

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

KIOXIA AMERICA, INC. and
KIOXIA CORPORATION,
Petitioners,

v.

BiTMICRO, LLC,
Patent Owner.

Case IPR2023-00743
Patent 6,496,939

PATENT OWNER'S PRELIMINARY RESPONSE

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Pursuant to 37 C.F.R. § 42.107, Patent Owner BiTMICRO, LLC (“BiTMICRO” or “Patent Owner”) files this preliminary response to the Petition, setting forth reasons why the Petition for *inter partes* review (“IPR”) of claims 1-3, 6, 10-12, and 15 of U.S. Patent No. 6,496,939 (the “’939 Patent”), as requested by Kioxia America, Inc. and Kioxia Corporation (“Petitioners”), should be denied.¹

I. INTRODUCTION

At the time of the ’939 Patent’s filing, computer systems possessed two different types of memory: volatile and non-volatile. Volatile memory, which does not retain data upon loss of power, could include cache memory and main memory of the computer system. Unlike volatile memory, non-volatile memory does not lose its data upon a power loss. The inventors of the ’939 Patent recognized that volatile memory in a computer system contains newly written and/or modified data that is subject to erasure if the computer system loses power quickly.

The ’939 Patent discloses a solution for avoiding memory loss upon experiencing a loss of power in a computer system, and also recognizes that this solution may allow for a memory transaction such as securely erasing data to prevent unauthorized access. By including a plurality of super capacitors that can be charged while power is active, the computer system can temporarily draw

¹ By submitting this Preliminary Response, no waiver of any argument is intended by Patent Owner. Patent Owner will have a right to file a complete response to the Petition, should the Board institute *inter partes* review. 37 C.F.R. § 42.120(a).

power from the charged super capacitors if power sensors recognize a power loss. This temporary power gives the computer system a brief time to perform data reconfiguration, such as transferring data from volatile memory to non-volatile memory. However, the inventors of the '939 Patent also recognized that once the super capacitors have discharged to a predetermined level, proper operation of the computer system cannot occur due to insufficient voltage differential. Thus, the '939 Patent discloses cutting off power from the super capacitors based on the super capacitors discharging to a predetermined level.

Consistent with this disclosure, the challenged claims are directed generally to a method and system for controlling data in a computer system when the computer system loses power. As claimed, upon experiencing a power loss, the method and system activate a plurality of super capacitors to provide power for data management in the computer system, but only until the super capacitors discharge to a predetermined level. This temporary power supply via the super capacitors enables the system to reconfigure data before shutting down due to the loss of power. As an example of the data reconfiguration, the data can be transferred from volatile memory to non-volatile memory. Claim 1's "method for controlling data in a computer system when the computer system loses power" includes, in relevant part, the steps of "activating a plurality of super capacitors to supply power to the computing engine based upon power being removed from the

computer system” and “deactivating the plurality of super capacitors to cut off power to the computing engine based upon the plurality of super capacitors discharging to a predetermined level.” Claim 3 depends from claim 1, and further recites “allowing all data to be transferred from the at least one volatile memory to the at least one non-volatile memory.” Independent claim 10 recites substantially similar features as the above-quoted features of claim 1. For example, claim 10 is a system claim and claims a “means for deactivating the plurality of super capacitors to cut off power to the computing engine based upon the plurality of super capacitors discharging to a predetermined level.”

Petitioners assert four grounds against these challenged claims.

In Ground 1, Petitioners contend that challenged claims 1-3 are obvious over the Horning² reference in view of the Stokes³ reference.

In Ground 2, Petitioners contend that challenged claims 1-3 are obvious over the Germer⁴ reference in view of Horning, further in view of Stokes.

² U.S. Patent No. 5,414,861 (“Horning”).

³ U.S. Patent No. 4,701,858 (“Stokes”).

⁴ U.S. Patent No. 4,591,782 (“Germer”).

In Ground 3, Petitioners contend that challenged claims 1-3, 6, 10-12, and 15 are obvious over the Bruder⁵ reference in view of Horning, further in view of Stokes.

