** | |
| [27] | *The railway traffic control apparatus of claim 20, wherein the railway traffic control apparatus is configured to transmit the secret release code to the user terminal by transmitting a message to the user terminal, the message comprising one or more embedded links.* |
| **Claim 28** | |
| [28] | *The railway traffic control apparatus of claim 27, wherein the railway traffic control apparatus is configured to receive the secret release code transmitted via the network in response to selection of at least one of the one or more embedded links in the message, on the user terminal.* |
| **Claim 29** | |
| [29] | *The railway traffic control apparatus of claim 27, wherein the message comprises a text message or an email.* |
| **Claim 30** | |
| 30[Pre] | *A method for controlling railway access using a railway traffic control apparatus configured for centralized control of traffic of a centrally controllable railway network including plural railways and a plurality of railway traffic interlocks dispersed in said plural railways constituting said railway network, the method comprising:* |
| 30[A] | *placing a block on one or more sections of railway track in any of said plural railways constituting said railway network that is managed by centralized control operation from the railway traffic control apparatus, the railway traffic control apparatus controlling, by said centralized control operation, one or more interlocks amongst the plurality of railway traffic interlocks dispersed in said plural railways constituting said railway network, to prevent trains from traversing the one or more sections of railway track;* |
| 30[B] | *generating a secret release code associated with the blocked one or more sections of railway track;* |
| 30[C] | *transmitting the secret release code to a user terminal via a network;* |
| 30[D] | *receiving the secret release code via the network; and* |
| 30[E] | *responsive to receiving the secret release code from the terminal, removing the block from the one or more sections of railway track.* |
| **Claim 31** | |

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|---|---|
| [31] | *The method of claim 30, wherein the block is placed via an interlocking signal prohibiting trains from traversing the one or more sections of railway track.* |
| **Claim 32** | |
| [32] | *The method of claim 30, wherein the railway traffic control apparatus is configured to place the block by causing one or more of the plurality of railway traffic interlocks to display a STOP signal.* |
| **Claim 33** | |
| [33] | *The method of claim 30, wherein only the railway traffic control apparatus and the user terminal receive the secret release code generated by the railway traffic control apparatus.* |
| **Claim 34** | |
| [34] | *The method of claim 30, further comprising:*<br><br>*storing the secret release code in a memory of the railway traffic control apparatus.* |
| **Claim 35** | |
| [35] | *The method of claim 30, further comprising:*<br><br>*generating and storing block removal information in response to removing the block from the one or more sections of railway track.* |
| **Claim 36** | |
| [36] | *The method of claim 35, wherein the block removal information comprises a date and time when the block was removed and identification information of a user who entered the secret removal code.* |
| **Claim 37** | |
| [37] | *The method of claim 30, wherein transmitting the secret release code comprises transmitting a message to the user terminal, the message comprising one or more embedded links.* |
| **Claim 38** | |
| [38] | *The method of claim 37, wherein the secret release code is transmitted via the network in response to selection of at least one of the one or more embedded links in the message, on the user terminal, and is received by the railway traffic control apparatus.* |
| **Claim 39** | |
| [39] | *The method of claim 37, wherein the message comprises a text message or an email.* |

| **Claim 40** | |
|---|---|
| 40[Pre] | *A system comprising:* |
| 40[A] | *a railway control apparatus comprising a processor and a memory device, the railway control apparatus configured to communicate with a plurality of railway traffic interlocks and a user terminal via a network and to perform centralized control of traffic of a centrally controllable railway network including plural railways and the plurality of railway traffic interlocks dispersed in said plural railways constituting said railway network, wherein the processor is configured by execution of computer program instructions to cause the railway control apparatus to:* |
| 40[B] | *receive a selection of track sections to block in any of said plural railways constituting said railway network that is managed by centralized control operation from the railway control apparatus, wherein each selected track section corresponds to one or more railway traffic interlocks amongst the plurality of railway traffic interlocks dispersed in said plural railways constituting said railway network;* |
| 40[C] | *responsive to receiving the selection, generate a secret code associated with the selected track sections;* |
| 40[D] | *responsive to generating the secret code, save the secret code in the memory device;* |
| 40[E] | *associate the secret code with a remote user of the user terminal;* |
| 40[F] | *transmit a block signal to the corresponding one or more railway traffic interlocks to place a block on the selected track sections; and* |
| 40[G] | *transmit the secret code to the remote user of the user terminal.* |
| **Claim 41** | |
| 41[Pre] | *The system of claim 40, wherein the processor configured by execution of computer program instructions additionally causes the railway control apparatus to:* |
| 41[A] | *receive the secret code from the user terminal via the network;* |
| 41[B] | *verify the secret code by comparing the secret code received from the user terminal with the secret code stored in the memory device;* |
| 41[C] | *receive an instruction to remove the block from the selected track sections, after verifying the secret code; and* |
| 41[D] | *responsive to the instruction to remove the block received after verifying the secret code, transmit a block removal signal to the corresponding railway traffic interlocks.* |

I, Lori Kaufman of Earlysville, Virginia, declare that:

## I. INTRODUCTION

1. I have personal knowledge of the facts stated herein, and if called upon to testify to those facts I could and would competently do so.

2. I have been retained by Venable LLP, counsel for Westinghouse Airbrake Technologies Corporation ("Wabtec"), to analyze U.S. Patent RE47,835 ("RE'835 Patent") (EX1001) and to provide my opinions regarding the patentability of claims 1-7, 9-16, 18-41 of the RE'835 Patent.

3. I understand that Wabtec is requesting that the Patent Trial and Appeal Board ("PTAB" or "Board") to institute an *inter partes* review ("IPR") proceeding of the RE'835 Patent.

4. I have been asked to provide my independent analysis of the RE'835 Patent based on the prior art cited in this declaration.

5. Petitioner's counsel has asked me to consider whether certain references disclose or suggest, alone or in combination, the features recited in certain claims of the RE'835 Patent. I have also been asked to consider the state of the art and the prior art available before the time of the alleged invention of the RE'835 Patent. My opinions are provided in this Declaration.



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6. My opinions in this Declaration are based on my understanding as an expert in the relevant field, and my education, training, research, knowledge, and personal and professional experience, as well as the materials considered herein.

7. I am being compensated for my time at my standard hourly consulting rate of $350 per hour. My compensation does not depend on the outcome of this matter or the specifics of my testimony. I have no financial interest in the outcome of this matter.

8. To my knowledge, I have no financial interest in Petitioner. Counsel for Petitioner has informed me that Railware, Inc. ("Railware") purports to own the RE'835 Patent. To the best of my knowledge, I have no financial interest in Railware and, to my recollection, have had no contact with Railware or the named inventor, Mr. Ross Pirtle, of the RE'835 Patent. To the best of my knowledge, I do not have any financial interest in the RE'835 Patent.

9. To the extent any mutual funds or other investments that I own have a financial interest in the Petitioner, the Patent Owner, or the RE'835 Patent, I am not aware of, and do not control, any financial interest that would affect or bias my judgment.

10. This Declaration summarizes the opinions I have formed to date. I reserve the right to modify my opinions, if necessary, based on further review and

analysis of information that I receive subsequent to the filing of this report, including in response to positions taken Railware or its experts that I have not yet seen, including any secondary consideration evidence that Railware or its expert may consider and present.

## II. QUALIFICATIONS

11. I am over the age of 18 and am competent to write this declaration. I have personal knowledge, or have developed knowledge of these technologies based upon education, training, or experience, of the matters set forth herein.

12. A copy of my curriculum vitae ("CV") is being submitted herewith as Appendix 1 to this declaration.

13. As set forth in my CV, I obtained a Bachelor of Science in 1987, Master of Science in 1993, and Doctor of Philosophy in 1997, all in Electrical Engineering from the University of Virginia in Charlottesville, Virginia.

14. For my doctoral dissertation, I performed an in-depth quantitative analysis of software failures in safety-critical systems. As part of my research, I developed a collection of statistical models to assess rare event failures that combined Markov modeling with Statistics of the Extremes. The success of my research led to several publications, and my obtaining a postdoctoral research position within the Department of Electrical Engineering at the University of Virginia beginning in the summer of 1997.

15. Initially, the focus of my postdoctoral research involved work for the Nuclear Regulatory Commission ("NRC") in which I performed risk analysis for safety-critical control systems. During this time period, the Department of Electrical Engineering received funding from the Federal Railroad Administration ("FRA") to develop a risk assessment model for Positive Train Control ("PTC") that would satisfy the FRA's Office of Safety requirements for granting approval to a given PTC system.

16. Based upon my doctoral research as well as my on-going postdoctoral research, I was brought in to support the risk analysis for the North American Joint PTC ("NAJPTC") Project (commonly referred to as the Illinois Department of Transportation ("IDOT") PTC) and the CSX Communications-Based Train Management ("CBTM") system in approximately mid-1998. The initial documentation that I was provided to support developing a risk assessment model for a given PTC system included documentation from Conrail, CSXT, and Norfolk Southern entitled PTC ON-BOARD PLATFORM System Requirements Document 1997-1998 Conrail, CSXT, and Norfolk Southern. From this system requirements document, I was able to extend the modeling concepts from my dissertation and NRC work to that of a risk informed model using simulation to develop a repeatable



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experiment to provide a quantified assessment of expected PTC performance with evidence from a safety perspective.

17. The premise of my train control risk assessment modeling was based on the concept of a three-state Markov model to represent all CBTM and PTC components; that is, any device found on or along the track infrastructure or on board a consist could be in one of three states: (1) Operational: the device is functioning as designed; (2) Failed Safe: the device has failed in a known way that is detectable by the overarching system design; (3) Failed Unsafe: the device has failed in an unknown way that potentially places the overall system at risk. Each of the CBTM and PTC model components was referred to as an "object".

18. For each "object" defined by the Conrail, CSXT, and Norfolk Southern document above, I applied the three-state Markov model to create a module to support a simulation-based risk assessment. The three state Markov model allowed for the discrete simulation of the communications to the wayside devices and movement authorities (both via signal and verbal commands). I also incorporated static models of computer controlled braking curves for the consists taken from information provided by Wabtec (PTC) and CSX (CBTM). The key parametric data required to support this simulation was the equipment failure rate data that we obtained from the FRA and CSX for CBTM, and from the Union Pacific Railroad



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("UPRR"), Lockheed Martin, Union Switch and Signal, and the FRA for the NAJPTC program.

19. Once I was engaged in my PTC research in 1998, I met and worked with railroad experts from CSX, Burlington Northern Santa Fe ("BNSF"), UPRR and Norfolk Southern that included current and former wayside workers, engineers, dispatchers, and others. Additionally, I met and worked with representatives from several labor unions such as the Brotherhood of Locomotive Engineers ("BLE") and Brotherhood of Railroad Signalmen ("BRS"), various offices within the FRA, the Association of American Railroads ("AAR"), the NAJPTC, and Railroad Safety Advisory Committee ("RSAC"). The BRS and BLE made available various engineers and wayside workers for me to meet. I also travelled to Spartanburg, South Carolina, to ride aboard a PTC-equipped CSX train (CBTM) and witness an FRA brake test.

20. These meetings allowed for the refinement of the "object" model parameters and introduced the concept of extending the "object" models to include human factors (that is, the role of the dispatcher, engineer, conductor, and railway workers in train control operations).

21. In addition to the aforementioned modeling, I also applied my knowledge of discrete event simulation from my graduate studies to develop the

requirements that defined the needed Monte Carlo simulation environment to produce the necessary data to support a statistically valid PTC risk assessment. While I did not participate in any development of the software to support the simulation, I supported the selection of algorithms for the random number generation to support the Monte Carlo simulation and the Use Cases to test various train movement algorithms.

22. The combination of my "object" modeling and simulation work resulted in the development of the Axiomatic Safety-Critical Assessment Process ("ASCAP") that simulated the movement of trains as the interaction of a collection of discrete objects using a Monte Carlo simulation. ASCAP modeled the various hardware/software functions (operations) and human in the loop actions as: onboard objects (*e.g.*, onboard computer, engineer, conductor, wheel sets, displays, and radio), wayside objects (*e.g.*, monitored switches, grade crossings, signals (absolute and intermediate) wayside interface units ("WIUs"), work crews with radios, and broken rail detection circuits), and dispatcher objects.

23. The FRA knew that the system functionality was not particularly unique between different PTC systems. From my meetings with the RSAC, CSX, FRA, BLE, BRS and others, I understood the requirements for a PTC system to be universal across the industry. In particular, the functionality of the onboard, wayside,



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and dispatch center equipment was similar, and from a risk assessment modeling perspective, it was identical. For example, the modeling of CBTM monitored switches and onboard enforcement of penalty braking was reused in PTC. It was this fact that allowed for concurrent modeling of CBTM and the NAJPTC project.

24. The state of each object at the time of intersection was determined via a Monte Carlo "draw" and the outcome on train movement was defined by a well-defined set of outcomes derived from the General Code of Operating Rules ("GCOR"), CBTM, and PTC operational requirements. The fact that the three-state Markov model for the objects for the CBTM project (Conrail, CSXT, and Norfolk Southern document above) and the NAJPTC project provided the same functionality allowed for their reuse. The only required changes were the difference in GCOR for Direct Traffic Control ("DTC"), Centralized Traffic Control ("CTC"), and PTC operations.

25. From my multiple interactions with the FRA, RSAC, CSX, BLE, BRS, and others, and my own study of GCOR, train control systems, and documentation for the CBTM and the NAJPTC effort, I developed a very strong understanding of rail operations (DTC, Track Warrant Systems ("TWS"), CTC, CBTM, and PTC) in general by the fall of 2000 to further refine my modeling.



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26. The paper entitled "The Axiomatic Safety-Critical Assessment Process (ASCAP) Simulation Methodology," from the Proceedings of the 9th IFAC Symposium on Control in Transportation Systems, Braunschweig, Germany, 2000, was one of the papers that I published describing the ASCAP concept for quantitative modeling of PTC-based systems for risk assessment. In this paper, I presented an overview of the three-state Markov model concept used in fault tolerant computing and its application to modeling PTC system objects as defined in the Conrail, CSXT, and Norfolk Southern document above. This three-state Markov model provided the flexibility to model both hardware and software systems required to implement train control systems such as DTC, TWS, CTC, CBTM, and PTC, as well as the human factors impact of dispatchers, train crews, and rail workers on operations.

27. As a result of my on-going NAJPTC and CSX CBTM modeling efforts, my postdoctoral position led to my becoming a Principal Scientist with the Department of Electrical Engineering at the University of Virginia in the fall of 2000.

28. To further refine the accuracy of the ASCAP simulation, I actively engaged with Wabtec on the NAJPTC project to develop the braking profile models for normal and emergency braking of the consist for use in the ASCAP simulation.



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These models required ASCAP to model the consist as a distributed mass rather than a point to capture a realistic braking profile that incorporated the track grade, curve and elevation, and the effects of pressure distributed across each wheel set brakes.

29. To provide the level of detail expected from my PTC risk assessment work with regard to the impact of human factors, I travelled to the CSX dispatch center in Jacksonville, Florida, and the Norfolk Southern dispatch center in Roanoke, Virginia, to further my knowledge of rail operations by watching and interviewing engineers, conductors, and dispatchers within their operational environments.

30. As a Principal Scientist, I continued to grow my understanding of PTC, and expanded my areas of rail safety research to include the upgrade of the New York City Transit Authority ("NYCTA") Carnarsie Line. By 2002, my work was concentrated almost exclusively in extending the modeling and simulation constructs that I developed for CBTM and PTC to the NYCTA effort. As part of my NYCTA support, I successfully completed Track Safety School in 2002 to further my understanding of NYCTA operations, and to ensure the alignment of my modeling and simulation work with actual operational practice.

31. Additionally, the same model constructs for CBTM and PTC objects (onboard, wayside and dispatch) were reusable for the NYCTA Canarsie Line risk



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assessment project. Again, this reuse was permissible due to similar nature of requirements across the platforms.

32. By 2002, after approximately four years, I had developed an in-depth understanding of PTC operations, how CBTM could be considered a PTC system, why PTC could function as a non-vital overlay, the importance of human-in-the-loop modeling to better analyze the potential benefit of a PTC system, identified the range of ASCAP objects for all PTC equipment required by the CBTM and NAJPTC efforts (note: they were the same collection of objects), and understood how these concepts in many ways were similar, if not identical, to the NYCTA Carnarsie Line upgrade. I had leveraged my educational knowledge and expertise in stochastic analysis and rare event modeling, to develop a collection of reusable modeling objects that could effectively represent any PTC system.

33. I continued this work until I left the Department of Electrical Engineering at the University of Virginia in February 2004 for other business pursuits, primarily IT and Department of Defense related. In 2005 while employed at Commonwealth Computer Research, Inc., I received an award from the FRA to review safety analysis reports in support of the on-going IDOT PTC system development.

34. In 2006, I supported the development of requirements for a generalized train movement simulator to the support quantification of PTC systems using multiple routing algorithms. While at Booz Allen (in or around 2007), I worked with my colleague to identify potential accident scenarios that could arise due to communication issues with the IDOT PTC system (NAJPTC). Concurrent with this activity, I quantified the maximum allowable communication timeout period for the communications architecture so that the PTC system would not pose a greater risk of train collisions, derailments, and accidents, as compared to a traditional cab signal system.



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## III. MATERIALS CONSIDERED

35. My opinions contained in this Declaration are based on the documents I reviewed, my professional judgment, as well as my education, experience, and knowledge of the field.

36. In preparing this declaration, I have reviewed and/or considered the documents cited in the Exhibit List and the documents referenced in this declaration.

37. In addition, I have reviewed the below documents:

- U.S. Provisional Application No. 61/893,547 to Pirtle
- U.S. Patent No. 9,517,782 (the "'782 Patent")
- File History of '782 Patent
- U.S. Patent RE49,115 (the "RE'115 Patent")
- File History of RE'115 Patent
- Petition for *Inter Partes* Review, IPR2023-01179, Paper 2, Jul. 6, 2023 ('782 Patent)
- Patent Owner Preliminary Response, IPR2023-01179, Paper 7, Oct. 23, 2023 ('782 Patent)
- PTAB Decision Denying Institution of *Inter Partes* Review, IPR2023-01179, Paper 8, Jan. 22, 2024 ('782 Patent)

- Petition for *Inter Partes* Review, IPR2023-01180, Paper 2, Jul. 6, 2023 (RE'835 Patent)
- Patent Owner Preliminary Response, IPR2023-01180, Paper 7, Oct. 23, 2023 (RE'835 Patent)
- PTAB Decision Denying Institution of *Inter Partes* Review, IPR2023-01180, Paper 8, Jan. 22, 2024 (RE'835 Patent)
- Petition for *Inter Partes* Review, IPR2023-01181, Paper 2, Jul. 6, 2023 (RE'115 Patent)
- Patent Owner Preliminary Response, IPR2023-01181 Paper 7, Oct. 23, 2023 (RE'115 Patent)
- PTAB Decision Denying Institution of *Inter Partes* Review, IPR2023-01181, Paper 8, Jan. 22, 2024 (RE'115 Patent)

## IV. UNDERSTANDING OF LEGAL PRINCIPLES

38. I am not a lawyer, and I will not provide any legal opinions in this IPR declaration. Although not a lawyer, I have been advised that certain legal standards are to be applied by technical experts in forming opinions regarding the meaning and validity of patent claims.

### A. Claim Construction

39. I understand that claim construction in an *Inter Partes* Review is controlled by the standard in *Phillips v. AWH Corp*., 415 F.3d 1303 (Fed. Cir. 2005) (en banc).

40. I have been informed that claim construction begins with the language of the claims. The words are given their "ordinary and customary meaning," which is "the meaning that the term would have to a person of ordinary skill in the art in question at the time of the invention, i.e., as of the effective filing date of the patent application."

41. The specification and prosecution history are sources of intrinsic evidence that informs the meaning of the claim language. Extrinsic evidence, such as expert testimony and dictionaries, may be useful in educating judges regarding the field of the invention or helping determine what a person of ordinary skill in the art ("POSITA") would understand claim terms to mean. However, extrinsic evidence in general is viewed as less reliable than intrinsic evidence.

42. I understand that in this proceeding, any claim term that is not construed should be given its plain and ordinary meaning.

### B. Priority

43. I understand that a continuation application is a later-filed application that has the same disclosure (specification and figures) as an earlier filed application

to which the later-filed application claims priority. A continuation is generally entitled to the same priority date as the later-filed application to which it claims priority.

### C. Obviousness

44. I have been informed by counsel and understand that a prior art reference can render a patent claim obvious to one of ordinary skill in the art if the differences between the subject matter set forth in the patent claim and the prior art are such that the subject matter of the claim would have been obvious at the time the alleged invention was made.

45. In analyzing obviousness, I understand that it is important to consider the scope of the claims, the level of skill in the relevant art, the scope and content of the prior art, the differences between the prior art and the claims, and any secondary considerations.

46. I have been informed by counsel and understand that a single reference can render a patent claim obvious if any differences between that reference and the claims would have been obvious to a person of ordinary skill in the art. Alternatively, the teachings of two or more references may be combined in the same way as disclosed in the claims, if such a combination would have been obvious to one having ordinary skill in the art.



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47. In determining whether a combination based on either a single reference or multiple references would have been obvious, I have been informed by counsel and understand that it is appropriate to consider the following factors:

- Whether the teachings of the prior art references disclose known concepts combined in familiar ways, and when combined, would yield predictable results;
- Whether a POSITA could implement a predictable variation, and would see the benefit of doing so;
- Whether the claimed elements represent one of a limited number of known design choices, and would have a reasonable expectation of success by those skilled in the art;
- Whether a POSITA would have recognized a reason to combine known elements in the manner described in the claim;
- Whether there is some teaching or suggestion in the prior art to make the modification or combination of elements claimed in the patent;
- Whether the innovation applies a known technique that had been used to improve a similar device or method in a similar way; and



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- Whether there was a design need or problem known to the POSITA that would have motivated the POSITA to combine the elements, as claimed.

48. I been informed by counsel and understand that a POSITA has ordinary creativity and is not an automaton.

49. I been informed by counsel and understand that all prior art references are to be looked at from the viewpoint of a POSITA.

50. I been informed by counsel and understand that, in considering obviousness, it is important not to determine obviousness using the benefit of hindsight derived from the patent being considered, and that obviousness is analyzed from the perspective of a POSITA at the time of the invention.

51. I been informed by counsel and understand that when the claimed subject matter involves combining pre-existing elements to yield no more than one would expect from such an arrangement, the combination is obvious. I also I been informed by counsel and understand that in assessing whether the claimed subject matter is obvious, one must consider whether the claimed improvement is more than the predictable use of prior art elements according to their established functions.

52. I been informed by counsel and understand that there need not be a precise teaching in the prior art directed to the specific subject matter of a claim

because one can take account of the inferences and creative steps that a person of skill in the art would employ.

53. I been informed by counsel and understand that obviousness cannot be based on the hindsight combination of components selectively culled from the prior art. I been informed by counsel and understand that in an obviousness analysis, neither the motivation nor the avowed purpose of the alleged inventor controls the inquiry. Any need or problem known in the field at the time of the invention and addressed by the patent can provide a reason for combining elements. For example, I been informed by counsel and understand that it is important to consider whether there existed at the time of the invention a known problem for which there was an obvious solution encompassed by the patent's claims. I been informed by counsel and understand that known techniques can have obvious uses beyond their primary purposes, and that in many cases a person of ordinary skill can fit the teachings of multiple pieces of prior art together like pieces of a puzzle.

54. I been informed by counsel and understand that, when there is a reason to solve a problem and there are a finite number of identified, predictable solutions, a person of ordinary skill has good reason to pursue the known options within his or her technical grasp. I further have been informed by counsel and understand that, if this leads to the anticipated success, it is likely the product not of innovation but of



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ordinary skill and common sense, which bears on whether the claim would have been obvious.

55. I been informed by counsel and understand that secondary considerations can include, for example, evidence of commercial success of the invention, evidence of a long-felt need that was solved by an invention, evidence that others copied an invention, or evidence that an invention achieved a surprising result. I further have been informed by counsel and understand that such evidence must have a nexus or causal relationship to the elements of a claim, in order to be relevant.

56. I am unaware of any such secondary considerations asserted by Railware for RE'835 Patent.

## V. BACKGROUND OF THE TECHNOLOGY

### A. Known Problem to Protect Railway Workers

57. RE'835 Patent allegedly is directed to a conventional centralized railway control system to generate a code when a block is placed, transmit the code to a railway worker's conventional mobile device, and receive the code in return to remove the block. EX1001, Abstract, 1:29-2:10, 2:49-3:6, 4:8-10.

58. I believe that before the Priority Date it was a known problem to a POSITA of protecting railway workers from removal of a block by the dispatcher while maintenance track work is performed.



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59. For instance, the prior art discusses that the CTC dispatcher and worker communicate to ensure the track block is safely removed only when the worker has left the subject area. EX1004, Vol. I: 6 ("[w]hen a dispatcher [grants] a request for roadway worker protection …. the track is placed off-limits (blocked) for other uses. In Central Traffic Control (CTC) territory, blocking a track protects the roadway worker since it prevents the dispatcher from routing trains on that track."), 36 ("worker can retrieve a list of Form Ds … under his/her authority … [and] [f]ollowing the link[] 'Cancel/Fulfill' … the roadway worker is able to give some track under his authority back to the dispatcher"), 1 ("Voice radio communications are vital to the safe and efficient operation of the railroads. Voice radio supports two types of communication tasks. The first type includes safety-critical communications related to train movements and allocation of track between roadway workers and trains."), 9 (proposed that any future systems/applications should include a "verification system that prevent[s] or minimize[s] common human error"), 27 ("prompt the roadway worker for confirmation" before "giving any section of track back to the dispatcher"); Vol. II: 12 ("[o]nce a track is blocked, the dispatcher temporarily loses authority over that track."), 11 ("Blue ... track section is authorized for maintenance ... [which means the] track has been protected …. [T]he dispatcher temporarily loses control over that section of track.").



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60. There are other examples that discuss this two-way communication to protect the railway worker. EX1019, 5:1-11 ("the responsibility for unblocking the work zone" should be put in the hands of the railway worker to make it "technically impossible" for the central dispatcher to route trains on that section of track); EX1020, [0009] ("in the rail transportation system, the workers may be in danger due to erroneous situation recognition or manipulation mistake of an ordering person in an operation control center, even if workers are performing maintenance work inside the railroad line area."), [0150], [0151] ("since the worker can initiate the maintenance work after confirming that the safety measure is maintained, it is possible to prevent the safety measure from not being performed due to erroneous situation recognition or manipulation mistake of the ordering person and to prevent the worker from being in danger."), [0152]; EX1007, 16:1-21 (a railway worker must enter "a specific code before it is deemed the target zone 108 is safe for the passage of the vehicle."), 13:35-14:4.

**B. Conventional Centralized Traffic Control ("CTC") Systems**

61. RE'835 Patent acknowledges it was well-known to use "centralized traffic control" to control interlocking signals (via an interface) for track blocking and unblocking control track by transmitting a signal, *e.g.*, blocking signal or unblocking (or block removal) signal, to track interlocks.



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Interlocking signals govern movement within a sector controlled by an interlock. For example, on a specific track line, a track may be divided into sections of 400 to 2500 m, on each of which trains move at a speed depending on an interlocking signal exhibited by an interlock at an entrance to the section.

* * *

Interlocking systems usually incorporate a 3-color system by which the train, or train conductor, is informed to proceed at regular speed, is informed to proceed at a reduced speed or is prohibited from proceeding through the upcoming section.

* * *

One method of ***controlling all of the interlocks*** within a rail system is through a ***centralized traffic control (CTC)***, or traffic control system (TCS). A ***CTC is used for monitoring, tracking and operating trains traversing tracks throughout a network***. The CTC is controlled by a single person known as a train dispatcher.

* * *

***Information regarding track conditions, train traffic, scheduling, etc., are presented on a control console which may include a map of the entire rail system controlled by the CTC. Through the control console, the dispatcher has control of each interlock signal (that is, the dispatcher controls the train traffic and flow of train traffic using the interlocks) and is constantly made aware of the positions of trains in the railway system as such positions are electronically reported by signals present***

> ***throughout the railway system. In addition, in order to provide for safe traffic control and avoid accidents or collisions, signals are provided throughout the track network, or interlocks.***
>
> The ***interlocks may be controlled from the CTC in any of various different ways***, including, e.g., direct wiring, by pulse codes sent over a wire to distant locations, etc. In addition, interlocks can also be controlled by a native mechanism detecting presence of a train on the track. That is, when a train occupies a certain section of track, the interlock prevents other trains from proceeding onto the same
>
> . . .

EX1001, 1:29-2:10 (emphasis added).

62. Railware's expert, Mehdi Ahmadian, Ph.D, in the SEPTA litigation agrees that CTC systems with dispatcher console or interface to control track blocking and unblocking via interlocks were known. Dr. Ahmadian cites a 2010 public document before the Priority Date in support.

> CTC systems typically include control consoles, which may take a variety of forms and have a variety of back-end and front-end components, that display various pieces of information, such as track conditions, train traffic, and scheduling. Through the control console, the dispatcher can view and control the movement of trains throughout the railway network. Movement of trains within a sector of track is typically governed by interlocking signals, which are controlled by the dispatcher via a

> control console. Shown below is an example of a control center where dispatchers control train traffic using a CTC system: [Footnote 1: Pratima Bhattacharyya, Reporter's Notebook Taking a look at SEPTA control, DAILY PENNSYLVANIAN (Oct. 5, 2010), https://www.thedp.com/article/2010/10/reporters_notebook_taking_a_look_at_septa_control]: . . . .

EX1025, ¶ 14.

63. From the 2010 public document, Dr. Ahmadian cites the below image, showing a CTC dispatcher console to control track blocking and unblocking.



*Id*.



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64. Dr. Ahmadian further discusses that the '782 Patent, which allegedly claims priority to the same provisional application as RE'835 Patent, controls interlocking signals from the dispatcher's interface.

> According to the '782 patent, in a standard railway system, "[i]nterlocking signals govern movement within a sector controlled by an interlock." *Id*. at 1:27-28. "[A] track may be divided into sections," and an "interlocking signal" is exhibited at the entrance to each track section. *Id*. at 1:28-32. "[T]he interlocking signal displays a color system which instructs the conductor of the train, or the train operating by automated response, how to move through the upcoming section of track." *Id*. at 1:32-35.

*Id*., ¶¶ 22, 23; *see supra* ¶ 61 (discussing the RE'835 interlocking statements).

> The '782 patent further explains that "all of the interlocks" within a railway system may be controlled electronically through "a centralized traffic control (CTC)." *Id.* at 1:40-44. "The CTC is controlled by a single person known as a train dispatcher." *Id*. at 1:46-47. "Information regarding track conditions, train traffic, scheduling, etc." is displayed to the dispatcher "on a control console," and "[t]hrough the control console, the dispatcher has control of each interlock signal." *Id*. at 1:48-59.

EX1025, ¶ 24.

65. Further, Dr. Ahmadian cites a 2002 dictionary (Railway Age's Comprehensive Railroad Dictionary, 2nd Ed. (2002)) to assert that CTC was well-

known: "a commonly used railroad dictionary at the time defines 'centralized traffic control' to mean 'a system of rail operation by means of which the movement of trains over routes and through blocks on a designated section of track or tracks is directed by signals controlled from a designated central point.'" *Id*., ¶ 204. This also supports my opinion, given this 2002 inclusion, that CTC systems were known to a POSITA.

66. The prior art also teaches that it was known for a dispatcher to operate a track display to control interlocking signals (via an interface) for track blocking and unblocking control track by transmitting a signal, *e.g.*, blocking signal or unblocking signal, to track interlocks.

67. For example, this is shown in the FRA-Report below, particularly Figure 1 and associated Table 2 describing the track status.

**Table 2. Representation of Color Code for Monitoring Track Status**

| Color | Meaning |
|---|---|
| White | Indicates that the track segment is available for routing trains or other uses. |
| Red | Means train or track vehicle occupancy. A train currently occupies that block. |
| Green | Indicates that the track segment has been cleared (authorized for use) for train movement. The train has not yet entered this block. |
| Blue | Indicates that a track section is authorized for track maintenance. This means that a portion of track has been protected for use by maintenance of way crews or track equipment. When the dispatcher gives track authority to a work crew, the dispatcher temporarily loses control over that section of track. Trains cannot enter this track segment unless authorized by the roadway worker responsible for that block. |

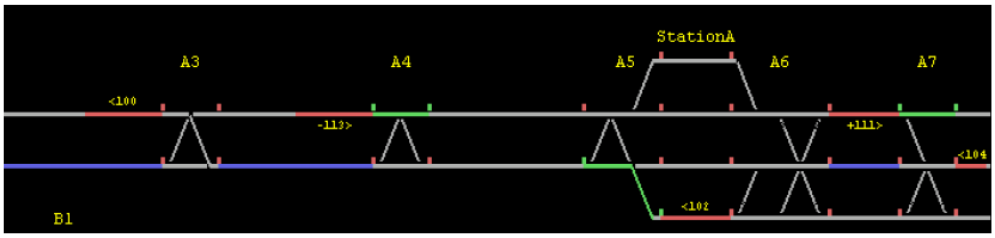



**Figure 1. Track Chart Display**

EX1004, Vol. II: 11 (Fig. 1, Table 2), 10; Vol. I: 1 ("[i]n centralized traffic control territory, switches and signals receive commands from the dispatcher's computer."), 6 ("In Central Traffic Control (CTC) territory, blocking a track protects the roadway worker since it prevents the dispatcher from routing trains on that track.").



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68. This is also shown in Malsch[1] for Figures 3 and 8 below with "Active Track Layout" and "Block Track" and "Unblock Track" buttons for interlockings:

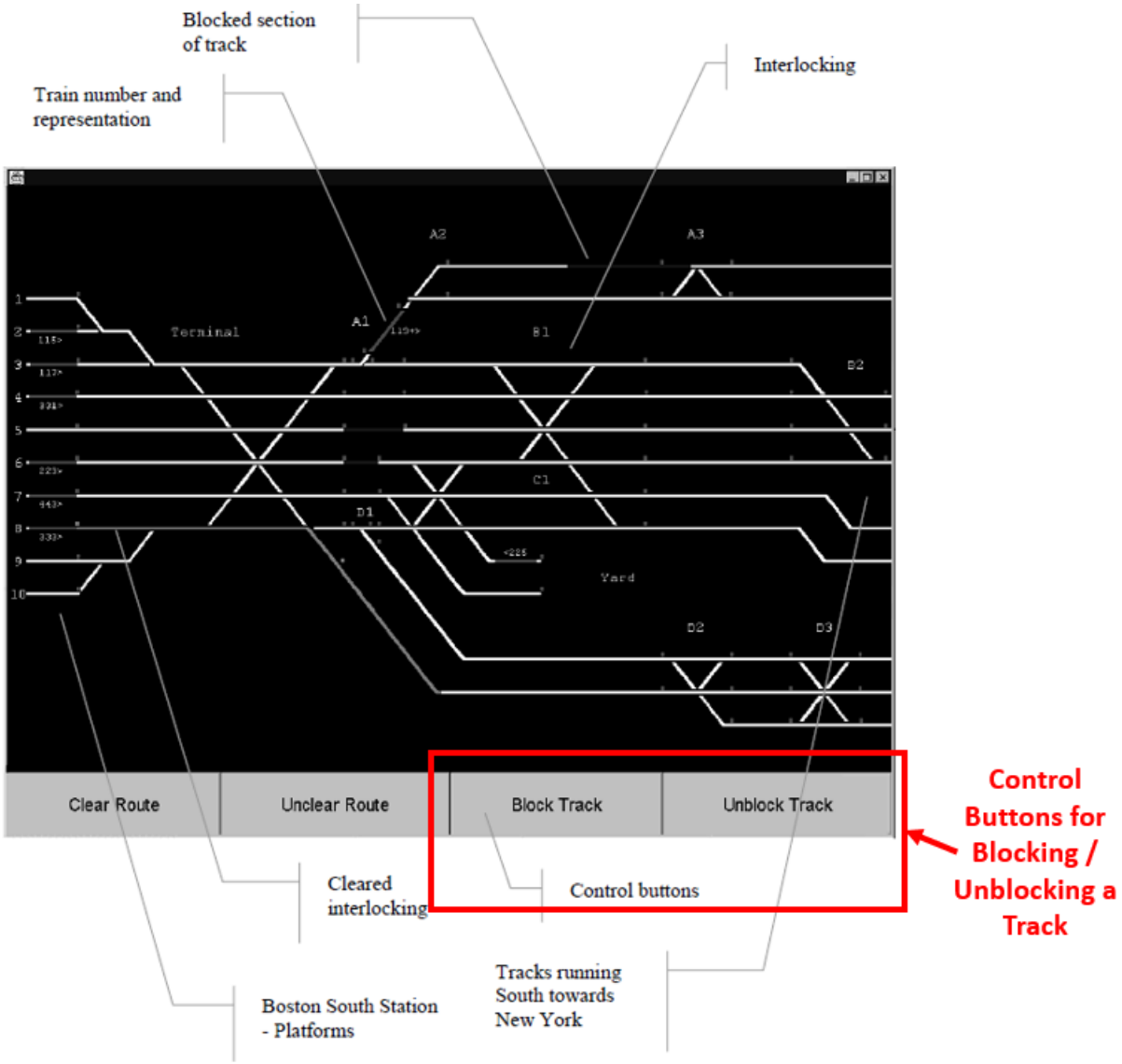



**Figure 3. Active Track Layout**

[1] EX1021 was accessible to interested members of the relevant public. EX1021, front page ("This document is available to the public through the National

EX1021, 10 (Fig. 3) (annotated), 9 ("The main routing tasks were accomplished using mouse-activated buttons located at the bottom of the screen; clearing and unclearing a route as well as blocking and unblocking tracks. . . . The dispatcher blocked a track to enable roadway workers and their equipment to occupy the track. Unblocking the track removed this protection for the roadway worker crew and equipment and made the track available for train movements or other MOW crews. The simulator propagated the state of the signal to the adjacent block.")

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Technical Information Service, Springfield, VA 22161. This document is also available on the FRA website at www.fra.dot.gov"), Report Documentation Page ("12a. Distribution/Availability Statement"), notice page ("This document is disseminated under … the Department of Transportation in the interest of information exchange."); EX1012-1015 (*see* "DOT/FRA/ORD-04/11"); EX1016.



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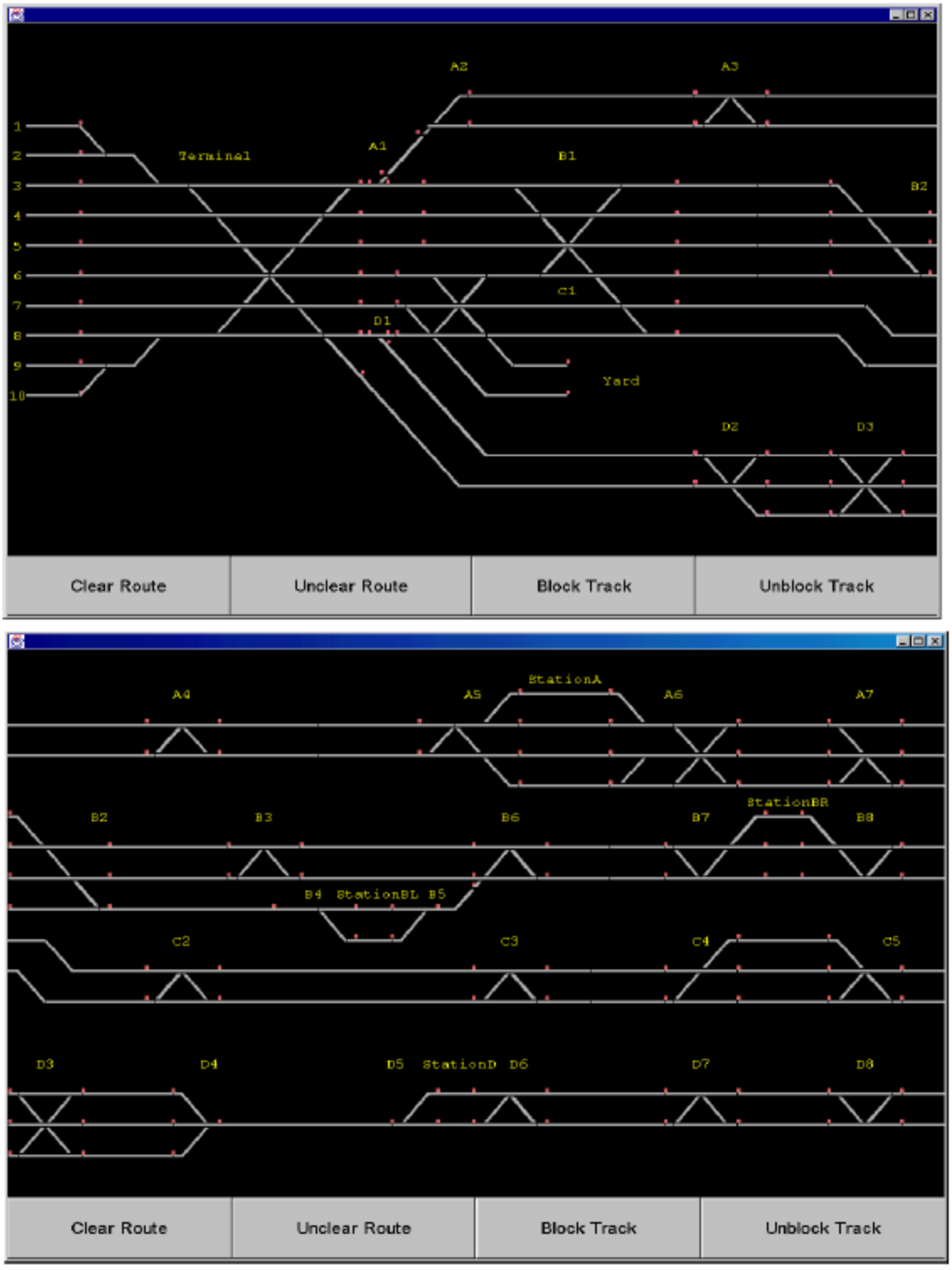



**Figure 8. Track Layout**

*Id*., Fig. 8, 6 ("The routing interface displayed the track layout and was modeled after a Central Traffic Control (CTC) based signal system. It simulated routing activity for a track network on the Northeast Corridor."), 8 (display updated "when a train passed an interlocking. Stations and interlockings were named."), 1 ("In CTC territories, the dispatcher monitors train position via signals communicated by track circuitry, on a visual display (i.e., a computer display or mimic board) and monitors events through two-way radio communications with railroad crews in the field."), 59 ("**Centralized Traffic Control (CTC)**: A signal system that allows the dispatcher to know which blocks are occupied by trains and roadway workers, and to control switches and signals remotely from the dispatch center.") (emphasis in original).

