



Method Of Procedure For Retrofitting ECS Power Systems (CC848791491)

Notice:

Every effort was made to ensure that the information in this document was complete and accurate at the time of printing. However, information is subject to change.

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1.0 Introduction

Tyco Electronics Corporation Power Systems provided the Lineage 2000 ECS power systems throughout the 1980s and 1990s. These parallel controlled rectifier systems have since been replaced by systems with serial controlled rectifiers such as the 596 series of rectifiers that are managed by newer system controllers. Lineage 2000 ECS plant controllers do not interface with the 596-series GPS-style rectifiers. The 596-series of rectifiers are the market replacements for the 364-series, SR rectifiers of these ECS plants. It becomes necessary to retrofit the controller, rectifiers, and rectifier shelves of these existing plants when growth or replacements beyond the present installed capacity is desired. This replacement or upgrade path is provided through the use of the J85501M1 rack-mount Vector controller, the J85702H1 PXS (Power Expansion Shelves), and the 848742271 upgrade Kit.

The ECS controller is replaced by a 1U Vector controller (J85501M1). All rectifier shelves are replaced by PXS shelves (J85702H1) e/w the appropriate 596-series rectifiers. No change is needed to the output distribution, batteries, or LVD options of these plants with this retrofit. These retrofit components provide a cost-effective means of growth and modernization to this installed base of ECS plants.

There are two basic styles of ECS plants in the Lineage 2000 family; plants that utilize a busbar backbone for the rectifier shelves and those where the rectifier shelf outputs are cabled to the plant distribution and battery buses. These basic styles support both -48V and +24V DC systems. These systems are identified below:

Busbar Backbone ECS Plants

J85500E1	+24V	1200A		4 shelves (12 rectifiers) max
J85500E2	+24V	1200A		4 shelves (12 rectifiers) max
J85500G2	-48V	600A		4 shelves (12 rectifiers) max
H569-403	+24V	600A		2 shelves (6 rectifiers) max

Cabled Rectifier Shelf ECS Plants

J85500D1	-48V	300A		2 shelves (6 rectifiers) max
J85500D2	-48V	300A		2 shelves (6 rectifiers) max
J85500D3	-48V	300A		2 shelves (6 rectifiers) max
J85500G1	-48V	300A		2 shelves (6 rectifiers) max
H569-401	-48V	300A	½ H	1 or 2 shelves (3 or 6 rectifiers) max
H569-408	-48V	300A	½ H	1 or 2 shelves (3 or 6 rectifiers) max
H569-419	-48V	300A	½ H	1 or 2 shelves (3 or 6 rectifiers) max
H569-420	+24V	600A		2 shelves (6 rectifiers) max

There are also several additional styles to which the present retrofit kits do not apply. Consult technical field support for options if the power system is one of the systems identified below:

J85500H1	-24V	600A	Busbar Backbone	2 shelves (6 rectifiers) max
H569-405	+24V	300A	Compact Bay Station	1 shelf (3 rectifiers) max
H569-416	-48V	600A	Flat Busbar Backbone	4 shelves (12 rectifiers) max

This Method Of Procedure (MOP) is partitioned into individual MOPs for specific ECS system styles. The following sections are: Retrofit of -48V ECS Plants w/Cabled Rectifier Shelves, Retrofit of +24V ECS Plant w/Cabled Rectifier Shelves, and Retrofit of -48V/+24V ECS Plants w/Busbar Backbone. Properly identify the system to be retrofitted and go to the appropriate section to use the correct MOP.

2.0 Retrofit of -48V ECS Plants w/Cabled Rectifier Shelves

This MOP is used to replace the J85501D ECS controller, 364-type ECS rectifiers, J85702B ECS rectifier shelves, and the ECS CP5 LVD/Fuse card of a J85500D or J85500G1 (-48V full-height) or H569-401, H569-408, or H569-419 (-48V half-height) ECS plant with a J85501M1 1U Vector controller, 596A2 GPS rectifiers, J85702H1 PXS rectifier shelves, and a CC109110500 Vector Fuse Board. The ECS rectifiers, shelves, and controller cards will be removed from the frame and can be used elsewhere in the customer's network or maintained as spares.



J85500D Retrofitted ECS Plant



Side Profile of Retrofitted ECS Plant

Parts required for this retrofit activity are furnished as part of a common ECS Plant Retrofit Kit per 848742271 plus the required controller, rectifier shelf (ves) and rectifiers. AC input circuits for the existing ECS rectifiers will be reused and/or supplemented as necessary for the new rectifiers and shelf (ves). Plant batteries will be retained along with all existing distribution within the existing ECS power bay.

Note that even though there may be room for up to 8 of the 50 amp 596A2 rectifiers in the retrofitted plant, the total plant load must still be limited to the 300 amp capacity of the load shunt in the plant.

2.1 Retrofit Steps

1. Evaluate the plant load and rectifier capacity relationships. During this retrofit, one rectifier shelf (maximum 3 ECS rectifiers) will be removed from service at a time, so the plant load must be less than the initial rectifier capacity less this removed capacity (maximum 150 amps or the batteries will be called upon (discharge) to supply the difference during the retrofit. Single shelf ECS plants or plants without AC service to an unequipped rectifier shelf will have no rectifier capacity while the shelf is replaced. Three options for addressing a load > the working rectifier capacity are:
 - a. Lower the office load somewhat by turning down unneeded / spare equipment loads;
 - b. Permit the partial battery discharge to occur; or
 - c. Utilize a temporary charger such as a CPS shelf or battery charger to supplement the plant rectifiers that remain in service.

Prepare for the retrofit by taking one or a combination of the steps noted. If a partial battery discharge is to be permitted, it is suggested that a discharge test of the office batteries be performed prior to the retrofit to determine that battery reserve is adequate and there is confidence in their ability to support a portion of the office load without service risk.

2. Examine and document wire colors for all I/O alarm or load conductors terminated on TB101 to TB104 of the CP1 card inside the J85501D ECS controller or connected to the existing ECS CP5 LVD/Fuse card. Cross reference each conductor to its ultimate termination at TB1 to TB8 of the J85501M1 1U Vector alarm card (as detailed on Fig. 2-7 of its product manual) or at TB501 of the Vector Fuse Board. Remove these terminal

blocks and conductors from the ECS controller enclosure and secure them nearby for ultimate rerouting into their 1U Vector assignments. Office alarms may activate at this point if open-on-alarm signals are being used.