In Ground 4, Petitioners contend that challenged claims 1-3 and 6 are obvious over the Weber⁶ reference in view of Horning, further in view of Stokes.

However, in each ground, the asserted references fail to disclose every claimed feature of the challenged claims. Further, Petitioners’ reliance on Horning in each Ground is wrong and fatal to each challenge.

In Ground 1, Petitioners rely upon Horning to disclose the claimed step of “deactivating the plurality of super capacitors to cut off power to the computing engine based upon the plurality of super capacitors discharging to a predetermined level” as recited in independent claim 1. Horning discloses a long-term battery-powered back-up power supply that initiates a data transfer process once the back-up power supply discharges to the point where the remaining supply must be allocated to data transfer. Petitioners point to the power level in Horning “where there is only enough energy left for the data transfer,” as the claimed “predetermined level.” This is wrong, and Petitioners’ exclusive reliance on Horning to disclose this claimed feature fatally infects all four of Petitioners’

⁵ U.S. Patent No. 4,559,616 (“Bruder”).

⁶ U.S. Patent No. 5,596,708 (“Weber”).

grounds challenging the validity of the '939 Patent claims. This is because Horning's power level relied upon by Petitioners identifies when the reserve power supply is used to ***begin the data transfer task***, not when Horning performs any deactivation or disconnection of the reserve power supply. Indeed, Horning discloses no power level at which any deactivation or disconnection occurs. Therefore, Horning discloses no "deactivating" step "upon the plurality of super capacitors discharging to a predetermined level."

Again, Petitioners rely solely upon Horning to disclose this feature in each challenge. Horning's failure in Ground 1 infects each of the challenges asserted in the Petition.

Ultimately, none of the cited art, whether considered alone or in any asserted combination, discloses every relied-upon feature of the challenged claims. In particular, no reference discloses at least "deactivating the plurality of super capacitors to cut off power to the computing engine based upon the plurality of super capacitors discharging to a predetermined level" as recited in challenged independent claims 1 and 10.

As such, each ground presented in the Petition is deficient, and the Petition should be denied without institution.

II. THE BOARD NEED NOT REACH ANY CLAIM CONSTRUCTION ISSUES TO DENY THE PETITION

In the Petition, Petitioners submit the following proposed constructions for nine terms appearing in the challenged claims.

Term	Petitioners’ Proposed Construction
Claims 1 and 10: “predetermined level”	Plain and ordinary meaning
Claims 1, 2, 6, 10, 11, and 15: “computing engine”/”computer engine”	“comprising a processor or similar structure for directing the transfer and storage of data in memory, volatile memory, and non-volatile memory.”
Claim 10: “means for activating a plurality of super capacitors to supply power to the computing engine based upon power being removed from the computer system”	Means-plus-function Structure: “down-converter and up-converter, and equivalents thereof, together with associated circuit components” Function: “activating a plurality of super capacitors to supply power to the computing engine based upon power

	being removed from the computer system”
Claim 10: “means for reconfiguring the data in the computing engine”	Means-plus-function Structure: “processor or equivalent structure that directs the transfer and storage of data in memory” Function: “reconfiguring the data in the computing engine”
Claim 10: “means for deactivating the plurality of super capacitors to cut off power to the computing engine based upon the plurality of super capacitors discharging to a predetermined level”	Means-plus-function Structure: “down-converter 42 in Figure 1 (and corresponding text) and equivalents thereof, and switches, transistors, gates, <i>etc.</i> that are generally known in the art” Function: “deactivating the plurality of super capacitors to cut off power to the computing engine based upon the plurality of super capacitors discharging to a predetermined level”

Claim 12: “means for allowing all data to be transferred from the at least one volatile memory to the at least one non-volatile memory”	Means-plus-function Structure: “processor or equivalent structure that directs the transfer and storage of data in memory and is configured to transfer all data from volatile to non-volatile memory” Function: “allowing all data to be transferred from the at least one volatile memory to the at least one non-volatile memory”
Claim 6: “reversing the flow of current between the computing engine and the plurality of super capacitors”	Plain and ordinary meaning
Claim 15: “means for reversing the flow of current between the computing engine and the plurality of super capacitors”	Means-plus-function Structure: “down-converter 42 and up-converter in Figure 1 (and corresponding text), and equivalents thereof”