69. Other references likewise discuss similar known CTC systems. *See e.g.*, EX1020, [0002] ("The present invention relates to a control system for controlling a target device having an influence on safety of maintenance work, and a terminal device for maintenance worker and a control device included in the control system."), [0060] ("The central control device 100 . . . for controlling the rail transportation control system 1").



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### C. Using a Secret Code for Authorization or Authentication

70. As discussed below, the RE‘835 Patent allegedly recites a secret code, according to Railware.

71. I believe a secret code, including “one-time password” (“OTP”), was generated and transmitted in railway and other industries before the Priority Date.

- EX1005, 8:14-16 (“generating, at the server station, the personal secret code, e.g. a random number of a predetermined number of digits.”), 12:13-21 (The secret code is transferred over a network such as the Internet to a “railroad track … technician[.]”), 4:3-8 (secret code is sent to a specific user and to ensure secret, the code can be “terminate[d]” after “a one-time use”).
- EX1009, 13:66-14:8 (“generates a confirmation code and supplies that code to the customer” where the code is “randomly generated so as not to be predictable,” and “will be known only to the customer” or the relevant person), 15:7-27.
- EX1006, 6:63-7:4 (“authentication computer [server] 2 generates the transaction authorization number TAN or the comparable password” using “a random number generator 5 ….”), 7:16-18 (“The transaction authorization number TAN or the comparable password can be a one-time usable transaction authorization number TAN or a one time usable password.”).
- EX1008, Abstract (“one-time use access code … may be issued by a server … [and] may be generated using a cryptographically strong random number generator”), 7:30-42 (“every access code



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issued by server 30 … will be unique to the requester. That requester, and only that requester, will know the access code"), 9:41-44.

- EX1011, 4:31-38 (server generating a "cipher lock code" for a specific user and transmitting the code in "encrypted form" over the Internet to the user's wireless device which "decrypt[s]" it), 5:7-14 (user permitted "one-time access").

72. I also believe a POSITA knew before the Priority Date that secret codes were transmitted to a central system in railway and other industries for safety and security.

- EX1007, 16:1-21 (railway worker must enter on their mobile device "a specific code before it is deemed the target zone [] is safe for the passage of the vehicle."), 13:35-14:4, 15:16-35 (a railway worker enters a secret code "such as a PIN (personal identification number) or password only known to the user" which "[u]pon the successful entry of this code to the interface [of the remote command center, it] … transmit[s] a signal to the signalling device" which changes "from a red light [(blocked track)] to a green light [(unblocked track)] and signals the operator of the train to proceed." ), 20:31-37.
- EX1005, 2:8-13 ("transfer[s] a message containing the personal secret code from the [] communication device via the communication network to the server station" which verifies it), claim 1, 7:1-17, Abstract, 6:1-9.



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- EX1009, 14:18-25 ("Then, the confirmation code which was supplied for the given transaction is compared to the confirmation code that was received … to ensure that the customer is, in fact, providing a proper confirmation of the authorization.").
- EX1006, 7:8-15 (code "is transmitted again to the authorization computer" which "verifies" the code to control, *e.g.*, a locking mechanism or "physical access controls."), Abstract, 5:7-9, 5:24-48, 7:60-61.

73. Thus, a POSITA was aware and employed secret codes before the Priority Date across a range of fields, including railway systems.

### D. Known Workers Operating Mobile Device to Take Possession or Control of Worksite

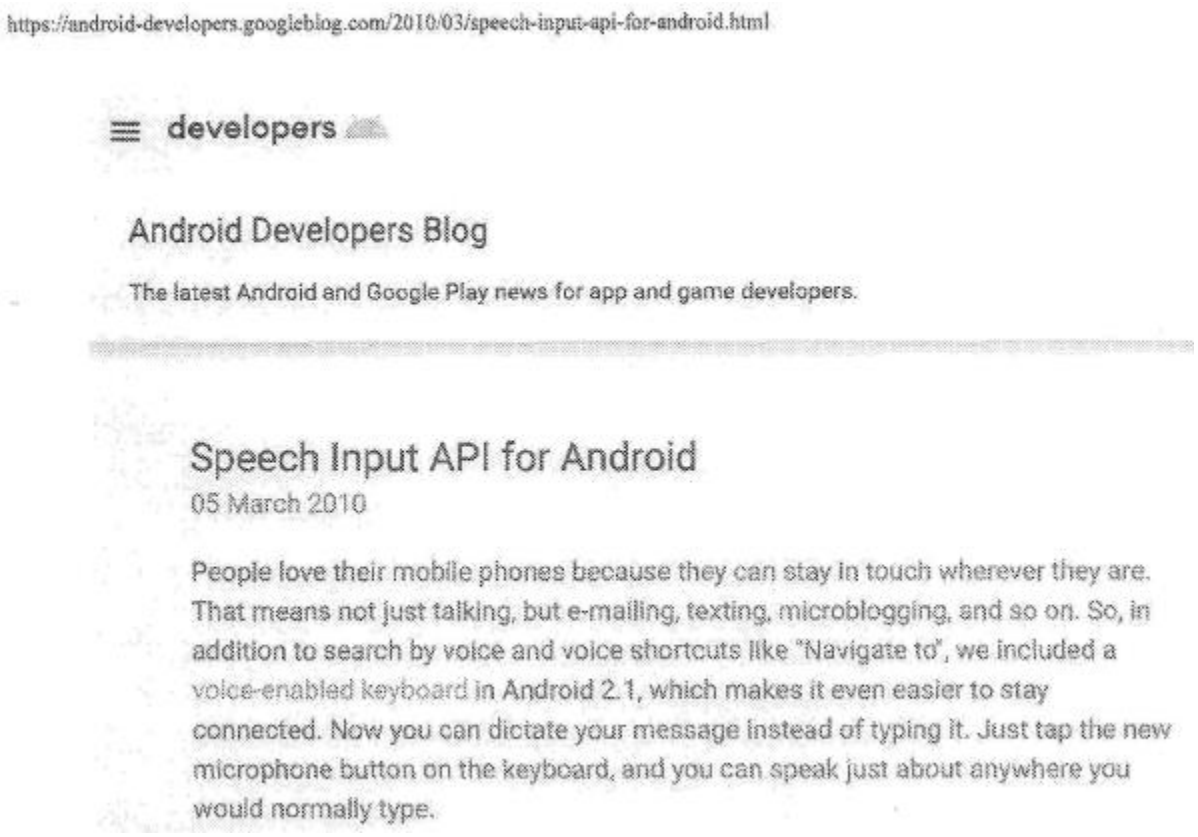
74. Before the Priority Date, it was conventional for railway workers to operate a mobile device for communicating with a central control system (dispatcher) for controlling a track.

75. The named inventor acknowledged to the USPTO in the application leading to RE'115 Patent that mobile phones, text messaging, and email were conventional before the Priority Date and thus indicated that these known communication methods could be applied to railway systems. EX1017, 8 (¶¶ 5-7), 15-16.



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76. This acknowledgement is shown below in a document provided by Mr. Pirtle to the USPTO.




*Id*., 15 (excerpt).

77. Several prior references also state that workers operated mobile devices for track control, such as to take possession and return possession of a work zone, with a CTC system. *See e.g.*, EX1004, Vol. I: 13, 29 ("The PDA also enabled the roadway worker to request a variety of work authorizations (Form D and Foul Time)."), 6 ("If the dispatcher grants permission to work …. the track is placed off-limits (blocked) … [and] blocking a track protects the roadway worker since it

prevents the dispatcher from routing trains on that track."), 36 (FRA-Report describes that the "worker can retrieve a list of Form Ds … under his/her authority … [and] [f]ollowing the link[] 'Cancel/Fulfill' … the roadway worker is able to give some track under his authority back to the dispatcher."); Vol. II: 11 ("Blue ... track section is authorized for maintenance ... [which means the] track has been protected …. When the dispatcher gives track authority to a work crew, the dispatcher temporarily loses control over that section of track."), 12; EX1020, Abstract ("A terminal device carried by a maintenance worker transmits, to a central control device, a request to maintain a first state in which a central control device controls a target device so that maintenance work is safely performed."), [0068] ("The terminal device 200 is, for example, a portable PC (Personal Computer) or PDA (Personal Digital Assistant), and is carried by the worker at a worksite where the maintenance work is performed. The terminal device 200 transmits a request for PIN lock or a request for PIN lock release to the central control device 100 in response to a manipulation of the worker."), [0082] ("After the worker performs the selection of the safety measure . . . the worker touch[es] a button B11 . . . [to] request for approval (Request PTW)."), Fig. 2, [0097] (the worker on the PDA interface selects "in FIG. 4, an unlock request button B32 for requesting the release of the PIN lock."), Fig. 4; EX1019, 7:1-18 ("The external workstation is therefore able to take over a part of



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the functionality of the traffic control system such that the operator of the external workstation can ensure blocking of the work zone. The external workstation preferably comprises a module for wireless communication, whereby the operator of the external workstation can take up position with a great measure of freedom close to the work area."), 11:3-17 ("In step 41 the withdrawal of the work zone is transferred to the traffic control system from the mobile workstation . . . . In step 43 the traffic control system sends a confirmation of receipt of the withdrawal data and this results in situation 44 wherein the occupied work zone is once again available to the traffic control system. In step 45 the work zone is unblocked within the traffic control system . . . .")

## VI. OVERVIEW OF THE RE'835 PATENT

### A. Summary

78. The RE'835 Patent was filed on March 22, 2018 as Application No. 15/928,955 and issued on February 4, 2020.

79. This is a reissue of U.S. Patent No. 9,403,545 ("'545 Patent"), Application No. 14/519,727, filed on October 21, 2014 and issued August 2, 2016, and claims alleged priority to a provisional with Application No. 61/893,547 filed on October 21, 2013. EX1001, front page.



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80. As discussed, I believe the RE'835 Patent combines known CTC systems with conventional mobile devices and a known code for authorization or authentication. *See supra* Sections V.B-D.

81. Specifically, the RE'835 Patent describes a CTC generic computer—which is configured to operate as the claimed railway traffic control apparatus—blocks a track based on a worker's request as well as generates and transmits a code to a worker's terminal, who transmits the same code to the railway traffic control apparatus to unblock the track. EX1001, Abstract ("Tools . . . to control traffic over a railway track section . . . [where] a block is placed . . . [and] a release code is generated . . . [such that] [t]he block is removed from the track section when the release code is received by the system."), 1:21-2:10, 2:49-3:6, 4:8-10. In other words, RE'835 Patent adapts conventional blocking mechanisms in conventional CTC systems by implementing a code that is generated, sent to a worker, and then received from the worker before releasing a block on the track. *Id*.

82. I understand Railware refers to this as the "crux of the inventive aspect." EX1018, 30:17-24 ("a code is sent out to the railway worker in the field and the block can only be released when that railway field worker provides the code back to the dispatcher. That is the crux of the inventive aspect….").

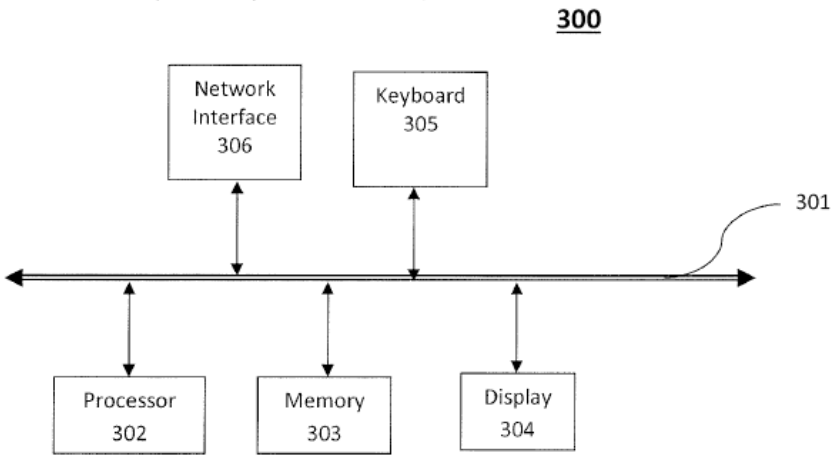


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83. However, independent Claim 40 does not require the worker to transmit or return the code to the CTC system to unblock the track.

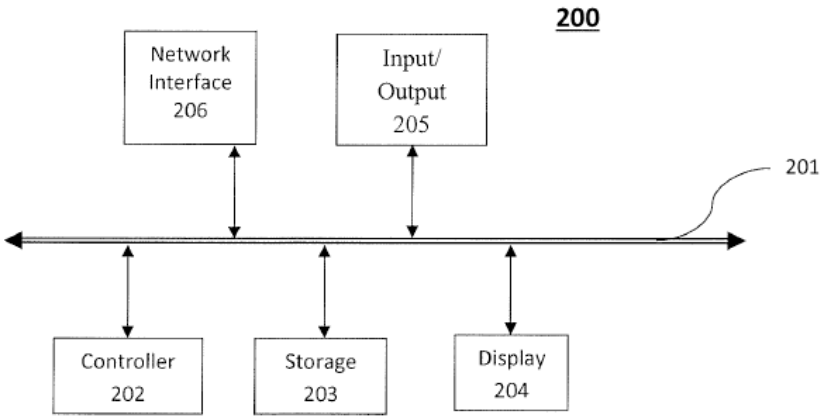
84. The known railway traffic control apparatus (Fig. 3B) and worker's user terminal (Fig. 3A) are shown below.

(Amended) **FIGURE 3B**




*Id.*, Fig. 3B, 6:17-30, 6:57-7:27.

**FIGURE 3A**




*Id.*, Fig. 3A, 6:31-56, 9:23-25.



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### B. Prosecution History

85. The application leading to the ’545 Patent did not receive a substantive office action rejection. EX1023.

86. On March 22, 2018, a reissue application of the ’545 Patent was filed. EX1002.

87. After preliminary amendments were filed on March 22, 2018 and May 24, 2018, claims 20-41 were added to existing claims 1-19. *Id*., 155-157, 242-254.

88. On January 23, 2019, a non-final office action rejection was issued based on several grounds, such as certain claims were anticipated by primary reference EP Publication No. 1308366 to Rahn et al. (“Rahn”) (Ground 6); rendered obvious over Rahn with US Publication No. 2011/0006912 to Sheardown et al. (“Sheardown”) and Tamaribuchi (Ground 7); and rendered obvious over Rahn, Sheardown, Tamaribuchi, and Wise (Ground 8). EX1002, 306-330.

89. On April 23, 2019, the applicant filed a new inventor oath asserting “at least one error” because claim 40 broadens claim 1, where the latter “unnecessarily limits the system to include ‘a rail personnel contact database . . . .’” *Id*., 368-369.

90. The applicant traversed the rejection on April 23, 2019, including the primary reference, Rahn. *Id*., 370-418.



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91. On June 12, 2019, the examiner issued a final office action but stated certain claims would be "allowable if rewritten or amended to overcome the rejection(s) under 35 U.S.C. 112(b) . . . ." *Id*., 426-455.

92. On August 9, 2019, the applicant amended several claims and cancelled claims 8, 17 in response to a final office action. *Id*., 484-511.

93. On September 16, 2019, a notice of allowance was issued. *Id*., 555-565.

94. On December 8, 2020 and June 1, 2021, certificate of corrections were issued relating to statements on the related applications. EX1001, last two pages.

### C. Priority Date

95. I have been asked to assume for the purpose of this declaration a priority date of October 21, 2013 (the "Priority Date"), the date of the provisional application, but to reserve the right to offer opinions about this priority date (and priority chain) before the PTAB or otherwise if asked.

## VII. LEVEL OF ORDINARY SKILL IN THE ART

96. I have been informed that a POSITA is a hypothetical person who is presumed to have the skill and experience of an ordinary worker in the field at the time of the alleged invention.

97. I believe a POSITA as of the Priority Date would have had at least a bachelor's degree in electrical, mechanical, or related engineering, and would have had at least two (2) years of experience in railway operations or railway control



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systems. A higher level of education or skill might make up for less experience, and vice-versa.

98. Railware's expert offered a similar POSITA description in the SEPTA litigation.

> It is my opinion that a person of ordinary skill in the art of the Asserted Patents would have (i) at least a bachelor's degree in electrical, mechanical, industrial or related engineering, and (ii) would have had at least two (2) years of experience in railway safety, railway operations, and/or railway control systems. A higher level of education or specific skill might make up for less experience, and vice-versa.

EX1025, ¶ 63; EX1024, 26.

99. I was a POSITA at the time of the Priority Date as discussed in my Qualifications (*see* Section II) and CV.

100. My analysis and conclusions set forth in this declaration are based on my educational background and experiences in the field (*see* Section II).

101. Based on my knowledge and experience, I believe that I am considered to be a POSITA in the field of the RE'835 Patent.

102. Also, based on my knowledge and experience, I understand and know of the capabilities of persons of ordinary skill in the field before the Priority Date.



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## VIII. IDENTIFICATION OF CHALLENGES

103. This Declaration explains the conclusions that I have formed based on my analysis.

104. To summarize those conclusions:

105. **Ground 1:** Based upon my knowledge and experience, I believe that claims 1-7, 9-16, 18-41 of the RE'835 Patent are obvious by FRA-Report (EX1004) and Kruijswijk (EX1005).

106. **Ground 2:** Based upon my knowledge and experience, I believe that claims 1-7, 9-16, 18-41 of the RE'835 Patent are obvious by FRA-Report, Kruijswijk, and Macey (EX1007).

107. **Ground 3:** Based upon my knowledge and experience, I believe that claims 1-7, 9-16, 18-41 of the RE'835 Patent are obvious by FRA-Report and Schmitz (EX1006).

108. **Ground 4:** Based upon my knowledge and experience, I believe that claims 1-7, 9-16, 18-41 of the RE'835 Patent are obvious by FRA-Report, Byford (EX1011), and Macey.



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## IX. CLAIM CONSTRUCTION

109. I have generally applied the plain and ordinary meaning of the terms recited in the claims, as would have been understood by persons of skill in the art as of the Priority Date. In *Railware, Inc. v. Southeastern Pennsylvania Transportation Authority*, Case No. 2:24-cv-02963-JMY (EDPA) (the "SEPTA litigation"), the parties filed proposed constructions. EX1024-1027. The SEPTA litigation was dismissed.

110. I understand Petitioner does not believe any claim terms require express construction for purposes of this IPR given the prior art disclosure herein.

111. Nonetheless, I have been asked to (i) explain herein how the prior art satisfies even Railware's (and SEPTA's) proposed constructions in the SEPTA litigation as well as the Board's discussion of the claimed code in the RE'835 Patent IPR (IPR2023-01180 ("-1180 IPR")) and (ii) reserve the right to respond to any proposed constructions advanced by Railware in this proceeding.

112. For purposes of this IPR only, I have been asked to apply their constructions, along with the Board's discussion for the claimed code in the prior institution-denied -1180 IPR.

113. However, I have been asked to reserve the right to respond to any claim construction arguments or decision and all rights to raise claim construction arguments in any proceeding.



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**A. Claimed Code: "removal code"** (claims 1, 3, 5-7, 9-10, 12, 14-16, 18-19); **"secret release code"** (claims 20, 23-24, 27-28, 30, 33-34, 37-38); **"secret code"** (claims 40-41); and **"secret removal code"** (claims 26 and 36)[2]

| Term | Railware | SEPTA |
|---|---|---|
| "removal code"<br><br>"secret release code"<br><br>"release code"[3] | "A code that is not readily available to the user of the railway [traffic] control apparatus (*i.e.*, the dispatcher)." EX1024, 17, 18, 23, 19-21, 7; EX1025, ¶¶ 152, 148, 113-114, 128-130.. | Indefinite. EX1026, 23-24. |
| "secret code" | "A code that is not readily available to the user of the railway control apparatus (*i.e.*, the dispatcher)." *Id*. | Indefinite. EX1026, 23-24. |

114. I understand Railware's expert in the SEPTA litigation asserted "those skilled in the art that 'secret,' as applied to the Code Terms, means a code that is not

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[2] Railware and SEPTA in their briefs list only certain claims for each term herein. *See* EX1024, EX1026.

[3] This term appears in Railware's brief (EX1024, 17), but it is not recited in the RE'835 Patent claims.



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readily available to the dispatcher ….” EX1025, ¶¶ 152, 148, 113-114, 128-130; EX1024, 18 (“‘secret’ from the dispatcher.”) (citation omitted), 23, 19-21, 7.

115. I understand Railware’s expert in litigation contended that, “a code qualifies as not readily available to the dispatcher based on whether the dispatcher can see or easily access the code before it is time for removal the block.” EX1025, ¶154; EX1024, 27.

116. I understand Railware’s expert asserted that, “there are ***a lot of parameters that are involved*** there that, ***absent of knowing those parameters***, then the ***secretness of the code to the dispatcher or its availability or lack of cannot*** be ***definitively ascertained***.” EX1026, 28 (emphasis added); EX1027, 100:6-102:2. I agree.

117. I understand the Board previously denied the -1180 IPR challenging the claims of RE’835 Patent, finding that the prior art did not show the claimed code.

118. While the Board in -1180 IPR stated it was not construing the claimed code, the Board did assess it as shown below:

> The ’835 patent makes clear that the code is “only” received by the relevant railway field worker and an internal storage … Although the ’835 patent describes alternative means for retrieving the code from internal storage when the field worker is unavailable, accessibility to the code is limited and this alternative access is only provided where “no maintenance

> worker [is] available to transmit the random secret code." *See id*. at 10:44–48; *see also id*. at 6:3–6, 9:54–56, 10:23–30, 10:35–52 (consistently describing the "removal code"/"secret release code"/"secret code" as "secret").

IPR2023-01180, Paper 8, 20-21 (Jan. 22, 2024) (citing EX1001) (internal citations omitted), n.3 ("no material difference between" the code terms).

119. I understand in the prior IPR, the Board noted, while not resolving Railware's proposed construction (similar to the above), that the specification fails to inform how a POSITA "would have distinguished a code that is 'readily available' to the dispatcher from a code that is not 'readily available.'" *Id*., 21 n.12; EX1026, 26.

120. I agree with the Board that the specification does not state when the claimed code is "not readily available to the dispatcher" because, for instance, the specification never uses the words "readily available" and "a lot of parameters that are involved" as discussed above. Also, "whether the dispatcher can see or easily access the code before it is time for removal the block" compounds this issue as Railware has introduced another subjective term ("easily access") not defined or discussed in the specification on top of "readily available."

121. Further, Railware alleges in a July 8, 2025 Complaint: "software that will only allow the dispatcher to release track and time authority after both the RWIC

[Roadway Worker In Charge] and one authorized person in the work group has entered a special pin code into the system." EX1030, ¶ 89.

### B. "railway control apparatus" (claims 1, 40-41) and "railway traffic control apparatus" (claims 1-2, 6, 10-16, 18-30, 32-34, 38)

| Railware | SEPTA |
|---|---|
| "[n]o construction necessary or plain and ordinary meaning" EX1025, ¶183. | "centralized traffic control (CTC) console used by the train dispatcher" EX1026, 21. |

122. Railware's expert believes the term should be "broadly understood and encompasses a number of hardware (such as processor and memory components) and software components beyond just the dispatcher's console." EX1025, ¶¶194, 200-201, 183-186, 192, 210, 223.

### C. "user terminal" (claims 1, 20, 23, 27-28, 30, 33, 37-38, 40-41)

| Railware | SEPTA |
|---|---|
| "user terminal of a railway field worker" EX1025, ¶¶226, 239; EX1024, 43, 47. | "railway field worker's mobile user device" EX1026, 6-7. |

123. Railware believes its construction encompasses "'***any communication device***' and not necessarily a 'mobile user device'." EX1024, 47 (emphasis in original).

### D. "from the terminal" (claims 20, 30) and "from the user terminal" (claim 41)

| Railware | SEPTA |
|---|---|
| "[n]o construction necessary or plain and ordinary meaning" EX1025, ¶¶327-28, 356, 358. | "transmitted from the user terminal (as previously defined)" EX1026, 15-16. |

124. Railware's expert contends these terms do not require construction beyond Railware's proposed construction for "user terminal" above and the "claims are … agnostic as to how the code is transmitted to the railway control apparatus, only specifying that the code must be 'receiv[ed].'" EX1025, ¶¶328, 356, 358.

### E. "railway traffic controller" (claims 2, 11)

| Railware | SEPTA |
|---|---|
| "[n]o construction necessary or plain and ordinary meaning" EX1025, ¶¶362, 368. | "train dispatcher" EX1026, 29. |

125. Railware's expert asserts "railway traffic controller" is the "individual or entity that is controlling railway traffic … [and] is doing so by interfacing with the 'user interface'…." EX1025, ¶¶362, 368, 367, 371-373.

### F. "via the network" (claims 20, 28, 30, 38, 41)

| Railware | SEPTA |
|---|---|
| "No construction necessary or plain and ordinary meaning" EX1025, ¶¶ 375-377, 382, 385 | "via the same network used to transmit the secret release code" EX1026, 30. |

126. Railware's expert contends network is "broadly understood" to include "various communications systems and hardware and software components." EX1025, ¶¶385 (citations omitted), 382 ("one or more networks"), 375-377.

### G. Remaining Claim Terms

127. For the remaining claim terms of the RE'835 Patent, I have applied their plain and ordinary meaning as understood by a POSITA.

## X. GROUND 1: CLAIMS 1-8 ARE OBVIOUS OVER FRA-REPORT AND KRUIJSWIJK

### A. Summary of FRA-Report

128. *Supporting Railroad Roadway Worker Communications with a Wireless Handheld Computer* ("FRA-Report") (EX1004) is a two-volume report that was published by the U.S. Department of Transportation, Federal Railroad Administration in October 2004.

129. Volume I of FRA-Report ("Vol. I") discusses the study from the perspective of the "Usability for the Roadway Worker" and Volume II ("Vol. II") discusses the study as to the "Impact on Dispatcher Performance." EX1004, Vol I: Title Page, Vol II: Title Page.

130. This report was developed to support the development of data link (digital communications) technologies from the roadway worker perspective to improve their safety.

#### 1. One Reference or Motivation to Combine

131. A POSITA would have understood FRA-Report to be an omnibus multi-volume publication that constitutes a single unified publication for the several points outlined below.

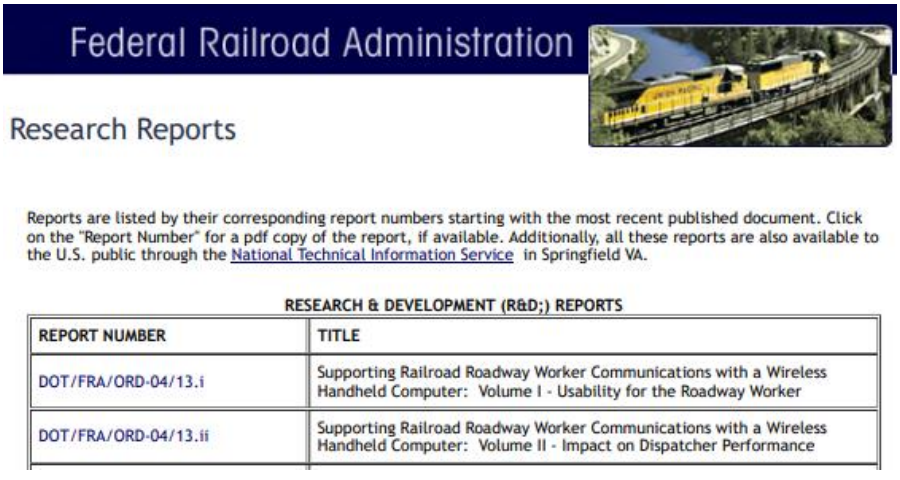
- Vol. II states that it is "***continuing development and evaluation of the [Vol. I] application*** …." EX1004, Vol. II: 3 (emphasis added), Abstract ("This ***report*** is the ***second in a series***



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documenting the development and evaluation of a software application to facilitate communications for railroad roadway workers.") (emphasis added), ix, 5 ("The information described here adds to [Vol I] ...."), 72. As such, Vol. I and Vol. II form a single publication.

- Both FRA-Report volumes were published by the U.S. Department of Transportation, FRA. EX1004, Vol. I and Vol. II: cover page.
- Both FRA-Report volumes were published with the same report number ("DOT/FRA/ORD-04/13." with a "i" and "ii") and at the same date of October 2004. EX1004, Vol. I and Vol. II: Report Documentation Page, Boxes 2 and 10.
- Both FRA-Report volumes share overlapping authors. EX1004, Vol. I, Vol. II: Report Documentation Page, Box No. 6.
- A POSITA accessing FRA-Report publicly would have found them together as shown below.




*See e.g.*, EX1012, 1.



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- Both volumes are in the field of, and solve the problem of, railway control for safe maintenance work and both have substantially similar network architecture. EX1004, Vol. I: Abstract, 1, 6, 14 (Fig. 2), 29, 37-38; Vol. II: Abstract, ix, 3, 5, 10-12, 16 (Fig. 4).

132. Given the significant overlapping aspects discussed above, I believe that a POSITA would have considered FRA-Report Vol. I and Vol. II to be one publication that would have been consulted by a POSITA together.

133. Alternatively, I believe a POSITA would have been motivated to combine the two volumes with a reasonable expectation of success for the reasons above.

**2. Accessible to Interested Members of the Relevant Public**

134. I believe the FRA-Report was accessible to interested members of the relevant public based on the FRA's statements, including that FRA-Report was generally "available to the public": "This document is ***available to the public*** through the National Technical Information Service, Springfield, VA 22161. This document is also available on the FRA website at www.fra.dot.gov." EX1004, Vol. I, Vol. II: front page (emphasis added), Report Documentation Page ("12a. Distribution/Availability Statement"), notice page ("This document is disseminated under the sponsorship of the Department of Transportation in the interest of information exchange.")



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135. Also, I believe the Internet Archive confirms FRA-Report was available to the relevant public at www.fra.dot.gov in, for instance, 2005, 2006, 2008, and 2009 and under "Research Reports." EX1012-1015 (*see* "DOT/FRA/ORD-04/13.i" and "DOT/FRA/ORD-04/13.ii"); EX1016 (Internet Archive affidavit for the websites in EX1012-1015). It would have been normal for a POSITA to visit the FRA in 2005-2009 to keep updated on current information such that the POSITA would have reviewed or seen the FRA-Report.

136. I further believe the FRA-Report was accessible to interested members of the relevant public because, as discussed above, they were published together.

### 3. FRA-Report Overview

137. FRA-Report explains that current communications technology "offers the opportunity to improve productivity and safety in railroad operations" and that the Report "documents the design and evaluation of a digital communication device intended to improve roadway worker safety and productivity." EX1004, Vol. I: iii; Vol. II: ix-x.

138. It also teaches that "[c]ommunications are vital in making railroad operations safe and efficient," and that providing mobile devices to roadway workers for digital communications between them and central dispatch improves both safety and productivity. *Id*., Vol. I: 1-2; Vol. II: 1-2.

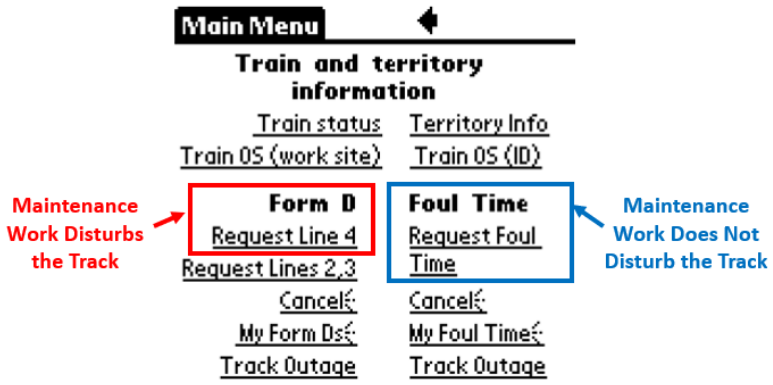


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139. FRA-Report describes a CTC system that, upon a railway worker's request from a mobile phone (PDA), blocks the track to "protect[] the roadway worker since it prevents the dispatcher from routing trains on that track" (*id.*, Vol. I: 6, 11-14) because "the dispatcher temporarily loses authority over that track" to the worker. *Id.*, Vol. II: 12.

140. The work authorization can include that a "track is placed off-limits (blocked) for other uses" via "Foul Time" or "Form D, Line 4." *Id.*, Vol. I: 6-8. "Foul Time" (sometimes called "track and time") is used when a worker needs a track taken out of service (*i.e.*, blocked) for maintenance work, but the work does not disturb the track. *Id.*, Vol. I: 8-9. "Form D, Line 4" is used when a worker needs a track taken out of service (*i.e.*, blocked) for maintenance work, and the work involves on-track equipment or will disturb the track. *Id.*

141. The Figure below depicts the roadway worker's mobile device interface for requesting blocking of the track under both Form D, Line 4 and Foul Time.

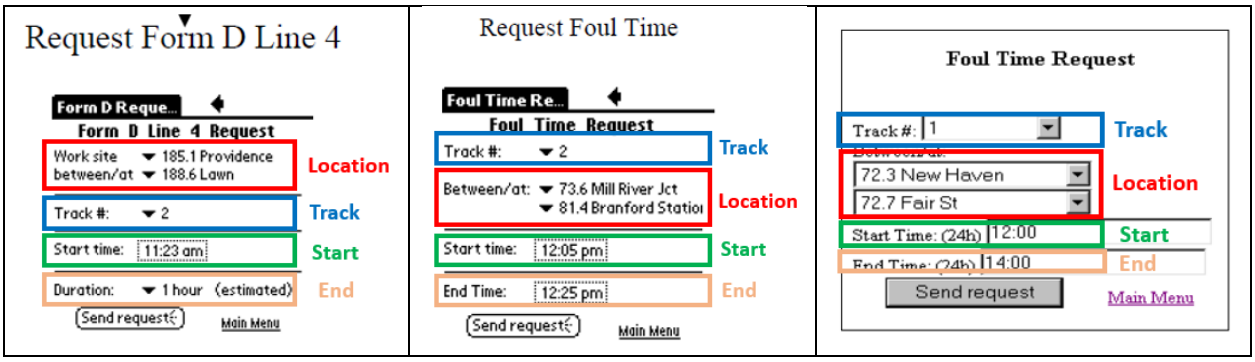





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*Id.*, Vol. I: 16 (Fig. 4, annotated); *see also* Vol. II: 17 (Fig. 5).

142. When the worker clicks "Request Line 4" or "Request Foul Time," the worker is brought to a subsequent screen where the worker inputs information for the maintenance request, such as the worksite location, track number, and timing.




*Id.*, Vol. I: 34 (Fig. A-3 (Left), annotated), 35 (Fig. A-4 (Center), annotated); Vol. II: 19 (Fig. 8 (right), annotated).

143. The roadway worker's request for blocking of a track is transmitted to the dispatcher, such as via a "wireless data link" (*i.e.*, wireless access to the internet). *Id.*, Vol. I: Abstract ("A prototype communications device was developed for roadway workers to request train and territory information and to request track protection from the dispatcher. The device uses a wireless data link to send and receive information in digital form."), iii, x, 13-14 (Fig. 2); Vol. II: ix-x, 15-16 (Fig. 4).

144. The worker who requested the block track will be sent by the CTC system information, including "Form D number (automatically assigned by system),

Form D recipient, date, direction of travel, track number, track location, and information about trains or track cars ahead." *Id*., Vol. I: 38.

145. The CTC requests confirmation by the railway worker. *Id*., Vol. I: 34-35 (Figs. A-3, A-4). The confirmation request includes such information as: (1) date, (2) worker's identity, (3) track and location, and (4) the dispatcher granting the request. *See id.*




*Id*., Vol. I: 34 (Fig. A-3 (left)), 35 (Fig. A-4 (center)); Vol. II: 20 (Fig. 11 (right)).

146. The dispatcher operates a workstation comprising multiple monitors that is used to control the switches and signals in the field which will block and unblock the track. *Id*., Vol. II: 10 ("Each dispatcher is in charge of a specific territory where he/she has authority to route the trains, take tracks out of service, and grant work authorizations. Each dispatcher has a workstation to control the switches and signals."), 11, 28.

147. The dispatcher workstation displays a color-coded representation of the track which the dispatcher operates to control a plurality of railways and interlocks.



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For instance, the interlocks for the tracks in blue have been controlled to block the track while the tracks in green have been unblocked.

**Table 2. Representation of Color Code for Monitoring Track Status**

| Color | Meaning |
|---|---|
| White | Indicates that the track segment is available for routing trains or other uses. |
| Red | Means train or track vehicle occupancy. A train currently occupies that block. |
| Green | Indicates that the track segment has been cleared (authorized for use) for train movement. The train has not yet entered this block. |
| Blue | Indicates that a track section is authorized for track maintenance. This means that a portion of track has been protected for use by maintenance of way crews or track equipment. When the dispatcher gives track authority to a work crew, the dispatcher temporarily loses control over that section of track. Trains cannot enter this track segment unless authorized by the roadway worker responsible for that block. |

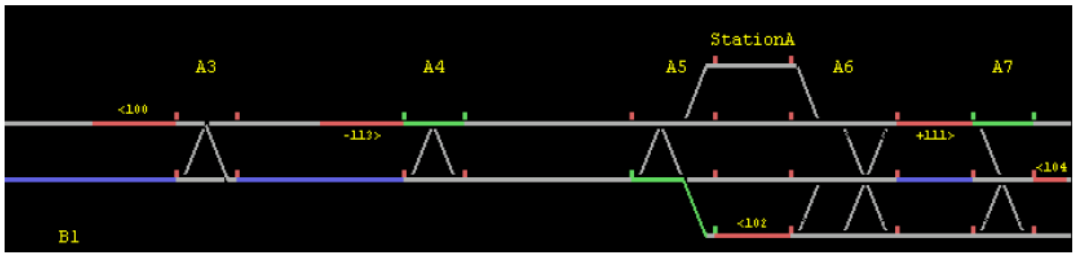



**Figure 1. Track Chart Display**

*Id*., Vol. II: 10-11 (Fig. 1, Table 2).

148. "If the dispatcher grants permission to work, (under Foul Time, Form D, or verbal permission) the track is placed off-limits (blocked) for other uses." *Id*., Vol. I: 6. In CTC systems, "blocking a track protects the roadway worker since it prevents the dispatcher from routing trains on that track." *Id*. In other words, "[s]witch operation is restricted, and the signals (wayside and in-cab) for the blocked track will display a stop signal at both ends to prevent movement by unauthorized

track vehicles." *Id*.; Vol. II: 11 ("After receiving the request, the dispatcher decided whether to grant, modify, or deny the request. … If the dispatcher intended to grant the work authorization, the dispatcher proceeded to protect the requested track.").

149. Placing a block on the track transfers authority over that track to the worker, and the "dispatcher will not be able to reverse or normalize a switch that is part of the blocked track." *Id*., Vol. I: 6 ("Once authorization for track use is granted to a roadway crew and the track is blocked, the dispatcher has delegated authority over that track to the roadway crew."); Vol. II: 12 ("Once a track is blocked, the dispatcher temporarily loses authority over that track."). A dispatcher also cannot route trains over a blocked track. *Id*., Vol. I: 6; Vol. II: 12-13.