3. Starting with the ECS rectifiers located in the bottom shelf (if present) of the plant, disconnect each rectifier from the ECS controller by performing the following steps in turn:
 - a. Turn off the rectifier.
 - b. Loosen the cover under its output CB switch and disconnect its controller ribbon cable connection. Adjust its internal HVSD setting at dip switch positions 1-4 (located to the immediate left of the ribbon cable connection) to the highest value recognized for the rectifier as shown on its chart.
 - c. Turn the rectifier back on.
 - d. If necessary, make an adjustment to its FL Volts Adjust potentiometer to adjust its output current to a level similar to the remaining rectifiers in the plant. Perfect adjustment is not necessary or possible.

Rectifiers on the top shelf may be turned off and removed from their shelf after the remainder of the plant rectifiers have been conditioned per this step.

4. Remove the top J85702B ECS rectifier shelf as follows:
 - a. Turn off the AC input breakers for the three rectifier positions at the AC service panel. Follow lock-out / tag-out procedures as necessary. Verify that AC voltage is NOT present on the three AC plugs on the front of the rectifier shelf.
 - b. Remove the shelf covers from the rectifier shelf and disconnect the incoming AC conductors, removing them from their entrance, out the left or right side of the shelf. Pull these conductors and their conduits free from the ECS shelf and secure in a fashion to permit the shelf removal.
 - c. Using insulated tools and adequate protection over all exposed metal framework, disconnect the shelf output cable connections at the (+) and (-) rectifier shelf buses at the rear of the rectifier shelf. If rear access to the frame is not available, these removals will need to be accomplished by reaching through the ECS shelf from the front, requiring extra caution. Retain this hardware for reuse with the PXS rectifier shelf. Insulate and secure these conductors in a safe manner at the rear of the frame. Disconnect the shelf ribbon cable from its connection at the rear right of the shelf. Leave the ribbon cable in place.
 - d. Remove the ECS rectifier shelf from the ECS frame by removing (and saving for reuse) the four frame mounting screws on its left and right bracket assembly.
5. Mount the top J85702H1 PXS rectifier shelf into the lower portion of the space vacated by the shelf in Step-4:
 - a. Place a thin layer of No-Ox onto the PXS shelf rear busbar connections and mount the 846745263 rear output buses furnished with the PXS shelf onto these locations at the rear of the shelf. Uses the M8 hardware furnished with the shelf and torque these connections to 160 in-lbs.
 - b. Slide the PXS shelf into place on the lower portion of the vacated frame space.
 - c. Secure the PXS shelf to the frame upright reusing the frame mounting screws removed in Step-4.
 - d. Using insulated tools and adequate protection over all exposed metal framework, connect the reused shelf output cables removed in Step-4, to the (+) and (-) 846745263 rear output buses of the PXS shelf, reusing the hardware previously removed from the ECS rectifier shelf. Once again, if rear access to the frame is not available, these connections will need to be accomplished by reaching through the PXS shelf from the front, requiring extra caution. Torque these connections to 135 in-lbs.



PXS Shelf Rear Output Cables

- e. Remove the left and right shelf covers from the PXS shelf. Open KO's in the right-side KO mounting plate and/or use KO reducers on the existing left side openings as necessary and terminate any reused conduit drops for the three AC circuits removed from the ECS shelf into the PXS shelf. Extend any right side circuits using the extension wire nut assemblies (furnished with the PXS shelf) under the right cover of the shelf, if necessary. Remove and dispose of the clear plastic cover over the left quarter of the shelf to permit access for the right side cables. Replace the right cover, but leave the left AC cover off or loosely attached when completed as a fourth circuit must still be added from either the next ECS shelf below it or from the AC service panel.



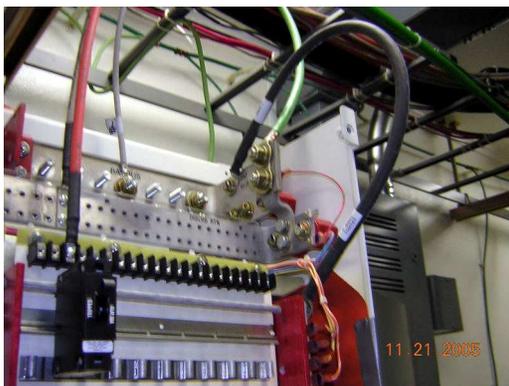
**PXS Shelf in Place with Both
Left & Right Side AC Wiring**

6. Mount the J85501M1 1U Vector controller into the upper 2 inches of space vacated by the shelf in Step-4. Use the new mounting brackets furnished in the retrofit kit and new frame mounting screws to set it at the same depth as the ECS controller shell and verify that enough clearance is left below it to permit the new 596A2 rectifiers to mount and be freely inserted into the PXS shelf located directly below it.



1U Vector with Drawer Extended

7. Slide the drawer for the 1U Vector open and verify that the GCM card is firmly secured onto the BUJ termination card and that the dip switches, LVD and voltage selection jumpers are correctly positioned for your application. Refer to Fig. 2-6 of the 1U Vector product manual for details. Route the CC848778415 combo power/sense & LVD (if equipped) cable set into it through the opening on the left side of the drawer to their plug connections at P5 & J13 on the rear of the BUJ card of the 1U Vector. Insure that sufficient slack exists to permit the 1U Vector drawer to slide open and closed. Route the other end of these cables out the rear of the shelf, up the rear of the frame, and out onto the inside of the distribution cover door to the right edge of the ECS CP5 LVD/Fuse card. Use wire ties or 12-cord to secure this cable in place.
8. Route the serial bus cable set for the initial PXS rectifier shelf (furnished with it) through the opening on the left side of the 1U Vector drawer to its connection on J7 or J8 of the BUJ card of the 1U Vector. Connect at both ends and secure with wire ties or 12-cord, insuring free operation of the 1U Vector drawer and no interference with the left rectifier mounting position of the PXS rectifier shelf.
9. Identify whether the ECS plant LVBD option is in place. If so, some action will be required to strap out the contactor during the replacement of the ECS CP5 LVD/Fuse card if battery backup is to be furnished throughout. The period without battery reserve should be 2 minutes or less while this card is replaced with the new Vector Fuse Board. If this is unacceptable, one or two temporary flex 2 AWG w/1-hole lug cable assemblies (p/o 847802931 cable kit - 170A capacity each) may be used to tie the charge battery and discharge buses together in the top of the cabinet. Extreme care, insulated tools, and adequate protection of grounded surfaces must be used when adding and removing these temporary LVBD straps. The following pictures show one such cable in place on the ED83241-30 DC Distribution Panel used in the majority of these ECS plants. Note that the distribution panel end terminates onto one of the two "round" hot bus nuts at the right edge of the distribution panel.