	Function: “reversing the flow of current between the computing engine and the plurality of super capacitors”
Claim 15: “means for discharging current from the plurality of super capacitors to the computing engine”	Means-plus-function Structure: “voltage down-converter or equivalent structure that converts a high voltage signal to a lower voltage signal and is configured to discharge current from the capacitors to the computing engine” Function: “discharging current from the plurality of super capacitors to the computing engine”

See Pet., 7-16. Without expressly agreeing to Petitioners’ constructions, and without waiving its right to submit its proposed constructions in a Patent Owner Response, Patent Owner submits that the Board need not engage in any pre-institution claim construction. For the reasons presented in Section III below, Petitioners’ grounds each include fundamental flaws and fail to establish the

disclosure of every claimed element in each independent claim. These findings do not require the Board to conduct any construction of the above-identified terms.

III. PETITIONERS' CHALLENGES FAIL ON THE MERITS

A. The Challenged Claims Require Deactivating the Super Capacitors Based Upon the Super Capacitors Discharging to a Predetermined Level

Claim 1's "method for controlling data in a computer system when the computer system loses power" includes, in relevant part, the steps of "activating a plurality of super capacitors to supply power to the computing engine based upon power being removed from the computer system" and "deactivating the plurality of super capacitors to cut off power to the computing engine based upon the plurality of super capacitors discharging to a predetermined level." The "deactivating" step is identified as [Claim 1c] in the Petition. *See* Pet., 24. Independent claim 10 recites a substantially similar feature, namely a "means for deactivating the plurality of super capacitors to cut off power to the computing engine based upon the plurality of super capacitors discharging to a predetermined level."⁷

Providing exemplary support for these claimed features, the '939 Patent discloses charge level sensors in the computer system that "inform the computer

⁷ As noted in Section II above, Petitioners agree that the claimed function for this claim term is "deactivating the plurality of super capacitors to cut off power to the computing engine based upon the plurality of super capacitors discharging to a predetermined level." Pet., 12-13.

system that the super-capacitor voltage has fallen below the fully charged and partially charged levels.” ’939 Pat., 5:36-38. “[O]nce the super-capacitors discharge to a predetermined level,” they are deactivated to shut down power to the computer system. *See, e.g.*, ’939 Pat., 5:39-42; FIGURE 3 (Steps 108 and 110).

The deactivation of the super capacitors is described by the ’939 Patent as providing exemplary “positive side effects” for protecting the computer system. ’939 Pat., 5:44. “First, if the output voltage from the down-converter were allowed to fall below the minimum operating voltage of the computer system, the computer system could continue to run with unpredictable and potentially serious results.” ’939 Pat., 5:44-48. “Also, by not fully discharging the super-capacitors they will take only a few seconds to recharge once the external system power is restored, whereas the initial charge of super-capacitors may take up to 5 minutes.” ’939 Pat., 5:48-52. Thus, the claimed “deactivating the plurality of super capacitors” step is “based upon the plurality of super capacitors discharging to a predetermined level.”

Claim 3, which depends directly from claim 2 and indirectly from claim 1, further recites “allowing all data to be transferred from the at least one volatile memory to the at least one non-volatile memory.” This requirement for transferring all data out of volatile memory is not a claimed feature of claim 1 or claim 10, however. Further, this feature of claim 3 provides an additional

limitation to claim 1’s “reconfiguring” step, not claim 1’s “deactivating” step. As a result, even when claim 3 is read in light of base claims 1 and 2, the “deactivating the plurality of super capacitors” step is “based upon the plurality of super capacitors discharging to a predetermined level,” not upon whether all—or less than all—data has been transferred out of volatile memory.