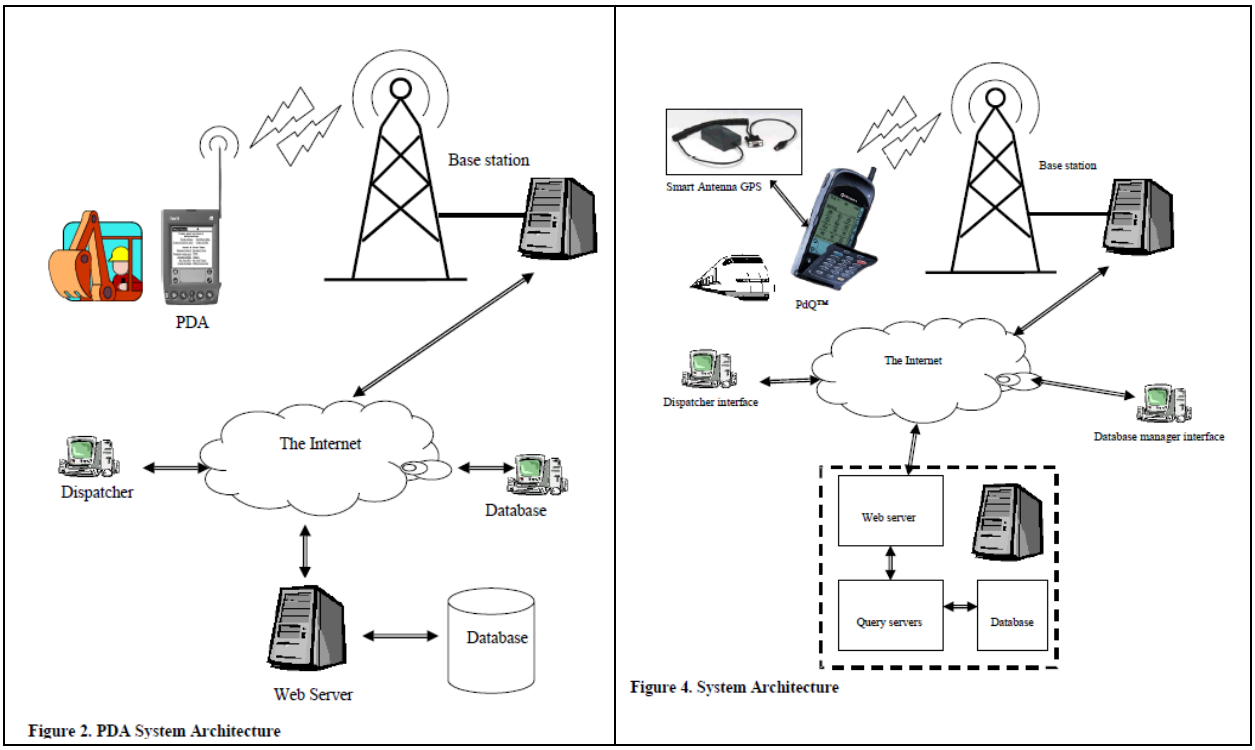
150. After performing any work, the worker selects on the mobile phone "the links [or prompts] 'Cancel/Fulfill' or 'Clear' …. to give some track under his authority back to the dispatcher." *Id*., Vol. I: 36-37, 32 (Fig. A-1), 6; *see also id*., Vol. II: 12.

151. The dispatcher uses the workstation to unblock the track and make it available for other uses. *Id*., Vol. I: 6; Vol. II: 12 ("Once the job is complete, the roadway worker returns control of the track to the dispatcher, who releases the track for other uses."), 10-11.



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152. Figure 2 of Volume I, and Figure 4 of Volume II depict the system architecture.




*Id*., Vol. I: 14 (Fig. 2 (left)); Vol. II: 16 (Fig. 4 (right)).

153. In other words, the FRA-Report teaches that the worker controls blocking and unblocking of the track from his mobile device.

### 4. Analogous Art

154. Based on my review of the RE'835 Patent's prosecution history (EX1002), FRA-Report was not considered during prosecution of the RE'835 Patent.

155. In my opinion, FRA-Report is analogous art to the RE'835 Patent because FRA-Report is from the same field of endeavor as the RE'835 Patent of

workers, railway work, or access control. EX1001, title, Abstract, 1:21-2:10, 2:49-3:6, 4:8-10, 4:42-46; EX1004, Vol. I: 6, 36-37, Abstract, 32 (Fig. A-1); Vol. II: 10-12, 18-20, Abstract and summary of the FRA-Report discussed above.

156. I believe Railware's expert's description of the RE'835 Patent supports the above field of endeavor. EX1025, ¶¶54 ("control traffic over a railway track section when a railway worker is working on or near the track section"), 57, 20; EX1024, 6, 13-14.

157. FRA-Report, as shown in my analysis above, is also reasonably pertinent to any purported problem addressed in the RE'835 Patent, namely, controlling or authorizing access to a location or a region, such as by workers or railway traffic. EX1001, title, Abstract, 1:21-2:10, 2:49-3:6, 4:8-10, 4:42-46.

**5. Prior -1180 IPR**

158. I understand that Petitioner relies on the same primary reference (FRA-Report) as -1180 IPR, but in combination of new references not considered in the prior IPR.

159. As discussed more below, I believe the FRA-Report discloses a CTC system blocking a track at a railway worker's request and not unblocking the track until the worker selects on a mobile device interface a link ("Cancel/Fulfill") to confirm it is safe. *See e.g.*, EX1004, Vol. I: 6, 11-14, 29, 36.



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160. In other words, FRA-Report already discloses blocking and unblocking the track at the worker's request or control.

161. I further note that the FRA-Report is combined with new prior art (Kruijswijk, Schmitz, Macey and others) that teaches transmitting and/or returning a secret code from the relevant person to control access, such that the FRA-Report's CTC system will not unblock the track until the relevant worker provides the code, *e.g.*, sending the code via the cancel/fulfill link or conveying the code by calling or texting the dispatcher. EX1005, 8:14-20, 3:29-34; EX1006, 6:63-7:4, 8:19-21, 5:58, 2:57-3:5, Abstract; EX1007, 15:22-35*;* EX1008, Abstract, 7:30-42, 9:41-44. I further outline below with corroborating references that it was known to a POSITA to generate and return a secret code, *e.g.*, for safety and security, and the problem of protecting railway workers, among other reasons, which would have led a POSITA to apply the secret-code references (as the claimed code) in FRA-Report. *See e.g.*, *infra* ¶¶ 228-233, 255-261.

162. In my opinion, based on these new references, the instant Petition renders the RE'835 Patent obvious.

**B. Summary of Kruijswijk and Analogous Art**

163. PCT Pub. No. WO 2007/107554 A1 (EX1005, "Kruijswijk") published on September 27, 2007 and is therefore prior art under at least AIA 35 U.S.C. § 102(a) without any § 102(b) exceptions.



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164. Kruijswijk discloses a system used for railway safety, that involves comparing a communicated "secret code" for identity verification. EX1005, Abstract, 12:13-21 ("railway track" "technicians" using this system for railway "safety checks").

165. Specifically, Kruijswijk teaches "generating, at the server station, the personal secret code, e.g. a random number …." *Id*., 8:14-16, 3:30.

166. The secret code is transferred over a network such as the Internet to a railway worker or "railroad track … technician[.]" *Id*., 12:13-21, 13:25-28, 1:11-17, 3:29-34, 8:21-25.

167. Thereafter, the worker "transfer[s] a message containing the personal secret code from the [] communication device via the communication network to the server station" which verifies it with the saved code. *Id*., 6:1-9 ("database includes, for a particular user … the personal secret code itself, and/or verification data for verifying that a code entered indeed is the personal secret code of the respective user."), 2:8-13, 11:8-17, Abstract.

168. Based on my review of the RE'835 Patent's prosecution history (EX1002), Kruijswijk was not considered during prosecution of the RE'835 Patent.

169. In my opinion, Kruijswijk as shown in my above analysis is analogous art to the RE'835 Patent because Kruijswijk is from the same field of endeavor as



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the RE'835 Patent of workers, railway work, or access control. EX1001, title, Abstract, 1:21-2:10, 2:49-3:6, 4:8-10, 4:42-46; EX1025, ¶¶20, 54, 57; EX1024, 6, 13-14; EX1005, 12:13-21, Abstract, 3:29-34, 8:14-25.

170. For instance, Kruijswijk describes workers, railway work, and access control below:

> One application of the invention is to use it for safety checks that must be performed by at least two technicians. Regulations (by the company or the government) may require some kind of proof that the safety checks were really performed by the technicians. With this invention, it can be proved that the technicians were at least at the same physical position. For instance, after the repair of a railroad track, regulations may require inspection by two technicians.

*Id*., 12:13-21.

171. A POSITA would have understood that Kruijswijk is a form of "access control" because it verifies the railway workers are in the correct location, otherwise, they would have been asked to move to the proper location (or be denied access to the current location if not in the correct area).

172. Additionally, Kruijswijk, as shown in my analysis above, is reasonably pertinent to any purported problem addressed in the RE'835 Patent, namely, controlling or authorizing access to a location or a region, such as by workers or



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railway traffic. EX1001, title, Abstract, 1:21-2:10, 2:49-3:6, 4:8-10, 4:42-46; EX1005, 12:13-21, Abstract, 3:29-34, 8:14-25.

### C. Analysis of Independent Claim 1

#### 1. 1[Pre]: "A centralized railway control system comprising:"

173. I understand that a preamble may or may not be limiting and believe that the FRA-Report teaches Limitation 1[Pre].

174. FRA-Report teaches a centralized railway control system—"Central Traffic Control (CTC)"—such as "North East Corridor dispatcher" to grant railway track protection to workers. EX1004, Vol. I: 6, 34 (Fig. A-3).

175. Specifically, FRA-Report teaches railway workers operating a user terminal (or PDA) interface to request work authorization or block the track, *e.g.*, Form D request, from the CTC system for safety. EX1004, 6 ("When a dispatcher receives a request for roadway worker protection . . . [and if] the dispatcher grants permission to work, (under . . . Form D . . .) the track is placed off-limits (blocked) for other uses. In Central Traffic Control (CTC) territory, blocking a track protects the roadway worker since it prevents the dispatcher from routing trains on that track."), 32 and 34 (Figs. A-1, A-3) ("**North East Corridor dispatcher** has received your request . . . 2 track out of service") (emphasis in original), iv, 1 ("In centralized traffic control territory, switches and signals receive commands from the dispatcher's computer."), Abstract ("A prototype communications device was



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developed for roadway workers . . . to request track protection" from "dispatchers at the Central Traffic Control Center"), 29 ("The PDA also enabled the roadway worker to request a variety of work authorizations (Form D and Foul Time)."), Fig. 2 (showing centralized system), 58.

176. After any work, the railway worker selects or activates the "Cancel/Fulfill" or "Clear" link (displayed by the CTC on the user terminal interface), "to give some track under his authority back to the dispatcher [CTC]." *Id*., Vol. I: 36-37, 6, 14 (Figs. 2), 32 (A-1), 34 (A-3), 29; Vol. II: 12, 10-11.

177. Additionally, it was known to a POSITA to for a dispatcher to operate a centralized railway control system with plural railways and interlocks as RE'835 Patent and other references acknowledge. *See supra* Section V.B.

**2. 1[A]: "a rail personnel contact database registering, for each railway personnel, an electronic contact address of the railway personnel; and"**

178. I believe that the FRA-Report teaches Limitation 1[A].

179. Claim Limitations 1[A], 10[B], and 19[B] recite a "rail personnel contact database" while independent Claims 20, 30, and 40 do not recite such a rail personnel contact database.

180. FRA-Report describes that the worker PDA's electronic contract address, such as a device ID, along with dispatcher and other worker information are registered in the CTC system's database (or other storage). EX1004, Vol. I: 39 ("***The***

***database includes information about dispatchers, roadway workers … Dispatchers (dispatchers.txt) … Roadway workers (MWForemen.txt). Includes information about registered PDAs and their owner***.") (emphasis added), 57 ("Each Palm VII device had a built in device ID . . . [and this] device ID was used to identify which roadway worker was sending each request."), 38 ("If the dispatcher grants the Form D, the appropriate information will be sent to the roadway worker who requested it."), 13 ("A work authorization was sent to the dispatcher while an information request was answered by the system without interrupting the dispatcher by querying the database."), 14 (Fig. 2: "Database"); Vol. II: 16 (Fig. 4: "Database"); Limitation 1[B] (showing database), 1[D] (discussing retrieving electronic contact address).

181. It was known to a POSITA to store data in a standalone database and/or multiple databases (or other storage) with a link between the data because database configuration, the number of databases used, and the location of the data storage is simply a design choice made among well-known alternatives that could be used depending on the needs of the system.

182. Additionally, it would have been known to a POSITA that the PDA includes electronic addresses, *e.g.*, a MAC address, device ID, or IP address, and that some or all of that information would have been stored in the railway traffic control apparatus' database used for communicating with workers.



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183. These are routinely used in the field as contact addresses, and that some or all of that information would have been stored in the CTC system database used for communicating with workers.

**3. 1[B]: "a railway traffic control apparatus *configured for centralized control of traffic of a centrally controllable railway network including plural railways and a plurality of railway traffic interlocks dispersed in said plural railways constituting said railway network*, for controlling access to railway tracks, said railway traffic control apparatus comprising a processor, a non-transitory medium storing one or more programs of executable instructions, and a network interface through which the railway traffic control apparatus communicates via a network with a user terminal,"**

184. I believe that the FRA-Report teaches Limitation 1[B].

185. FRA-Report discloses a railway traffic control apparatus (or railway control apparatus) or CTC dispatcher's console or computer (*e.g.*, processor, non-transitory medium or storage), database, and web and query servers with associated database—along with a network interface for communicating over a network (Internet) with a worker's PDA, as shown below.



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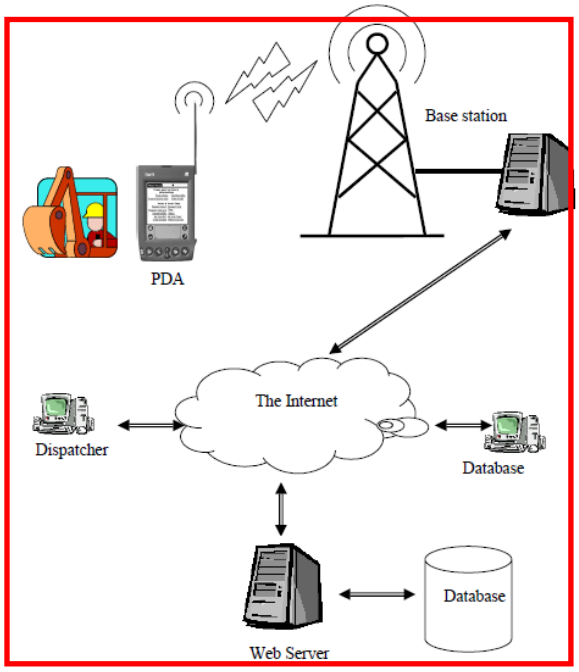



Figure 2. PDA System Architecture

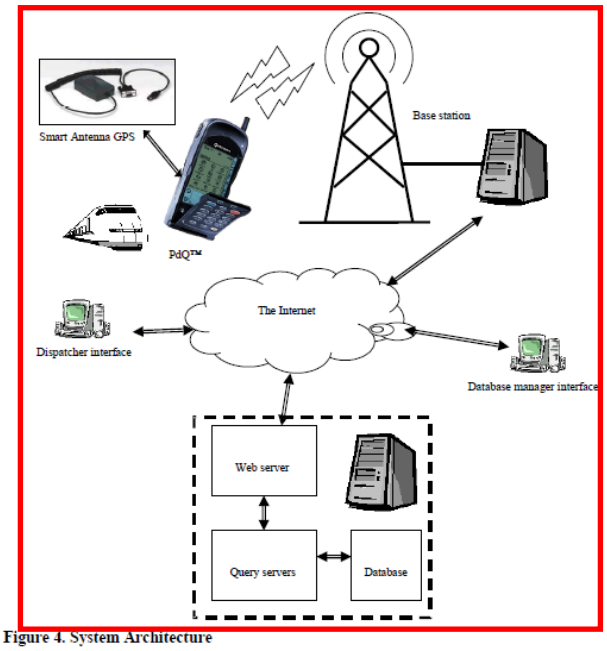



Figure 4. System Architecture

EX1004, Vol. I: 14 (Fig. 2, annotated), 13, 31, 36-39, 1, 6; Vol. II: 16 (Fig. 4, annotated), 43-46.

186. The railway traffic control apparatus with the dispatcher's computer, web server, and/or query server each have a processor and a non-transitory medium such as a hard drive or other storage for storing one or more programs of executable instructions. *Id.*; *id.*, Vol. I: Fig. 2 (showing computers), 31 ("dispatcher's terminal" and query/web server described as a "computer"), 36 ("query servers used in this study were mainly written in Java (Sun Microsystems, 2001) . . . . [A] Common Gateway Interface (CGI) script . . . [was] used as an interface between the web server and the query servers. It reads the HTML forms as sent by the PDA . . . and returns the requested information to the PDA."), 38-40, 11 ("[A] software application was



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developed for use on a PDA"), Fig. 1 ("Dispatcher's terminal"); Vol. II: 10 ("Each dispatcher has a workstation [processor] to control the switches and signals."). A POSITA would further understand the dispatcher's CTC workstation or computer could be a standalone computer or multiple computers or in combination with one or more servers (or accesses the software on a central server or series of servers) because a railway system may require several computers or servers to operate a railway system. For instance, a POSITA would have made a design choice for a dispatcher's CTC workstation to consist of multiple computers in combination with multiple servers to provide a level of availability (fault tolerance) necessary to ensure that the system is operational and functional upon demand.

187. It was known to a POSITA that computers (servers) would have hard drive(s), memory (such as RAM), and other storage to store data necessary for the computer. It was common for computers to have processors to execute software (or instructions) residing on the computers as they are invoked, such as an operating system and other applications. *See e.g.*, EX1020, [0067] ("The control unit 190 includes a CPU (Central Processing Unit) for reading and executing a program from the storage unit 140 and controls each unit of the central control device 100."), [0351] ("Also, a program for realizing all or some of the functions of the central control device 100 or the terminal device 200 may be recorded in a computer-



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readable recording medium. The program recorded in this recording medium may be read and executed with a computer system to perform a process of each unit. Also, the 'computer system' cited herein includes an OS or software of a peripheral device and the like."), [0353].

188. This railway traffic control apparatus provides centralized traffic control over a railway network because FRA-Report centrally controls (such as "dispatchers at the Central Traffic Control Center") over the Internet (or network interface) blocking and unblocking of tracks based on the worker's work authorization (Form D) request and later cancellation of such request from the worker's mobile phone (PDA). *See* Limitation 1[Pre]; EX1004, Vol. I: 1 ("In centralized traffic control territory, switches and signals receive commands from the dispatcher's computer."), Abstract ("dispatchers at the Central Traffic Control Center" and a "communications device was developed for roadway workers … to request track protection from the dispatcher. The device uses a wireless data link to send and receive information in digital form."), 29 ("The PDA also enabled the roadway worker to request a variety of work authorizations (Form D and Foul Time)."), x ("The prototype device operated on a personal digital assistant (PDA) with wireless access to the Internet."), 37 ("worker has finished their job or wants to cancel or fulfill a Form D and is giving the track back to the dispatcher ....



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Cancel/Fulfill Form D: Works together with [Retrieve list of active Form Ds]. This is the step to actually cancel or fulfill the Form D.") (emphasis in original), 13 ("[T]he server redirected the message to the appropriate destination via the Internet. Through this transaction, the PDA sent and received information to a web server. A number of servers look for requests sent by the PDA, the dispatchers, or a database manager."), 11.

189. In other words, the railway traffic control apparatus controls access to the railway tracks. Specifically, the dispatcher via the railway traffic control apparatus at "Central Traffic Control (CTC)" operates or selects a track display to transmit, *e.g.*, a blocking (block signal) or unblocking (or block removal) signal, to the interlocks to block or unblock the track in the railway network with a plurality of railways and interlocks.

> ***Each dispatcher has a workstation to control the switches and signals. This workstation also displays a representation of the track (see Figure 1).*** Track displays use scale compression extensively to show more details around ***crucial points such as stations and interlockings***.
>
> . . . .
>
> ***At the Traffic Control Center, the dispatcher could use the track display to protect the track segment in question using software that controlled various switched and signals in the***



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> ***field. . . . Operation of these switches is restricted and the protected track will display stop signals at both ends.***

EX1004, Vol. II: 10-12 (emphasis added), 18 ("dispatcher would communicate with the roadway worker through the computer aided dispatch (CAD) system."), 28 (dispatcher via the CAD system "allocate[s] track to trains, and track equipment or roadway workers using a variety of keyboard and mouse commands."), 68 ("**Interlocking**: An interconnection of signals and signals appliances") (emphasis in original), 67 ("**Block Signal**: A fixed signal [stop] displayed to trains at the entrance to a block to govern use of that block.") (emphasis in original); Vol. I: 1 ("In centralized traffic control territory, switches and signals receive commands from the dispatcher's computer. These commands determine the track over which the train will travel …."), 6 ("In Central Traffic Control (CTC) territory . . . signals . . . for the blocked track will display a stop signal at both ends to prevent movement by unauthorized track vehicles."), Abstract; *see also* Limitation 1[Pre].

190. Figure 1 below illustrates the dispatcher's "representation of the track" or track display for a railway network with a plurality of railways and interlocks. For instance, the dispatcher via the railway traffic control apparatus selected the blue tracks to control the corresponding interlocks such that they are "protected for use"



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or blocked. Likewise, the dispatcher selected the tracks in green to control the corresponding interlocks such that they have been "cleared" or unblocked.

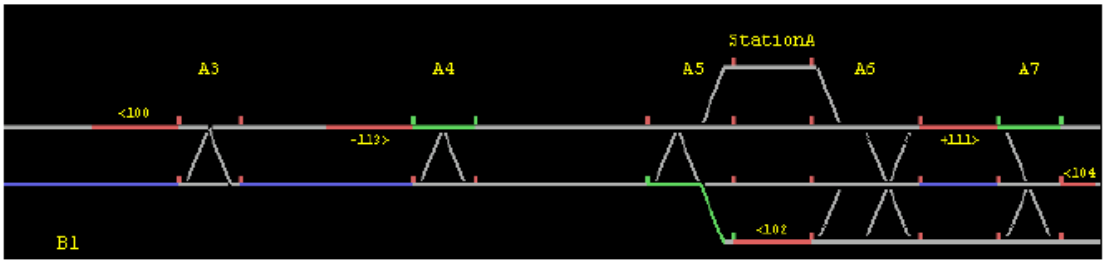



**Figure 1. Track Chart Display**

EX1004, Vol. II: Fig. 1.

**Table 2. Representation of Color Code for Monitoring Track Status**

| Color | Meaning |
|---|---|
| White | Indicates that the track segment is available for routing trains or other uses. |
| Red | Means train or track vehicle occupancy. A train currently occupies that block. |
| Green | Indicates that the track segment has been cleared (authorized for use) for train movement. The train has not yet entered this block. |
| Blue | Indicates that a track section is authorized for track maintenance. This means that a portion of track has been protected for use by maintenance of way crews or track equipment. When the dispatcher gives track authority to a work crew, the dispatcher temporarily loses control over that section of track. Trains cannot enter this track segment unless authorized by the roadway worker responsible for that block. |

*Id*., Table 2 ("Monitoring Track Status"), 1 ("In signal territory, ***the track equipment provides dispatchers with information about signal states, switch states, and train location***.") (emphasis added), 10 ("The current study focused on signal territories, where dispatchers receive automatic indication of train location.").

191. FRA-Report stores track information, *e.g.*, interlockings. EX1004, Vol. I: 39 ("The database includes information . . . Track information (Track Info.txt).



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Includes information about all the ***locations along the track*** (milepost, dispatcher in charge, maximum train speed, ***interlocking or station***)") (emphasis added), 15 ("A *Train Status* option (general information about a train: last interlocking, next interlocking, direction of travel and delays) was added.") (emphasis in original).

192. The track display automatically updates based on, *e.g.*, railway traffic control apparatus blocking and unblocking the track. EX1004, Vol. II: Table 2 ("Representation of Color Code for ***Monitoring Track Status***") (emphasis added), 10 ("The current study focused on signal territories, where dispatchers receive automatic indication of train location."), 1, Fig. 1

193. FRA-Report teaches a dispatcher interface below that a POSITA would have combined with the above interface or separately used to assign the worker, "Oriol," for "1 track out of service between/at 81.5 Branford and 90.4 Guilford":

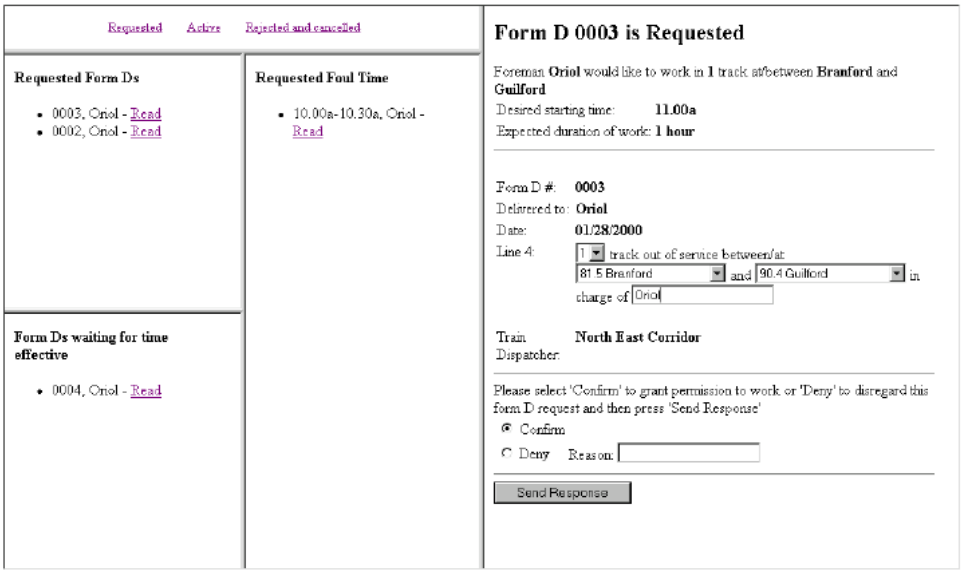



**Figure A-5. Dispatcher Interface**



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*Id*., Vol. I: 40 (Fig. A-5).

194. FRA-Report further teaches that the railway traffic control apparatus includes a network interface through which it communicates via a network, *e.g.*, "Internet," with the worker's PDA, such as for work authorization. *Id*., Vol. I: 14 (Fig. 2 ("Internet … Base station")), 13 ("[T]he server redirected the message to the appropriate destination via the Internet.... A number of servers look for requests sent by the PDA, the dispatchers, or a database manager."); Vol. II, 16 (Fig. 4). In fact, the worker's "device was selected that had wireless access to the Internet, and could be used anywhere along the track." *Id*., Vol. I: 13. Additionally, because the dispatcher is remotely controlling interlocks (*e.g.*, switches and signals), the railway traffic control apparatus would have included a network interface to communicate with them.

195. Regardless, the RE'835 Patent acknowledges a CTC system was known to control interlocks for blocking and unblocking a track in a railway network from a dispatcher's display. *See* Section V.B. According to Railware's expert, the below 2010 public document—which is before the Priority Date—shows a "control center where dispatchers control train traffic using a CTC system."



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EX1025, ¶¶ 14, 22-23.

196. Thus, FRA-Report teaches Limitation 1[B]. The FRA-Report also teaches (and it was known) a railway traffic control apparatus (or railway control apparatus) under Railware's construction, which is "broadly understood and encompasses a number of hardware (such as processor and memory components) and software components beyond just the dispatcher's console" (*see supra* ¶ 122), given FRA-Report discloses a dispatcher's console or computer and even other hardware and software (such as the database and servers) to control track blocking and unblocking. *See* Limitation 1[A].

197. Additionally, FRA-Report discloses SEPTA's construction of a railway traffic control apparatus because FRA-Report teaches a CTC "console used by the train dispatcher" for, *e.g.*, blocking and unblocking tracks, as shown above. *See supra* ¶ 122.

198. Regardless, a POSITA would have understood that FRA-Report teaches SEPTA's construction because it is simply a design choice in the FRA-Report for the dispatcher's console to contain the software and hardware to perform the railway traffic control apparatus functionality, and a POSITA would have further recognized that hardware and software can be stored on one computer or divided between different computers or servers to perform functions.

199. FRA-Report discloses that the railway worker's mobile device provides a user interface that displays information, *e.g.*, "Main Menu," "My Form D's," "My Foul Time," "Clear," and "Cancel/Fulfill," among many others, communicated over the network with the railway traffic control apparatus, as shown in the PDA interfaces outlined in Figures A-1 and A-3 below.



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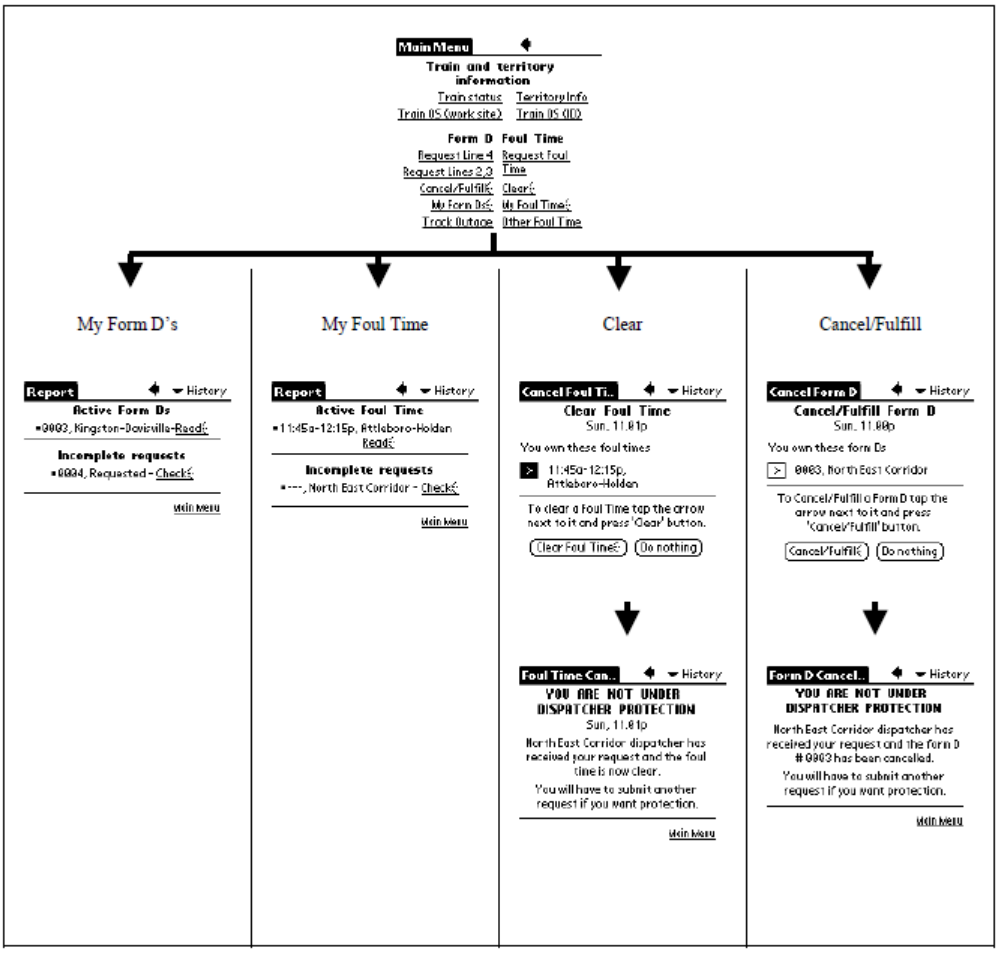



**Figure A-1. PDA Screen Shots (1)**

*Id.*, Vol. I: 32 (Fig. A-1).

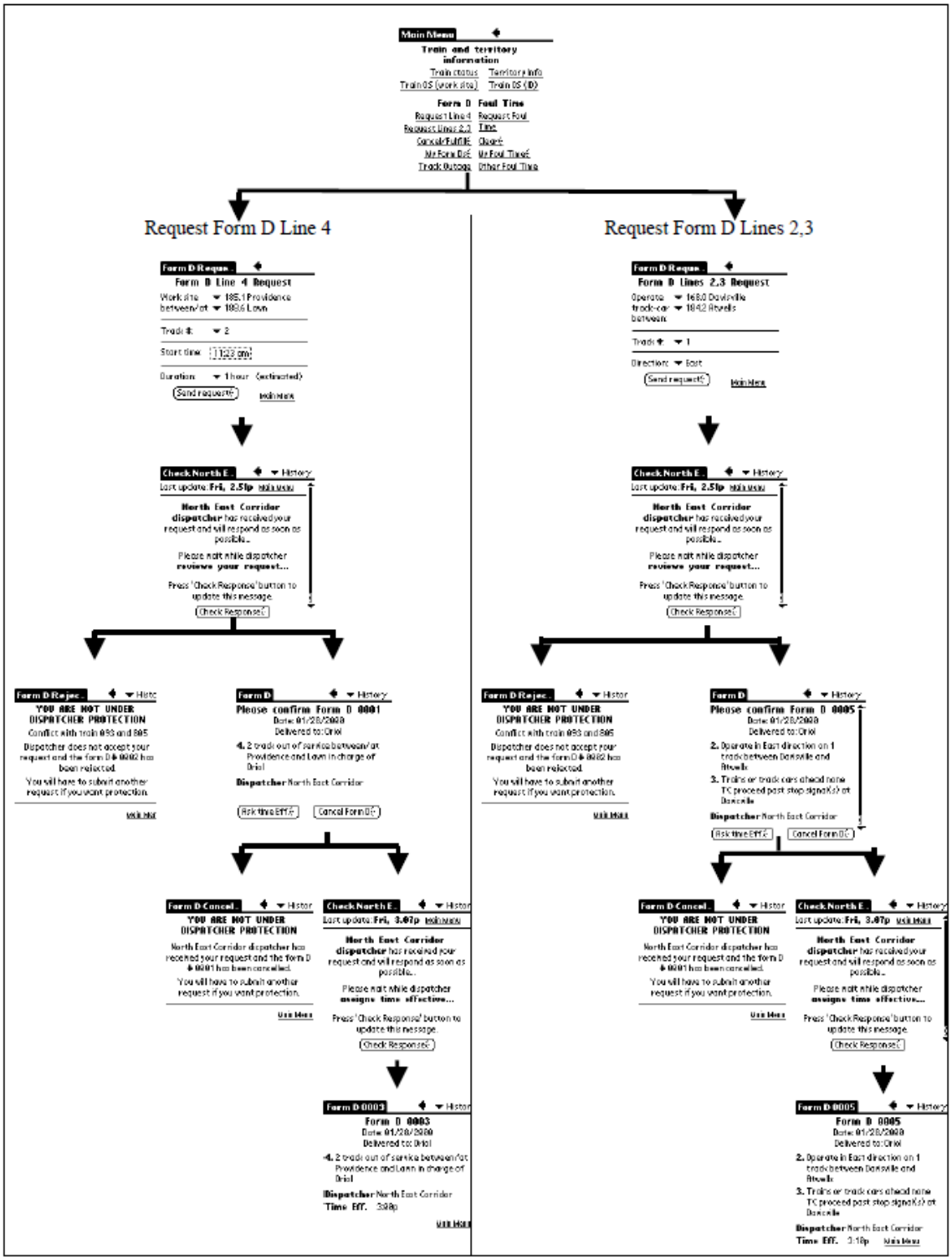



**Figure A-3. PDA Screen Shots (3)**



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*Id*., Vol. I: 34 (Fig. A-3), 31 ("**Web server**. This server hosts the master files that are used as templates to send information back to the PDA.") (emphasis in original), 36 ("The query servers … read[] the HTML forms as sent by the PDA … and returns the requested information to the PDA").

200. Thus, FRA-Report teaches a "user terminal" under Railware and SEPTA's construction because, as discussed above, the worker's mobile device receives and displays information and Railware believes this is satisfied with "'***any communication device***' and not necessarily a 'mobile user device'." *See supra* ¶123.

**4. 1[C]: "wherein execution of said one or more programs of executable instructions configures *the railway traffic control apparatus comprising* the processor to include:**

**a block placing part to place a block on one or more specified track sections *in any of said plural railways constituting said railway network that is managed by centralized control operation from the railway traffic control apparatus, the railway traffic control apparatus controlling, by said centralized control operation, one or more interlocks amongst the plurality of railway traffic interlocks dispersed in said plural railways constituting said railway network, to block railway traffic to the specified track sections and thereby* to permit a railway field worker to enter the track sections [while blocking railway traffic to said track sections];"**

201. I believe that the FRA-Report teaches Limitation 1[C].

202. Claims 1 and 10 recite a block placing part, a code generation part, and a block removal part. Claim 19 recites a block placing part.

203. Claims 20, 30, and 40 do not recite these parts.



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204. The RE'835 Patent discusses implementing such "parts" as software and/or hardware. EX1001, 2:49-3:6.

205. Likewise, FRA-Report discloses implementing these three parts in software and/or hardware via the railway traffic control apparatus' processor. *See* Limitation 1[B]; EX1004, Vol. I: 14 (Fig. 2), 31, 36-39, 40 (Fig. A-5).

206. FRA-Report teaches the railway traffic control apparatus has a processor and one or more programs of executable instructions to implement the three parts. *See* Limitation 1[B]; EX1004, Fig. 2, 14, 31, 36, 38, 39, Fig. A-5.

207. Additionally, implementing a program with executable instructions in a computer was known to a POSITA. *See* Limitation 1[B].

208. The worker selects a Form D work authorization link on the worker's mobile device interface, such as "Request Form D Line 4" or "Request Form D Lines 2, 3" in Figures A-1 or A-3 and transmits such work authorization—or request to block the track—to the railway traffic control apparatus. EX1004, Vol. I: 32 (Fig. A-1), 34 (Fig. A-3), 16 (Fig. 4), 37 ("**Requests sent by PDA**: Request Form D line 4: … to perform a work that will require a Form D line 4 authorization.") (emphasis in original), 6 (worker operates a PDA to request work authorization, *e.g.*, Form D Line 4, "on or near the track" from the railway traffic control apparatus), 11 ("software application was developed for use on a PDA with wireless



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communication capabilities. . . . This prototype was designed to enable the roadway worker to request information or work authorization with minimal data entry."), 29 ("The PDA also enabled the roadway worker to request a variety of work authorizations (Form D . . . )"), Abstract ("A prototype communications device was developed for roadway workers to request train and territory information and to request track protection from the dispatcher. The device uses a wireless data link to send and receive information in digital form."), 37 ("**Dispatcher Query Server**. Handles requests sent by the PDA that need dispatcher interaction such as requests that have to do with work permissions and answers sent by dispatcher to the PDA") (emphasis in original); *see* Limitations 1[Pre], 1[B].

209. As discussed, FRA-Report teaches plural railways in a railway network that is managed by central control from the railway traffic control apparatus, including the dispatcher from the track display controlling one or more interlocks (transmitting signals to the interlocks) to block and unblock the track. *See* Limitation 1[B]. The track display automatically updates based on, *e.g.*, the railway traffic control apparatus blocking and unblocking the track. *Id*.; EX1004, Vol. II: Table 2, 10 ("The current study focused on signal territories, where dispatchers receive automatic indication of train location.").



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210. Based on the worker's Form D request—or request to block the track—the railway traffic control apparatus' processor executes a block placing part (software / hardware) to place a block and block the track, also denoted as "out of service," by transmitting signals to the interlocks in the railway network.

> Query servers used in this study were mainly written in Java (Sun Microsystems, 2001)
>
> . . . .
>
> **Dispatcher Query Server**. Handles requests sent by the PDA that need dispatcher interaction
>
> . . . .
>
> Answer request for Form D line 4: ***Used by a dispatcher to grant or deny the requested Form D lines 4. If the dispatcher grants the Form D, the appropriate information will be sent to the roadway worker*** who requested it … [such as] Form D number (automatically assigned by system) … foreman in charge ***of the track out of service***.

EX1004, Vol. I: 36-38 (emphasis added), 6 ("When a dispatcher receives a request for roadway worker protection …. [and if] the dispatcher grants permission to work, (under …. Form D ….) the track is placed off-limits (blocked) for other uses. In Central Traffic Control (CTC) territory, blocking a track protects the roadway worker since it prevents the dispatcher from routing trains on that track."), 14 ("The database contained . . . track out of service under Form D"), 31, Abstract, 13.



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211. This block placing part software/hardware is also shown in Figure A-3 where the railway traffic control apparatus' processor blocks a track based on a work authorization request, particularly "***Form D Request Line 4*** … Send Request … ***North East Corridor dispatcher has received your request*** … 2 ***track out of service*** between/at Providence and Lawn in charge of Oriol." EX1004, Vol. I: 34 (Fig. A-3) (emphasis added).

212. The track display discussed above would implement this blocked track, "2 track out of service," by transmitting signals to the interlocks. EX1004, Vol. II: 10-12, Figs. 1, 15, Table 2; Vol. I: 1, 6; *see* Limitation 1[B]; Section V.B.