LVBD Temporary Strap on ED83241-30 ECS Distribution Panel

A similar strap may be used near the rear center of the ED83138-30 DC Distribution Panel in the newest J85500D3 L-23 to L-27 versions of this panel.

10. With the LVBD option (if equipped) defeated or ignored (Step-9), remove the P501, P504 and P506 cable sets from the left edge of the ECS CP5 LVD/Fuse card as it is viewed on the inside of the distribution panel door. The ECS controller will lose power and the LVBD contactor (if equipped) will open (de-energize) at this point. Remove all other connections to the ECS CP5 LVD/Fuse card and remove it from the panel door. Set the voltage option jumpers P502, P503, and P505 on the replacement Vector Fuse Board, furnished in the retrofit kit for the correct system voltage. Mount it in place of the ECS CP5 card, and connect the P501, P504 and P506 cable sets onto its left edge first, then the 1U Vector's P5 and J13 cables onto its right edge. The 1U Vector controller should boot up and the LVBD contactor (if equipped) will close (energize) as these cables are plugged in.

Add any other connections onto E501, E502, and TB501 of the Vector Fuse Board as necessary. After boot up of the 1U Vector controller, refer to the Fig. 2-5 menu map and/or Chapter 4 of the 1U Vector product manual and set configuration items as required for the site. At a minimum, program the proper float voltage, shunt size, alarm and LVD thresholds at this point.



ECS CP5 LVD/Fuse Card



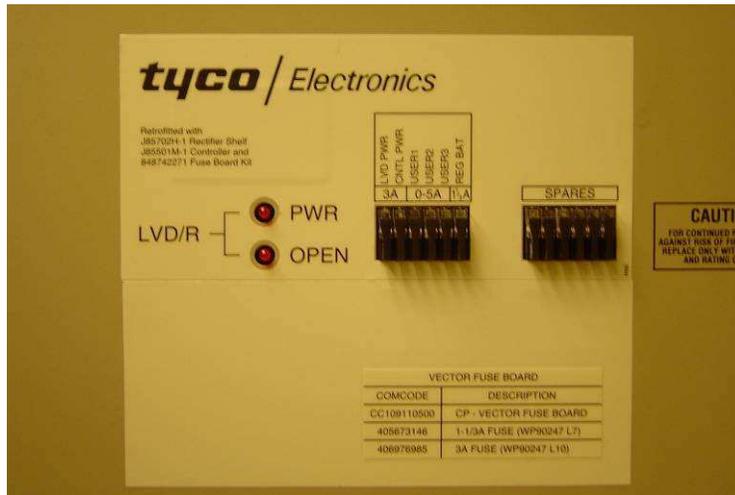
Replacement Vector Fuse Board

11. Turn on AC power for the first three (or as many as are provided) rectifier positions (right to left) of the initial PXS shelf and insert these 596A2 rectifiers onto the shelf. ID them appropriately, using their power/ID switches and insure that these IDs match those identified for their reused AC input panel circuits. If necessary, adjust the 1U Vector float voltage set point to have them take a portion (or all) of the office load off the remaining ECS rectifiers left in the plant.
12. After being satisfied that the initial PXS rectifiers are supporting their portion of the office load, remove the next shelf's ECS rectifiers (if present) and the 2nd ECS rectifier shelf (if present) by repeating the procedure shown in Step-4 for the initial shelf.
13. Either add a new circuit from the AC panel or cut back (left side) / reroute and extend (right side) an AC input circuit from the 2nd ECS rectifier shelf into the left side of the initial PXS shelf. Replace its left side AC cover, turn on AC power for it, and insert a 4th 596A2 rectifier (if provided). ID it appropriately using its power/ID switch. Verify that it assumes a portion of the office load, load-sharing with the other rectifiers of the PXS shelf.
14. Mount a second J85702H1 PXS rectifier shelf (if provided) into the lower portion of the space vacated by the shelf removed in Step-12, repeating the procedure shown in Step-5 for the initial shelf. If a second PXS shelf is not added at this time, the space opened by the ECS shelf removal may be filled with a 12 inch blank cover.

Assuming that a 2nd PXS shelf is provided, connect either new or reused AC input circuits from the removed ECS rectifiers into the 2nd PXS shelf in a fashion similar to that used for the initial PXS shelf. A 2 inch blank

cover may be used to fill the unused space at the top of the added PXS shelf. Route, secure, and connect the serial bus cable set furnished with the 2nd PXS shelf up to its appropriate connection on the initial PXS shelf. Turn on AC power for the equipped rectifier positions of the 2nd PXS shelf and insert these 596A2 rectifiers. ID them appropriately, using their power/ID switches. Verify that they assume a portion of the office load, load-sharing with the other PXS rectifiers.

15. Route the TB101 to TB104 alarm cabling of the ECS controller from Step-2 into the left side of the 1U Vector, insuring that sufficient slack exists to permit the drawer to slide open and closed when securing this cabling with wire ties or 12-cord. Terminate this cabling onto TB1 to TB8 of the 1U Vector as detailed on Fig. 2-7 of its product manual. Reconnect any additional ABS circuits previously assigned to the ECS CP5 LVD/Fuse card onto replacement assignments of the Vector Fuse Board. Mount additional standoffs and the rear cover from the retrofit kit to protect the inside of the Vector Fuse Board. Install the Vector Fuse Board retrofit label from the retrofit kit onto the front of the distribution door. Cover the LVD/R stenciling of this label with the Vector Fuse Board spare parts portion of the label if the LVD option is not equipped in the plant.



Vector Fuse Board Retrofit Label

If temperature compensation thermistors or 210E thermal probe multiplexer(s) are being added to monitor battery temperatures, connect and wire them to their terminations on J1 or J3 of the 1U Vector BUJ card or to TB5 or TB6 of its Alarm Board, and complete the Temperature Compensation configuration as described in the 1U Vector product manual.