Petitioners identify no reference that discloses or suggests the full “deactivating” step of claim 1. For example, Petitioners’ overview of the cited references, included as Section IX of the Petition, discusses no instance in any of these cited references that discloses or suggests the step of “deactivating” a back-up power supply “based upon” the back-up power supply “discharging to a predetermined level,” as claimed. See Pet., 16-19. In particular, while describing the Horning reference, Petitioners state that a “control subsystem manages backup power and the data transfer process. ... *After the data transfer power is completed*, power is removed from the memory arrays and the data protection system is deactivated.” Pet., 18 (emphasis added). No mention is made in the overview section, or anywhere else in the Petition, of any predetermined level in Horning serving as a basis for deactivating any power supply.

Indeed, as will be more fully discussed below, none of the cited references disclose or suggest these features. As a result, each of Petitioners’ challenges fails to establish unpatentability of any challenged claim.

B. Ground 1 Based on Horning in view of Stokes Fails to Disclose or Suggest Every Claimed Feature

Petitioners contend that “Horning in view of Stokes teaches, and therefore renders obvious, claims 1-3 of the ’939 patent.” Pet., 19. As introduced above and discussed in more detail below, Horning in view of Stokes clearly fails to disclose or suggest every claimed feature, including at least “deactivating the plurality of super capacitors to cut off power to the computing engine based upon the plurality of super capacitors discharging to a predetermined level.”

Horning describes the use of a reserve power supply 34 as a back-up power source during a power loss. Upon experiencing a power loss, Horning first implements power load sequence 74. Under power load sequence 74, “the power load 74 on the reserve power supply is the same as that placed on the main power supply 32 before the power loss occurred, i.e., the primary and secondary power conductors 22 and 24, respectively, remain energized.” Horning, 6:47-52. If the power loss continues, Horning reduces the power load on the reserve power supply 34 in a next sequence. As Horning discloses, “[i]f power is not restored before the expiration of the power load sequence 74,” Horning will “begin reduced power load sequence 76 by removing power from the secondary power line 24.” Horning, 6:61-65. If the power loss is not restored during the reduced power load sequence 76, Horning implements a third and final phase of back-up power. “If power is not restored during this reduced power load sequence 76,” Horning does

not disclose any deactivation or disconnection upon the reserve power supply 34 reaching a predetermined level. Instead, Horning discloses “transferring data from the volatile memory 15 to the non-volatile memory array 18 while there is still enough power in the reserve power supply 34 to accomplish this data transfer.” Horning, 7:10-23.

Horning does not, however, disclose a power level of the reserve power supply when any deactivation or disconnection of the reserve power supply occurs. Rather, Horning only discloses a disconnection after the data transfer process is complete, and without disclosing a power level corresponding to the disconnection: “After all the data have been transferred, the reserve power supply 34 is disconnected from all the power conductors and the system 10 will remain in this power off state until power is restored to the system.” Horning, 7:23-27; *see also id.*, 9:23-27 (“after all the data have been transferred, the supervisor circuit removes power from the [power conductors], thereby deactivating the entire data protection system 10.”), 11:14-17 (“The program will execute this process until the save is complete and then shut off power to the entire data protection system 10 (FIG 1).”). According to Horning, the level of the reserve power supply 34 can initiate the data transfer task, but *not* a deactivation of the reserve power supply 34. *See* Horning, 8:13-19 (“If ... the reserve power supply 34 is discharged to the point where there is only enough energy to accomplish the data transfer task, the data

protection system 10 will automatically initiate the data transfer process to ensure complete data integrity even if the user mistakenly programmed too long a time period for power load sequences 74 and 76.”).

The Petition notably glosses over this distinction between the challenged claim and Horning. Addressing the “deactivating” step of claim 1, Petitioners state that Horning “discloses conserving reserve power by discharging the reserve power supply only to the point where there is enough energy to accomplish the data transfer task.” Pet., 25 (citing Horning, 8:13-17). Without acknowledging that this reserve power supply point corresponds to Horning’s start of the data transfer process, not a deactivation, Petitioners characterize Horning’s “level where there is only enough energy left for the data transfer” as the claimed “predetermined level.” Pet., 25. This is wrong, however, as there is no deactivation occurring in Horning at this level or even based on this level. This level in Horning marks the level when the reserve power supply is used to begin the data transfer task.