213. Figure A-3 also shows this blocking in "Request Lines 2, 3" below.



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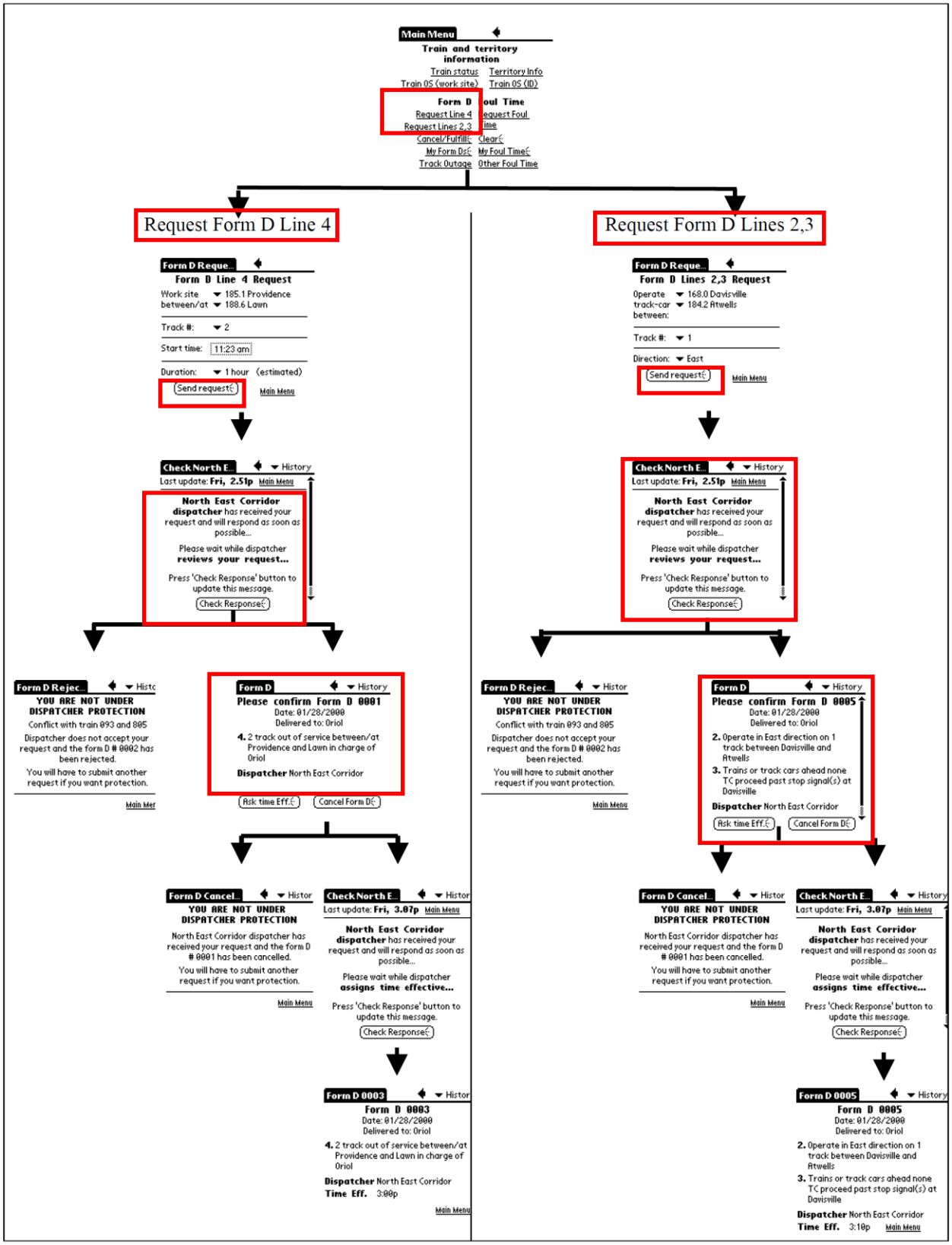



**Figure A-3. PDA Screen Shots (3)**



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EX1004, Fig. A-3 (annotated), 31.

214. While the track is blocked (shown in blue in Figure 1, *supra* ¶¶ 189-190), the railway worker can enter the track to perform, *e.g.*, maintenance work, because the worker—not the dispatcher—has authority over the track. EX1004, Vol. II: 11 ("Blue ... [means the] track has been protected …. When the dispatcher gives track authority to a work crew, the dispatcher temporarily loses control over that section of track."), 12; Vol I: 32 (Fig. A-1), 34 (Fig. A-3 with track "out of service" until worker cancels the request), 6 ("blocking a track protects the roadway worker since it prevents the dispatcher from routing trains on that track."); *see* Limitation 1[E].

215. Additionally, RE'835 Patent acknowledges and other references show that it was known to a POSITA each track has a corresponding interlock controlled by CTC operation using color-coded track display, such as transmitting a signal to interlock(s), e.g., blocking or unblocking signal, to control blocking and unblocking of railway track(s). *See* Section V.B.

**5. 1[D]: "a code generation part to generate a removal code, retrieve the electronic contact address of the railway field worker from the rail personnel contact database, and transmit the removal code to the electronic contact address of the railway field worker; and"**

216. FRA-Report and Kruijswijk disclose and render obvious Limitation 1[D].



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217. FRA-Report teaches receiving a request to block the track and the railway traffic control apparatus (CTC system or CTC dispatcher's console discussed in Limitation 1[B]) queries or retrieves the worker's electronic contact address from the database. EX1004, Vol. I: 57 ("Each Palm VII …. device ID was used to identify which roadway worker was sending each request."), 13 ("***work authorization was sent to the dispatcher*** while an information request was answered by the system … ***by querying the database***.") (emphasis added), 39 ("The database includes … Roadway workers (MWForemen.txt). Includes information about registered PDAs and their owner."), 38 ("sent to the roadway worker who requested it"), 34 (Fig. A-3) ("Delivered to: Oriol"); 1[A] (worker stored in database).

218. The railway traffic control apparatus generates a Form D number and transmits information (*e.g.*, track-related) to the worker's PDA or electronic contact address ("sent to the roadway worker who requested it"):

> ***If the dispatcher grants*** the Form D [blocks the track], the ***appropriate information*** will be ***sent to the roadway worker who requested it***. This information includes Form D number (automatically assigned by system), Form D recipient, date, track number, track location, and ***foreman in charge of the track out of service***.

EX1004, Vol. I: 38 ("Form D line 4") (emphasis added), 34 (Fig. A-3) ("Delivered to: Oriol"), 57.



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219. FRA-Report teaches further examples of the CTC retrieving the worker's electronic contact address in communicating with and displaying information over the network on the worker's PDA.

220. For instance, Figure A-3 or "PDA Screen Shots (3)" shows the CTC system retrieving the worker's electronic contact address (PDA) to block the track ("2 track out of service") for the worker ("Oriol") and transmitting that information to the worker's PDA: "***Form D Line 4 Request*** … ***North East Corridor dispatcher has received*** your request … Please confirm Form D 0001 … ***Delivered to: Oriol*** … ***2 track out of service*** between/at Providence and Lawn ***in charge of Oriol***." *Id*., Vol. I: 34 (Fig. A-3) (emphasis added). This is shown below.



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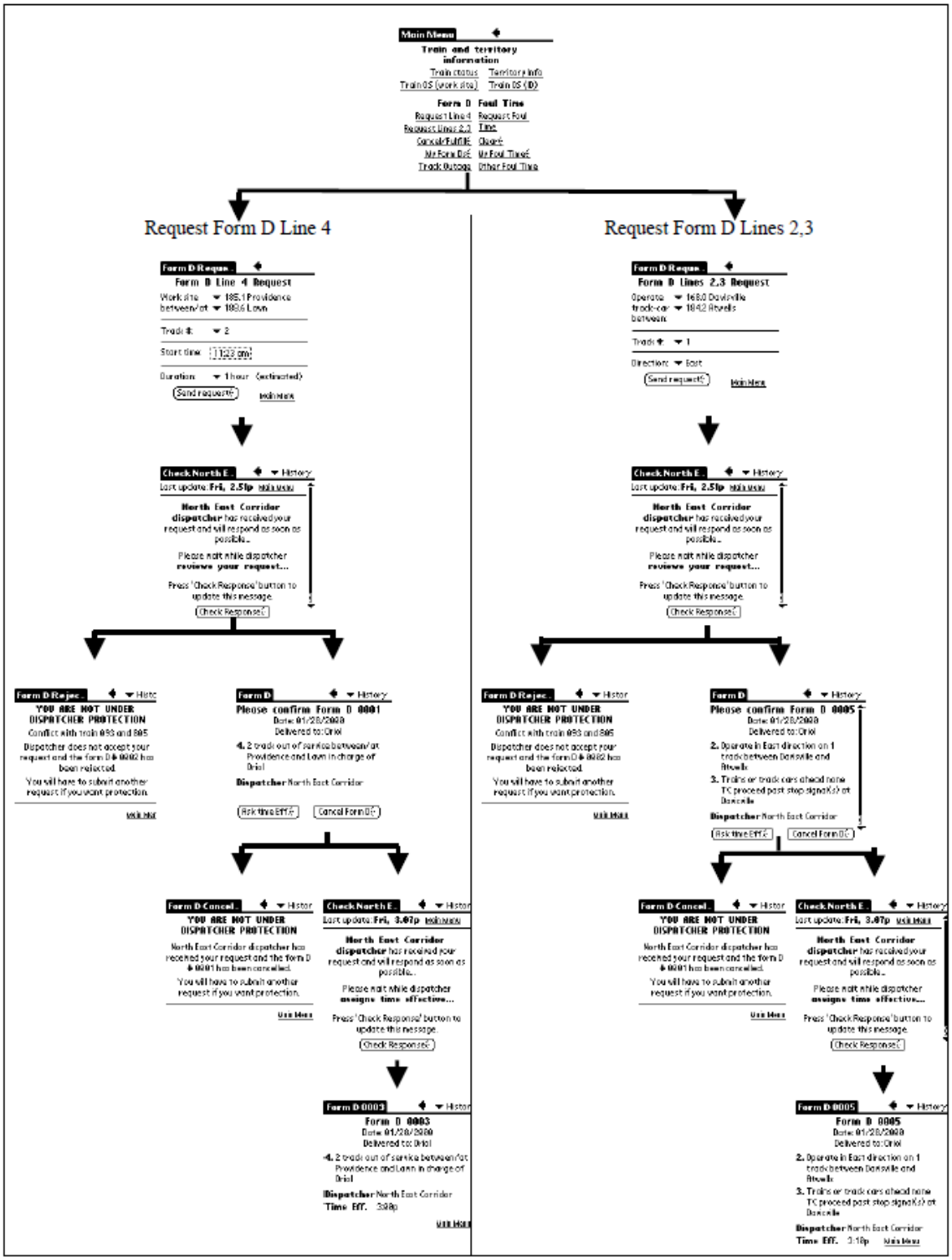



**Figure A-3. PDA Screen Shots (3)**



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*Id*., 31 ("**Web server**. This server hosts the master files that are used as templates to send information back to the PDA.") (emphasis in original), 36 ("The query servers … read[] the HTML forms as sent by the PDA … and returns the requested information to the PDA").

221. Likewise, Figure A-1 or "PDA Screen Shots (1)" below shows the CTC system retrieving the worker's electronic contact address to communicate and display information, *e.g.*, "Main Menu," "My Form D's," "My Foul Time," "Clear," and "Cancel/Fulfill," among many others ("You own these form Ds 0003, NorthEast Corridor … NorthEast Corridor dispatcher has received your request and the form D # 0003 has been cancelled"), over the network on the worker's PDA.



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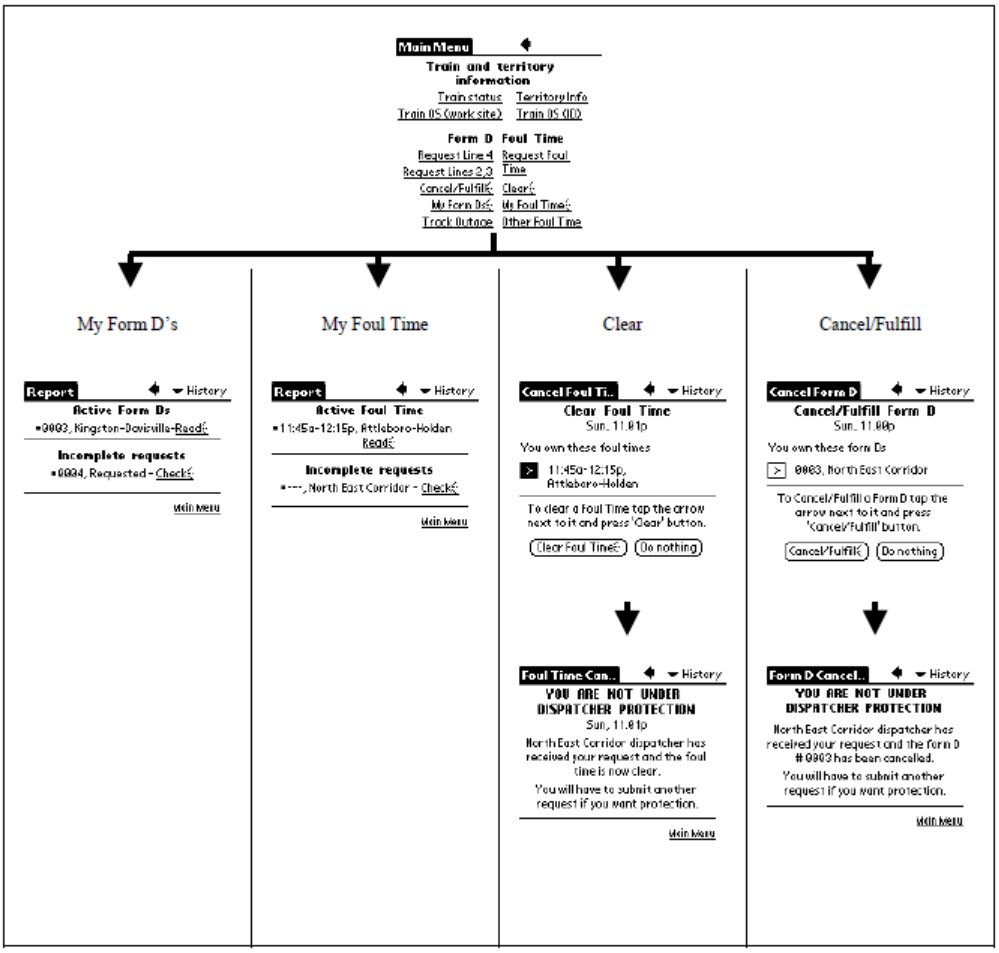



**Figure A-1. PDA Screen Shots (1)**

*Id.*, Vol. I: 32 (Fig. A-1).

222. As mentioned, Claims 1 and 10 recite a code generation part. A POSITA would have understood that the hardware and software used to place a block would have included corresponding hardware (*e.g.*, processor) and software to generate the code or code generation part given the railway traffic control apparatus CAD system controls switches and signals to block and unblock the track. *See* Limitations 1[B], 1[C].

(a) FRA-Report and Kruijswijk Combination

223. As discussed above, FRA-Report discloses that the dispatcher operates the track display (or another interface) and via the railway traffic control apparatus blocks the track, retrieves the worker's electronic address from the database, as well as generates and transmits information (*e.g.*, track-related) to the worker's electronic contact address or PDA. *See* Limitations 1[Pre]-[D].

224. Kruijswijk supplies the claimed code such that the dispatcher in FRA-Report operates the track display via the railway traffic control apparatus to block the track as well as retrieve the worker's electronic contact address, generate (code generation part: hardware, *e.g.*, processor, and/or software), and transmit the claimed code (as taught in Kruijswijk) to the worker's electronic contact address accessible by the worker's PDA interface.

225. Kruijswijk teaches "generating, at the server station, the personal secret code" such as "a random number," and "cryptographical methods may be applied" based on user data. EX1005, 8:14-20, 3:29-34. "Subsequently the personal secret code is transferred" by the server to the railway worker ("railroad track" "technician"), *e.g.*, mobile phone (such as SMS, email), over the network or Internet.



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EX1005, 8:21-25, 12:13-21 (worker "safety checks"), 11:8-17, Abstract, 13:25-28, 5:3-6, 3:29-34.

226. Thus, FRA-Report and Kruijswijk disclose and render obvious Limitation 1[D]. Given the foregoing, they also disclose this limitation under the Board's discussion of the claimed code (*see supra* ¶ 118), including Kruijswijk's secret code discloses and renders obvious the claimed code: [a] Kruijswijk describes its code as a "secret code" and only received by the relevant worker; [b] to ensure secrecy, the code can be "terminate[d]" after "a one-time use"; and [c] the relevant worker transmits the secret code to the server, and the server verifies the relevant worker as part of "safety checks" after track maintenance is performed. EX1005, 12:13-21, 4:3-8, 9:8-10, 6:1-9 ("verification data for verifying that a code entered indeed is the personal secret code of the respective user."), 7:1-17.[4]

[4] Kruijswijk discusses in a separate embodiment that the secret code "may" be shared between workers, and Railware contends this is a secret code. EX1005, 11:19-24; EX1030, ¶89; *see supra* ¶ 121. Notably, as described above, Kruijswijk's several other embodiments teach a "secret code" that is only known to the relevant person (railway worker), including the server verifying the relevant worker provided the secret code. EX1005, 3:29-34 ("In an embodiment … transferring the personal secret code to the second user"), 6:1-9 ("In particular the database includes, for a particular user, control data corresponding to a personal secret code PSC 23, for



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227. Further, FRA-Report and Kruijswijk disclose and render obvious Limitation 1[D] under Railware's construction, including Kruijswijk discloses and renders obvious the claimed code or a "code that is not readily available to the user of the railway [traffic] control apparatus (*i.e.*, the dispatcher)" for the above reasons [a]-[c]. As such, the code is secret to the relevant person or "not readily available" to dispatcher when Kruijswijk is combined with the FRA-Report. Railware's expert states that, "***any method of generating the string of symbols to serve*** as the ***Code Terms would be within*** the ***scope of the inventions***." EX1025, ¶¶163 (emphasis added), 166; EX1024, 28. This broad understanding reinforces too that Kruijswijk teaches a secret code.

228. Additionally, FRA-Report and Kruijswijk also disclose and render obvious Limitation 1[D], including under the Board and Railware's understanding of the claimed code, because a POSITA would have had a motivation to combine and reasonable expectation of success to implement Kruijswijk as the claimed code or secret code as generating and transmitting a secret code, *e.g.*, for safety and

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example the personal secret code itself, and/or verification data for verifying that a code entered indeed is the personal secret code of the respective user."), 9:27-10:4 ("In an embodiment … a message containing the personal secret code is transferred"), 8:14-35, 7:1-17.



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security, only received by the relevant worker was taught before the Priority Date. EX1008, Abstract ("one-time use access code … may be issued by a server … [and] may be generated using a cryptographically strong random number generator"), 7:30-42 ("every access code issued by server 30 … will be unique to the requester. ***That requester, and only that requester, will know the access code***") (emphasis added), 9:41-44; EX1007, 15:22-35 ("specific code" is "only known to the" railway worker), 20:25-37; EX1009, 13:66-14:8 ("generates a confirmation code and supplies that code to the customer" where the code is "randomly generated" and "will be known only to the" relevant person), 15:7-27; EX1011, 4:31-38 (server generating a "cipher lock code" for the relevant user), 5:7-14 (user permitted "one-time access"), 3:61-4:3, Abstract, 5:25-30. Thus, it would have been predictable or obvious to try in implementing Kruijswijk as the claimed code or secret code in FRA-Report.

229. Further, a POSITA would have had a motivation to combine and reasonable expectation of success to implement Kruijswijk as the claimed code or secret code, which is generated and transmitted in FRA-Report to the worker's electronic contact address, to address the known problem of protecting railway workers from removal of a block by the dispatcher while track work is performed. *See* Section V.A. In other words, such a code would have ensured that it is only



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known to the worker and the track can only be released by the worker returning that code.

230. Similarly, a POSITA would have had a motivation to combine and reasonable expectation of success to implement Kruijswijk as the claimed code or secret code because it was known to a POSITA that a worker uses a mobile phone for controlling track possession, including to take control of a work zone and return it to the central system, and thus implementing a code only known to the worker would have been obvious to try for safety and security. *See* Section V.D.

231. Likewise, a POSITA would have had a motivation to combine and reasonable expectation of success to implement Kruijswijk as the claimed code or secret code given the use of one-time password or one-time code for authorization or authentication was prevalent before the Priority Date, as shown above and other prior art. *See* Section V.C.

232. In my view, a POSITA would have been motivated with a reasonable expectation of success to use a one-time code in the railway industry, including the FRA-Report because the one-time code would have improved safety and security of the worker such that only the worker would know the code and would return the one-time code to remove the track block.

233. Also, such known authentication systems would have driven a POSITA to apply code authentication to ensure the code is only known to the worker and the track only unblocked when the railway traffic control apparatus receives the code transmitted by the worker. Thus, it would have been predictable in implementing Kruijswijk as the claimed code or secret code in FRA-Report.

234. Accordingly, FRA-Report and Kruijswijk disclose and render obvious Limitation 1[D]. It was known to save the generated code, including password protected or encrypted to prevent improper access, into a database (or other storage) and would further FRA-Report's verification goal (discussed further below) to verify the worker's transmitted code in Limitation 1[E] with the saved code in determining if to unblock the track. EX1005, 6:1-5 ("database includes ... the personal secret code itself"), Abstract, 7:1-17, 11:8-17; EX1006, 7:8-15, Fig. 2; EX1007, 15:28-35; EX1008, 7:54-59 ("access code table 50 ... may be maintained at server 30 ...."); EX1009, Figs. 12, 14, 14:19-25, 15:17-27. Also, storing data is known (or design choice) and the FRA-Report stores significant information. Limitations 1[A]-[C].

(b) Motivation to Combine FRA-Report and Kruijswijk with a Reasonable Expectation of Success

235. A POSITA would have had a motivation to combine and reasonable expectation of success such that the dispatcher operates the track display via the railway traffic control apparatus and blocks the track as well as generates and



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transmits the claimed code as taught in Kruijswijk in FRA-Report to the worker's retrieved electronic contact address because they involve railway technology and worker safety. *See* Sections X.A.3-4, B; EX1005, 12:17-21.

236. Kruijswijk expressly teaches that its invention is applied in the railway field (EX1005, 12:17-21, "after the repair of a railroad track"), is an Internet-based system—as with the FRA-Report, and thus would have been a natural and predictable option for a POSITA to look to when modifying the FRA-Report. *See* Sections X.A.3-4, B. FRA-Report (like Kruijswijk) also discusses improving safety based on where rail workers are when providing confirmations. EX1004, Vol. I: 20-21 ("work authorizations accepted in a location that was not the one requested."); EX1005, 12:13-21.

237. Likewise, CTC systems and secret-code authentication or verification systems were known, so modifying FRA-Report with the code taught in Kruijswijk would have been simply applying a known technique to a known device for increased safety. *See supra* Sections V.B-C.

238. FRA-Report recognized that a secret-code system (or similar technologies) would have been implemented in the FRA-Report to augment worker safety: [1] "improve roadway worker safety and productivity" (EX1004, Vol. I: Preface); [2] "positively identify the person communicating" (*id*., Vol. I: 57); and



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[3] implement "a verification system that prevent[s] or minimize[s] common human error." *Id*., Vol. I: 9, 27 ("Before giving any section of track back to the dispatcher, the system should prompt the roadway worker for confirmation."), iv ("develop intelligent railroad systems"), Report Documentation Page ("Subject Terms … intelligent railroad systems"). Likewise, prior art discusses that technologies would have been applied to augment worker safety. EX1028, 4 ("the potential exists to develop portable roadway worker devices that combine technologies for … reliable communication, as well as data storage, retrieval, and computation functions to support maintenance and inspection tasks"); EX1015, 1 (EX1028 referenced in March 2009). Thus, such teachings provide the motivation to combine FRA-Report and Kruijswijk.

239. A POSITA would have been further motivated by the FRA-Report's goals to "improve roadway worker safety and productivity" (EX1004, Vol. I: Preface) and implement a "verification system." EX1004, Vol. I: 9, 27 ("Before giving any section of track back to the dispatcher, the system should prompt the roadway worker for confirmation."); Limitations 1[B], [D]-[E] (FRA-Report teaching two-way communication between the worker's user terminal and railway traffic control apparatus). A POSITA would have thus recognized, to prevent the dispatcher from erroneously revoking a blocked track, that the worker in FRA-



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Report implements a "handshake" or verification protocol where the code taught in Kruijswijk is associated with the blocked track and transmitted to the worker who later unblocks the track with the same code. This would have enhanced the prior worker and the dispatcher handshake or two-way communication over radio. EX1028, 14-15.

240. Notably, FRA-Report recognized the need "to positively identify the person communicating with the PDA by utilizing some form of password protection." EX1004, Vol. I: 57. FRA-Report even proposes various solutions including (i) a "device ID" to be sent with messages and/or (ii) "password-protected access to the system" such as a "personal password." EX1004, Vol. I: 57-58. Therefore, FRA-Report urges a need and readiness to implement robust verification measures (including password-based ones) to effectively verify roadway worker identities, and Kruijswijk teaches one such solution in the railway maintenance field. A POSITA would have been motivated to incorporate Kruijswijk for at least this reason.

241. A POSITA would have appreciated that modifying FRA-Report with Kruijswijk would have had a reasonable expectation of success. FRA-Report was published in October 2004, or nine (9) years before the Priority Date, and built and tested a railway worker and dispatcher CTC system containing a server(s) with



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software generating railway data and transmitting such data to railway worker to control from a mobile device blocking and unblocking the track. Limitations 1[Pre]-1[C]. Further, the worker's PDA in FRA-Report has existing encryption and decryption technology (EX1004, Vol. I: 57), otherwise, this was known. EX1011, 4:25-24. Thus, it would have been predictable to generate and transmit a code in FRA-Report to the worker's device. EX1004, Vol. II: 15, 21, 27, 41, 63 (SMS "is a ***globally accepted wireless service*** that enables the transmission" and "is a ***reliable, low-cost*** communication mechanism.") (emphasis added). FRA-Report notes that "[t]he system is designed to be highly configurable." EX1004, Vol. I: 41; EX1021; EX1028. With such hardware and software, the FRA-Report would have had flexibility when the code is generated, such as before or after the block is placed, depending on the needs for the system, such as safety, efficiency, and workflow, and would have been a predictable design choice for a POSITA designing or modifying a system as disclosed in FRA-Report.

242. Likewise there would have been a reasonable expectation of success given that, for example, Kruijswijk was published in 2007 and Macey was published in 2010, which both involve a worker using a mobile phone and code in a rail system. EX1005, 8:14-25, 12:13-21, 11:8-17, Abstract, 13:25-28, 5:3-6, 3:29-34; EX1007, 15:16-35, 20:31-37, 16:1-21, 13:35-14:4. This shows that a code was implemented



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in railway systems. Also, from October 2004 to before the Priority Date, mobile device, server, and technology capabilities evolved, and with such enhanced technology, it would have been predictable for a POSITA to apply those capabilities to enhance FRA-Report with a code-based system. *See* Sections V.A-D; EX1017, 8 (¶¶ 5-7), 15-16 (named inventor acknowledged to the USPTO that mobile phones, text messaging, and email were conventional before the Priority Date).

243. The POSITA would further have been motivated to modify FRA-Report with a reasonable expectation of success for the worker's interface to receive and display (such as prompt or text box message) the claimed code taught in Kruijswijk given the worker's existing user interfaces and it is a design choice by a POSITA. Limitation 1[B].

244. Alternatively, a POSITA would have been motivated to modify FRA-Report to transmit the code taught by Kruijswijk with a reasonable expectation of success to the worker's electronic contact address through other methods, including text message or email message given such methods would have provided an alternate form to the worker and text, email, and links were well-known. EX1004, Vol. II: 15, 21, 27, 63; EX1017, 15-16 ("05 March 2010 People love their mobile phone .... That means not just talking, but e-mailing, texting ... and so on."). As another option, the



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text and email message would have included an embedded link to activate the return of the code.

**6. 1[E]: "a block removal part to remove only upon entry of the removal code *by said centralized control operation from the railway control apparatus*, the block placed by the block placing part on said one or more track sections."**

245. FRA-Report and Kruijswijk disclose and render obvious Limitation 1[E].

246. FRA-Report describes that the "worker can retrieve a list of Form Ds … ***under his/her authority*** … [and] [f]ollowing the link[] 'Cancel/Fulfill' … the ***roadway worker is able to give some track under his authority back to the dispatcher***." EX1004, Vol. I: 36 (emphasis added), 37 ("Cancel/Fulfill Form D: Works together with [Retrieve list of active Form Ds]. This is the step to actually cancel or fulfill the Form D.") (emphasis in original), 38 ("Clear Foul Time: Works together with [Retrieve list of active Foul Time]. This step is required to clear the Foul Time.") (emphasis in original), 16 and Fig. 4 ("Cancel" Form D and "Cancel" Foul Time), 32 and Fig. A-1 ("Clear Foul Time" and "Cancel/Fulfill Form D").

247. Thus, selecting or activating the "Cancel/fulfill" link transmits information to the railway traffic control apparatus (or railway control apparatus) block removal part (software and/or hardware), which unblocks the track "under [worker's] authority" by transmitting a block removal or unblocking signal to the



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interlock(s). *See* Limitation 1[B]; EX1004, Vol. I: 36, 37 ("My Form Ds: Used to retrieve a list of current Form Ds . . . under the authority of the roadway worker holding the PDA.") (emphasis in original); Vol. II: 15 ("The application can also be used to request and cancel work authorizations."), 18 ("The application software also handles the several types of work authorization requests and cancellations (Foul Time and Form Ds). … Cancel work authorization (automatic).").

248. This is further shown in Figure A-1, particularly "***Cancel/Fulfill Form D*** … ***You own these form Ds 0003***, NorthEast Corridor … ***Cancel/Fulfill*** … ***Form D Cancel*** … ***YOU ARE NOT UNDER DISPATCHER PROTECTION*** [track unblocked] NorthEast Corridor ***dispatcher has received your request*** and ***the form D # 0003 has been cancelled***." EX1004, Vol. I: 32 (Fig. A-1) (emphasis added), 37 ("Cancel/fulfill Form D: Works together with the previous request. This is the step to actually cancel or fulfill the Form D."), 6 ("When the job is completed … the dispatcher unblocks the track making it available for other uses.").



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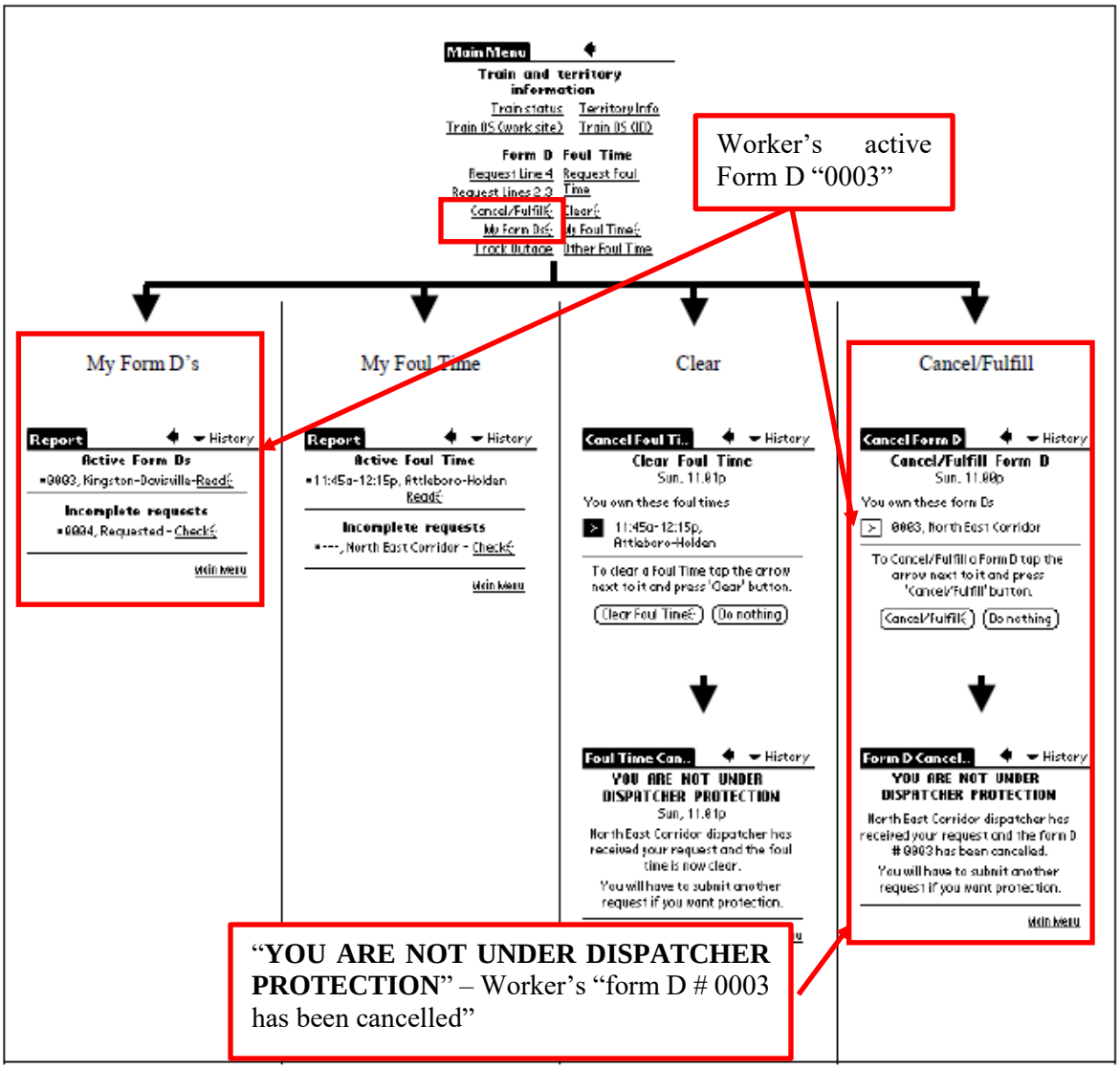



**Figure A-1. PDA Screen Shots (1)**

EX1004, Vol. I: 32 (Fig. A-1) (annotated).

249. As mentioned, Claims 1 and 10 recite a block removal part. A POSITA would have understood in FRA-Report that the hardware and software used to place a block would have included corresponding hardware (*e.g.*, processor) and software to remove the block or block removal part given the railway traffic control apparatus

CAD system controls switches and signals to block and unblock the track. *See* Limitations 1[B], 1[C].

(a) FRA-Report and Kruijswijk Combination

250. FRA-Report teaches the worker selects the "Cancel/fulfill" link to transmit information to the railway traffic control apparatus block removal part (software and/or hardware), which by centralized control operation unblocks the track "under [worker's] authority." EX1004, Vol. I: 36-37, 6; Vol. II: 15, 18; Limitations 1[B]-[E].

251. Kruijswijk supplies transmitting the claimed code such that the worker in FRA-Report transmits the code, *e.g.*, selecting the "Cancel/Fulfill" link (or, *e.g.*, by call, text, email), to the railway traffic control apparatus, which by centralized control operation will only unblock the track once the transmitted code is entered by the dispatcher or automatically by the railway traffic control apparatus.

252. Specifically, "after the repair of [the] railroad track" (EX1005, 12:17-18), the worker's mobile phone "request[s] … to enter a personal secret code." *Id*., claim 1, 7:1-17, 2:8-11.

253. Thereafter, the worker (via the phone) "transfer[s] a message containing the personal secret code from the [] communication device via the communication network to the server station." *Id*., claim 1, 7:1-17, Abstract.



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254. The "server station" then "verif[ies]" "the personal secret code" based on the worker's data in the database. *Id*., Abstract, 7:1-17 ("The personal secret code . . . is verified using the user control data from the database."), 6:1-9 ("verifying that a code entered indeed is the personal secret code"), 12:13-21 (worker "safety checks"). Thus, FRA-Report and Kruijswijk disclose and render obvious Limitation 1[E].

255. Additionally, FRA-Report and Kruijswijk also disclose and render obvious Limitation 1[E] because a POSITA would have had a motivation to combine and reasonable expectation of success to implement from Kruijswijk the transmitted claimed code in FRA-Report to the railway traffic control apparatus, which will only unblock the track with the transmitted code given it was known. EX1007, 16:1-21 (railway worker must enter on their mobile device "a specific code before it is deemed the target zone [] is safe for the passage of the vehicle."), 13:35-14:4; *see also* EX1006, 7:8-15 (code "is transmitted again to the authorization computer" which "verifies" the code to control, *e.g.*, a locking mechanism), Abstract, 5:7-9, 5:24-48, 7:60-61.

256. Specifically, Macey teaches the railway worker enters a secret code "such as a PIN (personal identification number) or password ***only known to the user***" to unblock the track: "[u]pon the successful entry of this code to the interface



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[of the remote command center, it] … transmit[s] a signal to the signalling device" which changes "from a red light [(blocked track)] to a green light [(unblocked track)] and signals the operator of the train to proceed." EX1007, 15:16-35 (emphasis added), 20:31-37. Thus, it would have been a predictable design choice to implement from Kruijswijk the transmitted claimed code in FRA-Report to unblock the track.

257. Additionally, a POSITA would have had a motivation to combine and reasonable expectation of success to implement from Kruijswijk the transmitted claimed code in FRA-Report to the railway traffic control apparatus to unblock the track to address the known problem of protecting railway workers from improper removal of a track block. *See* Section V.A. Thus, a POSITA would have used the worker's transmitted code to unblock the track to ensure the track block can only be removed by the worker returning that code.

258. Also, a POSITA would have had a motivation to combine and reasonable expectation of success to implement from Kruijswijk the transmitted claimed code in FRA-Report to the railway traffic control apparatus to unblock the track because it was known that a worker uses a mobile phone for controlling track possession, including to take control of a work zone and return it to the central system. *See* Section V.D. As such, implementing a code (as taught by Kruijswijk) to only unblock a track would have been predictable. Thus, the worker with the code



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would hold possession of the track and would transfer such possession by transmitting the code to the dispatcher to unblock the track.

259. Also, a POSITA would have had a motivation to combine and reasonable expectation of success to implement from Kruijswijk the transmitted claimed code in FRA-Report to unblock the track given the use of one-time password or one-time code transmitted to a server for authorization or authentication for safety and security was prevalent before the Priority Date. *See* Section V.C.

260. As such, the known authentication systems would have driven a POSITA to apply code authentication to railway systems to ensure a track block is only unblocked when the railway traffic control apparatus receives the code transmitted by the worker. Thus, it would have been predictable or obvious to try to implement Kruijswijk in FRA-Report.

261. Alternatively, FRA-Report and Kruijswijk teach 1[E] because Railware has apparently stated that this limitation includes when a worker is unavailable to transmit the code in return, and thus a "Chief Traffic Controller" (or similar person) retrieves the code from the railway traffic control apparatus' storage. EX1024, 21-22; EX1025, ¶¶118-120; *see supra* ¶ 118 ("unavailable"). Such a code lookup would have been obvious to try to a POSITA, where another person obtains the saved code from storage in the railway traffic control apparatus and enters the code (or provides



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it to the dispatcher) to release the track block. It was routine and predictable, as outlined below, to store codes and use them to control another action, such as worker safety or control access. *See infra* ¶ 265.

262. Claims 1[E], 10[C], and 19[C] further recite removing the block "only upon entry of the removal code" while independent Claims 20, 30, 40 do not recite such code entry. Railware has asserted that the code can be manually entered by the dispatcher or automatically "without dispatcher intervention." EX1024, 11-12 (Railware asserting "dispatcher ... enters the removal or release code into the railway control apparatus" or automatically "without dispatcher intervention"); EX1025, ¶¶ 296 (asserting "numerous ways … the release or removal code may be returned to the dispatcher or the railway control apparatus" including "manually" and "automatically"), 312-313, 321, 341, 350, 358.

263. Nonetheless, to the extent a dispatcher must enter the code, a POSITA would have had a motivation to combine and reasonable expectation of success for the dispatcher to enter the worker's transmitted code via the dispatcher interface (such as a prompt or text box) into the railway traffic control apparatus. This would have ensured the dispatcher is alerted to the information provided, prevented the track block from being (improperly) released until the dispatcher enters the code, and reduced any miscommunication between the dispatcher and worker. The entry



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of a code into an interface was also known and a straightforward or design choice change, particularly given the existing hardware, software, and dispatcher interfaces in the FRA-Report. EX1010, 4:10-17 ("operator H to enter the displayed code into the OCU 42 for purposes of confirming that the operator is paying attention to information"), 4:48-53, 5:24-30; Limitations 1[A]-[C], [E].

264. Otherwise, a POSITA would have had a motivation to combine and reasonable expectation of success to automatically unblock the track block using the transmitted code given FRA-Report already automatically unblocks the track based on the worker as outlined previously. *See supra* ¶¶ 245-249, Sections X.A.3-4. This is also a design choice, *e.g.*, would have improved efficiency and saved resources by automatically or seamlessly unblocking the track.