16. Test and observe alarms (RFA, ACF, MJF, BD, etc.) and features for the retrofitted power plant as specified by the customer's requirements. Verify that alarms are transmitted properly to the alarm monitoring center. Test the operation of the LVBD contactor (if equipped) through a combination of temporarily raising the programming for the LVD disconnect & reconnect thresholds and lowering of the plant voltage. Return all programming to normal levels when completed and remove any temporary LVD contactor cable strap(s) added previously in Step-9.
17. Remove the circuit pack(s) from the retired ECS controller and replace its door with the blank cover furnished in the retrofit kit. The 1U Vector product manual and any other site documentation may be conveniently stored in the right half of the emptied ECS controller shell.

If temporary chargers were connected or any office loads were turned down in Step-1, they may be disconnected or returned to service as is appropriate.

3.0 Retrofit of +24V ECS Plant w/Cabled Rectifier Shelves

This MOP replaces the J85501D ECS controller, 364-type ECS rectifiers, J85702C (+24V) ECS rectifier shelves, and the ECS CP5 LVD/Fuse card of a H569-420 (+24V half-height) ECS plant with a J85501M1 1U Vector controller, 596-series GPS rectifiers, J85702H1 PXS rectifier shelf(ves), and a CC109110500 Vector Fuse Board. The ECS rectifiers, shelves, and controller cards will be removed from the frame for possible use elsewhere in the customer's network or kept as spares.

This MOP shall be reserved for situations where access space to the right and rear of the frame is available for routing the new shelf output cables up to terminations within the ECS distribution panel of the plant.



H569-420 Retrofitted ECS Plant

Except for the rectifier shelf output cabling, most of the parts required for this retrofit activity are furnished as part of a common ECS Plant Retrofit Kit per 848742271 plus the required controller, rectifier shelf(ves) and rectifiers. AC input circuits for the existing ECS rectifiers will be reused and/or supplemented as necessary for the new rectifiers and shelf (ves). Plant batteries will be retained along with all existing distribution within the existing ECS power bay.

Note that even though there is room for up to 4 GPS 596-series rectifiers on each shelf of the retrofitted plant and larger capacity rectifiers (125 amp vs. 100 amp) may be used, the total plant load must still be limited to the 600 amp capacity of the load shunt in this plant.

3.1 Retrofit Steps

1. Evaluate the plant load and rectifier capacity relationships During this retrofit, one rectifier shelf (maximum 3 ECS rectifiers) will be removed from service at a time, so the plant load must be less than the initial rectifier capacity less this removed capacity (maximum 150 amps or the batteries will be called upon (discharge) to supply the difference during the retrofit. Single shelf ECS plants or plants without AC service to an unequipped rectifier shelf will have no rectifier capacity while the shelf is replaced. Three options for addressing a load > the working rectifier capacity are:
 - a. Lower the office load somewhat by turning down unneeded / spare equipment loads;
 - b. Permit the partial battery discharge to occur; or
 - c. Utilize a temporary charger such as a CPS shelf or battery charger to supplement the plant rectifiers that remain in service.

Prepare for the retrofit by taking one or a combination of the steps noted. If a partial battery discharge is to be permitted, it is suggested that a discharge test of the office batteries be performed prior to the retrofit to

determine that battery reserve is adequate and there is confidence in their ability to support a portion of the office load without service risk.

2. Examine and document wire colors for all I/O alarm or load conductors terminated on TB101 to TB104 of the CP1 card inside the J85501D ECS controller or connected to the existing ECS CP5 LVD/Fuse card. Cross reference each conductor to its ultimate termination at TB1 to TB8 of the J85501M1 1U Vector alarm card (as detailed on Fig. 2-7 of its product manual) or at TB501 of the Vector Fuse Board. Remove these terminal blocks and conductors from the ECS controller enclosure and secure them nearby for ultimate rerouting into their 1U Vector assignments. Office alarms may activate at this point if open-on-alarm signals are being used.
3. Starting with the ECS rectifiers located in the bottom shelf (if present) of the plant, disconnect each rectifier from the ECS controller by performing the following steps in turn:
 - a. Turn off the rectifier.
 - b. Loosen the cover under its output CB switch and disconnect its controller ribbon cable connection. Adjust its internal HVSD setting at dip switch positions 1-4 (located to the immediate left of the ribbon cable connection) to the highest value recognized for the rectifier as shown on its chart.
 - c. Turn the rectifier back on.
 - d. If necessary, make an adjustment to its FL Volts Adjust potentiometer to adjust its output current to a level similar to the remaining rectifiers in the plant. Perfect adjustment is not necessary or possible.

Rectifiers on the top shelf may be turned off and removed from their shelf after the remainder of the plant rectifiers have been conditioned per this step.

4. Remove the top J85702C ECS rectifier shelf as follows:
 - a. Turn off the AC input breakers for the three rectifier positions at the AC service panel. Follow lock-out / tag-out procedures as necessary. Verify that AC voltage is NOT present on the three AC plugs on the front of the rectifier shelf.
 - b. Remove the shelf covers from the rectifier shelf and disconnect the incoming AC conductors, removing them from their entrance, out the left or right side of the shelf. Pull these conductors and their conduits free from the ECS shelf and secure in a fashion to permit the shelf removal.
 - c. Using insulated tools and adequate protection over all exposed metal framework, disconnect the shelf output cable connections at the (+) and (-) rectifier shelf buses at the rear of the rectifier shelf. Disconnect and remove these conductors also from their plant end terminations on the charge battery and charge ground buses of the ECS distribution panel. Retain this hardware for reuse with the PXS rectifier shelf.
 - d. Disconnect the shelf ribbon cable from its connection at the rear right of the shelf. Leave the ribbon cable in place.
 - e. Remove the ECS rectifier shelf from the ECS frame by removing (and saving for reuse) the four frame mounting screws on its left and right bracket assembly.
5. Mount the top J85702H1 PXS rectifier shelf into the lower portion of the space vacated by the shelf in Step-4:
 - a. Slide the PXS shelf into place on the lower portion of the vacated frame space.
 - b. Secure the PXS shelf to the frame upright reusing the frame mounting screws removed in Step-4.
 - c. Remove the left and right shelf covers from the PXS shelf. Prepare four lengths of flex 00 AWG cable as output conductors for the shelf, two each, positive (hot) and negative (return). Using 2-hole crimp connectors and No-Ox, connect to the internal bus works under the right side cover of the J85702H1 L-8 PXS shelf, route out the right side of the shelf, and up to the ECS distribution panel.
 - d. Using insulated tools and adequate protection over all exposed metal framework, connect the shelf output cables in a back-to-back arrangement for each polarity onto the charge battery (+) and charge ground (-) bus positions freed up by the ECS shelf cables removed in Step-4, using 2-hole crimp connectors and No-Ox and reusing the hardware previously removed from the ECS rectifier shelf cabling. Torque these connections to 240 in-lbs.