Petitioners’ expert, Dr. Baker, duplicates the Petition’s error, stating that “Horning teaches deactivating a reserve power supply to cut off power to the computing engine upon the reserve power system discharging to a predetermined level—i.e., a level where there is only enough energy left for the data transfer.” Ex. 1003, ¶134. Like the Petition, Dr. Baker’s interpretation of Horning is plainly

wrong. Upon Horning's reserve power system discharging to a low level, Horning begins a data transfer process, it does not deactivate the reserve power supply or cut off power to the computing engine.

Simply put, Horning's reserve power level cited to and relied upon by Petitioners does not correspond to the deactivation of Horning's reserve power supply 34. Petitioners have completely missed the mark in interpreting Horning, which only discloses "deactivating the entire data protection system 10" "after all the data have been transferred" and not based on reserve power system 34 "discharging to a predetermined level." Horning, 9:24-27; *see also id.*, 7:23-27, 11:14-17. Indeed, Horning discloses nothing about the level of the reserve power supply 34 when any disconnection occurs.

Along with their incorrect interpretation of Horning's data transfer process, Petitioners also fail to address the requirement that the claimed "level" at issue be "predetermined." *See Pet.*, 24-26. Specifically, Petitioners fail to point to any disclosure in Horning that would justify interpreting the level at which Horning begins the data transfer process as "predetermined." Horning discloses the level to begin the data transfer process as corresponding to a "low voltage condition" where the "storage batteries in the reserve power supply 34 are almost exhausted." Horning, 13:16-20. But Petitioners provide no basis to conclude that such low voltage condition is "predetermined."

Finally, Petitioners propose to combine Horning with Stokes, and state that “it also would have been obvious to discharge [Stokes'] super-capacitors to a predetermined level at which there is enough charge to complete the data transfer task, and then disconnect those super-capacitors upon completion of data transfer, as taught by Horning.” Pet., 26. But this statement confirms that Petitioners' theory is wrong. At the alleged “predetermined level” pointed to by Petitioners, there is no deactivation of any power, and any deactivation in Horning is not “based upon the [back-up power] discharging to a predetermined level.”

Moreover, Stokes fails to remedy the shortcomings of Horning. Petitioners rely on Stokes to argue that “[s]uper-capacitors are also quickly rechargeable upon restoration of the primary power source.” Pet., 24 (citing Stokes, 4:28-32). But Stokes fails to recognize any reason not to fully discharge a Double Layer Capacitor (DLC) disclosed by Stokes. Unlike Stokes, the '939 Patent warns against completely discharging the claimed plurality of super-capacitors while connected to the computing engine due to insufficient voltage potential to power the system, and it therefore sets a “predetermined level” for deactivation. *See, e.g.*, '939 Pat., 5:48-52. A POSITA faced with Horning and Stokes would have understood only that super-capacitors “are quickly rechargeable” per Stokes, and would have had no reason to deactivate any “super capacitors to cut off power to the computing engine based upon the plurality of super capacitors discharging to a

predetermined level.” As such, even if combined, Horning in view of Stokes fails to disclose at least the complete “deactivating” step of claim 1.

For all of these reasons, Horning and Stokes fail to disclose at least “deactivating the plurality of super capacitors to cut off power to the computing engine based upon the plurality of super capacitors discharging to a predetermined level.”

C. Ground 2 Based on Germer in view of Horning Further in view of Stokes Fails to Disclose or Suggest Every Claimed Feature

Petitioners again rely on Horning for the claimed “predetermined level” in claim 1. *See* Pet., 34-36 (“As discussed above, it would have been obvious to a POSITA to include the teachings of Horning, including Horning’s functionality for deactivating the reserve power system, in the system and method of Germer ...”). But Horning fails to disclose these features as recited in claim 1 for the same reasons addressed above in Ground 1. Further, Petitioners do not rely on Germer or Stokes to remedy the above-discussed shortcoming of Horning.

Thus, Petitioners’ Ground 2 fails for the same reasons as Ground 1.