265. Under either entering the code by the dispatcher or automatically by the railway traffic control apparatus, FRA-Report's railway traffic control apparatus by centralized control operation would compare the generated code stored in the database (or other storage) with the worker's transmitted code and if the code does not match, then the track remains blocked, or if the code matches, then the track is unblocked (*e.g.*, transmit block removal signal to the interlock as discussed in Limitation 1[B]). It was known to save a generated code into a database (or other storage), including password protected or encrypted to prevent improper access, and



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compare (or verify) codes to control another action. EX1005, 6:1-9, Abstract, 7:1-17, 11:8-17; EX1007, 15:28-35; EX1008, 7:54-59; EX1009, Figs. 12, 14 ("received confirmation code = supplied confirmation code?"), 14:19-25, 15:17-27.

266. Additionally, FRA-Report would not release the track block based on an incorrect, or arbitrary, transmitted code as that would jeopardize the worker's safety. It also would have been contrary to FRA-Report to provide safety to the worker. EX1004, Vol. I: Abstract ("[a] prototype communications device was developed for roadway workers . . . to request track protection from the dispatcher."), Preface ("digital communication device intended to improve roadway worker safety and productivity.")

267. Also, Railware's understanding of "user terminal" and "from the terminal" (claims 20, 30) or "from the user terminal" (claim 41) reinforces FRA-Report and Kruijswijk teach 1[E] given for the former, "'any communication device'" can be used while the latter, the "claims are … agnostic as to how the code is transmitted to the railway control apparatus …." *See supra* ¶¶ 123-124.

(b) Motivation to Combine FRA-Report and Kruijswijk with a Reasonable Expectation of Success

268. A POSITA would have modified FRA-Report with Kruijswijk because it would have been predictable given CTC systems and secret-code systems were known, FRA-Report recognized that a secret-code system would have been



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implemented in the FRA-Report, and prior art discusses that technologies would have been applied to enhance worker safety. *See supra* ¶¶ 228-233, 238-242; Sections V.B-C. In other words, it would have been simply applying a known technique to a known device for increased safety.

269. Likewise, FRA-Report and Kruijswijk involve railway technology and worker safety including verification, including Kruijswijk verifying the transmitted code. *See* Sections X.A.3-4, B. Thus, a POSITA would have combined them, particularly as it would strengthen FRA-Report's goals to "improve roadway worker safety and productivity" (EX1004, Vol. I: Preface) and implement "a verification system that prevent[s] or minimize[s] common human error.". EX1004, Vol. I: 9, 27. A "handshake" or verification protocol, where the worker unblocks the track with the code taught in Kruijswijk, would thus have been obvious to try or a predictable next step. *See supra* ¶ 239; EX1028, 4, 14-15.

270. FRA-Report recognized the need "to positively identify the person communicating with the PDA by utilizing some form of password protection," even offering various proposals on solutions towards this objective including a password-based one. EX1004, Vol. I: 57-58. A POSITA would have been motivated to combine FRA-Report and Kruijswijk, given FRA-Report itself discloses a readiness



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to receive improvements—including password-based ones—towards verifying a track worker. *Id*.

271. Alternatively, a POSITA would have been motivated to modify FRA-Report to transmit the code upon the worker [a] selecting the "Cancel/Fulfill" link (such as automatically or prompt the worker to enter the code), [b] calling, or [c] texting or emailing a message (such as via an embedded link activated to transmit the code) to the railway traffic control apparatus to unblock the track. EX1005, 12:20-21 ("By using standard SMS-messages, the investments to implement this invention are very low."); EX1004, Vol II.: 15, 21, 27, 63; EX1017, 15-16. This would have provided an efficient and alternative means to unblock the track, particularly as both the FRA-Report and Kruijswijk discuss text messages and text, email, and links were well-known. *Id*.

272. A POSITA would have appreciated that modifying FRA-Report with Kruijswijk would have had a reasonable expectation of success. FRA-Report notes that "[t]he system is designed to be highly configurable" (EX1004, Vol. I: 41) and already has hardware, software, and dispatcher and worker interfaces in the FRA-Report for blocking and unblocking the track at the railway worker's request. *See supra* ¶ 241; Limitations 1[Pre]-[C].



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273. A POSITA would have appreciated that modifying FRA-Report with Kruijswijk would have had a reasonable expectation of success. FRA-Report describes a CTC system with software to unblock a track at the worker's request from a mobile device. Limitations 1[A]-[C], [E]. FRA-Report states that "[t]he system is designed to be highly configurable" (EX1004, Vol. I: 41). Other prior art references also show a reasonable expectation of success and that before the Priority Date, mobile device, server, and other technology evolved. *See supra* ¶ 242; Sections V.A-D. Thus, it would have been predictable to transmit the code from the worker device to the CTC system to unblock the track.

## D. Analysis of Independent Claim 10

### 1. 10[Pre]: "A railway traffic control apparatus *configured for centralized control of traffic of a centrally controllable railway network including plural railways and a plurality of railway traffic interlocks dispersed in said plural railways constituting said railway network*, for controlling access to railway tracks, said railway traffic control apparatus comprising:"

274. *See* Limitations 1[Pre] and 1[B].



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**2. 10[A]: "a block placing part to place a block on one or more [selected] *specified* track sections *in any of said plural railways constituting said railway network that is managed by centralized control operation from the railway traffic control apparatus, the railway traffic control apparatus controlling, by said centralized control operation, one or more interlocks amongst the plurality of railway traffic interlocks dispersed in said plural railways constituting said railway network, to block railway traffic to the specified track sections and thereby* to permit a railway field worker to enter the track sections [while blocking railway traffic to said track sections];"**

275. *See* Limitations 1[B]-[C]; EX1004, Vol. II: 10-12, Fig. 1, Table 2.

**3. 10[B]: "a code generation part to generate a removal code, determine an electronic contact address of the railway field worker by accessing a rail personnel contact database registering, for each railway personnel, electronic contact information of the railway personnel, and transmit the removal code to the electronic contact address of the railway field worker; and"**

276. *See* Limitations 1[A] and [D].

**4. 10[C]: "a block removal part to remove only upon entry of the removal code *by said centralized control operation from the railway traffic control apparatus,* the block placed by the block placing part on said one or more track sections for the railway field worker."**

277. *See* Limitation 1[E].



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## E. Analysis of Independent Claim 19

### 1. 19[Pre]: "A method for *controlling railway access using a railway traffic control apparatus of* a centralized railway control system [to control access to railway tracks] *configured for centralized control of traffic of a centrally controllable railway network including plural railways and a plurality of railway traffic interlocks dispersed in said plural railways constituting said railway network*, the method comprising:"

278. *See* Limitations 1[Pre] and 1[B].

### 2. 19[A]: "providing a user interface [on a user terminal] *of the railway traffic control apparatus*, including a block placing part to place a block on one or more specified track sections *in any of said plural railways constituting said railway network that is managed by centralized control operation from the railway traffic control apparatus, the railway traffic control apparatus controlling, by said centralized control operation, one or more interlocks amongst the plurality of railway traffic interlocks dispersed in said plural railways constituting said railway network, to block railway traffic to the specified track sections and thereby* to permit a railway field worker to enter the track sections [while blocking railway traffic to said track sections];"

279. *See* Limitations 1[B]-[C]; EX1004, Vol. II: 10-12, Fig. 1, Table 2.

### 3. 19[B]: "generating a removal code, determining an electronic contact address of the railway field worker by accessing a rail personnel contact database registering, for each railway personnel, electronic contact information of the railway personnel, and transmitting the removal code to the electronic contact address of the railway field worker; and"

280. *See* Limitations 1[A] and [D].



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**4. 19[C]: "permitting the block to said one or more track sections to be removed only upon entry of the removal code [in the centralized railway control system] *by said centralized control operation from the railway traffic control apparatus*."**

281. *See* Limitation 1[E].

**F. <u>Analysis of Independent Claim 20</u>**

**1. 20[Pre]: "*A railway traffic control apparatus configured for centralized control of traffic of a centrally controllable railway network including plural railways and a plurality of railway traffic interlocks dispersed in said plural railways constituting said railway network, the railway traffic control apparatus comprising a processor and configured to:*"**

282. *See* Limitations 1[Pre] and 1[B].

**2. 20[A]: "*place a block on one or more sections of railway track in any of said plural railways constituting said railway network that is managed by centralized control operation from the railway traffic control apparatus, the railway traffic control apparatus controlling, by said centralized control operation, one or more interlocks amongst the plurality of railway traffic interlocks dispersed in said plural railways constituting said railway network, to prevent trains from traversing the one or more sections of railway track;"***

283. *See* Limitations 1[B]-[C]; EX1004, Vol. II: 10-12, Fig. 1, Table 2.

**3. 20[B]: *"generate a secret release code associated with the blocked one or more sections of railway track;"***

284. *See* Limitation 1[D].

285. Claim Limitations 20[B] and 30[C] recite a "secret release code" and Claim Limitation 40[C] recites a "secret code."



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286. The Board and Railware treat these as the same as "removal code" in independent Claims 1, 10, and 19. *See supra* ¶¶ 114-118.

287. FRA-Report and Kruijswijk teach a secret release code and secret code. *See* Limitation 1[D].

288. Claim Limitations 20[B] and 30[B] also recite generating the claimed code "associated with the blocked one or more sections of railway track" while Limitation 40[C] recites "associated with the selected track sections."

289. FRA-Report and Kruijswijk describe, upon a worker's request, the railway traffic control apparatus blocks a track (selected on the track display) associated with the worker as well as generates and transmits an associated code to the worker. *See* Limitations 1[B]-[D]; *see also* EX1004, Vol. I: 34 (Fig. A-3) ("Delivered to: Oriol … 2 track out of service between/at Providence and Lawn in charge of Oriol."), 32 (Fig. A-1).

290. Thus, the generated code is associated with the block or selected track sections.

#### 4. 20[C]: "*transmit the secret release code to a user terminal via a network;*"

291. *See* Limitation 1[D].

#### 5. 20[D]: *"receive the secret release code via the network; and"*

292. *See* Limitation 1[E].



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293. FRA-Report teaches "via the network" in Claims 20[D], 28, 30[D], 38, 41[A] under Railware and SEPTA'a constructions because the worker operating the PDA transmits the code to the railway traffic control apparatus over "one or more networks" or "the same network" used to transmit the code to the worker. *See supra* ¶ 126 (Railware: "one or more networks"; SEPTA: "the same network"); Limitations 1[B], 1[D]-[E]; EX1004, Vol. I: 14 (Fig. 2).

294. A POSITA would have recognized that alternatively the railway traffic control apparatus would transmit the code to the worker and worker would return the code to it over different networks in FRA-Report and depending on the needs of the system, such as for efficiency and costs.

#### 6. 20[E]: *"responsive to receiving the secret release code from the terminal, remove the block from the one or more sections of railway track."*

295. *See* Limitation 1[E].

296. Claims 20[E] and 30[E] do not recite the "entry" of the secret release code. The analysis of Limitation 1[E] applies here since the railway traffic control apparatus unblocks the track in response to receiving the secret code.

297. Additionally, FRA-Report teaches "from the terminal" in Claims 20[E] and 30[E] and "from the user terminal" in Claim 41[A] under Railware and SEPTA's constructions given the worker from the mobile device transmits the claimed code to the railway traffic control apparatus and according to Railware's expert, the



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"claims are … agnostic as to how the code is transmitted." EX1025, ¶¶328, 356, 358; *see supra* ¶ 124; 1[E].

### G. Analysis of Independent Claim 30

**1. 30[Pre]: "A method for controlling railway access using a railway traffic control apparatus configured for centralized control of traffic of a centrally controllable railway network including plural railways and a plurality of railway traffic interlocks dispersed in said plural railways constituting said railway network, the method comprising:"**

298. *See* Limitations 1[Pre] and 1[B].

**2. 30[A]: *"placing a block on one or more sections of railway track in any of said plural railways constituting said railway network that is managed by centralized control operation from the railway traffic control apparatus, the railway traffic control apparatus controlling, by said centralized control operation, one or more interlocks amongst the plurality of railway traffic interlocks dispersed in said plural railways constituting said railway network, to prevent trains from traversing the one or more sections of railway track;"***

299. *See* Limitations 1[B]-[C]; EX1004, Vol. II: 10-12, Fig. 1, Table 2.

**3. 30[B]: *"generating a secret release code associated with the blocked one or more sections of railway track;"***

300. *See* Limitations 1[D], 20[B].

**4. 30[C]: *"transmitting the secret release code to a user terminal via a network;"***

301. *See* Limitation 1[D].

**5. 30[D]: *"receiving the secret release code via the network; and"***

302. *See* Limitations 1[E], 20[D].



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**6. 30[E]: *"responsive to receiving the secret release code from the terminal, removing the block from the one or more sections of railway track."***

303. *See* Limitations 1[E], 20[E].

## H. Analysis of Independent Claim 40

304. Claim 40 does not require that the worker transmit the secret code to the railway (traffic) control apparatus to unblock the track.

**1. 40[Pre]: *"A system comprising:"***

305. *See* Limitation 1[Pre].

**2. 40[A]: *"a railway control apparatus comprising a processor and a memory device, the railway control apparatus configured to communicate with a plurality of railway traffic interlocks and a user terminal via a network and to perform centralized control of traffic of a centrally controllable railway network including plural railways and the plurality of railway traffic interlocks dispersed in said plural railways constituting said railway network, wherein the processor is configured by execution of computer program instructions to cause the railway control apparatus to:"***

306. *See* Limitations 1[Pre] and 1[B].

**3. 40[B]: *"receive a selection of track sections to block in any of said plural railways constituting said railway network that is managed by centralized control operation from the railway control apparatus, wherein each selected track section corresponds to one or more railway traffic interlocks amongst the plurality of railway traffic interlocks dispersed in said plural railways constituting said railway network;"***

307. *See* Limitations 1[B]-[C].



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**4. 40[C]: *"responsive to receiving the selection, generate a secret code associated with the selected track sections;"***

308. *See* Limitations 1[B]-[D].

**5. 40[D]: *"responsive to generating the secret code, save the secret code in the memory device;"***

309. *See* Limitation 1[D].

310. Regardless, it was known or a design choice to a POSITA to save a code in a database or other storage such that the saved code could later be verified to determine if the track should be unblocked or remain blocked. *See supra* ¶ 265.

**6. *40[E]: "associate the secret code with a remote user of the user terminal;"***

311. *See* Limitations 1[C]-[D]; EX1004, Vol. I: 38, 39, 57, Fig. A-3.

312. The code is associated with the worker because the code is generated based on the worker's request to block the track and transmitted to the worker. *See* Limitations 1[C]-1[D].

**7. 40[F]: "*transmit a block signal to the corresponding one or more railway traffic interlocks to place a block on the selected track sections; and"***

313. *See* Limitations 1[B]-[C].

314. FRA-Report teaches that the dispatcher blocks the track by selecting the track on the display and transmitting a block signal to the interlocks to display stop signals which will protect the track for the worker. *See* Limitations 1[B]-[C];



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EX1004, Vol. II: 1 ("In signal territory, the track equipment provides dispatchers with information about signal states, switch states, and train location. In signal territory with track circuits, trains shunt (activate) the track circuit at the block entrance and exit."), 10-11 ("Each dispatcher has a workstation to control the switches and signals. . . . If the dispatcher intended to grant work authorization, the dispatcher proceeded to protect the requested track. At the Traffic Control Center, the dispatcher could use the track display to protect the track segment in question using software that controlled various switched and signals in the field."), 12 ("Operation of these switches is restricted and the protected track will display stop signals at both ends."), Fig. 1, Table 2, 67; Vol. I: 6 ("signals (wayside and in-cab) for the blocked track will display a stop signal at both ends to prevent movement by unauthorized track vehicles."), 8.

315. Additionally, RE'835 Patent acknowledges, and other references show that it was known to a POSITA each track has a corresponding interlock controlled by CTC operation using color-coded track display, such as transmitting a signal to interlock(s), e.g., blocking signal, to block the track(s). *See* Section V.B.

**8. 40[G]: "*transmit the secret code to the remote user of the user terminal.*"**

316. *See* Limitation 1[D].



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## I. Analysis of Dependent Claims 2-7, 9, 11-16, 18, 21-29, 31-39, 41

317. I believe FRA-Report and Kruijswijk render obvious dependent claims 2-7, 9, 11-16, 18, 21-29, 31-39, 41.

### 1. Claim 2: "The centralized railway control system of claim 1, wherein the railway traffic control apparatus further comprises: a [RTC] *railway traffic controller (RTC)* user interface to permit a user to specify said one or more track sections to be blocked, specify an instruction to the centralized railway control system to block the railway traffic to the specified track sections, and specify identifying information of the railway field worker to be performing work in the specified track sections."

**Claim 11: "The railway traffic control apparatus of claim 10, further comprising: a [RTC] *railway traffic controller (RTC)* user interface to permit a user to specify [said one or more] track sections to be blocked, specify an instruction to the [centralized] railway *traffic* control [system] *apparatus* to block the railway traffic to the specified track sections, and specify identifying information of the railway field worker to be performing work in the specified track sections."**

318. *See* limitations 1[B]-[C], 40[F].

319. FRA-Report teaches that the dispatcher operates an interface to specify instructions to the railway traffic control apparatus to block track sections. *See* Limitations 1[B]-[C]. FRA-Report also stores and assigns a worker via the dispatcher interface to the blocked track. *Id*.; *see also* EX1004, Vol. I: 34 (Fig. A-3: "track out of service between/at Providence and Lawn in charge of Oriol.").



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320. This is also shown in the below dispatcher interface, specifying identifying information on the railway field worker, "Oriol," to be performing work in the specified track sections, "81.5 Branford and 90.4 Guilford," is shown below:

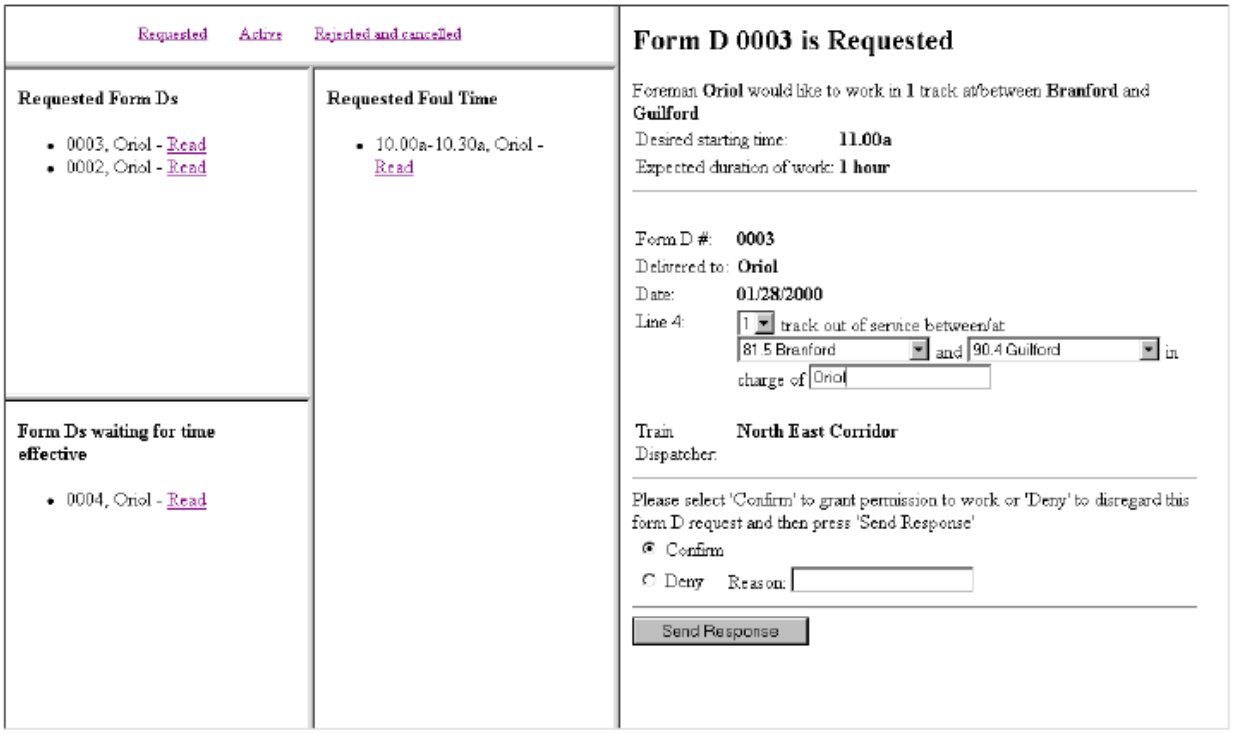



**Figure A-5. Dispatcher Interface**

EX1004, Vol. I: 40 (Fig. A-5).

321. A POSITA would have had a motivation to combine and reasonable expectation of success to associate on the track display (or another screen) the railway worker with the track blocked because it would have been a straightforward change or design choice, particularly given FRA-Report's hardware, software, and interfaces. *See supra* ¶¶ 241-243; Limitations 1[Pre]-[C]; EX1004, Vol. II: 21



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("[s]ending a message by clicking on a roadway worker on the tracking display"), 15, 27, 41, 63.

322. Moreover, it would increase efficiency in the event the current worker is unable to start or complete the work by reassigning the work on the screen to a new worker.

323. A POSITA would have understood that the RE'835 Patent acknowledges it was known to a POSITA a dispatcher's interface for blocking a track and associating that track with a worker. *See* Section V.B.

324. Additionally, FRA-Report teaches the "railway traffic controller" under Railware and SEPTA's constructions because a dispatcher operates the track display to block track sections, among other functions. *See* Limitations 1[A]-[C].

**2. Claim 3: "The centralized railway control system of claim 1, further comprising:**

**a railway control database registering block identifying information, including block limits identifying the one or more blocked track sections, along with the removal code for removing the block of the track sections."**

**Claim 12: "The railway traffic control apparatus of claim 10, wherein block identifying information, including block limits identifying the one or more blocked track sections, is registered in a railway control database, along with the removal code for removing the block of the track sections."**

325. *See* Limitations 1[B]-[C], 40[D].



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326. FRA-Report discloses registering block identifying information in a database or other storage, such as "track[s] out of service," date, worker in charge, "Form D," and others. EX1004, Vol. I: 14, 31 (database stores "out of service track under Form D"), 39 ("The database includes information . . . [including] Track information (Track Info.txt). Includes information about all the locations along the track") (emphasis in original), 36-38, 32 (Fig. A-1), 34 (Fig. A-3: "track out of service between/at Providence and Lawn in charge of Oriol."), 39 ("Form Ds . . . are . . . stored in the machine running the web server").

327. As discussed, a POSITA would have been motivated with a reasonable expectation of success to generate the code associated with the blocked track and store the code in the database (or other storage) for later verification to determine if to unblock the track. *See* Limitations 1[E], 40[D].

328. Further, POSITA would have had a motivation to combine and reasonable expectation of success to register the claimed information in a database (or other storage) to enhance safety by determining if the correct procedures were followed (*e.g.*, correct block in place or removed); analyzing or addressing any error, issue, or irregularity; and/or training others, as well as storing data is known or a design-choice.



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329. Also, the claimed information is known railway data and thus it would have been obvious to try and store such information.

330. Moreover, FRA-Report stores significant information, including the above, such that the claimed data could be efficiently maintained and thus it would have been obvious to try to store the claimed data. *See* Limitations 1[A]-[C]; *supra* ¶ 326.

**3. Claim 4: "The centralized railway control system of claim 1, further comprising:**

**a railway control database registering (a) identification of the user who specified the instruction to block the track sections and (b) block identifying information, including block limits identifying the one or more blocked track sections, notes specifying reasons for the block, and date and time at which the block was placed."**

**Claim 13: "The railway traffic control apparatus of claim 10, wherein block identifying information, including block limits identifying the one or more blocked track sections, notes specifying reasons for the block, and date and time at which the block was placed, are registered in a railway control database, along with identification of the user who specified the instruction to block the track sections."**

331. FRA-Report discloses a railway control database that registers or stores the dispatcher who requested the block ("dispatcher in charge") for the track sections and the worker who requested the block ("Oriol"). EX1004, Vol. I: 14 ("The database contained . . . track out of service under Form D . . . and territory information (maximum speed, dispatcher in charge, rules that apply)."), 39 ("The



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database includes information about dispatchers, roadway workers .... [including] Track information (Track Info.txt). Includes information about all the locations along the track ....") (emphasis in original), 34 (Fig. A-3: "track out of service between/at Providence and Lawn in charge of Oriol."), 32 (Fig. A-1), 38.

332. A POSITA would have understood FRA-Report's database likewise stores block identifying information, including block limits identifying the one or more blocked track sections ("track out of service under Form D" above); notes specifying reasons for the block (*e.g.*, Form D, worksite description); and date and time at which the block was placed. *See* Claims 3, 12; EX1004, 31 ("This database stores information about past train schedules, expected schedules in the future, current delay, train information (direction of travel, number of cars, engine number), out of service track under Form D, out of service track under Foul Time, and territory information (maximum speed, dispatcher in charge, rules that apply)."), 34-35 (Figs. A-3–A-4) ("Start Time:…Duration:…Date:…"; shows reasons for work and dispatcher), 37 ("**Dispatcher Query Server**. . . . **Requests sent by PDA**: Request Form D line 4: Used to send a ***work site description to the dispatcher***, track number, and ***desired window of time to perform a work*** that will require a Form D line 4 authorization.") (emphasis added), 37 ("Track outage: This feature is used to retrieve a list of track that is currently out of service under Form D authorization.") (emphasis



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in original), 38 ("If the dispatcher grants the Form D, the appropriate information will be sent to the roadway worker who requested it [including] . . . Form D number (automatically assigned by system), Form D recipient, date, track number, track location, and foreman in charge of the track out of service."), Fig. A-5 (showing tracks blocked, date and time, and worker "Oriol").

333. Regardless, a POSITA would have had a motivation to combine and reasonable expectation of success to store the claimed information to enhance safety by determining if the correct procedures were followed (*e.g.*, correct block in place or removed); analyzing or addressing any error, issue, or irregularity; and/or training others, as well as storing data is known or a design-choice.

334. Further, the claimed information is known railway data and thus it would have been obvious to try and store such information.

335. Moreover, FRA-Report stores significant information, including the above, such that the claimed data could be efficiently maintained and thus it would have been obvious to try to store the claimed data. *See* Limitations 1[A]-[C]; *supra* ¶¶ 331-332.

**4. Claim 5: "The centralized railway control system of claim 1, wherein upon placement by the block placing part of the block of railway traffic to said one or more specified track sections, the code generation part transmits the removal code to the electronic contact address of the railway field worker, and the block of railway traffic to said one or more specified**

**track sections remains in place in the centralized railway control system until the entry of the removal code in the centralized railway control system to cause the block removal part to remove the block on said one or more track sections."**

**Claim 14: "The railway traffic control apparatus of claim 10, wherein upon placement by the block placing part of the block of railway traffic to said one or more specified track sections, the code generation [code] *part* transmits the removal code to the electronic contact address of the railway field worker, and the block of railway traffic to said one or more specified track sections remains in place in the [centralized] railway *traffic* control [system] *apparatus* until the entry of the removal code in the [centralized] railway *traffic* control [system] *apparatus* to cause the block removal part to remove the block on said one or more track sections."**

336. *See* Limitations 1[C]-1[E].

**5. 6[Pre]: "The centralized railway control system of claim 1, wherein the railway traffic control apparatus further comprises:"**

**6[A]: "a block removal user interface to permit a user to enter the removal code to cause the block removal part to remove the block on said one or more track sections,"**

**6[B]: "wherein the block of railway traffic to said one or more specified track sections remains in place in the centralized railway control system until the entry of the removal code through the block removal user interface."**

**15[Pre]: "The railway traffic control apparatus of claim 10, further comprising:"**

**15[A]: "a block removal user interface to permit a user to enter the removal code to cause the block removal part to remove the block on said one or more *specified* track sections,"**



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**15[B]: "wherein the block of railway traffic to said one or more specified track sections remains in place in the [centralized] railway *traffic* control [system] *apparatus* until the entry of the removal code through the block removal user interface."**

337. *See* Limitations 1[C]-1[E]; Claims 5, 14.

**6. 7[Pre]: "The centralized railway control system of claim 6, wherein the block removal user interface further requires, in addition to the entry of the removal code, the user to specify that confirmation that the track sections have been cleared has been obtained from the railway field worker associated with the block, before the block removal user interface permits the removal code to be transmitted to the block removal pail, and"**

**7[A]: "the centralized railway control system further comprises a railway control database registering (a) block identifying information identifying the one or more blocked track sections, date and time at which the block was placed and identifying [information] the railway field worker associated with the block, and (b) block removal information identifying date and time at which the block was removed and identifying the user who entered the removal code and specified that confirmation that the track sections have been cleared was obtained from the railway field worker associated with the block."**

**16[Pre]: "The railway traffic control apparatus of claim 15, wherein the block removal user interface further requires, in addition to the entry of the removal code, the user to specify that confirmation that the track sections have been cleared has been obtained from the railway field worker associated with the block, before the block removal user interface permits the removal code to be transmitted to the block removal part, and"**

**16[A]: "block identifying information identifying the one or**



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> **more blocked track sections, date and time at which the block was placed and identifying [information] the railway field worker associated with the block is registered in a railway control database, along with block removal information identifying date and time at which the block was removed and identifying the user who entered the removal code and specified that confirmation that the track sections have been cleared was obtained from the railway field worker associated with the block."**

338. A POSITA would have been motivated with a reasonable expectation of success to require entry of the code in the dispatcher interface to unblock the track because it would, *e.g.*, ensure the dispatcher is alerted to the code provided and prevent miscommunication between the dispatcher and worker. *See* Limitation 1[E]; Claims 5, 14. Likewise, it would further the goal that someone does not remove the track block until the dispatcher enters the code. *Id*.

339. A POSITA would have been further motivated with a reasonable expectation of success for the dispatcher to specify, *e.g.*, prompt or text box, confirmation from the worker that the track sections have been cleared. This would have provided another (known) level of protection to ensure all workers have left the track before unblocking the track. Limitations 1[B], 1[E]; EX1004, Vol. II: 10-12, Fig. 1, Table 2; EX1029, Figs. 6D, 5H, 25:4-9, 31:2-6.

340. FRA-Report teaches storing block identifying information, including a database (or other storage) for registering the blocked track, date and time block was placed, and worker associated with the blocked track, as discussed above, or a



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POSITA would have been motivated with a reasonable expectation of success to modify as such for the reasons previously discussed. *See* Claims 2, 11; 3, 12; 4, 13.

341. A POSITA would have been motivated with a reasonable expectation of success to generate and store block removal information, such as the date and time at which the block was removed, the user who entered the removal code, and confirmation that the track sections have been cleared to enhance safety by determining if the correct procedures were followed (*e.g.*, correct block in place or removed); analyzing or addressing any error, issue, or irregularity; and/or training others, as well as storing data is known or a design-choice.

342. Further, the claimed information is known railway data and thus it would have been obvious to try and store such information.

343. Moreover, FRA-Report tracks and stores significant information (*see e.g.*, Claims 2, 11; 3, 12; 4, 13) such that this block removal data could be efficiently stored and maintained and thus it would have been obvious to try to store the claimed data. *See* Limitations 1[A]-[C]; EX1004, Vol. I: Fig. A-1 ("Sun, 11:00 p . . . **YOU ARE NOT UNDER DISPATCHER PROTECTION** NorthEast Corridor dispatcher has received your request and the form D # 0003 has been cancelled.") (emphasis in original), 14.



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**7.** **Claim 9: "The centralized railway control system of claim 1, wherein the code generation part transmits an electronic message to the electronic contact address of the railway field worker, and the electronic message transmitted to the electronic contact address of the railway field worker includes the removal code and includes an embedded link for activating a return transmission of the removal code to the block removal part of the centralized railway control system."**

**Claim 18: "The railway traffic control apparatus of claim 10, wherein the code generation part transmits an electronic message to the electronic contact address of the railway field worker, and the electronic message transmitted to the electronic contact address of the railway field worker includes the removal code and includes an embedded link for activating a return transmission of the removal code to the block removal part of the [centralized] railway *traffic* control [system] *apparatus*."**

**Claim 27: "*The railway traffic control apparatus of claim 20, wherein the railway traffic control apparatus is configured to transmit the secret release code to the user terminal by transmitting a message to the user terminal, the message comprising one or more embedded links."***

**Claim 28*: "The railway traffic control apparatus of claim 27, wherein the railway traffic control apparatus is configured to receive the secret release code transmitted via the network in response to selection of at least one of the one or more embedded links in the message, on the user terminal."***

**Claim 29: "*The railway traffic control apparatus of claim 27, wherein the message comprises a text message or an email."***

**Claim 37: "*The method of claim 30, wherein transmitting the secret release code comprises transmitting a message to the user terminal, the message comprising one or more embedded links."***



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**Claim 38: "*The method of claim 37, wherein the secret release code is transmitted via the network in response to selection of at least one of the one or more embedded links in the message, on the user terminal, and is received by the railway traffic control apparatus."***

**Claim 39*: "The method of claim 37, wherein the message comprises a text message or an email."***

344. The combined references teach a railway traffic control apparatus which generates a code and transmits it and other information as a message to the worker's PDA or electronic contact address. *See* Limitations 1[D]-[E].

345. The worker selects or activates the "Cancel/Fulfill" or "Clear" embedded link that would transmit the code to the railway traffic control apparatus, which would unblock the track. *Id*.

346. Alternatively, the code would be transmitted to the worker via text or email message (such as with an embedded link). *Id*. The worker would transmit the code to the railway traffic control apparatus to unblock the track upon the worker calling or texting or emailing a message (such as via an embedded link activated to transmit the code). *Id*.

347. As another option, upon selecting the embedded link, the system would prompt the worker to enter the code and then transmit it. *Id*.

348. The motivation to combine and reasonable expectation of success is further shown in the FRA-Report, which includes the "Qualcomm® pdQ™



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Smartphone 800" for text messaging relating to work authorization. EX1004, Vol. II: 15 ("exhibited the ability to send and receive short text messages (SMS) . . . [which] enabled the dispatcher or roadway worker to alert each other when a request for track authorization was initiated or answered."), 21 ("The current hardware platform can use SMS to send and receive messages. . . . • Sending a message by clicking on a roadway worker on the tracking display • Sending an unstructured message to anybody at anytime."), 27 ("dispatchers particularly liked the feature for contacting a roadway worker via SMS"), 41, 63 (SMS "is a globally accepted wireless service that enables the transmission of alphanumeric messages between mobile subscribers and external systems such as web servers, electronic mail, paging, and voice-mail systems" and "is a reliable, low-cost communication mechanism."). Thus, it would have been obvious to try to implemented the claimed transmission methods.

349. Additionally, workers "were asked if they would use the PDA in their jobs. Interest was high for both requesting information and work authorizations" and since workers were familiar with email and cell phones, they would have been familiar with operating a user interface to enter and send text and numbers as a text message or an email. EX1004, Vol. I: 25, 16, 13.



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**8. Claim 21*: "The railway traffic control apparatus of claim 20, wherein the block is placed via an interlocking signal prohibiting trains from traversing the one or more sections of railway track."***

**Claim 31*: "The method of claim 30, wherein the block is placed via an interlocking signal prohibiting trains from traversing the one or more sections of railway track."***

350. *See* Limitations 1[B]-[C]; Section V.B; *infra* Claims 22, 32; EX1004, Vol. II: 10-12, Fig. 1, Table 2; Vol. I: 6, 8.

**9. Claim 22: *"The railway traffic control apparatus of claim 20, wherein the railway traffic control apparatus is configured to place the block by causing one or more of the plurality of railway traffic interlocks to display a STOP signal."***

**Claim 32: *"The method of claim 30, wherein the railway traffic control apparatus is configured to place the block by causing one or more of the plurality of railway traffic interlocks to display a STOP signal."***

351. The railway traffic control apparatus places a block by causing the interlocks to display a stop signal. *See* Limitations 1[B]-[C]; EX1004, Vol. II: 11-12 ("Operation of these switches is restricted and the protected track will display stop signals at both ends."); EX1004, Vol. I: 6 ("In Central Traffic Control (CTC) . . . the blocked track will display a stop signal at both ends to prevent movement by unauthorized track vehicles."), 8; Section V.B.



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**10. Claim 23*: "The railway traffic control apparatus of claim 20, wherein only the railway traffic control apparatus and the user terminal receive the secret release code generated by the railway traffic control apparatus."***

**Claim 33*: "The method of claim 30, wherein only the railway traffic control apparatus and the user terminal receive the secret release code generated by the railway traffic control apparatus."***

352. *See* Limitations 1[D]-[E].

**11. Claim 24: "*The railway traffic control apparatus of claim 20, wherein the railway traffic control apparatus is further configured to: store the secret release code in a memory of the railway traffic control apparatus."***

**Claim 34*: "The method of claim 30, further comprising: storing the secret release code in a memory of the railway traffic control apparatus."***

353. *See* Limitations 1[D]-[E], 40[D]; Claims 3, 12.

**12. Claim 25: "*The railway traffic control apparatus of claim 20, wherein the railway traffic control apparatus is further configured to: generate and store block removal information in response to removing the block from the one or more sections of railway track."***

**Claim 35: "*The method of claim 30, further comprising: generating and storing block removal information in response to removing the block from the one or more sections of railway track."***

354. A POSITA would also have been motivated with a reasonable expectation of success to generate and store block removal information. *See* Claims 7, 16.



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355. Likewise, a POSITA would have been motivated to generate and store such information in response to removing a track block to enhance safety by determining if the correct procedures were followed (*e.g.*, correct block placed and removed); analyzing or addressing any error, issue, or irregularity; and/or training others, as well as storing data is known or a design-choice.

356. Further, the claimed information is known railway data and thus it would have been obvious to try and store such information.

357. FRA-Report tracks and stores significant information as discussed above (*see e.g.*, Claims 2, 11; 3, 12; 4, 13), such that this data could be efficiently stored and maintained and thus it would have been obvious to try to store the claimed data. *See* Limitations 1[A]-[C].

**13. Claim 26: "*The railway traffic control apparatus of claim 25, wherein the block removal information comprises a date and time when the block was removed and identification information of a user who entered the secret removal code.*"**

**Claim 36: *"The method of claim 35, wherein the block removal information comprises a date and time when the block was removed and identification information of a user who entered the secret removal code."***

358. Claims 26 and 36 recite "secret removal code." FRA-Report and Kruijswijk teach a secret removal code. *See* Limitation 1[D].

359. As discussed, a POSITA would also have been motivated with a reasonable expectation of success to generate block removal information, as



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discussed above, consisting of the date and time when the block was removed and person who entered the code to remove the block. *See* Claims 7, 16.

**14. 41[Pre]:** ***"The system of claim 40, wherein the processor configured by execution of computer program instructions additionally causes the railway control apparatus to:"***

**41[A]:** ***"receive the secret code from the user terminal via the network;"***

**41[B]:** ***"verify the secret code by comparing the secret code received from the user terminal with the secret code stored in the memory device;"***

**41[C]:** ***"receive an instruction to remove the block from the selected track sections, after verifying the secret code; and"***

**41[D]:** ***"responsive to the instruction to remove the block received after verifying the secret code, transmit a block removal signal to the corresponding railway traffic interlocks."***

360. *See* Limitations 1[B], [E]; Sections V.B-C.



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## XI. GROUND 2: CLAIMS 1-8 ARE OBVIOUS OVER FRA-REPORT, KRUIJSWIJK, AND MACEY

### A. Summary of FRA-Report and Analogous Art

361. My explanation of FRA-Report above and incorporated here by reference. *See* Sections X.A.3-4.

### B. Summary of Kruijswijk and Analogous Art

362. My explanation of Kruijswijk above and incorporated here by reference. *See* Section X.B.

### C. Summary of Macey and Analogous Art

363. PCT Pub. No. WO 2010/012040 (EX1007, "Macey") published on February 4, 2010, and is therefore prior art under at least AIA 35 U.S.C. § 102(a) without any § 102(b) exceptions.

364. Macey discloses a system for enhancing railway worksite safety that involves comparing a secret code communicated by a railway worker before an approaching train is allowed to proceed through the worksite area. EX1007, 16:1-21, 1:5-8.

365. Macey further discloses an alert module that "may be a server or computer located at a central point, such as a headquarters or command cent[er] remote from" the tracks where railway workers are working for controlling over a



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wireless (or wired) network a signaling device to prevent an approaching train from entering a worksite. *Id*., 16:4-7, 15:28-35, 8:18-30, 14:22-35, 7:31-8:16.

366. The computer (or server) has "computer software implemented in any suitable computing language" and that "provides an interface 402 for the user to actively control and review the status of the detection device 200 and signalling device 300." *Id*., 14:6-15, 15:37-16:14.

367. Macey describes that a railway worker uses a device's interface (e.g., a mobile phone, PDA, or laptop computer) to receive alerts of a train approaching the work site. *Id*., 15:37-16:21, 8:3-8, 13:32-14:20, 14:28-15:8.