- e. The J85702H1 L-8 PXS shelf only permits incoming AC wiring access from the left side. Use KO reducers on the existing left side openings as necessary and terminate any reused conduit drops for the three AC circuits removed from the ECS shelf into the PXS shelf. Reroute and extend any right-side AC wiring down the left side of the frame or add new circuits from the AC service panel as necessary. Replace the right cover, but leave the left AC cover off or loosely attached when completed as a fourth circuit must still be added from either the next ECS shelf below it or from the AC service panel.



**L-8 PXS Shelf in Place with
Left Side AC Wiring Only**



1U Vector with Drawer Extended

6. Mount the J85501M1 1U Vector controller into the upper 2 inches of space vacated by the shelf in Step-4. Use the new mounting brackets furnished in the retrofit kit and new frame mounting screws to set it at the same depth as the ECS controller shell and verify that enough clearance is left below it to permit the new 596-series rectifiers to mount and be freely inserted into the PXS shelf located directly below it.
7. Slide the drawer for the 1U Vector open and verify that the GCM card is firmly secured onto the BUJ termination card and that the dip switches, LVD and voltage selection jumpers are correctly positioned for your application. Refer to Fig. 2-6 of the 1U Vector product manual for details. Route the CC848778415 combo power/sense & LVD (if equipped) cable set into it through the opening on the left side of the drawer to their plug connections at P5 & J13 on the rear of the BUJ card of the 1U Vector. Insure that sufficient slack exists to permit the 1U Vector drawer to slide open and closed. Route the other end of these cables out the rear of the shelf, up the rear of the frame, and out onto the inside of the distribution cover door to the right edge of the ECS CP5 LVD/Fuse card. Use wire ties or 12-cord to secure this cable in place.
8. Route the serial bus cable set for the initial PXS rectifier shelf (furnished with it) through the opening on the left side of the 1U Vector drawer to its connection on J7 or J8 of the BUJ card of the 1U Vector. Connect at both ends and secure with wire ties or 12-cord, insuring free operation of the 1U Vector drawer and no interference with the left rectifier mounting position of the PXS rectifier shelf.
9. Identify whether the ECS plant LVBD option is in place. If so, some action will be required to strap out the contactor during the replacement of the ECS CP5 LVD/Fuse card if battery backup is to be furnished throughout. The period without battery reserve should be 2 minutes or less while this card is replaced with the new Vector Fuse Board. If this is unacceptable, one (400A max capacity) or two temporary flex 0000 AWG cable assemblies (846666329) may be used to tie the charge and LVBD battery buses together in the top of the cabinet. Use care, insulated tools, and adequate protection of grounded surfaces when adding and removing these temporary LVBD straps to their terminations near the rear center of the ED83138-30 DC Distribution Panel of the H569-420 +24V ECS plant.
10. With the LVBD option (if equipped) defeated or ignored (Step-9), remove the P501, P504 and P506 cable sets from the left edge of the ECS CP5 LVD/Fuse card as it is viewed on the inside of the distribution panel door. The ECS controller will lose power and the LVBD contactor (if equipped) will open (de-energize) at this point. Remove all other connections to the ECS CP5 LVD/Fuse card and remove it from the panel door. Set the

voltage option jumpers P502, P503, and P505 on the replacement Vector Fuse Board, furnished in the retrofit kit for the correct system voltage. Mount it in place of the ECS CP5 card, and connect the P501, P504 and P506 cable sets onto its left edge first, then the 1U Vector's P5 and J13 cables onto its right edge. The 1U Vector controller should boot up and the LVBD contactor (if equipped) will close (energize) as these cables are plugged in.

Add any other connections onto E501, E502, and TB501 of the Vector Fuse Board as necessary. After boot up of the 1U Vector controller, refer to the Fig. 2-5 menu map and/or Chapter 4 of the 1U Vector product manual and set configuration items as required for the site. At a minimum, program the proper float voltage, shunt size, alarm and LVD thresholds at this point.



ECS CP5 LVD/Fuse Card



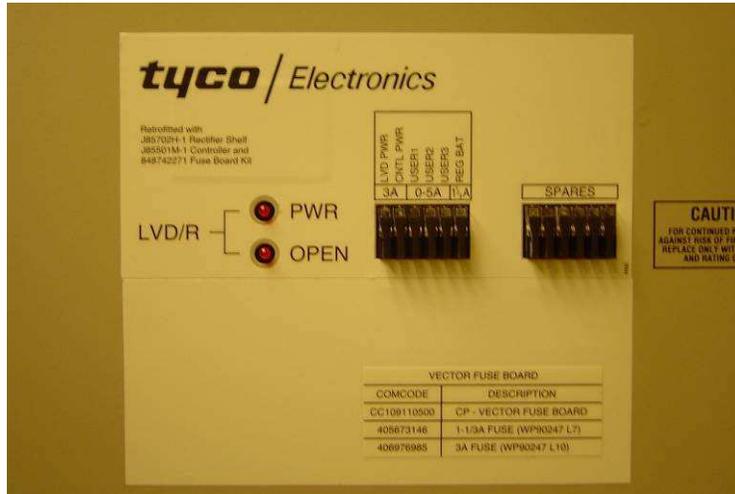
Replacement Vector Fuse Board

11. Turn on AC power for the first three (or as many as are provided) rectifier positions (right to left) of the initial PXS shelf and insert these 596-series rectifiers onto the shelf. ID them appropriately, using their power/ID switches and insure that these IDs match those identified for their reused AC input panel circuits. If necessary, adjust the 1U Vector float voltage set point to have them take a portion (or all) of the office load off the remaining ECS rectifiers left in the plant.
12. After being satisfied that the initial PXS rectifiers are supporting their portion of the office load, remove the next shelf's ECS rectifiers (if present) and the 2nd ECS rectifier shelf (if present) by repeating the procedure shown in Step-4 for the initial shelf.
13. Either add a new circuit from the AC panel or cut back (left side) / reroute and extend (right side) an AC input circuit from the 2nd ECS rectifier shelf into the left side of the initial PXS shelf. Replace its left side AC cover, turn on AC power for it, and insert a 4th 596-series rectifier (if provided). ID it appropriately using its power/ID switch. Verify that it assumes a portion of the office load, load-sharing with the other rectifiers of the PXS shelf.
14. Mount a second J85702H1 L-8 PXS rectifier shelf (if provided) into the lower portion of the space vacated by the shelf removed in Step-12, repeating the procedure shown in Step-5 for the initial shelf. If a second PXS shelf is not added at this time, the space opened by the ECS shelf removal may be filled with a 12 inch blank cover.