D. Ground 3 Based on Bruder in view of Horning Further in view of Stokes Fails to Disclose or Suggest Every Claimed Feature

Petitioners again rely on Horning for the claimed “predetermined level” in claim 1. *See* Pet., 43-45 (“As discussed above, it would have been obvious to a POSITA to include the teachings of Horning, including Horning’s functionality for

deactivating the reserve power system, in Bruder’s data protection system”); *see also* Pet., 57-58. But Horning fails to disclose these features as recited in claim 1 for the same reasons addressed above in Ground 1. For these same reasons, Horning fails to disclose these features as recited in claim 1 for the same reasons addressed above in Ground 1. Also for these same reasons, Horning fails to disclose the claimed function in [Claim 10c]: “means for deactivating the plurality of super capacitors to cut off power to the computing engine based upon the plurality of super capacitors discharging to a predetermined level.” Further, Petitioners do not rely on Bruder or Stokes to remedy the above-discussed shortcoming of Horning.

Thus, Petitioners’ Ground 3 fails for the same reasons as Ground 1.

E. Ground 4 Based on Weber in view of Horning Further in view of Stokes Fails to Disclose or Suggest Every Claimed Feature

Petitioners again rely on Horning for the claimed “predetermined level” in claim 1. *See* Pet., 69-70 (“As discussed above, it would have been obvious to a POSITA to include the teachings of Horning, including Horning’s functionality for deactivating the reserve power system, in the system and method of Weber”). But Horning fails to disclose these features as recited in claim 1 for the same reasons addressed above in Ground 1. Further, Petitioners do not rely on Weber or Stokes to remedy the above-discussed shortcoming of Horning.

Thus, Petitioners’ Ground 4 fails for the same reasons as Ground 1.

IV. CONCLUSION

For the reasons presented above, no *inter partes* review should be instituted.

Dated: July 26, 2023

/s/ Wayne M. Helge

Wayne M. Helge (Reg. No. 56,905)

NOSSAMAN, LLP

1401 New York Ave, NW

Suite 800

Washington, DC 20005

Telephone: (202) 887-1400

Email: whelge@nossaman.com

James T. Wilson (Reg. No. 41,439)

DAVIDSON BERQUIST JACKSON &

GOWDEY, LLP

8300 Greensboro Dr., Suite 500

McLean, VA 22102

Telephone: (571) 765-7700

Fax: (571) 765-7200

Email: jwilson@dbjg.com

Counsel for Patent Owner

CERTIFICATE OF WORD COUNT

The undersigned certifies that the foregoing PATENT OWNER'S PRELIMINARY RESPONSE complies with the type-volume limitation in 37 C.F.R. § 42.24(b)(1). According to the word-processing system's word count, the brief contains 4,027 words, excluding the parts of the brief exempted by 37 C.F.R. § 42.24(a).

By: /s/ Wayne M. Helge
Wayne M. Helge (Reg. No. 56,905)
Attorney for Patent Owner

CERTIFICATE OF SERVICE

I hereby certify that on July 26, 2023, a true and correct copy of the foregoing document was served via email, by consent, to Petitioners by serving the correspondence email addresses of record as follows:

Douglas F. Stewart
doug.stewart@bracewell.com
Bracewell LLP
701 Fifth Avenue, Suite 3420
Seattle, Washington 98104-7018
(206) 204-6200 (t)
(800) 404-3970 (f)
Registration No. 51,060

Jared D. Schuettenhelm
jared.schuettenhelm@bracewell.com
Bracewell LLP
701 Fifth Avenue, Suite 3420
Seattle, Washington 98104-7018
(206) 204-6200 (t)
(800) 404-3970 (f)
Registration No. 59,539

Patrick Connolly
patrick.connolly@bracewell.com
Bracewell LLP
701 Fifth Avenue, Suite 3420
Seattle, Washington 98104-7018
(206) 204-6200 (t)
(800) 404-3970 (f)
Registration No. 69,570

Service Email: Bracewell-
IP@bracewell.com

/s/ Wayne M. Helge
Wayne M. Helge (Reg. No. 56,905)
Attorney for Patent Owner