368. When a train proceeds towards a work zone, a detection device detects the presence of the train and sends a message to the alert module. *Id*., 7:31-8:1, 14:37-15:8. The train then proceeds along the track where it will come upon the signaling device which shows a "stop" (or red) signal when railway workers are working on or near the track, and the worksite is not safe for a train to pass. *Id*., at 8:18-9:6, 17:10-17, 18:1-9, 20:31-37.

369. After the work, the worker on the, *e.g.*, mobile device, enters "a specific code such as a PIN (personal identification number) or password only known to the user 112 to confirm that the status [of the track] is now safe for the passage of the vehicle." *Id*., 15:16-35, 13:25-14:4.



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370. This code is transmitted to alert module at the central system, and the alert module communicates with the signaling device to unblock the track, *e.g.*, changing "a red light [blocked track] to a green light [unblocked track] and signals the operator of the train to proceed." *Id.*, 20:31-37, 13:35-37 ("The alert module 400 comprises an interface 402 arranged for a user to enter an acknowledgement code 406…."), 15:28-35, 8:13-16, 8:35-9:6, 18:1-9.

371. Based on my review of the RE'835 Patent's prosecution history (EX1002), Macey was not considered during prosecution of the RE'835 Patent.

372. In my opinion, Macey is analogous art to the RE'835 Patent because Macey as shown in my analysis above is from the same field of endeavor as the RE'835 Patent of workers, railway work, or access control. EX1001, title, Abstract, 1:21-2:10, 2:49-3:6, 4:8-10, 4:42-46; EX1025, ¶¶20, 54, 57; EX1024, 6, 13-14; EX1007, 15:22-35, 16:1-21, 13:35-14:4, 20:31-37.

373. For instance, Macey teaches railway worker safety and controlling railway traffic or physical access control by the working entering "a specific code such as a PIN (personal identification number) or password only known to the user 112 to confirm that the status [of the track] is now safe for the passage of the vehicle." EX1007, 15:16-35, 20:31-37 ("Upon the code being entered into the



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interface, an acknowledgement is transmitted to the signalling device and reports the safe status of the worksite for the train to proceed (509).”), 13:25-14:4.

374. Additionally, Macey, as shown in my analysis above, is reasonably pertinent to any purported problem addressed in the RE’835 Patent, namely, controlling or authorizing access to a location or an area, such as by workers or railway traffic. EX1001, title, Abstract, 1:21-2:10, 2:49-3:6, 4:8-10, 4:42-46.

## D. Analysis of Independent Claim 1

### 1. 1[Pre]: “A centralized railway control system comprising:”

375. FRA-Report discloses Limitation 1[Pre]. *See* Ground 1, Limitation 1[Pre].

### 2. 1[A]: “a rail personnel contact database registering, for each railway personnel, an electronic contact address of the railway personnel; and”

376. FRA-Report discloses Limitation 1[A]. *See* Ground 1, Limitation 1[A].

### 3. 1[B]: “a railway traffic control apparatus *configured for centralized control of traffic of a centrally controllable railway network including plural railways and a plurality of railway traffic interlocks dispersed in said plural railways constituting said railway network*, for controlling access to railway tracks, said railway traffic control apparatus comprising a processor, a non-transitory medium storing one or more programs of executable instructions, and a network interface through which the railway traffic control apparatus communicates via a network with a user terminal,”

377. FRA-Report discloses Limitation 1[B]. *See* Ground 1, Limitation 1[B].



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**4. 1[C]: "wherein execution of said one or more programs of executable instructions configures *the railway traffic control apparatus comprising* the processor to include: a block placing part to place a block on one or more specified track sections *in any of said plural railways constituting said railway network that is managed by centralized control operation from the railway traffic control apparatus, the railway traffic control apparatus controlling, by said centralized control operation, one or more interlocks amongst the plurality of railway traffic interlocks dispersed in said plural railways constituting said railway network, to block railway traffic to the specified track sections and thereby* to permit a railway field worker to enter the track sections [while blocking railway traffic to said track sections];"**

378. FRA-Report discloses Limitation 1[C]. *See* Ground 1, Limitation 1[C].

**5. 1[D]: "a code generation part to generate a removal code, retrieve the electronic contact address of the railway field worker from the rail personnel contact database, and transmit the removal code to the electronic contact address of the railway field worker; and"**

379. FRA-Report and Kruijswijk disclose and render obvious Limitation 1[D]. *See* Ground 1, Limitation 1[D].

**6. 1[E]: "a block removal part to remove only upon entry of the removal code *by said centralized control operation from the railway control apparatus*, the block placed by the block placing part on said one or more track sections."**

380. FRA-Report and Kruijswijk disclose and render obvious Limitation 1[E]. *See* Ground 1, Limitation 1[E].

381. To the extent determined otherwise, the FRA-Report, Kruijswijk, and Macey disclose and render obvious this limitation.



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(a) FRA-Report, Kruijswijk, and Macey Combination

382. As mentioned, FRA-Report teaches the worker selects the "Cancel/fulfill" link to transmit information to the railway traffic control apparatus, which by centralized control operation unblocks the track. *See* Ground 1, Limitations 1[E], 1[B]-[C].

383. Kruijswijk teaches the claimed code. Macey supplies the implementation of only unblocking the track based on the worker transmitting a secret code to a central system. *See supra* ¶¶ 255-256; Section XI.C.

384. Thus, based on or following Macey's implementation, the worker would transmit the claimed code as taught in Kruijswijk to the railway traffic control apparatus in FRA-Report, which by centralized control operation will only unblock the track once the transmitted code is entered by the dispatcher or automatically by the railway traffic control apparatus. *See* Ground 1, Limitation 1[E]. As such, FRA-Report, Kruijswijk, and Macey disclose and render obvious Limitation 1[E].

385. Additionally, a POSITA would have been motivated to combine with a reasonable expectation of success FRA-Report and Kruijswijk with Macey's implementation because it was predictable or obvious to try given known problem of protecting workers, a worker controlling a work zone, and one-time code. *See supra* ¶¶ 257-260. This would have ensured the dispatcher would not remove the track block without the worker's code.



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386. It would have been obvious, as discussed, to automatically unblock the track or the dispatcher enters the code (or chief traffic controller retrieving the code from storage if the worker is unavailable). *See supra* ¶¶ 261-266. Also, Railware's understanding of "user terminal" and "from the terminal" reinforces FRA-Report, Kruijswijk, and Macey teach 1[E]. *See supra* ¶¶ 123-124, 267.

(b) Motivation to Combine FRA-Report, Kruijswijk, and Macey with a Reasonable Expectation of Success

387. A POSITA would have combined them with a reasonable expectation of success as it would have been predictable given CTC systems and secret-code systems were known, FRA-Report recognized that a secret-code system would have been implemented in the FRA-Report, and prior art discusses that technologies would have been applied to enhance worker safety. *See supra* ¶¶ 228-233, 238-242; Sections V.B-C. In other words, it would have been simply applying a known technique to a known device for increased safety.

388. FRA-Report's "verification system" and goal to "minimize[] common human error" further enhance such motivation for the FRA-Report, Kruijswijk, and Macey combination. EX1004, Vol. I: 9, 27. A "handshake" or verification protocol, where the worker unblocks the track with the code taught in Kruijswijk, would thus have been a predictable next step. *See supra* ¶ 239; EX1028, 4, 14-15. Macey teaches verifying the user with a secret code. EX1007, 15:16-35, 20:31-37.



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389. Notably, FRA-Report recognized the need "to positively identify the person communicating with the PDA by utilizing some form of password protection." EX1004, Vol. I: 57. FRA-Report even proposes various solutions including (i) a "device ID" to be sent with messages and/or (ii) "password-protected access to the system" such as a "personal password." EX1004, Vol. I: 57-58. Therefore, FRA-Report urges a need and readiness to implement robust verification measures (including password-based ones) to effectively verify roadway worker identities, and Macey teaches one such solution in the railway maintenance field. Thus, a POSITA would have been motivated to combine FRA-Report, Kruijswijk, and Macey to verify a track worker with the code. EX1004, Vol. I: 57-58.

390. A POSITA would have been motivated to combine FRA-Report, Kruijswijk, and Macey given they all involve railway technology. *See* Sections X.A.3-4, X.B, XI.C. Moreover, all involve worker device communication with a central railway system for railway work and thus, such overlap would have further motivated a POSITA to combine them. *Id*. Thus, a POSITA would have combined them, particularly as it would strengthen FRA-Report's goal to "improve roadway worker safety and productivity." EX1004, Vol. I: Preface; Ground 1, Limitation 1[E] (verifying saved code with worker's transmitted code to unblock the track).



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391. Alternatively, a POSITA would have been motivated to modify FRA-Report to transmit the code upon the worker [a] selecting the "Cancel/Fulfill" link (such as automatically or prompt the worker to enter the code), [b] calling, or [c] texting or emailing a message (such as an embedded link activated to transmit the code) to the railway traffic control apparatus to unblock the track. *See supra* ¶ 271.

392. A POSITA would have appreciated that modifying FRA-Report and Kruijswijk with Macey's implementation would have had a reasonable expectation of success given the hardware and software in FRA-Report. *See supra* ¶¶ 241-242.

## E. Analysis of Independent Claim 10

### 1. 10[Pre]: "A railway traffic control apparatus *configured for centralized control of traffic of a centrally controllable railway network including plural railways and a plurality of railway traffic interlocks dispersed in said plural railways constituting said railway network*, for controlling access to railway tracks, said railway traffic control apparatus comprising:"

393. *See* Ground 1, Limitations 1[Pre] and 1[B].

### 2. 10[A]: "a block placing part to place a block on one or more [selected] *specified* track sections *in any of said plural railways constituting said railway network that is managed by centralized control operation from the railway traffic control apparatus, the railway traffic control apparatus controlling, by said centralized control operation, one or more interlocks amongst the plurality of railway traffic interlocks dispersed in said plural railways constituting said railway network, to block railway traffic to the specified track sections and thereby* to permit a railway field worker to enter the track sections [while blocking railway traffic to said track sections];"



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394. *See* Ground 1, Limitations 1[B]-[C]; EX1004, Vol. II: 10-12, Fig. 1, Table 2.

**3. 10[B]: "a code generation part to generate a removal code, determine an electronic contact address of the railway field worker by accessing a rail personnel contact database registering, for each railway personnel, electronic contact information of the railway personnel, and transmit the removal code to the electronic contact address of the railway field worker; and"**

395. *See* Ground 1, Limitations 1[A] and [D].

**4. 10[C]: "a block removal part to remove only upon entry of the removal code *by said centralized control operation from the railway traffic control apparatus,* the block placed by the block placing part on said one or more track sections for the railway field worker."**

396. *See* Limitation 1[E]; Ground 1, Limitation 1[E].

## F. Analysis of Independent Claim 19

**1. 19[Pre]: "A method for *controlling railway access using a railway traffic control apparatus of* a centralized railway control system [to control access to railway tracks] *configured for centralized control of traffic of a centrally controllable railway network including plural railways and a plurality of railway traffic interlocks dispersed in said plural railways constituting said railway network,* the method comprising:"**

397. *See* Ground 1, Limitations 1[Pre] and 1[B].



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**2. 19[A]: "providing a user interface [on a user terminal] *of the railway traffic control apparatus,* including a block placing part to place a block on one or more specified track sections *in any of said plural railways constituting said railway network that is managed by centralized control operation from the railway traffic control apparatus, the railway traffic control apparatus controlling, by said centralized control operation, one or more interlocks amongst the plurality of railway traffic interlocks dispersed in said plural railways constituting said railway network, to block railway traffic to the specified track sections and thereby* to permit a railway field worker to enter the track sections [while blocking railway traffic to said track sections];"**

398. *See* Ground 1, Limitations 1[B]-[C]; EX1004, Vol. II: 10-12, Fig. 1, Table 2.

**3. 19[B]: "generating a removal code, determining an electronic contact address of the railway field worker by accessing a rail personnel contact database registering, for each railway personnel, electronic contact information of the railway personnel, and transmitting the removal code to the electronic contact address of the railway field worker; and"**

399. *See* Ground 1, Limitations 1[A] and [D].

**4. 19[C]: "permitting the block to said one or more track sections to be removed only upon entry of the removal code [in the centralized railway control system] *by said centralized control operation from the railway traffic control apparatus*."**

400. *See* Limitation 1[E]; Ground 1, Limitation 1[E].



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## G. Analysis of Independent Claim 20

### 1. 20[Pre]: "*A railway traffic control apparatus configured for centralized control of traffic of a centrally controllable railway network including plural railways and a plurality of railway traffic interlocks dispersed in said plural railways constituting said railway network, the railway traffic control apparatus comprising a processor and configured to:*"

401. *See* Ground 1, Limitations 1[Pre] and 1[B].

### 2. 20[A]: "*place a block on one or more sections of railway track in any of said plural railways constituting said railway network that is managed by centralized control operation from the railway traffic control apparatus, the railway traffic control apparatus controlling, by said centralized control operation, one or more interlocks amongst the plurality of railway traffic interlocks dispersed in said plural railways constituting said railway network, to prevent trains from traversing the one or more sections of railway track;*"

402. *See* Ground 1, Limitations 1[B]-[C]; EX1004, Vol. II: 10-12, Fig. 1, Table 2.

### 3. 20[B]: "*generate a secret release code associated with the blocked one or more sections of railway track;*"

403. *See* Ground 1, Limitations 1[D], 20[B].

### 4. 20[C]: "*transmit the secret release code to a user terminal via a network;*"

404. *See* Ground 1, Limitation 1[D].

### 5. 20[D]: "*receive the secret release code via the network; and*"

405. *See* Limitation 1[E]; Ground 1, Limitations 1[E], 20[D].



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**6. 20[E]: *"responsive to receiving the secret release code from the terminal, remove the block from the one or more sections of railway track."***

406. *See* Limitation 1[E]; Ground 1, Limitations 1[E], 20[E].

## H. Analysis of Independent Claim 30

**1. 30[Pre]: "A method for controlling railway access using a railway traffic control apparatus configured for centralized control of traffic of a centrally controllable railway network including plural railways and a plurality of railway traffic interlocks dispersed in said plural railways constituting said railway network, the method comprising:"**

407. *See* Ground 1, Limitations 1[Pre] and 1[B].

**2. 30[A]: *"placing a block on one or more sections of railway track in any of said plural railways constituting said railway network that is managed by centralized control operation from the railway traffic control apparatus, the railway traffic control apparatus controlling, by said centralized control operation, one or more interlocks amongst the plurality of railway traffic interlocks dispersed in said plural railways constituting said railway network, to prevent trains from traversing the one or more sections of railway track;"***

408. *See* Ground 1, Limitations 1[B]-[C]; EX1004, Vol. II: 10-12, Fig. 1, Table 2.

**3. 30[B]: *"generating a secret release code associated with the blocked one or more sections of railway track;"***

409. *See* Ground 1, Limitations 1[D], 20[B].

**4. 30[C]: *"transmitting the secret release code to a user terminal via a network;"***

410. *See* Ground 1, Limitation 1[D].



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**5. 30[D]: *"receiving the secret release code via the network; and"***

411. *See* Limitation 1[E]; Ground 1, Limitations 1[E], 20[D].

**6. 30[E]: *"responsive to receiving the secret release code from the terminal, removing the block from the one or more sections of railway track."***

412. *See* Limitation 1[E]; Ground 1, Limitations 1[E], 20[E].

## I. Analysis of Independent Claim 40

413. Claim 40 does not require that the code is returned by the worker to the railway (traffic) control apparatus to unblock the track.

**1. 40[Pre]: *"A system comprising:"***

414. *See* Ground 1, Limitation 1[Pre].

**2. 40[A]: *"a railway control apparatus comprising a processor and a memory device, the railway control apparatus configured to communicate with a plurality of railway traffic interlocks and a user terminal via a network and to perform centralized control of traffic of a centrally controllable railway network including plural railways and the plurality of railway traffic interlocks dispersed in said plural railways constituting said railway network, wherein the processor is configured by execution of computer program instructions to cause the railway control apparatus to:"***

415. *See* Ground 1, Limitations 1[Pre] and 1[B].



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**3. 40[B]: *"receive a selection of track sections to block in any of said plural railways constituting said railway network that is managed by centralized control operation from the railway control apparatus, wherein each selected track section corresponds to one or more railway traffic interlocks amongst the plurality of railway traffic interlocks dispersed in said plural railways constituting said railway network;"***

416. *See* Ground 1, Limitations 1[B]-[C].

**4. 40[C]: *"responsive to receiving the selection, generate a secret code associated with the selected track sections;"***

417. *See* Ground 1, Limitations 1[B]-[D].

**5. 40[D]: *"responsive to generating the secret code, save the secret code in the memory device;"***

418. *See* Ground 1, Limitations 1[D], 40[D].

**6. *40[E]: "associate the secret code with a remote user of the user terminal;"***

419. *See* Ground 1, Limitations 1[C]-[D], 40[E].

**7. 40[F]: "*transmit a block signal to the corresponding one or more railway traffic interlocks to place a block on the selected track sections; and"***

420. *See* Ground 1, Limitations 1[B]-[C], 40[F].

**8. 40[G]: "*transmit the secret code to the remote user of the user terminal."***

421. *See* Ground 1, Limitation 1[D].



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### J. Analysis of Dependent Claims 2-7, 9, 11-16, 18, 21-29, 31-39, 41

422. For the reasons discussed in Ground 1, FRA-Report, Kruijswijk, and Macey disclose and render obvious dependent claims 2-7, 9, 11-16, 18, 21-29, 31-39, 41 (*see supra* ¶¶ 317-360), except here the FRA-Report and Kruijswijk are combined with (and follow) Macey's implementation of unblocking a track to only remove the track block in FRA-Report once the transmitted code (taught in Kruijswijk) is entered by the dispatcher or automatically by the railway traffic control apparatus.

#### 1. Claim 2: "The centralized railway control system of claim 1, wherein the railway traffic control apparatus further comprises: a [RTC] *railway traffic controller (RTC)* user interface to permit a user to specify said one or more track sections to be blocked, specify an instruction to the centralized railway control system to block the railway traffic to the specified track sections, and specify identifying information of the railway field worker to be performing work in the specified track sections."

**Claim 11: "The railway traffic control apparatus of claim 10, further comprising: a [RTC] *railway traffic controller (RTC)* user interface to permit a user to specify [said one or more] track sections to be blocked, specify an instruction to the [centralized] railway *traffic* control [system] *apparatus* to block the railway traffic to the specified track sections, and specify identifying information of the railway field worker to be performing work in the specified track sections."**

423. *See* Limitation 1[E]; Ground 1, Claims 2, 11.



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**2. Claim 3: "The centralized railway control system of claim 1, further comprising:**

**a railway control database registering block identifying information, including block limits identifying the one or more blocked track sections, along with the removal code for removing the block of the track sections."**

**Claim 12: "The railway traffic control apparatus of claim 10, wherein block identifying information, including block limits identifying the one or more blocked track sections, is registered in a railway control database, along with the removal code for removing the block of the track sections."**

424. *See* Limitation 1[E]; Ground 1, Claims 3, 12.

**3. Claim 4: "The centralized railway control system of claim 1, further comprising:**

**a railway control database registering (a) identification of the user who specified the instruction to block the track sections and (b) block identifying information, including block limits identifying the one or more blocked track sections, notes specifying reasons for the block, and date and time at which the block was placed."**

**Claim 13: "The railway traffic control apparatus of claim 10, wherein block identifying information, including block limits identifying the one or more blocked track sections, notes specifying reasons for the block, and date and time at which the block was placed, are registered in a railway control database, along with identification of the user who specified the instruction to block the track sections."**

425. *See* Limitation 1[E]; Ground 1, Claims 4, 13.



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**4. Claim 5: "The centralized railway control system of claim 1, wherein upon placement by the block placing part of the block of railway traffic to said one or more specified track sections, the code generation part transmits the removal code to the electronic contact address of the railway field worker, and the block of railway traffic to said one or more specified track sections remains in place in the centralized railway control system until the entry of the removal code in the centralized railway control system to cause the block removal part to remove the block on said one or more track sections."**

**Claim 14: "The railway traffic control apparatus of claim 10, wherein upon placement by the block placing part of the block of railway traffic to said one or more specified track sections, the code generation [code] *part* transmits the removal code to the electronic contact address of the railway field worker, and the block of railway traffic to said one or more specified track sections remains in place in the [centralized] railway *traffic* control [system] *apparatus* until the entry of the removal code in the [centralized] railway *traffic* control [system] *apparatus* to cause the block removal part to remove the block on said one or more track sections."**

426. *See* Limitation 1[E]; Ground 1, Claims 5, 14.

**5. 6[Pre]: "The centralized railway control system of claim 1, wherein the railway traffic control apparatus further comprises:"**

**6[A]: "a block removal user interface to permit a user to enter the removal code to cause the block removal part to remove the block on said one or more track sections,"**

**6[B]: "wherein the block of railway traffic to said one or more specified track sections remains in place in the centralized railway control system until the entry of the removal code through the block removal user interface."**

**15[Pre]: "The railway traffic control apparatus of claim 10,**



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**further comprising:"**

**15[A]: "a block removal user interface to permit a user to enter the removal code to cause the block removal part to remove the block on said one or more *specified* track sections,"**

**15[B]: "wherein the block of railway traffic to said one or more specified track sections remains in place in the [centralized] railway *traffic* control [system] *apparatus* until the entry of the removal code through the block removal user interface."**

427. *See* Limitation 1[E]; Ground 1, Claims 6, 15.

**6. 7[Pre]: "The centralized railway control system of claim 6, wherein the block removal user interface further requires, in addition to the entry of the removal code, the user to specify that confirmation that the track sections have been cleared has been obtained from the railway field worker associated with the block, before the block removal user interface permits the removal code to be transmitted to the block removal pail, and"**

**7[A]: "the centralized railway control system further comprises a railway control database registering (a) block identifying information identifying the one or more blocked track sections, date and time at which the block was placed and identifying [information] the railway field worker associated with the block, and (b) block removal information identifying date and time at which the block was removed and identifying the user who entered the removal code and specified that confirmation that the track sections have been cleared was obtained from the railway field worker associated with the block."**

**16[Pre]: "The railway traffic control apparatus of claim 15, wherein the block removal user interface further requires, in addition to the entry of the removal code, the user to specify that confirmation that the track sections have been cleared**



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**has been obtained from the railway field worker associated with the block, before the block removal user interface permits the removal code to be transmitted to the block removal part, and"**

**16[A]: "block identifying information identifying the one or more blocked track sections, date and time at which the block was placed and identifying [information] the railway field worker associated with the block is registered in a railway control database, along with block removal information identifying date and time at which the block was removed and identifying the user who entered the removal code and specified that confirmation that the track sections have been cleared was obtained from the railway field worker associated with the block."**

428. *See* Limitation 1[E]; Ground 1, Claims 7, 16.

**7. Claim 9: "The centralized railway control system of claim 1, wherein the code generation part transmits an electronic message to the electronic contact address of the railway field worker, and the electronic message transmitted to the electronic contact address of the railway field worker includes the removal code and includes an embedded link for activating a return transmission of the removal code to the block removal part of the centralized railway control system."**

**Claim 18: "The railway traffic control apparatus of claim 10, wherein the code generation part transmits an electronic message to the electronic contact address of the railway field worker, and the electronic message transmitted to the electronic contact address of the railway field worker includes the removal code and includes an embedded link for activating a return transmission of the removal code to the block removal part of the [centralized] railway *traffic* control [system] *apparatus*."**

**Claim 27: "*The railway traffic control apparatus of claim 20,***



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***wherein the railway traffic control apparatus is configured to transmit the secret release code to the user terminal by transmitting a message to the user terminal, the message comprising one or more embedded links."***

**Claim 28*: "The railway traffic control apparatus of claim 27, wherein the railway traffic control apparatus is configured to receive the secret release code transmitted via the network in response to selection of at least one of the one or more embedded links in the message, on the user terminal."***

**Claim 29: "*The railway traffic control apparatus of claim 27, wherein the message comprises a text message or an email."***

**Claim 37: "*The method of claim 30, wherein transmitting the secret release code comprises transmitting a message to the user terminal, the message comprising one or more embedded links."***

**Claim 38: "*The method of claim 37, wherein the secret release code is transmitted via the network in response to selection of at least one of the one or more embedded links in the message, on the user terminal, and is received by the railway traffic control apparatus."***

**Claim 39*: "The method of claim 37, wherein the message comprises a text message or an email."***

429. *See* Limitation 1[E]; Ground 1, Claims 9, 18, 27-29, 37-39.

**8. Claim 21*: "The railway traffic control apparatus of claim 20, wherein the block is placed via an interlocking signal prohibiting trains from traversing the one or more sections of railway track."***

**Claim 31*: "The method of claim 30, wherein the block is placed via an interlocking signal prohibiting trains from traversing the one or more sections of railway track."***

430. *See* Limitation 1[E]; Ground 1, Claims 21, 31.

**9. Claim 22:** ***"The railway traffic control apparatus of claim 20, wherein the railway traffic control apparatus is configured to place the block by causing one or more of the plurality of railway traffic interlocks to display a STOP signal."***

**Claim 32:** ***"The method of claim 30, wherein the railway traffic control apparatus is configured to place the block by causing one or more of the plurality of railway traffic interlocks to display a STOP signal."***

431. *See* Limitation 1[E]; Ground 1, Claims 22, 32.

**10. Claim 23***: "The railway traffic control apparatus of claim 20, wherein only the railway traffic control apparatus and the user terminal receive the secret release code generated by the railway traffic control apparatus."*

**Claim 33***: "The method of claim 30, wherein only the railway traffic control apparatus and the user terminal receive the secret release code generated by the railway traffic control apparatus."*

432. *See* Limitation 1[E]; Ground 1, Claims 23, 33.

**11. Claim 24: "***The railway traffic control apparatus of claim 20, wherein the railway traffic control apparatus is further configured to: store the secret release code in a memory of the railway traffic control apparatus."*

**Claim 34***: "The method of claim 30, further comprising: storing the secret release code in a memory of the railway traffic control apparatus."*

433. *See* Limitation 1[E]; Ground 1, Claims 24, 34.

**12. Claim 25:** ***"The railway traffic control apparatus of claim 20, wherein the railway traffic control apparatus is further configured to: generate and store block removal information in response to removing the block from the one or more sections of railway track."***



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**Claim 35:** ***"The method of claim 30, further comprising: generating and storing block removal information in response to removing the block from the one or more sections of railway track."***

434. *See* Limitation 1[E]; Ground 1, Claims 25, 35.

**13. Claim 26: "*The railway traffic control apparatus of claim 25, wherein the block removal information comprises a date and time when the block was removed and identification information of a user who entered the secret removal code."***

**Claim 36:** ***"The method of claim 35, wherein the block removal information comprises a date and time when the block was removed and identification information of a user who entered the secret removal code."***

435. *See* Limitation 1[E]; Ground 1, Claims 26, 36.

**14. 41[Pre]:** ***"The system of claim 40, wherein the processor configured by execution of computer program instructions additionally causes the railway control apparatus to:"***

**41[A]:** ***"receive the secret code from the user terminal via the network;"***

**41[B]:** ***"verify the secret code by comparing the secret code received from the user terminal with the secret code stored in the memory device;"***

**41[C]:** ***"receive an instruction to remove the block from the selected track sections, after verifying the secret code; and"***

**41[D]:** ***"responsive to the instruction to remove the block received after verifying the secret code, transmit a block removal signal to the corresponding railway traffic interlocks."***

436. *See* Limitation 1[E]; Ground 1, Claim 41.



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## XII. GROUND 3: CLAIMS 1-8 ARE OBVIOUS OVER FRA-REPORT AND SCHMITZ

### A. Summary of FRA-Report and Analogous Art

437. My explanation of FRA-Report above and incorporated here by reference. *See* Sections X.A.3-4.

### B. Summary of Schmitz and Analogous Art

438. U.S. Patent No. 6,078,908 (EX1006, "Schmitz") issued on June 20, 2000, and is therefore prior art under at least AIA 35 U.S.C. § 102(a) without any § 102(b) exceptions.

439. Schmitz discloses a data transmission system for verifying a user or relevant person's identity using a secret password/code, including for controlling access to a secured location. EX1006, 1:37-2:7, 2:39, 2:57-3:5, 5:7-48.

440. Schmitz teaches that, upon the relevant person's request, an "authentication computer [server] 2 generates the transaction authorization number TAN or the comparable password" using "a random number generator 5 …." *Id.*, 6:63-7:4, 8:19-21, 5:58, 2:57-3:5, Abstract.

441. The server transmits this code over the Internet to the relevant person's receiver, *e.g.*, mobile phone, radio, email address. *Id.*, 2:21-24, 3:3-18, 5:3-6, 6:63-7:4, 7:54-65, Abstract. "The receiver 3 can be a radio receiver incorporated into the data input apparatus 1." *Id.*, 7:60-61.

442. Thereafter, the relevant person enters the code into a "data input apparatus" of the receiver, and the code "is transmitted again to the authorization computer 2" which "verifies" the code to control access to a lock or "physical access controls." *Id*., 7:4-15, 5:7-9, 5:24-31.

443. Based on my review of the RE'835 Patent's prosecution history (EX1002), Schmitz was not considered during prosecution of the RE'835 Patent.

444. In my opinion, Schmitz is analogous art to the RE'835 Patent because a POSITA would have understood Schmitz, as shown in my analysis above, is in the same field of endeavor as the RE'835 Patent of workers, railway work, or access control. EX1001, title, Abstract, 1:21-2:10, 2:49-3:6, 4:8-10, 4:42-46; EX1025, ¶¶20, 54, 57; EX1024, 6, 13-14; EX1006, 5:7-9, 5:24-31, 5:35-48.

445. For instance, Schmitz provides a non-exhaustive list of fields of application, such as "computer centers," "airports," and "security regions," (EX1006, 5:35-48) for employing its invention for, *e.g.*, "access controls" (*id*., 5:7-9, 5:24-33). *See id*., 9:23-24 ("[t]he user obtains full access to or access limited to specific regions of the computer only after authorization."), 5:12-14 ("The authorization computer checks and verifies this password, possibly also in connection with the access permission to the concrete space at the concrete time.")



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446. A POSITA would have understood that Schmitz would have been applied to railway work (*e.g.*, "computer centers," "security regions"). A POSITA would have also understood that Schmitz's reference to a "user" is a broad term that could encompass numerous categories, such as a worker.

447. The broad applicability of Schmitz is further shown by "[t]he present invention can be universally employed in the region of data transmission systems. This holds for example also for the Internet and intranets, local area networks LAN, wide area networks WAN, etc." *Id.*, 5:3-6.

448. Additionally, Schmitz, as shown in my analysis above, is reasonably pertinent to any purported problem addressed in the RE'835 Patent of controlling or authorizing access to a location or a region, such as by workers or railway traffic, because like with the RE'835 Patent, Schmitz controls access to locations or regions such as "security regions" (like railway traffic).

449. For example, Schmitz describes that it applies to "physical access controls" (EX1006, 5:7-9, 5:24-31) or "authorization of data transmission systems employing a transaction authorization number (TAN) or a comparable password." *Id.*, 6:55-58. Also, Schmitz seeks to ensure a third-party cannot improperly "misuse" or access the code, and the code could be "one-time" use. *Id.*, 1:11-33, 7:16-18 ("The



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transaction authorization number TAN or the comparable password can be a one-time usable transaction authorization number TAN or a one time usable password.").

450. Once authorized, "[t]he user obtains full access to or access limited to specific regions of the computer only after authorization." *Id.*, 9:23-24, 5:12-14 ("The authorization computer checks and verifies this password, possibly also in connection with the access permission to the concrete space at the concrete time.")

### C. Analysis of Independent Claim 1

#### 1. 1[Pre]: "A centralized railway control system comprising:"

451. FRA-Report discloses Limitation 1[Pre]. *See* Ground 1, Limitation 1[Pre].

#### 2. 1[A]: "a rail personnel contact database registering, for each railway personnel, an electronic contact address of the railway personnel; and"

452. FRA-Report discloses Limitation 1[A]. *See* Ground 1, Limitation 1[A].

#### 3. 1[B]: "a railway traffic control apparatus *configured for centralized control of traffic of a centrally controllable railway network including plural railways and a plurality of railway traffic interlocks dispersed in said plural railways constituting said railway network*, for controlling access to railway tracks, said railway traffic control apparatus comprising a processor, a non-transitory medium storing one or more programs of executable instructions, and a network interface through which the railway traffic control apparatus communicates via a network with a user terminal,"

453. FRA-Report discloses Limitation 1[B]. *See* Ground 1, Limitation 1[B].



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**4. 1[C]: "wherein execution of said one or more programs of executable instructions configures *the railway traffic control apparatus comprising* the processor to include: a block placing part to place a block on one or more specified track sections *in any of said plural railways constituting said railway network that is managed by centralized control operation from the railway traffic control apparatus, the railway traffic control apparatus controlling, by said centralized control operation, one or more interlocks amongst the plurality of railway traffic interlocks dispersed in said plural railways constituting said railway network, to block railway traffic to the specified track sections and thereby* to permit a railway field worker to enter the track sections [while blocking railway traffic to said track sections];"**

454. FRA-Report discloses Limitation 1[C]. *See* Ground 1, Limitation 1[C].

**5. 1[D]: "a code generation part to generate a removal code, retrieve the electronic contact address of the railway field worker from the rail personnel contact database, and transmit the removal code to the electronic contact address of the railway field worker; and"**

455. FRA-Report and Schmitz disclose and render obvious Limitation 1[D].

(a) FRA-Report and Schmitz Combination

456. As discussed, FRA-Report discloses that the dispatcher operates the track display (or another interface) and via the railway traffic control apparatus blocks the track, retrieves the worker's electronic address from the database, as well as generates and transmits information (*e.g.*, track-related) to the worker's electronic contact address or PDA. *See* Ground 1, Limitations 1[D], 1[Pre]-[C].



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457. Schmitz supplies the claimed code such that the dispatcher in FRA-Report operates the track display via the railway traffic control apparatus to block the track as well as retrieve the worker's electronic contact address, generate and transmit the claimed code (as taught in Schmitz) to the worker's electronic contact address accessible by the worker's PDA interface. *See* Ground 1, Limitations 1[Pre]-[D]; Sections X.A.3-4, XII.B.

458. Specifically, Schmitz teaches that, upon a user's request, an "authentication computer [authorization computer or server] 2 generates the transaction authorization number TAN or the comparable password" using "a random number generator 5 …." EX1006, 6:63-7:4, 8:19-21, 5:58, 3:29-33, 2:57-3:5, Abstract. The server transmits this code over the Internet to an authorized user's electronic address, *e.g.*, mobile phone, radio, email address. *Id*., 2:21-24, 3:3-18, 5:3-6, 6:63-7:4, 7:54-65, Abstract.

459. FRA-Report and Schmitz disclose and render obvious Limitation 1[D]. Given the foregoing, they also disclose this limitation based on the Board's discussion of the claimed code (*see supra* ¶ 118) because the code taught in Schmitz (TAN or password) is randomly-generated and secret or only known to the relevant person. EX1006, 6:63-7:4, 8:19-21, 5:58, 2:57-3:5, Abstract 3:29-33. Notably, Schmitz seeks to ensure a third-party cannot "misuse" or improperly access the code,



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and the code could be "one-time" use. *Id*., 1:11-33, 7:16-18 ("The transaction authorization number TAN or the comparable password can be a one-time usable transaction authorization number TAN or a one time usable password.").

460. Further, FRA-Report and Schmitz disclose and render obvious Limitation 1[D] under Railware's construction, including the code taught in Schmitz is secret to the relevant person or "not readily available" to the dispatcher when combined with the FRA-Report. *See supra* ¶¶ 114-120.

461. Additionally, FRA-Report and Schmitz disclose and render obvious Limitation 1[D], including under the Board and Railware's understanding of the claimed code, because a POSITA would have had a motivation to combine and reasonable expectation of success to implement Schmitz as the claimed code or secret code in FRA-Report as generating and transmitting a secret code, *e.g.*, for safety and security, only received by the relevant worker was taught before the Priority Date. *See supra* ¶ 228; Section V.C. This would protect railway workers from an accidental (or even intentional) removal of a block by the dispatcher while the worker performed work. Thus, it would have been predictable or obvious to try in implementing Schmitz as the claimed code or secret code in FRA-Report.

462. Moreover, a POSITA would have had a motivation to combine and reasonable expectation of success to implement Schmitz as the claimed code or



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secret code, which is generated and transmitted in FRA-Report to the worker's electronic contact address accessible by the user interface, for safety and security to address the known problem of protecting railway workers from removal of a block by the dispatcher while track work is performed. *See* Section V.A. Such a code would have ensured that it is only known to the worker and the track can only be released by the worker returning that code.

463. Similarly, a POSITA would have had a motivation to combine and reasonable expectation of success to implement Schmitz as the claimed code or secret code because it was known to a POSITA that a worker uses a mobile phone for controlling track possession, including to take control of a work zone and return it to the central system, and thus implementing a code only known to the worker would have been obvious to try for safety and security. *See* Section V.D.

464. Likewise, a POSITA would have had a motivation to combine and reasonable expectation of success to implement Schmitz as the claimed code or secret code given the use of one-time password or one-time code for authorization or authentication was prevalent before the Priority Date, as shown above and other prior art. *See* Section V.C.

465. In my view, such known authentication systems would have driven a POSITA to apply code authentication to ensure the code is only known to the worker



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and the track is only unblocked when the railway traffic control apparatus receives the code transmitted by the worker. Thus, it would have been predictable in implementing Schmitz as the claimed code or secret code in FRA-Report.

(b) Motivation to Combine FRA-Report and Schmitz with a Reasonable Expectation of Success

466. A POSITA would have had a motivation to combine with a reasonable expectation of success given both FRA-Report and Schmitz discuss controlling access to ensure protection and thus, a POSITA would have been motivated to modify the FRA-Report with the claimed code taught in Schmitz. *See* Sections X.A.3-4, XII.B. Schmitz expresses the "very secure, low cost" of implementing its system. EX1006, 6:24-26.

467. Additionally, a POSITA would have modified FRA-Report with Schmitz because it would have been predictable given CTC systems and secret-code systems were known, FRA-Report recognized that a secret-code system would have been implemented in the FRA-Report, and prior art discusses that technologies would have been applied to enhance worker safety. *See supra* ¶¶ 228-233, 238-242; Sections V.B-C. In other words, it would have been simply applying a known technique to a known device for increased safety.

468. Significantly, FRA-Report recognized the need "to positively identify the person communicating with the PDA by utilizing some form of password



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protection." EX1004, Vol. I: 57. FRA-Report even proposes various solutions including (i) a "device ID" to be sent with messages and/or (ii) "password-protected access to the system" such as a "personal password." EX1004, Vol. I: 57-58. Therefore, FRA-Report urges a need and readiness to implement robust verification measures (including password-based ones) to effectively verify roadway worker identities, and Schmitz teaches one such code-based approach for identity verification. A POSITA would have been motivated to incorporate Schmitz for at least this reason.

469. A POSITA would have been further motivated by the FRA-Report's goals to "improve roadway worker safety and productivity" (EX1004, Vol. I: Preface) and implement a "verification system." EX1004, Vol. I: 9, 27. A POSITA would have thus recognized, to prevent the dispatcher from revoking a blocked track and increase security and safety, that FRA-Report would implement a "handshake" or verification protocol where the code taught in Schmitz is associated with the blocked track and transmitted to the worker who later unblocks the track with the same code. *See supra* ¶ 239.

470. A POSITA would have appreciated that modifying FRA-Report with Schmitz would have had a reasonable expectation of success to generate and transmit a code in FRA-Report to a worker's device given the hardware and software in FRA-



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Report. *See supra* ¶¶ 241-242; *see also* Ground 1, Limitations 1[Pre]-1[C]. Moreover, Schmitz describes the simplicity of implementing its system. EX1006, 6:24-26 ("very secure, low cost"). With such hardware and software, the FRA-Report would have had flexibility when the code is generated, such as before or after the block is placed, depending on the needs for the system, such as safety, efficiency, and workflow, or a design choice to a POSITA. *See supra* ¶¶ 241-243.

471. Further, the worker's PDA in FRA-Report has existing encryption and decryption technology (EX1004, Vol. I: 57), otherwise, this was known. EX1011, 4:25-24.

472. Also, technology evolved from FRA-Report to before the Priority Date, and with such enhanced technology, it would have been predictable for a POSITA to apply those capabilities to augment FRA-Report with a code-based system. EX1006, 6:24-26; *supra* ¶ 242; Sections V.A-D.

473. The POSITA would further have been motivated to modify FRA-Report with a reasonable expectation of success for the worker's interface to receive and display the claimed code taught in Schmitz given the worker's existing user interfaces and it is a design choice. *See supra* ¶¶ 241-243; Ground 1, Limitation 1[B].



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474. Alternatively, a POSITA would have been motivated to modify FRA-Report to transmit the code taught by Schmitz with a reasonable expectation of success by text message or email message as each would have provided an alternate form to the worker and text, email, and links were well-known. *See supra* ¶ 244. As another option, the text and email message would have included an embedded link to activate the return of the code.