Assuming that a 2nd PXS shelf is provided, connect either new or reused AC input circuits from the removed ECS rectifiers into the 2nd PXS shelf in a fashion similar to that used for the initial PXS shelf. A 2 inch blank cover may be used to fill the unused space at the top of the added PXS shelf. Route, secure, and connect the serial bus cable set furnished with the 2nd PXS shelf up to its appropriate connection on the initial PXS shelf. Turn on AC power for the equipped rectifier positions of the 2nd PXS shelf and insert these 596-series rectifiers. ID them appropriately, using their power/ID switches. Verify that they assume a portion of the office load, load-sharing with the other PXS rectifiers.

15. Route the TB101 to TB104 alarm cabling of the ECS controller from Step-2 into the left side of the 1U Vector, insuring that sufficient slack exists to permit the drawer to slide open and closed when securing this cabling

with wire ties or 12-cord. Terminate this cabling onto TB1 to TB8 of the 1U Vector as detailed on Fig. 2-7 of its product manual. Reconnect any additional ABS circuits previously assigned to the ECS CP5 LVD/Fuse card onto replacement assignments of the Vector Fuse Board. Mount additional standoffs and the rear cover from the retrofit kit to protect the inside of the Vector Fuse Board. Install the Vector Fuse Board retrofit label from the retrofit kit onto the front of the distribution door. Cover the LVD/R stenciling of this label with the Vector Fuse Board spare parts portion of the label if the LVD option is not equipped in the plant.



Vector Fuse Board Retrofit Label

If temperature compensation thermistors or 210E thermal probe multiplexer(s) are being added to monitor battery temperatures, connect and wire them to their terminations on J1 or J3 of the 1U Vector BUJ card or to TB5 or TB6 of its Alarm Board, and complete the Temperature Compensation configuration as described in the 1U Vector product manual.

16. Test and observe alarms (RFA, ACF, MJF, BD, etc.) and features for the retrofitted power plant as specified by the customer's requirements. Verify that alarms are transmitted properly to the alarm monitoring center. Test the operation of the LVBD contactor (if equipped) through a combination of temporarily raising the programming for the LVD disconnect & reconnect thresholds and lowering of the plant voltage. Return all programming to normal levels when completed and remove any temporary LVD contactor cable strap(s) added previously in Step-9.
17. Remove the circuit pack(s) from the retired ECS controller and replace its door with the blank cover furnished in the retrofit kit. The 1U Vector product manual and any other site documentation may be conveniently stored in the right half of the emptied ECS controller shell.

If temporary chargers were connected or any office loads were turned down in Step-1, they may be disconnected or returned to service as is appropriate.

4.0 Retrofit of -48V/+24V ECS Plants w/Busbar Backbone

This MOP replaces the J85501D ECS controller, 364-type ECS rectifiers, J85702B (-48V) or J85702C (+24V) ECS rectifier shelves, and the ECS CP5 LVD/Fuse card of a J85500E (+24V), J85500G2 (-48V), or H569-403 (+24V) ECS plant with a J85501M1 1U Vector controller, 596-type GPS rectifiers, J85702H1 PXS rectifier shelf(ves), and a CC109110500 Vector Fuse Board. The ECS rectifiers, shelves, and controller cards will be removed from the frame for possible use elsewhere in the customer's network or kept as spares.



J85500E2 ECS Plant



Retrofitted ECS Plant

Parts required for this retrofit activity are furnished as part of a common ECS Plant Retrofit Kit per 848742271 plus the required controller, rectifier shelf (ves) and rectifiers. AC input circuits for the existing ECS rectifiers will be reused and/or supplemented as necessary for the new rectifiers and shelf (ves). Plant batteries will be retained along with all existing distribution within the existing ECS power bay.

Note that even though there is room for up to four GPS 596-series rectifiers on each shelf of the retrofitted plant and, for +24V systems, larger capacity rectifiers (125 amp vs. 100 amp) may be used, the total plant load must still be limited to the 1200 amp (J85500E) or 600 amp (J85500G2 or H569-403) capacity of the load shunt in the plant.

4.1 Retrofit Steps

1. Evaluate the plant load and rectifier capacity relationships. During this retrofit, one rectifier shelf (maximum 3 ECS rectifiers) will be removed from service at a time, so the plant load must be less than the initial rectifier capacity less this removed capacity (maximum 150 amps (-48V) or 300 amps (+24V)) or the batteries will be called upon (discharge) to supply the difference during the retrofit. Three options for addressing a load > the working rectifier capacity are:
 - a. Lower the office load somewhat by turning down unneeded / spare equipment loads;
 - b. Permit the partial battery discharge to occur; or
 - c. Utilize a temporary charger such as a CPS shelf or battery charger to supplement the plant rectifiers that remain in service.

Prepare for the retrofit by taking one of the steps noted. If a partial battery discharge is to be permitted, it is suggested that a discharge test of the office batteries be performed prior to the retrofit to determine that battery

reserve is adequate and there is confidence in their ability to support a portion of the office load without service risk.

2. Examine and document wire colors for all I/O alarm or load conductors terminated on TB101 to TB104 of the CP1 card inside the J85501D ECS controller or connected to the existing ECS CP5 LVD/Fuse card. Cross reference each conductor to its ultimate termination at TB1 to TB8 of the J85501M1 1U Vector alarm card (as detailed on Fig. 2-7 of its product manual) or at TB501 of the Vector Fuse Board. Remove these terminal blocks and conductors from the ECS controller enclosure and secure them nearby for ultimate rerouting into their 1U Vector assignments. Office alarms may activate at this point if open-on-alarm signals are being used.
3. Starting with the ECS rectifiers located in the bottom shelves of the plant, disconnect each rectifier from the ECS controller by performing the following steps in turn:
 - a. Turn off the rectifier.
 - b. Loosen the cover under its output CB switch and disconnect its controller ribbon cable connection. Adjust its internal HVSD setting at dip switch positions 1-4 (located to the immediate left of the ribbon cable connection) to the highest value recognized for the rectifier as shown on its chart.
 - c. Turn the rectifier back on.
 - d. If necessary, make an adjustment to its FL Volts Adjust potentiometer to adjust its output current to a level similar to the remaining rectifiers in the plant. Perfect adjustment is not necessary or possible.