**6. 1[E]: "a block removal part to remove only upon entry of the removal code *by said centralized control operation from the railway control apparatus*, the block placed by the block placing part on said one or more track sections."**

475. FRA-Report and Schmitz disclose and render obvious Limitation 1[E].

(a) FRA-Report and Schmitz Combination

476. As discussed, FRA-Report teaches the worker selects the "Cancel/fulfill" link to transmit information to the railway traffic control apparatus, which by centralized control operation unblocks the track. *See* Ground 1, Limitations 1[E], 1[B]-[C].

477. Schmitz supplies transmitting the claimed code such that the worker in FRA-Report transmits the code (taught in Schmitz), *e.g.*, selecting the "Cancel/Fulfill" link (or, *e.g.*, by call, text, email), to the railway traffic control apparatus, which by centralized control operation will only unblock the track once



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the transmitted code is entered by the dispatcher or automatically by the railway traffic control apparatus. Ground 1, Limitation 1[E].

478. Specifically, Schmitz teaches the relevant person transmitting the code to the server. The person enters this code (TAN or password) into "data input apparatus" of the receiver, and the code "is transmitted again to the authorization computer" which "verifies" the code to control, *e.g.*, a locking mechanism or "physical access controls." EX1006, 7:8-15, Abstract, 5:7-9, 5:24-48, 7:60-61 ("The receiver 3 can be a radio receiver incorporated into the data input apparatus 1."). Accordingly, FRA-Report and Schmitz disclose and render obvious Limitation 1[E].

479. Additionally, a POSITA would have had a motivation to combine and reasonable expectation of success to implement from Schmitz the transmitted claimed code in FRA-Report to the railway traffic control apparatus, which will only unblock the track with the transmitted code given it was known. *See supra* ¶¶ 255-256; Section XI.C. Thus, it would have been a predictable design choice.

480. Further, a POSITA would have had a motivation to combine and reasonable expectation of success to implement from Schmitz the transmitted claimed code in FRA-Report to the railway traffic control apparatus to unblock the track to address the known problem of protecting railway workers from improper removal of a track block. *See* Section V.A. Thus, a POSITA would have used the



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worker's transmitted code to unblock the track. In other words, this would have ensured the track can only be released by the worker returning that code.

481. Similarly, a POSITA would have had a motivation to combine and reasonable expectation of success to implement from Schmitz the transmitted claimed code in FRA-Report to the railway traffic control apparatus to unblock the track as it was known that a worker uses a mobile phone for controlling track possession, including to take control of a work zone and return it to the central system. *See* Section V.D. As such, implementing a code (as taught by Schmitz) to unblock a track would have been obvious to try for safety and security. Thus, the worker with the code would hold possession of the track and would transfer such possession by transmitting the code to the dispatcher to unblock the track.

482. Also, a POSITA would have had a motivation to combine and reasonable expectation of success to implement from Schmitz the transmitted claimed code in FRA-Report to unblock the track given the use of one-time password or one-time code transmitted to a server for authorization or authentication for safety and security was prevalent before the Priority Date. *See* Section V.C.

483. In my view, such known authentication systems would have driven a POSITA to apply code authentication to railway systems to ensure a track block is only unblocked when the railway traffic control apparatus receives the code



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transmitted by the worker. Thus, it would have been predictable or obvious to try to implement Schmitz in FRA-Report.

484. Thus, FRA-Report and Schmitz disclose and render obvious Limitation 1[E].

485. It would have been obvious, as discussed, to automatically unblock the track or based on the dispatcher entering the code (or chief traffic controller retrieving the code from storage if the worker is unavailable). *See supra* ¶¶ 261-266. Also, Railware's understanding of "user terminal" and "from the terminal" reinforces FRA-Report and Schmitz teach 1[E]. *See supra* ¶¶ 123-124, 267.

(b) Motivation to Combine FRA-Report and Schmitz with a Reasonable Expectation of Success

486. A POSITA would have combined them with a reasonable expectation of success as it would have been predictable given CTC systems and secret-code systems were known, FRA-Report recognized that a secret-code system would have been implemented in the FRA-Report, and prior art discusses that technologies would have been applied to enhance worker safety. *See supra* ¶¶ 228-233, 238-242; Sections V.B-C. In other words, it would have been simply applying a known technique to a known device for increased safety.

487. FRA-Report's "verification system" and goal to "minimize[] common human error" would further enhance such motivation for FRA-Report and Schmitz.



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EX1004, Vol. I: 9, 27. A "handshake" or verification protocol, where the worker unblocks the track with the code taught in Schmitz, would thus have been a predictable next step. *See supra* ¶ 239; EX1028, 4, 14-15. Schmitz as discussed above teaches verifying the user with a secret code. EX1006, 7:8-15.

488. Likewise, FRA-Report recognized the need "to positively identify the person communicating with the PDA by utilizing some form of password protection." EX1004, Vol. I: 57-58. Thus, a POSITA would have been motivated to combine FRA-Report and Schmitz to verify a track worker with the code. EX1004, Vol. I: 57-58.

489. A POSITA would have combined FRA-Report and Schmitz with a reasonable expectation of success as both involve a verification system, along with access control (Section X.A.3-4, XII.B). Also, Schmitz provides a verification system with its code to access a lock or "physical access controls" and can be applied across numerous "fields of application, for example: computer centers, airports ... security regions ... shielded storage" among others. EX1006, 7:8-15, 5:7-9, 5:24-48. Thus, it would have been obvious to try because it would strengthen FRA-Report's goal to "improve roadway worker safety and productivity" as the dispatcher would not unblock the track without the worker's code. EX1004, Vol. I: Preface; Ground



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1, Limitation 1[E] (verifying saved code with worker's transmitted code to unblock the track).

490. Alternatively, a POSITA would have been motivated to modify FRA-Report to transmit the code upon the worker [a] selecting the "Cancel/Fulfill" link (such as automatically or prompt the worker to enter the code), [b] calling, or [c] texting or emailing a message (such as an embedded link activated to transmit the code) to the railway traffic control apparatus to unblock the track. *See supra* ¶ 271.

491. A POSITA would have appreciated that modifying FRA-Report with Schmitz would have had a reasonable expectation of success given the hardware, software, and dispatcher and worker interfaces in the FRA-Report. *See supra* ¶ 241; *see also* Ground 1, Limitations 1[Pre]-1[C].

492. Also, technology evolved from FRA-Report to before the Priority Date, and with such enhanced technology, it would have been predictable for a POSITA to apply those capabilities to augment FRA-Report with a code-based system to unblock the track. *See supra* ¶ 242; Sections V.A-D. Thus, it would have been predictable to transmit the code from the worker device to the CTC system to unblock the track.



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## D. Analysis of Independent Claim 10

### 1. 10[Pre]: "A railway traffic control apparatus *configured for centralized control of traffic of a centrally controllable railway network including plural railways and a plurality of railway traffic interlocks dispersed in said plural railways constituting said railway network,* for controlling access to railway tracks, said railway traffic control apparatus comprising:"

493. *See* Ground 1, Limitations 1[Pre] and 1[B].

### 2. 10[A]: "a block placing part to place a block on one or more [selected] *specified* track sections *in any of said plural railways constituting said railway network that is managed by centralized control operation from the railway traffic control apparatus, the railway traffic control apparatus controlling, by said centralized control operation, one or more interlocks amongst the plurality of railway traffic interlocks dispersed in said plural railways constituting said railway network, to block railway traffic to the specified track sections and thereby* to permit a railway field worker to enter the track sections [while blocking railway traffic to said track sections];"

494. *See* Ground 1, Limitations 1[B]-[C]; EX1004, Vol. II: 10-12, Fig. 1, Table 2.

### 3. 10[B]: "a code generation part to generate a removal code, determine an electronic contact address of the railway field worker by accessing a rail personnel contact database registering, for each railway personnel, electronic contact information of the railway personnel, and transmit the removal code to the electronic contact address of the railway field worker; and"

495. *See* Limitation 1[D]; Ground 1, Limitations 1[A] and [D].



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**4. 10[C]: "a block removal part to remove only upon entry of the removal code *by said centralized control operation from the railway traffic control apparatus,* the block placed by the block placing part on said one or more track sections for the railway field worker."**

496. *See* Limitation 1[E]; Ground 1, Limitation 1[E].

**E. <u>Analysis of Independent Claim 19</u>**

**1. 19[Pre]: "A method for *controlling railway access using a railway traffic control apparatus of* a centralized railway control system [to control access to railway tracks] *configured for centralized control of traffic of a centrally controllable railway network including plural railways and a plurality of railway traffic interlocks dispersed in said plural railways constituting said railway network,* the method comprising:"**

497. *See* Ground 1, Limitations 1[Pre] and 1[B].

**2. 19[A]: "providing a user interface [on a user terminal] *of the railway traffic control apparatus,* including a block placing part to place a block on one or more specified track sections *in any of said plural railways constituting said railway network that is managed by centralized control operation from the railway traffic control apparatus, the railway traffic control apparatus controlling, by said centralized control operation, one or more interlocks amongst the plurality of railway traffic interlocks dispersed in said plural railways constituting said railway network, to block railway traffic to the specified track sections and thereby* to permit a railway field worker to enter the track sections [while blocking railway traffic to said track sections];"**

498. *See* Ground 1, Limitations 1[B]-[C]; EX1004, Vol. II: 10-12, Fig. 1, Table 2.



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**3. 19[B]: "generating a removal code, determining an electronic contact address of the railway field worker by accessing a rail personnel contact database registering, for each railway personnel, electronic contact information of the railway personnel, and transmitting the removal code to the electronic contact address of the railway field worker; and"**

499. *See* Limitation 1[D]; Ground 1, Limitations 1[A] and [D].

**4. 19[C]: "permitting the block to said one or more track sections to be removed only upon entry of the removal code [in the centralized railway control system] *by said centralized control operation from the railway traffic control apparatus*."**

500. *See* Limitation 1[E]; Ground 1, Limitation 1[E].

**F. <u>Analysis of Independent Claim 20</u>**

**1. 20[Pre]: "*A railway traffic control apparatus configured for centralized control of traffic of a centrally controllable railway network including plural railways and a plurality of railway traffic interlocks dispersed in said plural railways constituting said railway network, the railway traffic control apparatus comprising a processor and configured to:*"**

501. *See* Ground 1, Limitations 1[Pre] and 1[B].

**2. 20[A]: "*place a block on one or more sections of railway track in any of said plural railways constituting said railway network that is managed by centralized control operation from the railway traffic control apparatus, the railway traffic control apparatus controlling, by said centralized control operation, one or more interlocks amongst the plurality of railway traffic interlocks dispersed in said plural railways constituting said railway network, to prevent trains from traversing the one or more sections of railway track;*"**

502. *See* Ground 1, Limitations 1[B]-[C]; EX1004, Vol. II: 10-12, Fig. 1, Table 2.



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**3. 20[B]: *"generate a secret release code associated with the blocked one or more sections of railway track;"***

503. *See* Limitation 1[D]; Ground 1, Limitations 1[D], 20[B].

**4. 20[C]: "*transmit the secret release code to a user terminal via a network;"***

504. *See* Limitation 1[D]; Ground 1, Limitation 1[D].

**5. 20[D]: *"receive the secret release code via the network; and"***

505. *See* Limitation 1[E]; Ground 1, Limitations 1[E], 20[D].

**6. 20[E]: *"responsive to receiving the secret release code from the terminal, remove the block from the one or more sections of railway track."***

506. *See* Limitation 1[E]; Ground 1, Limitations 1[E], 20[E].

## G. Analysis of Independent Claim 30

**1. 30[Pre]: "A method for controlling railway access using a railway traffic control apparatus configured for centralized control of traffic of a centrally controllable railway network including plural railways and a plurality of railway traffic interlocks dispersed in said plural railways constituting said railway network, the method comprising:"**

507. *See* Ground 1, Limitations 1[Pre] and 1[B].



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**2. 30[A]: *"placing a block on one or more sections of railway track in any of said plural railways constituting said railway network that is managed by centralized control operation from the railway traffic control apparatus, the railway traffic control apparatus controlling, by said centralized control operation, one or more interlocks amongst the plurality of railway traffic interlocks dispersed in said plural railways constituting said railway network, to prevent trains from traversing the one or more sections of railway track;"***

508. *See* Ground 1, Limitations 1[B]-[C]; EX1004, Vol. II: 10-12, Fig. 1, Table 2.

**3. 30[B]: *"generating a secret release code associated with the blocked one or more sections of railway track;"***

509. *See* Limitation 1[D]; Ground 1, Limitations 1[D], 20[B].

**4. 30[C]: *"transmitting the secret release code to a user terminal via a network;"***

510. *See* Limitation 1[D]; Ground 1, Limitation 1[D].

**5. 30[D]: *"receiving the secret release code via the network; and"***

511. *See* Limitation 1[E]; Ground 1, Limitations 1[E], 20[D].

**6. 30[E]: *"responsive to receiving the secret release code from the terminal, removing the block from the one or more sections of railway track."***

512. *See* Limitation 1[E]; Ground 1, Limitations 1[E], 20[E].

### H. Analysis of Independent Claim 40

513. Claim 40 does not require that the code is returned by the worker to the railway (traffic) control apparatus to unblock the track.



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**1. 40[Pre]: *"A system comprising:"***

514. *See* Ground 1, Limitation 1[Pre].

**2. 40[A]: *"a railway control apparatus comprising a processor and a memory device, the railway control apparatus configured to communicate with a plurality of railway traffic interlocks and a user terminal via a network and to perform centralized control of traffic of a centrally controllable railway network including plural railways and the plurality of railway traffic interlocks dispersed in said plural railways constituting said railway network, wherein the processor is configured by execution of computer program instructions to cause the railway control apparatus to:"***

515. *See* Ground 1, Limitations 1[Pre] and 1[B].

**3. 40[B]: *"receive a selection of track sections to block in any of said plural railways constituting said railway network that is managed by centralized control operation from the railway control apparatus, wherein each selected track section corresponds to one or more railway traffic interlocks amongst the plurality of railway traffic interlocks dispersed in said plural railways constituting said railway network;"***

516. *See* Ground 1, Limitations 1[B]-[C].

**4. 40[C]: *"responsive to receiving the selection, generate a secret code associated with the selected track sections;"***

517. *See* Limitation 1[D]; Ground 1, Limitations 1[B]-[D].

**5. 40[D]: *"responsive to generating the secret code, save the secret code in the memory device;"***

518. *See* Limitation 1[D]; Ground 1, Limitations 1[D], 40[D].



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**6.** ***40[E]: "associate the secret code with a remote user of the user terminal;"***

519. *See* Limitation 1[D]; Ground 1, Limitations 1[C]-[D], 40[E].

**7.** **40[F]: "*transmit a block signal to the corresponding one or more railway traffic interlocks to place a block on the selected track sections; and"***

520. *See* Ground 1, Limitations 1[B]-[C], 40[F].

**8.** **40[G]: "*transmit the secret code to the remote user of the user terminal."***

521. *See* Limitation 1[D]; Ground 1, Limitation 1[D].

## I. Analysis of Dependent Claims 2-7, 9, 11-16, 18, 21-29, 31-39, 41

522. For the reasons discussed in Ground 1, FRA-Report and Schmitz render obvious dependent claims 2-7, 9, 11-16, 18, 21-29, 31-39, 41 (*see supra* ¶¶ 317-360), except here FRA-Report is combined with Schmitz such that the railway traffic control apparatus generates, saves, and transmits a code as taught in Schmitz to the worker, who after any work, transmits the code to the railway traffic control apparatus which unblocks the track by entry of the code by the dispatcher or automatically compared with the saved code. *See* Limitations 1[D]-[E].



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**1. Claim 2: "The centralized railway control system of claim 1, wherein the railway traffic control apparatus further comprises: a [RTC] *railway traffic controller (RTC)* user interface to permit a user to specify said one or more track sections to be blocked, specify an instruction to the centralized railway control system to block the railway traffic to the specified track sections, and specify identifying information of the railway field worker to be performing work in the specified track sections."**

**Claim 11: "The railway traffic control apparatus of claim 10, further comprising: a [RTC] *railway traffic controller (RTC)* user interface to permit a user to specify [said one or more] track sections to be blocked, specify an instruction to the [centralized] railway *traffic* control [system] *apparatus* to block the railway traffic to the specified track sections, and specify identifying information of the railway field worker to be performing work in the specified track sections."**

523. *See* Limitations 1[D]-[E]; Ground 1, Claims 2, 11.

**2. Claim 3: "The centralized railway control system of claim 1, further comprising:**

**a railway control database registering block identifying information, including block limits identifying the one or more blocked track sections, along with the removal code for removing the block of the track sections."**

**Claim 12: "The railway traffic control apparatus of claim 10, wherein block identifying information, including block limits identifying the one or more blocked track sections, is registered in a railway control database, along with the removal code for removing the block of the track sections."**

524. *See* Limitations 1[D]-[E]; Ground 1, Claims 3, 12.



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**3. Claim 4: "The centralized railway control system of claim 1, further comprising:**

**a railway control database registering (a) identification of the user who specified the instruction to block the track sections and (b) block identifying information, including block limits identifying the one or more blocked track sections, notes specifying reasons for the block, and date and time at which the block was placed."**

**Claim 13: "The railway traffic control apparatus of claim 10, wherein block identifying information, including block limits identifying the one or more blocked track sections, notes specifying reasons for the block, and date and time at which the block was placed, are registered in a railway control database, along with identification of the user who specified the instruction to block the track sections."**

525. *See* Limitations 1[D]-[E]; Ground 1, Claims 4, 13.



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**4. Claim 5: "The centralized railway control system of claim 1, wherein upon placement by the block placing part of the block of railway traffic to said one or more specified track sections, the code generation part transmits the removal code to the electronic contact address of the railway field worker, and the block of railway traffic to said one or more specified track sections remains in place in the centralized railway control system until the entry of the removal code in the centralized railway control system to cause the block removal part to remove the block on said one or more track sections."**

**Claim 14: "The railway traffic control apparatus of claim 10, wherein upon placement by the block placing part of the block of railway traffic to said one or more specified track sections, the code generation [code] *part* transmits the removal code to the electronic contact address of the railway field worker, and the block of railway traffic to said one or more specified track sections remains in place in the [centralized] railway *traffic* control [system] *apparatus* until the entry of the removal code in the [centralized] railway *traffic* control [system] *apparatus* to cause the block removal part to remove the block on said one or more track sections."**

526. *See* Limitations 1[D]-[E]; Ground 1, Claims 5, 14.

**5. 6[Pre]: "The centralized railway control system of claim 1, wherein the railway traffic control apparatus further comprises:"**

**6[A]: "a block removal user interface to permit a user to enter the removal code to cause the block removal part to remove the block on said one or more track sections,"**

**6[B]: "wherein the block of railway traffic to said one or more specified track sections remains in place in the centralized railway control system until the entry of the removal code through the block removal user interface."**

**15[Pre]: "The railway traffic control apparatus of claim 10,**



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**further comprising:"**

**15[A]: "a block removal user interface to permit a user to enter the removal code to cause the block removal part to remove the block on said one or more *specified* track sections,"**

**15[B]: "wherein the block of railway traffic to said one or more specified track sections remains in place in the [centralized] railway *traffic* control [system] *apparatus* until the entry of the removal code through the block removal user interface."**

527. *See* Limitations 1[D]-[E]; Ground 1, Claims 6, 15.

**6. 7[Pre]: "The centralized railway control system of claim 6, wherein the block removal user interface further requires, in addition to the entry of the removal code, the user to specify that confirmation that the track sections have been cleared has been obtained from the railway field worker associated with the block, before the block removal user interface permits the removal code to be transmitted to the block removal pail, and"**

**7[A]: "the centralized railway control system further comprises a railway control database registering (a) block identifying information identifying the one or more blocked track sections, date and time at which the block was placed and identifying [information] the railway field worker associated with the block, and (b) block removal information identifying date and time at which the block was removed and identifying the user who entered the removal code and specified that confirmation that the track sections have been cleared was obtained from the railway field worker associated with the block."**

**16[Pre]: "The railway traffic control apparatus of claim 15, wherein the block removal user interface further requires, in addition to the entry of the removal code, the user to specify that confirmation that the track sections have been cleared**



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**has been obtained from the railway field worker associated with the block, before the block removal user interface permits the removal code to be transmitted to the block removal part, and"**

**16[A]: "block identifying information identifying the one or more blocked track sections, date and time at which the block was placed and identifying [information] the railway field worker associated with the block is registered in a railway control database, along with block removal information identifying date and time at which the block was removed and identifying the user who entered the removal code and specified that confirmation that the track sections have been cleared was obtained from the railway field worker associated with the block."**

528. *See* Limitations 1[D]-[E]; Ground 1, Claims 7, 16.

**7. Claim 9: "The centralized railway control system of claim 1, wherein the code generation part transmits an electronic message to the electronic contact address of the railway field worker, and the electronic message transmitted to the electronic contact address of the railway field worker includes the removal code and includes an embedded link for activating a return transmission of the removal code to the block removal part of the centralized railway control system."**

**Claim 18: "The railway traffic control apparatus of claim 10, wherein the code generation part transmits an electronic message to the electronic contact address of the railway field worker, and the electronic message transmitted to the electronic contact address of the railway field worker includes the removal code and includes an embedded link for activating a return transmission of the removal code to the block removal part of the [centralized] railway *traffic* control [system] *apparatus*."**

**Claim 27: "*The railway traffic control apparatus of claim 20,***



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***wherein the railway traffic control apparatus is configured to transmit the secret release code to the user terminal by transmitting a message to the user terminal, the message comprising one or more embedded links."***

**Claim 28*: "The railway traffic control apparatus of claim 27, wherein the railway traffic control apparatus is configured to receive the secret release code transmitted via the network in response to selection of at least one of the one or more embedded links in the message, on the user terminal."***

**Claim 29: "*The railway traffic control apparatus of claim 27, wherein the message comprises a text message or an email."***

**Claim 37: "*The method of claim 30, wherein transmitting the secret release code comprises transmitting a message to the user terminal, the message comprising one or more embedded links."***

**Claim 38: "*The method of claim 37, wherein the secret release code is transmitted via the network in response to selection of at least one of the one or more embedded links in the message, on the user terminal, and is received by the railway traffic control apparatus."***

**Claim 39*: "The method of claim 37, wherein the message comprises a text message or an email."***

529. *See* Limitations 1[D]-[E]; Ground 1, Claims 9, 18, 27-29, 37-39.

**8. Claim 21*: "The railway traffic control apparatus of claim 20, wherein the block is placed via an interlocking signal prohibiting trains from traversing the one or more sections of railway track."***

**Claim 31*: "The method of claim 30, wherein the block is placed via an interlocking signal prohibiting trains from traversing the one or more sections of railway track."***

530. *See* Limitations 1[D]-[E]; Ground 1, Claims 21, 31.



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**9. Claim 22:** ***"The railway traffic control apparatus of claim 20, wherein the railway traffic control apparatus is configured to place the block by causing one or more of the plurality of railway traffic interlocks to display a STOP signal."***

**Claim 32:** ***"The method of claim 30, wherein the railway traffic control apparatus is configured to place the block by causing one or more of the plurality of railway traffic interlocks to display a STOP signal."***

531. *See* Limitations 1[D]-[E]; Ground 1, Claims 22, 32.

**10. Claim 23***: "The railway traffic control apparatus of claim 20, wherein only the railway traffic control apparatus and the user terminal receive the secret release code generated by the railway traffic control apparatus."*

**Claim 33***: "The method of claim 30, wherein only the railway traffic control apparatus and the user terminal receive the secret release code generated by the railway traffic control apparatus."*

532. *See* Limitations 1[D]-[E]; Ground 1, Claims 23, 33.

**11. Claim 24: "***The railway traffic control apparatus of claim 20, wherein the railway traffic control apparatus is further configured to: store the secret release code in a memory of the railway traffic control apparatus."*

**Claim 34***: "The method of claim 30, further comprising: storing the secret release code in a memory of the railway traffic control apparatus."*

533. *See* Limitations 1[D]-[E]; Ground 1, Claims 24, 34.

**12. Claim 25:** ***"The railway traffic control apparatus of claim 20, wherein the railway traffic control apparatus is further configured to: generate and store block removal information in response to removing the block from the one or more sections of railway track."***



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**Claim 35:** ***"The method of claim 30, further comprising: generating and storing block removal information in response to removing the block from the one or more sections of railway track."***

534. *See* Limitations 1[D]-[E]; Ground 1, Claims 25, 35.

**13. Claim 26: "*The railway traffic control apparatus of claim 25, wherein the block removal information comprises a date and time when the block was removed and identification information of a user who entered the secret removal code."***

**Claim 36:** ***"The method of claim 35, wherein the block removal information comprises a date and time when the block was removed and identification information of a user who entered the secret removal code."***

535. *See* Limitations 1[D]-[E]; Ground 1, Claims 26, 36.

**14. 41[Pre]:** ***"The system of claim 40, wherein the processor configured by execution of computer program instructions additionally causes the railway control apparatus to:"***

**41[A]:** ***"receive the secret code from the user terminal via the network;"***

**41[B]:** ***"verify the secret code by comparing the secret code received from the user terminal with the secret code stored in the memory device;"***

**41[C]:** ***"receive an instruction to remove the block from the selected track sections, after verifying the secret code; and"***

**41[D]:** ***"responsive to the instruction to remove the block received after verifying the secret code, transmit a block removal signal to the corresponding railway traffic interlocks."***

536. *See* Limitations 1[D]-[E]; Ground 1, Claim 41.



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## XIII. GROUND 4: CLAIMS 1-8 ARE OBVIOUS OVER FRA-REPORT, BYFORD, AND MACEY

### A. Summary of FRA-Report and Analogous Art

537. My explanation of FRA-Report above and incorporated here by reference. *See* Sections X.A.3-4.

### B. Summary of Byford and Analogous Art

538. U.S. Patent No. 6,581,161 (EX1011, "Byford") issued on June 17, 2003, and is therefore prior art under at least AIA 35 U.S.C. § 102(a) without any § 102(b) exceptions.

539. Byford discloses a system for "controlling access to a secure location" by generating and transmitting a secret code to a relevant person (or user). EX1011, 4:31-38, Abstract.

540. Byford teaches a server generating a "cipher lock code" for the relevant person and transmitting the code in "encrypted form" over the Internet to the relevant person's wireless device which "decrypt[s]" it. *Id*., 4:31-38, 3:61-4:3, Abstract, 5:7-14 (user permitted "one-time access"), 5:25-30, claims 1, 3.

541. Based on my review of the RE'835 Patent's prosecution history (EX1002), Byford was not considered during prosecution of the RE'835 Patent.

542. In my opinion, Byford is analogous art to the RE'835 Patent because a POSITA would have understood Byford, as shown in my analysis above, is in the



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same field of endeavor as the RE'835 Patent of workers, railway work, or access control. EX1011, Abstract, 1:7-12, 3:61-65; EX1001, title, Abstract, 1:21-2:10, 2:49-3:6, 4:8-10, 4:42-46; EX1025, ¶¶20, 54, 57; EX1024, 6, 13-14.

543. For instance, Byford relates to access control as it is titled, "System, apparatus and method for controlling access" where the "present invention is concerned … [with] controlling access to a secure location …." EX1011, Abstract. This could include, "controlling access to facilities by potential users of those facilities, for example physical access to a building or secure area or container, or access to a particular computer system …." *Id*., 1:7-11, 4:59-62 ("access control device may vary, depending on the requirements of the particular building or secure area").

544. A POSITA would have understood that Byford would have been applied to railway work (*e.g.*, "secured location" or "secured area"). A POSITA would have also understood that Byford's reference to a "user" is a broad term that could encompass numerous categories, such as a worker.

545. Additionally, Byford, as shown in my analysis above, is reasonably pertinent to any purported problem addressed in the RE'835 Patent of controlling or authorizing access to a location or a region, such as by workers or railway traffic,



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because like with the RE'835 Patent, Byford controls access to locations or regions such as "secured location" or "secured area" (like railway tracks).

546. For instance, Byford teaches "controlling access to facilities by potential users of those facilities, for example physical access to a building or secure area … or access to a particular computer system …." *Id*., 1:7-11. Also, Byford seeks to ensure a third-party cannot improperly obtain access by encrypting the code and providing "one-time access." *Id*., 5:7-14. Byford notes, "[t]his offers protection against an intruder who has, for example, observed a cipher lock setting being used and then reuses it to gain unauthorised access." *Id*.

### C. Summary of Macey and Analogous Art

547. My explanation of Macey above and incorporated here by reference. *See* Section XI.C.

### D. <u>Analysis of Independent Claim 1</u>

#### 1. 1[Pre]: "A centralized railway control system comprising:"

548. FRA-Report discloses Limitation 1[Pre]. *See* Ground 1, Limitation 1[Pre].

#### 2. 1[A]: "a rail personnel contact database registering, for each railway personnel, an electronic contact address of the railway personnel; and"

549. FRA-Report discloses Limitation 1[A]. *See* Ground 1, Limitation 1[A].



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**3. 1[B]: "a railway traffic control apparatus *configured for centralized control of traffic of a centrally controllable railway network including plural railways and a plurality of railway traffic interlocks dispersed in said plural railways constituting said railway network*, for controlling access to railway tracks, said railway traffic control apparatus comprising a processor, a non-transitory medium storing one or more programs of executable instructions, and a network interface through which the railway traffic control apparatus communicates via a network with a user terminal,"**

550. FRA-Report discloses Limitation 1[B]. *See* Ground 1, Limitation 1[B].

**4. 1[C]: "wherein execution of said one or more programs of executable instructions configures *the railway traffic control apparatus comprising* the processor to include: a block placing part to place a block on one or more specified track sections *in any of said plural railways constituting said railway network that is managed by centralized control operation from the railway traffic control apparatus, the railway traffic control apparatus controlling, by said centralized control operation, one or more interlocks amongst the plurality of railway traffic interlocks dispersed in said plural railways constituting said railway network, to block railway traffic to the specified track sections and thereby* to permit a railway field worker to enter the track sections [while blocking railway traffic to said track sections];"**

551. FRA-Report discloses Limitation 1[C]. *See* Ground 1, Limitation 1[C].

**5. 1[D]: "a code generation part to generate a removal code, retrieve the electronic contact address of the railway field worker from the rail personnel contact database, and transmit the removal code to the electronic contact address of the railway field worker; and"**

552. FRA-Report and Byford disclose and render obvious Limitation 1[D].



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(a) FRA-Report and Byford Combination

553. As discussed, FRA-Report discloses that the dispatcher operates the track display (or another interface) and via the railway traffic control apparatus blocks the track, retrieves the worker's electronic address from the database, as well as generates and transmits information (*e.g.*, track-related) to the worker's electronic contact address or PDA. *See* Ground 1, Limitations 1[D], 1[Pre]-[C].

554. Byford supplies the claimed code such that the dispatcher in FRA-Report operates the track display via the railway traffic control apparatus to block the track as well as retrieve the worker's electronic contact address, generate and transmit the claimed code (as taught in Byford) to the worker's electronic contact address accessible by the worker's PDA interface. *See* Ground 1, Limitations 1[Pre]-[D]; Sections X.A.3, XIII.B.

555. Specifically, Byford teaches that after a server receives a request for access from the relevant person and validates such person, the server generates a "cipher lock code" and transmits this code in "encrypted form" over the Internet to the person's wireless device which "decrypt[s]" the code. EX1011, 4:31-40, 2:22-31, Abstract, 4:18-24, 5:25-30, claims 1, 3.

556. To prevent "unauthorized access," Byford provides "one-time access" code to the relevant person. *Id.*, 5:7-14. A POSITA would have recognized this



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"cipher lock code" could be, e.g., numeric (such as a random number) or alphanumeric for security. EX1005, 8:14-16; EX1006, 6:63-7:4, 2:65-3:1; *see* Section V.C.

557. FRA-Report and Byford disclose and render obvious Limitation 1[D]. Given the foregoing, they also disclose this limitation based on the Board's discussion of the claimed code (*see supra* ¶ 118), including the code taught in Byford is a secret code: encrypted code for "one-time access" provided to the relevant person. Byford validates the person before providing the "cipher lock code."

558. Further, FRA-Report and Byford disclose and render obvious Limitation 1[D] under Railware's construction, including the code taught in Byford is secret to the relevant person or "not readily available" to the dispatcher when combined with the FRA-Report. *See supra* ¶¶ 114-120. Accordingly, FRA-Report and Byford disclose and render obvious Limitation 1[D].

559. Additionally, FRA-Report and Byford disclose and render obvious Limitation 1[D], including under the Board and Railware's understanding of the claimed code, because a POSITA would have had a motivation to combine and reasonable expectation of success to implement Byford as the claimed code or secret code in FRA-Report as generating and transmitting a secret code, *e.g.*, for safety and security, only received by the relevant worker was taught before the Priority Date.



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See *supra* ¶ 228; Section V.C. This would protect railway workers from an accidental (or even intentional) removal of a block by the dispatcher while the worker performed maintenance work. Thus, it would have been predictable or obvious to try in implementing Byford as the claimed code or secret code in FRA-Report.

560. Moreover, a POSITA would have had a motivation to combine and reasonable expectation of success to implement Byford as the claimed code or secret code, which is generated and transmitted in FRA-Report to the worker's electronic contact address accessible by the user interface, for safety and security to address the known problem of protecting railway workers from removal of a block by the dispatcher while track work is performed. *See* Section V.A. Such a code would have ensured that it is only known to the worker and the track can only be released by the worker returning that code.

561. Similarly, a POSITA would have had a motivation to combine and reasonable expectation of success to implement Byford as the claimed code or secret code because it was known to a POSITA that a worker uses a mobile phone for controlling track possession, including to take control of a work zone and return it to the central system, and thus implementing a code only known to the worker would have been obvious to try for safety and security. *See* Section V.D.



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562. Further, a POSITA would have had a motivation to combine and reasonable expectation of success to implement Byford as the claimed code or secret code given the use of one-time password or one-time code for authorization or authentication was prevalent before the Priority Date, as shown above and other prior art. *See* Section V.C.

563. Such known authentication systems would have driven a POSITA to apply code authentication to ensure the code is only known to the worker and the track is only unblocked when the railway traffic control apparatus receives the code transmitted by the worker. Thus, it would have been predictable in implementing Byford as the claimed code or secret code in FRA-Report.

(b) Motivation to Combine FRA-Report and Byford with a Reasonable Expectation of Success

564. A POSITA would have had a motivation to combine with a reasonable expectation of success given both FRA-Report and Byford discuss controlling access to ensure protection and thus, a POSITA would have been motivated to modify the FRA-Report with the claimed code taught in Byford as only the worker would know the "cipher lock code" to unblock the track. See Sections X.A.3-4, XIII.B.

565. Additionally, a POSITA would have modified FRA-Report with Byford because it would have been obvious to try as CTC systems and secret-code systems were known, FRA-Report recognized that a secret-code system would have



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been implemented in the FRA-Report, and prior art discusses that technologies would have been applied to enhance worker safety. *See supra* ¶¶ 228-233, 238-242; Sections V.B-C. In other words, it would have been simply applying a known technique to a known device for increased safety.

566. Notably, FRA-Report recognized the need "to positively identify the person communicating with the PDA by utilizing some form of password protection." EX1004, Vol. I: 57. FRA-Report even proposes various solutions including (i) a "device ID" to be sent with messages and/or (ii) "password-protected access to the system" such as a "personal password." *Id*., Vol. I: 57-58. Therefore, FRA-Report urges a need and readiness to implement robust verification measures (including password-based ones) to effectively verify roadway worker identities, and Byford teaches one such code-based approach for identity verification. A POSITA would have been motivated to incorporate Byford for at least this reason.

567. A POSITA would have been further motivated by the FRA-Report's goals to "improve roadway worker safety and productivity" (EX1004, Vol. I: Preface) and implement a "verification system." EX1004, Vol. I: 9, 27. A POSITA would have thus recognized, to prevent the dispatcher from revoking a blocked track and increase security and safety, that FRA-Report would implement a "handshake" or verification protocol where the code taught in Byford is associated with the

blocked track and transmitted to the worker who later unblocks the track with the same code. *See supra* ¶ 239.

568. A POSITA would have appreciated that modifying FRA-Report with Byford would have had a reasonable expectation of success to generate and transmit a code in FRA-Report to a worker's device given the hardware and software in FRA-Report. *See supra* ¶¶ 241-242; *see also* Ground 1, Limitations 1[Pre]-1[C]. Also, the worker's PDA in FRA-Report has existing encryption and decryption technology (EX1004, Vol. I: 57), otherwise, this was known particularly as technology evolved before the Priority Date. EX1011, 4:25-24 ("well-known encryption schemes"). With such hardware and software, the FRA-Report would have had flexibility when the code is generated, such as before or after the block is placed, such as safety, efficiency, and workflow, or a design choice to a POSITA. *See supra* ¶¶ 241-243.

569. The POSITA would further have been motivated to modify FRA-Report with a reasonable expectation of success for the worker's interface to receive and display the code taught in Byford given the worker's existing user interfaces in the FRA-Report and it is a design choice by a POSITA. Ground 1, Limitations 1[Pre]-1[C].



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570. Alternatively, a POSITA would have been motivated to modify FRA-Report to transmit the code taught by Byford with a reasonable expectation of success to the worker by text message or email message. *See supra* ¶ 244.

**6. 1[E]: "a block removal part to remove only upon entry of the removal code *by said centralized control operation from the railway control apparatus*, the block placed by the block placing part on said one or more track sections."**

571. FRA-Report, Byford, and Macey disclose and render obvious Limitation 1[E].

(a) FRA-Report, Byford, and Macey Combination

572. As mentioned, FRA-Report teaches the worker selects the "Cancel/fulfill" link to transmit information to the railway traffic control apparatus, which by centralized control operation unblocks the track. *See* Ground 1, Limitations 1[E], 1[B]-[C]. Byford teaches the claimed code. Macey supplies the implementation of unblocking the track only based on the worker transmitting a secret code to a central system. *See supra* ¶¶ 255-256; Section XI.C.

573. Thus, based on or following Macey's implementation, the worker in FRA-Report would transmit the code as taught in Byford to the railway traffic control apparatus, which by centralized control operation will only unblock the track once the transmitted code is entered by the dispatcher or automatically by the railway



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traffic control apparatus. *See* Ground 1, Limitation 1[E]. As such, FRA-Report, Byford, and Macey disclose and render obvious Limitation 1[E].

574. Additionally, a POSITA would have had a motivation to combine and reasonable expectation of success to only unblock a track with the claimed code (as taught by Byford) following Macey's implementation in FRA-Report to address the known problem of protecting railway workers from improper removal of a track block. *See* Section V.A. Thus, a POSITA would have used the worker's transmitted code to unblock the track to ensure the track can only be released by the worker returning that code.

575. Similarly, a POSITA would have had a motivation to combine and reasonable expectation of success to only unblock a track with the claimed code (as taught by Byford) following Macey's implementation because it was known to a POSITA that a worker uses a mobile phone for controlling track possession, including to take control of a work zone and return it to the central system, and as such, implementing a code to only unblock a track with the claimed code (as taught by Byford) would have been obvious to try for safety and security. *See* Section V.D. Thus, the worker with the code would hold possession of the track and would transfer such possession by transmitting the code to the dispatcher to unblock the track.



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576. Also, a POSITA would have had a motivation to combine and reasonable expectation of success to only unblock a track with the claimed code (as taught by Byford) following Macey's implementation given the use of one-time password or one-time code transmitted to a server for authorization or authentication for safety and security was prevalent before the Priority Date. *See* Section V.C.

577. Such known authentication systems would have driven a POSITA to apply code authentication to railway systems to ensure a track block is only unblocked when the railway traffic control apparatus receives the code transmitted by the worker. Thus, it would have been predictable or obvious to try to implement Byford and Macey in FRA-Report.

578. Thus, FRA-Report, Byford, and Macey disclose and render obvious Limitation 1[E]. It would have been obvious, as discussed, to automatically unblock the track or based on the dispatcher entering the code (or chief traffic controller retrieving the code from storage if the worker is unavailable). *See supra* ¶¶ 261-266. Also, Railware's understanding of "user terminal" and "from the terminal" reinforces FRA-Report, Byford, and Macey teach 1[E]. *See supra* ¶¶ 123-124, 267.

(b) Motivation to Combine FRA-Report, Byford, and Macey with a Reasonable Expectation of Success

579. A POSITA would have combined them with a reasonable expectation of success as it would have been predictable given CTC systems and secret-code



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systems were known, FRA-Report recognized that a secret-code system would have been implemented in the FRA-Report, and prior art discusses that technologies would have been applied to enhance worker safety. *See supra* ¶¶ 228-233, 238-242; Sections V.B-C. In other words, it would have been simply applying a known technique to a known device for increased safety.

580. FRA-Report's "verification system" and goal to "minimize[] common human error" would further enhance such motivation. EX1004, Vol. I: 9, 27. A "handshake" or verification protocol, where the worker unblocks the track with the code taught in Byford, would thus have been obvious to try. *See supra* ¶ 239; EX1028, 4, 14-15.

581. FRA-Report recognized the need "to positively identify the person communicating with the PDA by utilizing some form of password protection," even offering various proposals on solutions towards this objective including a password-based one for which implementation was still forthcoming in the disclosed prototype. EX1004, Vol. I: 57-58. Therefore, FRA-Report itself discloses a readiness to receive improvements—including password-based ones—towards verifying a track worker (*id*., Vol. I: 57-58). A POSITA would have been motivated to combine FRA-Report, Byford, and Macey for at least this reason. Ground 1,



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Limitation 1[E] (verifying saved code with worker's transmitted code to unblock the track).

582. A POSITA would have been motivated to combine FRA-Report, Byford, and Macey given they involve controlling access to a location or secured area. *See* Sections X.A.3-4, XIII.B, XI.C. Moreover, all involve worker device communication with a central server or system and thus, such overlap would have further motivated a POSITA to combine them. *Id*.

583. Alternatively, a POSITA would have been motivated to modify FRA-Report to transmit the code upon the worker [a] selecting the "Cancel/Fulfill" link, [b] calling, or [c] texting or emailing a message (such as via an embedded link activated to transmit the code) to the railway traffic control apparatus to unblock the track to provide an efficient and alternative means to unblock the track and text, email, and links were well-known. *See supra* ¶ 271.

584. A POSITA would have appreciated that modifying FRA-Report and Byford with Macey's implementation would have had a reasonable expectation of success given the hardware and software in FRA-Report. *See supra* ¶¶ 241-242; *see also* Ground 1, Limitations 1[Pre]-1[C]. Thus, it would have been predictable to transmit the code from the worker device to the CTC system to unblock the track.



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## E. Analysis of Independent Claim 10

### 1. 10[Pre]: "A railway traffic control apparatus *configured for centralized control of traffic of a centrally controllable railway network including plural railways and a plurality of railway traffic interlocks dispersed in said plural railways constituting said railway network,* for controlling access to railway tracks, said railway traffic control apparatus comprising:"

585. *See* Ground 1, Limitations 1[Pre] and 1[B].

### 2. 10[A]: "a block placing part to place a block on one or more [selected] *specified* track sections *in any of said plural railways constituting said railway network that is managed by centralized control operation from the railway traffic control apparatus, the railway traffic control apparatus controlling, by said centralized control operation, one or more interlocks amongst the plurality of railway traffic interlocks dispersed in said plural railways constituting said railway network, to block railway traffic to the specified track sections and thereby* to permit a railway field worker to enter the track sections [while blocking railway traffic to said track sections];"

586. *See* Ground 1, Limitations 1[B]-[C]; EX1004, Vol. II: 10-12, Fig. 1, Table 2.

### 3. 10[B]: "a code generation part to generate a removal code, determine an electronic contact address of the railway field worker by accessing a rail personnel contact database registering, for each railway personnel, electronic contact information of the railway personnel, and transmit the removal code to the electronic contact address of the railway field worker; and"

587. *See* Limitation 1[D]; Ground 1, Limitations 1[A] and [D].



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**4. 10[C]: "a block removal part to remove only upon entry of the removal code *by said centralized control operation from the railway traffic control apparatus,* the block placed by the block placing part on said one or more track sections for the railway field worker."**

588. *See* Limitation 1[E]; Ground 1, Limitation 1[E].

## F. Analysis of Independent Claim 19

**1. 19[Pre]: "A method for *controlling railway access using a railway traffic control apparatus of* a centralized railway control system [to control access to railway tracks] *configured for centralized control of traffic of a centrally controllable railway network including plural railways and a plurality of railway traffic interlocks dispersed in said plural railways constituting said railway network,* the method comprising:"**

589. *See* Ground 1, Limitations 1[Pre] and 1[B].

**2. 19[A]: "providing a user interface [on a user terminal] *of the railway traffic control apparatus,* including a block placing part to place a block on one or more specified track sections *in any of said plural railways constituting said railway network that is managed by centralized control operation from the railway traffic control apparatus, the railway traffic control apparatus controlling, by said centralized control operation, one or more interlocks amongst the plurality of railway traffic interlocks dispersed in said plural railways constituting said railway network, to block railway traffic to the specified track sections and thereby* to permit a railway field worker to enter the track sections [while blocking railway traffic to said track sections];"**

590. *See* Ground 1, Limitations 1[B]-[C]; EX1004, Vol. II: 10-12, Fig. 1, Table 2.



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**3. 19[B]: "generating a removal code, determining an electronic contact address of the railway field worker by accessing a rail personnel contact database registering, for each railway personnel, electronic contact information of the railway personnel, and transmitting the removal code to the electronic contact address of the railway field worker; and"**

591. *See* Limitation 1[D]; Ground 1, Limitations 1[A] and [D].

**4. 19[C]: "permitting the block to said one or more track sections to be removed only upon entry of the removal code [in the centralized railway control system] *by said centralized control operation from the railway traffic control apparatus*."**

592. *See* Limitation 1[E]; Ground 1, Limitation 1[E].

## G. Analysis of Independent Claim 20

**1. 20[Pre]: "*A railway traffic control apparatus configured for centralized control of traffic of a centrally controllable railway network including plural railways and a plurality of railway traffic interlocks dispersed in said plural railways constituting said railway network, the railway traffic control apparatus comprising a processor and configured to:*"**

593. *See* Ground 1, Limitations 1[Pre] and 1[B].

**2. 20[A]: "*place a block on one or more sections of railway track in any of said plural railways constituting said railway network that is managed by centralized control operation from the railway traffic control apparatus, the railway traffic control apparatus controlling, by said centralized control operation, one or more interlocks amongst the plurality of railway traffic interlocks dispersed in said plural railways constituting said railway network, to prevent trains from traversing the one or more sections of railway track;*"**

594. *See* Ground 1, Limitations 1[B]-[C]; EX1004, Vol. II: 10-12, Fig. 1, Table 2.



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**3. 20[B]: *"generate a secret release code associated with the blocked one or more sections of railway track;"***

595. *See* Limitation 1[D]; Ground 1, Limitations 1[D], 20[B].

**4. 20[C]: "*transmit the secret release code to a user terminal via a network;"***

596. *See* Limitation 1[D]; Ground 1, Limitation 1[D].

**5. 20[D]: *"receive the secret release code via the network; and"***

597. *See* Limitation 1[E]; Ground 1, Limitations 1[E], 20[D].

**6. 20[E]: *"responsive to receiving the secret release code from the terminal, remove the block from the one or more sections of railway track."***

598. *See* Limitation 1[E]; Ground 1, Limitations 1[E], 20[E].

## H. Analysis of Independent Claim 30

**1. 30[Pre]: "A method for controlling railway access using a railway traffic control apparatus configured for centralized control of traffic of a centrally controllable railway network including plural railways and a plurality of railway traffic interlocks dispersed in said plural railways constituting said railway network, the method comprising:"**

599. *See* Ground 1, Limitations 1[Pre] and 1[B].



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**2. 30[A]: *"placing a block on one or more sections of railway track in any of said plural railways constituting said railway network that is managed by centralized control operation from the railway traffic control apparatus, the railway traffic control apparatus controlling, by said centralized control operation, one or more interlocks amongst the plurality of railway traffic interlocks dispersed in said plural railways constituting said railway network, to prevent trains from traversing the one or more sections of railway track;"***

600. *See* Ground 1, Limitations 1[B]-[C]; EX1004, Vol. II: 10-12, Fig. 1, Table 2.

**3. 30[B]: *"generating a secret release code associated with the blocked one or more sections of railway track;"***

601. *See* Limitation 1[D]; Ground 1, Limitations 1[D], 20[B].

**4. 30[C]: *"transmitting the secret release code to a user terminal via a network;"***

602. *See* Limitation 1[D]; Ground 1, Limitation 1[D].

**5. 30[D]: *"receiving the secret release code via the network; and"***

603. *See* Limitation 1[E]; Ground 1, Limitations 1[E], 20[D].

**6. 30[E]: *"responsive to receiving the secret release code from the terminal, removing the block from the one or more sections of railway track."***

604. *See* Limitation 1[E]; Ground 1, Limitations 1[E], 20[E].

## I. Analysis of Independent Claim 40

605. Claim 40 does not require that the code is returned by the worker to the railway (traffic) control apparatus to unblock the track.



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**1. 40[Pre]: *"A system comprising:"***

606. *See* Ground 1, Limitation 1[Pre].

**2. 40[A]: *"a railway control apparatus comprising a processor and a memory device, the railway control apparatus configured to communicate with a plurality of railway traffic interlocks and a user terminal via a network and to perform centralized control of traffic of a centrally controllable railway network including plural railways and the plurality of railway traffic interlocks dispersed in said plural railways constituting said railway network, wherein the processor is configured by execution of computer program instructions to cause the railway control apparatus to:"***

607. *See* Ground 1, Limitations 1[Pre] and 1[B].

**3. 40[B]: *"receive a selection of track sections to block in any of said plural railways constituting said railway network that is managed by centralized control operation from the railway control apparatus, wherein each selected track section corresponds to one or more railway traffic interlocks amongst the plurality of railway traffic interlocks dispersed in said plural railways constituting said railway network;"***

608. *See* Ground 1, Limitations 1[B]-[C].

**4. 40[C]: *"responsive to receiving the selection, generate a secret code associated with the selected track sections;"***

609. *See* Limitation 1[D]; Ground 1, Limitations 1[B]-[D].

**5. 40[D]: *"responsive to generating the secret code, save the secret code in the memory device;"***

610. *See* Limitation 1[D]; Ground 1, Limitations 1[D], 40[D].



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**6.** ***40[E]: "associate the secret code with a remote user of the user terminal;"***

611. *See* Limitation 1[D]; Ground 1, Limitations 1[C]-[D], 40[E].

**7.** **40[F]: "*transmit a block signal to the corresponding one or more railway traffic interlocks to place a block on the selected track sections; and"***

612. *See* Ground 1, Limitations 1[B]-[C], 40[F].

**8.** **40[G]: "*transmit the secret code to the remote user of the user terminal."***

613. *See* Limitation 1[D]; Ground 1, Limitation 1[D].

### J. Analysis of Dependent Claims 2-7, 9, 11-16, 18, 21-29, 31-39, 41

614. For the reasons discussed in Ground 1, FRA-Report, Byford, and Macey render obvious dependent claims 2-7, 9, 11-16, 18, 21-29, 31-39, 41 (*see supra* ¶¶ 317-360), except here FRA-Report is combined with Byford such that the railway traffic control apparatus generates, saves, and transmits a code as taught in Byford to the worker, who after any work, transmits the code taught in Byford to the railway traffic control apparatus which unblocks the track (as implemented in Macey) by entry of the code by the dispatcher or automatically compared with the saved code. *See* Limitations 1[D]-[E].



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**1. Claim 2: "The centralized railway control system of claim 1, wherein the railway traffic control apparatus further comprises: a [RTC] *railway traffic controller (RTC)* user interface to permit a user to specify said one or more track sections to be blocked, specify an instruction to the centralized railway control system to block the railway traffic to the specified track sections, and specify identifying information of the railway field worker to be performing work in the specified track sections."**

**Claim 11: "The railway traffic control apparatus of claim 10, further comprising: a [RTC] *railway traffic controller (RTC)* user interface to permit a user to specify [said one or more] track sections to be blocked, specify an instruction to the [centralized] railway *traffic* control [system] *apparatus* to block the railway traffic to the specified track sections, and specify identifying information of the railway field worker to be performing work in the specified track sections."**

615. *See* Limitations 1[D]-[E]; Ground 1, Claims 2, 11.

**2. Claim 3: "The centralized railway control system of claim 1, further comprising:**

**a railway control database registering block identifying information, including block limits identifying the one or more blocked track sections, along with the removal code for removing the block of the track sections."**

**Claim 12: "The railway traffic control apparatus of claim 10, wherein block identifying information, including block limits identifying the one or more blocked track sections, is registered in a railway control database, along with the removal code for removing the block of the track sections."**

616. *See* Limitations 1[D]-[E]; Ground 1, Claims 3, 12.



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**3. Claim 4: "The centralized railway control system of claim 1, further comprising:**

**a railway control database registering (a) identification of the user who specified the instruction to block the track sections and (b) block identifying information, including block limits identifying the one or more blocked track sections, notes specifying reasons for the block, and date and time at which the block was placed."**

**Claim 13: "The railway traffic control apparatus of claim 10, wherein block identifying information, including block limits identifying the one or more blocked track sections, notes specifying reasons for the block, and date and time at which the block was placed, are registered in a railway control database, along with identification of the user who specified the instruction to block the track sections."**

617. *See* Limitations 1[D]-[E]; Ground 1, Claims 4, 13.

**4. Claim 5: "The centralized railway control system of claim 1, wherein upon placement by the block placing part of the block of railway traffic to said one or more specified track sections, the code generation part transmits the removal code to the electronic contact address of the railway field worker, and the block of railway traffic to said one or more specified track sections remains in place in the centralized railway control system until the entry of the removal code in the centralized railway control system to cause the block removal part to remove the block on said one or more track sections."**

**Claim 14: "The railway traffic control apparatus of claim 10, wherein upon placement by the block placing part of the block of railway traffic to said one or more specified track sections, the code generation [code] *part* transmits the removal code to the electronic contact address of the railway field worker, and the block of railway traffic to said one or more specified track sections remains in place in the**



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**[centralized] railway *traffic* control [system] *apparatus* until the entry of the removal code in the [centralized] railway *traffic* control [system] *apparatus* to cause the block removal part to remove the block on said one or more track sections."**

618. *See* Limitations 1[D]-[E]; Ground 1, Claims 5, 14.

**5. 6[Pre]: "The centralized railway control system of claim 1, wherein the railway traffic control apparatus further comprises:"**

**6[A]: "a block removal user interface to permit a user to enter the removal code to cause the block removal part to remove the block on said one or more track sections,"**

**6[B]: "wherein the block of railway traffic to said one or more specified track sections remains in place in the centralized railway control system until the entry of the removal code through the block removal user interface."**

**15[Pre]: "The railway traffic control apparatus of claim 10, further comprising:"**

**15[A]: "a block removal user interface to permit a user to enter the removal code to cause the block removal part to remove the block on said one or more *specified* track sections,"**

**15[B]: "wherein the block of railway traffic to said one or more specified track sections remains in place in the [centralized] railway *traffic* control [system] *apparatus* until the entry of the removal code through the block removal user interface."**

619. *See* Limitations 1[D]-[E]; Ground 1, Claims 6, 15.



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**6.** **7[Pre]: "The centralized railway control system of claim 6, wherein the block removal user interface further requires, in addition to the entry of the removal code, the user to specify that confirmation that the track sections have been cleared has been obtained from the railway field worker associated with the block, before the block removal user interface permits the removal code to be transmitted to the block removal pail, and"**

**7[A]: "the centralized railway control system further comprises a railway control database registering (a) block identifying information identifying the one or more blocked track sections, date and time at which the block was placed and identifying [information] the railway field worker associated with the block, and (b) block removal information identifying date and time at which the block was removed and identifying the user who entered the removal code and specified that confirmation that the track sections have been cleared was obtained from the railway field worker associated with the block."**

**16[Pre]: "The railway traffic control apparatus of claim 15, wherein the block removal user interface further requires, in addition to the entry of the removal code, the user to specify that confirmation that the track sections have been cleared has been obtained from the railway field worker associated with the block, before the block removal user interface permits the removal code to be transmitted to the block removal part, and"**

**16[A]: "block identifying information identifying the one or more blocked track sections, date and time at which the block was placed and identifying [information] the railway field worker associated with the block is registered in a railway control database, along with block removal information identifying date and time at which the block was removed and identifying the user who entered the removal code and specified that confirmation that the track sections have been cleared was obtained from the railway field worker**



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**associated with the block."**

620. *See* Limitations 1[D]-[E]; Ground 1, Claims 7, 16.

**7. Claim 9: "The centralized railway control system of claim 1, wherein the code generation part transmits an electronic message to the electronic contact address of the railway field worker, and the electronic message transmitted to the electronic contact address of the railway field worker includes the removal code and includes an embedded link for activating a return transmission of the removal code to the block removal part of the centralized railway control system."**

**Claim 18: "The railway traffic control apparatus of claim 10, wherein the code generation part transmits an electronic message to the electronic contact address of the railway field worker, and the electronic message transmitted to the electronic contact address of the railway field worker includes the removal code and includes an embedded link for activating a return transmission of the removal code to the block removal part of the [centralized] railway *traffic* control [system] *apparatus*."**

**Claim 27: "*The railway traffic control apparatus of claim 20, wherein the railway traffic control apparatus is configured to transmit the secret release code to the user terminal by transmitting a message to the user terminal, the message comprising one or more embedded links."***

**Claim 28*: "The railway traffic control apparatus of claim 27, wherein the railway traffic control apparatus is configured to receive the secret release code transmitted via the network in response to selection of at least one of the one or more embedded links in the message, on the user terminal."***

**Claim 29: "*The railway traffic control apparatus of claim 27, wherein the message comprises a text message or an email."***

**Claim 37: "*The method of claim 30, wherein transmitting the***



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***secret release code comprises transmitting a message to the user terminal, the message comprising one or more embedded links."***

**Claim 38: "*The method of claim 37, wherein the secret release code is transmitted via the network in response to selection of at least one of the one or more embedded links in the message, on the user terminal, and is received by the railway traffic control apparatus."***

**Claim 39*: "The method of claim 37, wherein the message comprises a text message or an email."***

621. *See* Limitations 1[D]-[E]; Ground 1, Claims 9, 18, 27-29, 37-39.

**8. Claim 21*: "The railway traffic control apparatus of claim 20, wherein the block is placed via an interlocking signal prohibiting trains from traversing the one or more sections of railway track."***

**Claim 31*: "The method of claim 30, wherein the block is placed via an interlocking signal prohibiting trains from traversing the one or more sections of railway track."***

622. *See* Limitations 1[D]-[E]; Ground 1, Claims 21, 31.

**9. Claim 22: *"The railway traffic control apparatus of claim 20, wherein the railway traffic control apparatus is configured to place the block by causing one or more of the plurality of railway traffic interlocks to display a STOP signal."***

**Claim 32: *"The method of claim 30, wherein the railway traffic control apparatus is configured to place the block by causing one or more of the plurality of railway traffic interlocks to display a STOP signal."***

623. *See* Limitations 1[D]-[E]; Ground 1, Claims 22, 32.



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**10. Claim 23*: "The railway traffic control apparatus of claim 20, wherein only the railway traffic control apparatus and the user terminal receive the secret release code generated by the railway traffic control apparatus."***

**Claim 33*: "The method of claim 30, wherein only the railway traffic control apparatus and the user terminal receive the secret release code generated by the railway traffic control apparatus."***

624. *See* Limitations 1[D]-[E]; Ground 1, Claims 23, 33.

**11. Claim 24: "*The railway traffic control apparatus of claim 20, wherein the railway traffic control apparatus is further configured to: store the secret release code in a memory of the railway traffic control apparatus."***

**Claim 34*: "The method of claim 30, further comprising: storing the secret release code in a memory of the railway traffic control apparatus."***

625. *See* Limitations 1[D]-[E]; Ground 1, Claims 24, 34.

**12. Claim 25: "*The railway traffic control apparatus of claim 20, wherein the railway traffic control apparatus is further configured to: generate and store block removal information in response to removing the block from the one or more sections of railway track."***

**Claim 35: "*The method of claim 30, further comprising: generating and storing block removal information in response to removing the block from the one or more sections of railway track."***

626. *See* Limitations 1[D]-[E]; Ground 1, Claims 25, 35.



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**13.** **Claim 26: "*The railway traffic control apparatus of claim 25, wherein the block removal information comprises a date and time when the block was removed and identification information of a user who entered the secret removal code.*"**

**Claim 36: "*The method of claim 35, wherein the block removal information comprises a date and time when the block was removed and identification information of a user who entered the secret removal code.*"**

627. *See* Limitations 1[D]-[E]; Ground 1, Claims 26, 36.

**14.** **41[Pre]: "*The system of claim 40, wherein the processor configured by execution of computer program instructions additionally causes the railway control apparatus to:*"**

**41[A]: "*receive the secret code from the user terminal via the network;*"**

**41[B]: "*verify the secret code by comparing the secret code received from the user terminal with the secret code stored in the memory device;*"**

**41[C]: "*receive an instruction to remove the block from the selected track sections, after verifying the secret code; and*"**

**41[D]: "*responsive to the instruction to remove the block received after verifying the secret code, transmit a block removal signal to the corresponding railway traffic interlocks.*"**

628. *See* Limitations 1[D]-[E]; Ground 1, Claim 41.



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## XIV. CONCLUSION

629. For the foregoing reasons, it is my opinion that claims 1-7, 9-16, 18-41 of the RE'835 Patent are obvious in view of the prior art herein to a POSITA.

630. All statements made herein of my own knowledge are true, and all statements made on information and belief are believed to be true.

631. I may receive additional documentation and other factual evidence over the course of this IPR that will allow me to supplement and/or refine my opinions.

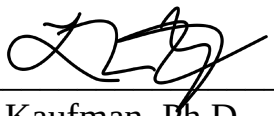
632. I reserve the right to add to, alter, or delete my opinions and my declaration upon discovery of any additional information

633. Further, I am aware that these statements are made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. § 1001, and may jeopardize the validity of the application or any patent issuing thereon.

634. I declare under penalty of perjury that the foregoing is true and correct.



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Lori Kaufman, Ph.D

Executed on November 14, 2025



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# APPENDIX 1

# LORI M. KAUFMAN, PhD.

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**EXPERIENCE SUMMARY:** Lori Kaufman is an experienced Information Technology (IT) and Risk Analysis expert with over 25 years of both academic and professional experience. In the proposal industry, she has served as a Proposal Manager, Volume Lead, and a Technical Writer/SME. Technically, she has led and managed teams ranging from small-scale operations with 10+ members, proposal teams with 50+ members, and Integrated Product Teams (IPTs) and large-scale operations with 100+ members. The diversity of her expertise and experience includes system development lifecycle process management, agile software development process management, ITIL, DODAF, FEAF, cybersecurity, IT security, cloud computing, software and cyber security, software assurance, software life cycle management, virtualization, technology integration, fault tolerant systems, risk analysis and management (including train control systems), quality assurance, program management, systems engineering and various elements of C4ISR using a of range of analytical and engineering skills.

**CAPABILITIES:** Lori Kaufman has over 20 years of leadership experience within both commercial and federal industry. She has led and written IT software/system assurance (including security and quality) plans for government agencies. She has provided analysis of cloud computing platforms for use within DOD and supported many IT programs from a life cycle management perspective throughout the federal government. She has overseen the development of several IT programs requiring the development of agile, ISO and CMMI processes. She has developed agile process management schema for both program management and software engineering and managed the development of FEAF/DODAF artifacts. She has also developed several ISO compliant logistics and supply chain models for various federal government agencies. Most recently, she has supported several cybersecurity and IA engagements using the RMF and the appropriate NIST/DCID requirements and integrating the DevSecOps pipeline into existing enterprises. She has supported various elements of C4ISR using a range of analytical and engineering skills. She has served as proposal manager for multiple federal opportunities, and has led the development of technical, management and staffing volumes. She is a recognized expert in railroad safety and supported various Positive Train Control (PTC) and Electronically Controlled Pneumatic (ECP) Brake safety assessments. She has served as an expert witness in a patent infringement case involving advanced rail control technology.

**EXPERIENCE HIGHLIGHTS:**

**Panorama Consulting LLC, Charlottesville, VA, May 2011 – Present**
**Principal Consultant (Owner)**
Provides subject matter expertise for IT system support and design (including cloud computing and enterprise architecture), cybersecurity, software security and risk analysis, software development and lifecycle management, FEAF/DODAF development, data mining and analytics, technical writing support and proposal support (including roles as capture manager and proposal manager) that includes FEDSIM. She has supported the development of DIACAP to Risk Management Framework (RMF) processes, and the implementation of the RMF. She has acted as a system architect supporting the integration of the DevSecOps pipeline within the existing systems engineering pipeline. In this capacity, she has developed the overarching framework for a DevSecOps pipeline with an emphasis on RMF compliance and meeting Authority to Operate (ATO) requirements for AWS and Azure platforms. She continues to develop analytic models for insider threat behavior and provides support across C4ISR program areas.

Supports various cloud computing initiatives and data center consolidation efforts that require internal and/or external cloud services and FedRAMP compliance; developing cyber security solutions; identifying server hardware to support distributed computing environments; providing software process management support; and providing management support for various IT initiatives. She is also developing an Indicators and Warnings (I&W) methodology for insider threat detection and the identification of anomalous behavior within the realm of cyber security. She continues supporting various Federal, State and Local proposal efforts as a subject matter expert in IT design and security for data centers and cloud environments. In addition, she also provides capture management, proposal management, and volume management for




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technical opportunities that include cybersecurity and software lifecycle management.

Served as a subject matter expert (SME) to support a Department of Veterans Affairs (VA) data center enterprise architecture storage upgrade to a cloud service environment. She audited architecture requirements development to ensure functional and operational compliance to customer needs and business compliance; she defined the key performance indicators (KPIs) to ensure SLA/SLO compliance to both end users and backend business support; she reviewed system design and assessed compliance to all requirements; she led the development of DODAF/FEAF viewpoints and personally developed all Operational Viewpoints (OVs); she assisted with the development of test plans to ensure compliance to all operational and functional requirements; she identified the architecture elements required to provide disaster recovery/operational recovery compliance with existing VA policy; and she assisted with the development of data migration planning for the “To Be” environment and future expansion to a nationwide cloud infrastructure to support end user services.

Served as an expert witness for a railroad supplier in a patent infringement case.

**Software Engineering Institute (SEI) | Carnegie Mellon, Pittsburgh, PA, November 2010 – April 2011**
**Senior Member of the Technical Staff – CERT**
Assisted in the expansion of software assurance and risk management analysis to provide an engineering and human factors perspective in process management modeling. She also supported Department of Homeland Security (DHS) efforts to develop a control baseline from which both cloud computing users and providers can develop an audit and risk assessment framework, and a process for repeatable risk assessment for Critical Infrastructure Protection (CIP).

**BAE Systems, Herndon, VA, December 2008 –October 2010**
**Deputy Chief Technology Officer**
Responsible for overseeing IT mission assurance from a technology perspective with an emphasis on information assurance (IA) and cybersecurity. She managed a team of 10 individuals in developing an ITIL v3 compliant IT security model to support the BAE Systems enterprise approach to service delivery. The focus of this effort was to develop a reusable, Federal Information System Management Act (FISMA) compliant process that ensures confidentiality, integrity, availability (CIA), non-repudiation and authentication. The elements of this model are applicable to cloud computing. She also lent her expertise to develop several white papers on numerous security-related proposals whose net value exceeded several billion dollars for the defense and intelligence communities. For these proposal efforts, Lori provided leadership and support in developing the management, cost (including defining the labor force needed to support the opportunity) and technical volumes.

Served as capture manager and subject matter expert for IT opportunities within the defense intelligence community that included DOD and other agencies. She provided leadership for engagements requiring IT infrastructure design, operations and maintenance and lifecycle management related mission needs. As capture manager, she routinely led teams consisting of 50+ individuals. She also directly supported customer engagements to ensure that all mission needs were understood and met.

Assisted in the identification, design, and analysis of the virtualization and multiple security level (MSL) platforms to support the October 2010 awarded ($300 million ceiling) Defense Intelligence Agency (DIA) Next Generation Desktop Computing Environment (NGDE).

Led and supported over one billion dollars in new business opportunities. Her contributions included both leadership and support in developing proposal technical, management, and cost volumes. Managed the technical writing teams, which consisted of 30+ domain experts, for both the technical volume and sample task order for the IT portion of the August 2010 awarded INSCOM OMNIBUS III IDIQ, which possesses a five-year $492 million ceiling.

**Booz Allen Hamilton, McLean, VA/Charlottesville, VA, January 2006 – December 2008**
**Associate**
Provided subject matter expertise and leadership across multiple domains relying upon her software assurance, systems engineering, IT, data mining, quality assurance and risk management experience.


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She assisted in the risk assessment of various transit and rail car programs for WMATA, Port Authority of New York and New Jersey and Amtrak. Her proposal management and support efforts yielded contracts in excess of $50,000,000 from the Department of Transportation (DOT), the Department of Homeland Security (DHS), and the Department of Defense (DOD).

**Air Force Space and Missile Systems Center MILSATCOM Joint Program Office, SMC Transformational Communication MILSATCOM System Engineering and Integration (SE&I) Segment Program, Transformational Satellite Communications System (TSAT)** - provided expert analysis to support all phases of the software life cycle. Managed 100+ individuals from various organizations (including Lockheed Martin, The Aerospace Corporation, and the U.S. Air Force) in the coordination of TSAT software risk identification, mitigation strategies and the dissemination of information to the appropriate system concerns and across program segments. Additionally, she supported the emerging software assurance activities within the program including quality assurance planning and security.

**SETA Support to the National Ground Intelligence Center (NGIC), Advanced Intelligence Projects Office (AIPO), Digital Reasoning Systems (DRS) Program Support** –Worked with the NGIC AIPO to demonstrate the application of an entity extraction and conceptual query tool (Interceptor™) developed by Digital Reasoning Systems (DRS) to support the warfighter.

**Federal Aviation Administration (FAA), Traffic Analysis and Review Program (TARP) Safety Risk Management Project** –Developed a Safety Risk Management Document (SRMD) and performed the requisite risk analysis.

**Transportation Security Administration (TSA), Checkpoint of the Future and Risk Management Analysis Tool** –performed a review of data mining algorithms to provide a summary of the state-of-the-art practices in knowledge discovery and pattern recognition to improve airport screening.

**Transportation Security Administration (TSA), Risk Management Task Force Project** – Assisted in the development of a behavioral process model that allows for the identification of potential threats and vulnerabilities that can be exploited by either natural disasters or terrorist attacks.

**Federal Railroad Administration, Test Plan Development for the General Train Movement Simulator for Safety Evaluation (GTMS-SE)** - Using IEEE Standard 829-1998, developed a software test plan for the General Train Movement Simulator for Safety Evaluation (GTMS-SE). The GTMS-SE developed by DecisionTek, LLC, is a general train movement simulator that mimics real-life operations and scenarios of train movement over a specific territory.

**Federal Railroad Administration, Optimum Communication Timeout Study** - In this study, she and her colleagues identified the potential accident scenarios that may arise due to this timeout period. Concurrently with this activity, she quantified the maximum allowable communication timeout period for this architecture so that the PTC system would not pose a greater risk of train collisions, derailments, and accidents than a traditional cab signal system.

**Independent Consultant, Charlottesville, VA, January 2006**
Provided technical support to DecisionTek, LLC, to develop the software requirements and specification document for the General Train Movement Simulator for Safety Evaluation (GTMS-SE).

**Commonwealth Computer Research, Inc., Charlottesville, VA, March 2004 – January 2006**
**Business Development Director**
Responsible for identifying and writing proposals, and program management. In these roles, she successfully competed and managed a Department of Defense (DOD) Small Business Innovation Research (SBIR) Phase I award from Naval Air Systems Command (NAVAIR) to improve E-2C radar tracking capabilities. The success of her 8-person team in this Phase I effort led to the award of a Phase II contract. She successfully developed the bid for a DoD SBIR Phase I award from the Office of Naval Research (ONR). Concurrent with these activities, she developed proposals resulting in contracts from the Federal Railroad Administration (FRA), U.S. **Army** and Procter & Gamble. For the FRA award, she provided expertise to review safety analysis reports in support of the on-going development Illinois Department of Transportation (IDOT) Positive Train Control (PTC) system. During her tenure, she

expanded company research interests through contract awards and generated over $1,400,000 in contracts.

**University of Virginia, Charlottesville, VA, November 2000 – February 2004**
**Principal Scientist**
Continued research assessing safety for railroad and transit railway signaling and processor-based control systems. She was responsible for ensuring that a simulation-based risk assessment of these systems complied with Department of Transportation (DOT) - Federal Railroad Administration (FRA) Proposed Rule 49 CFR Part 209, 234 and 236: Standards for Development and Use of Processor-Based Signal and Train Control Systems. She also continued to refine the model constructs as additional data became available.

**SAIC, Charlottesville, VA, March – April 2003**
**Independent Consultant**
Provided risk analysis expertise to the ARES Mars Airplane project. She derived parametric data from application experts and developed rudimentary models for baseline fault tree analysis.

**University of Virginia, Charlottesville, VA, June 1997 - October 2000**
**Postdoctoral Research Associate**

Engaged in research to assess safety for a Nuclear Regulatory Commission (NRC) control system for a reactor facility. She transitioned her research within the first few months of this postdoctoral term to support the safety analysis of railroad processor-based control systems. She was responsible for developing model constructs for the physical system and the associated railroad workers (engineers, conductors, dispatchers and maintenance of way workers) to support a simulation-based risk assessment of these systems compliant with Department of Transportation (DOT) - Federal Railroad Administration (FRA) Proposed Rule 49 CFR Part 209, 234 and 236: Standards for Development and Use of Processor-Based Signal and Train Control Systems.

**University of Virginia, Charlottesville, VA, August 1991 - May 1997**
**Graduate Research Assistant**

**University of Virginia, Charlottesville, VA, January - May 1993**
**Graduate Teaching Assistant**

**Computer Systems Engineer, Department of Criminal Justice Services, Richmond, VA, August 1988 - June 1991.**

**Electronics Engineer, Carderrock Division, Naval Surface Warfare Center, Bethesda, MD, July 1987 - July 1988.**

**EDUCATION:**
Ph.D. Electrical Engineering, University of Virginia, Charlottesville, VA, May 1997
School of Engineering and Applied Science
Dissertation: Dependability Analysis for Ultra-Dependable Systems using Statistics of the Extremes

M.S. Electrical Engineering, University of Virginia, Charlottesville, VA, May 1993
School of Engineering and Applied Science
Thesis: A Fault-Partitioning Based Parallel Automated Test Pattern Generation (ATPG) System

B.S. Electrical Engineering with Distinction, University of Virginia, Charlottesville, VA, May 1987
School of Engineering and Applied Science, Graduated with Distinction

**AWARDS & HONORS:**
- Tau Beta Pi - Engineering Honor Society
- Eta Kappa Nu - International Electrical Engineering Honor Society
- Raven Society - University of Virginia Honor Society

- 1993 Recipient of National Science Foundation Fellowship: NSF/GEE Minority Fellowship for Doctoral Studies in Engineering

**PROFESSIONAL CERTIFICATIONS:**

- ITIL v3 Foundation

**PROFESSIONAL AFILLIATIONS:**

- Senior Member IEEE
- Editor, *It All Depends* column for *IEEE Security and Privacy* magazine January 2009 – August 2011
- IEEE Reliability Society Administrative Committee 2000 - 2002
- IEEE Human Interface Technology Committee 2001 – 2002
- IEEE Reliability Representative to the Intelligent Transportation System (ITS) Council 2001 – 2002

## PUBLICATIONS

### Journals

Wolf, Joseph M., Lori M. Kaufman, Robert H. Klenke, James H. Aylor, and Ronald Waxman, "An Analysis of Fault Partitioned Parallel Test Generation," *IEEE Transactions on Computer-Aided Design*, Volume 15, Number 5, May 1996, pp. 517-534.

Kaufman, Lori M., Joanne Bechta Dugan, and Barry W. Johnson, "Using Statistics of the Extremes for Software Reliability Analysis," *IEEE Transactions on Reliability*, Volume 48, Number 3, September 1999, pp. 292-299.

Kaufman, Lori M., Joanne Bechta Dugan, and Barry W. Johnson, "Coverage Estimation Using Statistics Of The Extremes For When Testing Reveals No Failures," *IEEE Transactions on Reliability*, Volume 51, Number 1, January 2002, pp. 3-10.

### Federal Publications

Kaufman, Lori M. and Barry W. Johnson, "Embedded Digital System Reliability and Safety Analysis," U.S. Nuclear Regulatory Commission NUREG/GR-0020, February 2001.

### General Publications

Harauz, John, and Lori M. Kaufman, "A New Era of Presidential Security: The President and His Blackberry," *IEEE Security and Privacy*, Volume 7, Issue 2, March/April 2009, pp. 67-70.

Kaufman, Lori M., "Data Security in the World of Cloud Computing," *IEEE Security and Privacy*, Volume 7, Issue 4, July/August 2009, pp. 61-64.

Kaufman, Lori M., "Can a Trusted Environment Provide Security?" *IEEE Security and Privacy*, Volume 8, Issue 1, January/February 2010, pp. 50 - 52.

Kaufman, Lori M., "Can Public-Cloud Security Meet Its Unique Challenges?" *IEEE Security and Privacy*, Volume 8, Issue 3, July/August 2010, pp. 55-57.

Kaufman, Lori M., "How Private is the Internet?," *IEEE Security and Privacy*, Volume 9, Issue 1, January/February 2011, pp. 73 -75.

### Refereed Conference Proceedings

Klenke, Robert H., Lori M. Kaufman, James H. Aylor, Ronald Waxman, and Padmini Narayan, "Workstation Based Parallel Test Generation," *Proceedings of the IEEE International Test Conference*, Baltimore, Maryland, October 1993, pp. 419-428.

Kaufman, Lori M., D. Todd Smith, Joanne Bechta Dugan and Barry W. Johnson, "Software Reliability Analysis Using Statistics of the Extremes," *Proceedings of the Reliability and Maintainability Symposium*, Philadelphia, Pennsylvania, January 1997, pp. 175-180.

Kaufman, Lori M., Joanne Bechta Dugan, and Barry W. Johnson, "Using Statistics of the Extremes for Software Reliability Analysis of Safety Critical Systems," *Proceedings of the Ninth International Symposium on Software Reliability Engineering*, Paderborn, Germany, November 1998, pp. 355-363.

Kaufman, Lori M., Ragavan Manian, Kiran Vemuri, and Joanne Bechta Dugan, "System-Reliability Analysis of an Embedded Hardware/Software System using Fault Trees," *Proceedings of the Reliability and Maintainability Symposium*, Washington D.C., January 1999, pp. 135-141.

Kaufman, Lori M., Ray Gretlein, and Ronald J. Hayne, "A Quantitative Assessment of the Application of Software Reliability to Reusable Code," *Proceedings of the Reliability and Maintainability Symposium*, Washington D.C., January 1999, pp. 165-170.

Kaufman, Lori M., Ted C. Giras and Nabil Ghali, "Reliability of a Computer Based Transit Car Door System," *Proceedings of the International Topical Meeting on Probabilistic Safety Assessment, Volume 2*, Washington D.C., August 1999, pp. 941-946.

Kaufman, Lori M. Kaufman, Sanyukta Bhide and Barry W. Johnson, "Modeling of Common-Mode Failures in Digital Embedded Systems," *Proceedings of the Reliability and Maintainability Symposium,* Los Angeles, California, January 2000, pp. 350-357.

Tillack, Jonathan A., Lori M. Kaufman, Karthik Kannan and Barry W. Johnson, "Application of Design Standards to Safety-Critical Systems," *Proceedings of the Reliability and Maintainability Symposium,* Los Angeles, California, January 2000*,* pp. 345-349.

Kaufman, Lori M. and Ted Giras, "The Axiomatic Safety-Critical Assessment Process (ASCAP) Simulation Methodology," *Proceedings of the 9th IFAC Symposium on Control in Transportation Systems 2000, Volume 2*, Braunschweig, Germany, June 2000, pp. 534-539.

Joshi, Vikram V., Lori M. Kaufman and Ted C. Giras, "Human Behavior Modeling in Train Control Systems," *Proceedings of the Reliability and Maintainability Symposium,* Philadelphia, Pennsylvania, January 2001, pp. 183-188.

Monfalcone, Marc E., Lori M. Kaufman and Ted C. Giras, "Safety Assessment of a Direct Traffic Control (DTC) Train Control System using the Axiomatic Safety-Critical Assessment Process (ASCAP)," *Proceedings of the Reliability and Maintainability Symposium,* Philadelphia, Pennsylvania, January 2001*,* pp. 352-357.

Kaufman, Lori M. and Ted C, Giras, "Simulation of Rare Events in Transportation Systems," *Proceedings of the 2001 Winter Simulation Conference*, Washington D.C., December 2001, pp. 1380-1385.

Kaufman, Lori M., Maximo H. Salinas, Ronald D. Williams and Ted C. Giras, "Integrated Hardware/Software Device Testing for Use in a Safety-Critical Application," *Proceedings of the Reliability and Maintainability Symposium,* Tampa, Florida, January 2003, pp. 132-137.

**Non-Refereed Conference Proceedings**

Kaufman, Lori M. and Barry W. Johnson, "The Importance of Fault Detection Coverage in Safety Critical Systems," *Transactions of the Twenty-Sixth Water Reactor Safety Information Meeting*, U.S. Nuclear Regulatory Commission, NUREG/CP-0165, Bethesda, Maryland, October 1998, pp. 39-40.

Kaufman, Lori M. and Barry W. Johnson, "The Importance of Fault Detection Coverage in Safety Critical Systems," *Proceedings of the Twenty-Sixth Water Reactor Safety Information Meeting, Volume 2*, U.S. Nuclear Regulatory Commission, NUREG/CP-0166, Bethesda,

Maryland, October 1998, pp. 5-28.

**KEY SPEAKING ENGAGEMENTS**

Every Refereed and Non-Refereed Conference Proceeding Publication was presented at the cited conference for peer review and discussion.



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