Rectifiers on the top shelf may be turned off and removed from their shelf after the remainder of the plant rectifiers have been conditioned per this step.

4. Remove the top J85702B or J85702C ECS rectifier shelf as follows:
 - a. Turn off the AC input breakers for the three rectifier positions at the AC service panel. Follow lock-out / tag-out procedures as necessary. Verify that AC voltage is NOT present on the three AC plugs on the front of the rectifier shelf.
 - b. Remove the shelf covers from the rectifier shelf and disconnect the incoming AC conductors, removing them from their entrance, out the left or right side of the shelf. Pull these conductors and their conduits free from the ECS shelf and secure in a fashion to permit the shelf removal.
 - c. Using insulated tools and adequate protection over all exposed metal framework, especially the framework upright near the rectifier clips of the far-right position on the shelf, disconnect the shelf busbar connections to the (+) and (-) vertical bars at the rear of the frame. Retain this hardware (2, 5/16 nuts, washers, and lock washers per busbar) for reuse with the PXS rectifier shelf.
 - d. Remove the ECS rectifier shelf from the ECS frame by removing (and saving for reuse) the four frame mounting screws on its left and right bracket assembly. When extracting the shelf from the frame, reach back to the vertical bars to flex the (+) and (-) side insulators of the vertical bars flat, to avoid damage to them as the shelf busbars slide forward off their connections to the vertical frame busbars. Pull the shelf straight forward, taking care to maintain a safe distance between the rectifier clips of the far-right position on the shelf and the insulated frame upright.
 - e. Disconnect the shelf ribbon cable from its connection at the rear right of the shelf as it is extracted. Leave the ribbon cable in place.



**Fiber Protection for Right Position
Clips on ECS Rectifier Shelf**



Top ECS Rectifier Shelf Removed

6. Mount the top J85702H1 PXS rectifier shelf into the lower portion of the space vacated by the shelf in Step-4:
 - a. Inspect and, if necessary, clean the plant vertical bars where the ECS shelf was removed. Observe whether this assembly consists of 4, ¼ inch thick busbars or 2, ¼ inch thick busbars and set the distance for the rear shelf L-shaped busbars on the PXS shelf accordingly. No-Ox and secure these buses with M8 hardware furnished with the PXS shelf and torque to 160 in-lbs.
 - b. Place a thin layer of No-Ox onto the PXS shelf L-shaped rear busbars and slide the PXS shelf into place on the lower portion of the vacated space, insuring that the rear shelf busbars mate with the studs of the (+) and (-) vertical frame busbars. Once again, as the rear shelf busbars near the vertical frame busbars, reach back to the vertical bars to flex the (+) and (-) side insulators of the vertical bars flat, to avoid damage to them as the shelf busbars slide backward onto their connections to the vertical frame busbars. It may also be necessary to compress the vertical busbars together in order for them to fit properly between the PXS shelf rear busbars.
 - c. Secure the PXS shelf to the frame upright reusing the frame mounting screws removed in Step-4.
 - d. Using insulated tools and adequate protection over all exposed metal framework, connect the shelf busbar connections to the (+) and (-) vertical bars at the rear of the frame, reusing the 5/16 hardware previously used for this purpose with the removed ECS rectifier shelf. Torque these connections to 135 in-lbs.
 - e. Remove the left and right AC covers from the PXS shelf. Open KO's in the right-side KO mounting plate or use KO reducers on the existing left side openings as necessary and terminate the reused conduit drops for the three AC circuits removed from the ECS shelf into the PXS shelf. Extend any right side circuits using the extension wire nut assemblies (furnished with the PXS shelf) under the right cover of the shelf, if necessary. Remove and dispose of the clear plastic cover over the left quarter of the shelf to permit access for the right side cables. Replace the right AC cover, but leave the left AC cover off or loosely attached when completed as a fourth circuit must still be added from either the next ECS shelf below it or from the AC service panel.



**PXS Shelf Rear Busbars Adjusted for Width of
ECS Bay Backbone Busbars**



**PXS Shelf in Place with Both
Left & Right Side AC Wiring**

10. Mount the J85501M1 1U Vector controller into the upper 2 inches of space vacated by the shelf in Step-4. Use the new mounting brackets furnished in the retrofit kit and new frame mounting screws to set it at the same depth as the ECS controller shell and verify that enough clearance is left below it to permit the new 596-series rectifiers to mount and be freely inserted into the PXS shelf located directly below it.



1U Vector with Drawer Extended



**PXS Rectifier Shelf & 1U Vector Mounted in 1
ECS Rectifier Shelf Space**

11. Slide the drawer for the 1U Vector open and verify that the GCM card is firmly secured onto the BUJ termination card and that the dip switches, LVD and voltage selection jumpers are correctly positioned for your application. Refer to Fig. 2-6 of the 1U Vector product manual for details. Route the CC848778415 combo power/sense & LVD (if equipped) cable set into it through the opening on the left side of the drawer to their plug connections at P5 & J13 on the rear of the BUJ card of the 1U Vector. Insure that sufficient slack exists to permit the 1U Vector drawer to slide open and closed. Route the other end of these cables out the rear of the shelf, up the rear of the frame, and out onto the inside of the distribution cover door to the right edge of the ECS CP5 LVD/Fuse card. Use wire ties or 12-cord to secure this cable in place.
12. Route the serial bus cable set for the initial PXS rectifier shelf (furnished with it) through the opening on the left side of the 1U Vector drawer to its connection on J7 or J8 of the BUJ card of the 1U Vector. Connect at both ends and secure with wire ties or 12-cord, insuring free operation of the 1U Vector drawer and no interference with the left rectifier mounting position of the PXS rectifier shelf.
13. Identify whether the ECS plant LVBD option is in place. If so, some action will be required to strap out the contactor during the replacement of the ECS CP5 LVD/Fuse card if battery backup is to be furnished

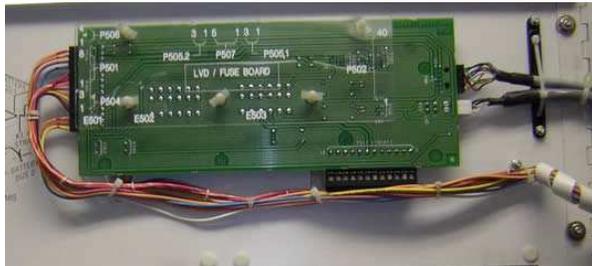
throughout. The period without battery reserve should be 2 minutes or less while this card is replaced with the new Vector Fuse Board. If this is unacceptable:

- a. for the J85500E +24V plant, a battery strap busbar (846650901) may be added between the charge and discharge battery buses directly beside the LVBD contactor assembly or
 - b. for the J85500G2 -48V or H569-403 +24V plants, one (400A max capacity) or two temporary flex 0000 AWG cable assemblies (846666329) may be used to tie the charge and LVBD battery buses together in the top of the cabinet.
14. With the LVBD option (if equipped) defeated or ignored (Step-9), remove the P501, P504 and P506 cable sets from the left edge of the ECS CP5 LVD/Fuse card as it is viewed on the inside of the distribution panel door. The ECS controller will lose power and the LVBD contactor (if equipped) will open (de-energize) at this point. Remove all other connections to the ECS CP5 LVD/Fuse card and remove it from the panel door. Set the voltage option jumpers P502, P503, and P505 on the replacement Vector Fuse Board, furnished in the retrofit kit for the correct system voltage. Mount it in place of the ECS CP5 card, and connect the P501, P504 and P506 cable sets onto its left edge first, then the 1U Vector's P5 and J13 cables onto its right edge. The 1U Vector controller should boot up and the LVBD contactor (if equipped) will close (energize) as these cables are plugged in.

Add any other connections onto E501, E502, and TB501 of the Vector Fuse Board as necessary. After boot up of the 1U Vector controller, refer to the Fig. 2-5 menu map and/or Chapter 4 of the 1U Vector product manual and set configuration items as required for the site. At a minimum, program the proper float voltage, shunt size, alarm and LVD thresholds at this point.



ECS CP5 LVD/Fuse Card



Replacement Vector Fuse Board

15. Turn on AC power for the first three (or as many as are provided) rectifier positions (right to left) of the initial PXS shelf and insert these 596-series rectifiers onto the shelf. ID them appropriately, using their power/ID switches and insure that these IDs match those identified for their reused AC input panel circuits. If necessary, adjust the 1U Vector float voltage set point to have them take a portion (or all) of the office load off the remaining ECS rectifiers left in the plant.



3 PXS Rectifiers in Service



**8 PXS Rectifiers with
All ECS Rectifiers Removed**

16. After being satisfied that the initial PXS rectifiers are supporting their portion of the office load, remove the next shelf's ECS rectifiers and the 2nd ECS rectifier shelf by repeating the procedure shown in Step-4 for the initial shelf.
17. Either add a new circuit from the AC panel or cut back as necessary and connect an AC input circuit from the 2nd ECS rectifier shelf into the left side of the initial PXS shelf, replace its left side AC cover, turn on AC power for it, and insert a 4th 596-series rectifier (if provided). ID it appropriately using its power/ID switch. Verify that it assumes a portion of the office load, load-sharing with the other rectifiers of the PXS shelf.
18. Mount a second J85702H1 PXS rectifier shelf (if provided) into the lower portion of the space vacated by the shelf removed in Step-12, repeating the procedure shown in Step-5 for the initial shelf. If a second PXS shelf is not added at this time, the space opened by the ECS shelf removal may be filled with a 12 inch blank cover.

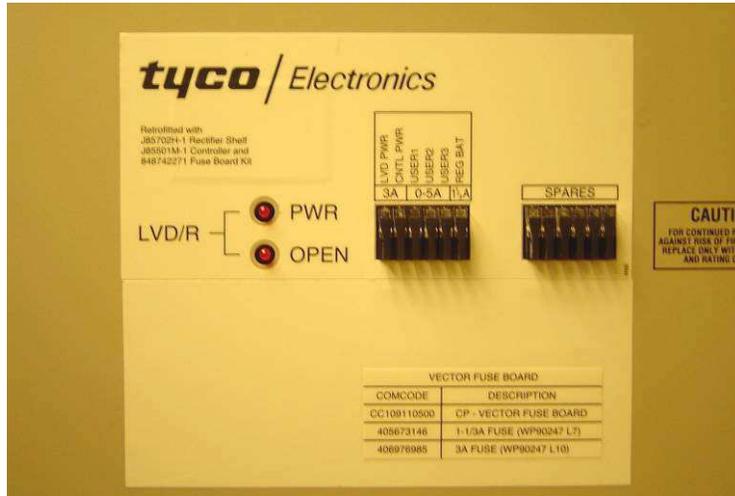
Assuming that a 2nd PXS shelf is provided, connect either new or reused AC input circuits from the removed ECS rectifiers into the 2nd PXS shelf in a fashion similar to that used for the initial PXS shelf. A 2 inch blank cover may be used to fill the unused space at the top of the added PXS shelf. Route, secure, and connect the serial bus cable set furnished with the 2nd PXS shelf up to its appropriate connection on the initial PXS shelf. Turn on AC power for the equipped rectifier positions of the 2nd PXS shelf and insert these 596-series rectifiers. ID them appropriately, using their power/ID switches. Verify that they assume a portion of the office load, load-sharing with the other PXS rectifiers.

19. After being satisfied that all PXS rectifiers in service are supporting office load, remove the remaining ECS rectifiers and rectifier shelf (ves) by repeating the procedure shown in Step-4 for the initial shelf. If a 3rd PXS shelf is provided, mount it into the lower portion of the space vacated by this shelf removal, repeating the procedure shown in Step-14 for the 2nd shelf. If a PXS shelf is not added at this time, the space opened by the ECS shelf removal(s) may be filled with 12 inch blank cover(s).

If the 3rd PXS shelf is provided, connect either new or reused AC input circuits from the removed ECS rectifiers into the 3rd PXS shelf in a fashion similar to that used for the 2nd PXS shelf. A 2 inch blank cover may be used to fill the unused space at the top of the added PXS shelf. Route, secure, and connect the serial bus cable set for the 3rd PXS shelf up to its appropriate connection on the 2nd PXS shelf. Turn on AC power for the equipped rectifier positions of the 3rd PXS shelf and insert these 596-series rectifiers. ID them appropriately, using their power/ID switches. Verify that they assume a portion of the office load, load-sharing with the other PXS rectifiers.

20. Route the TB101 to TB104 alarm cabling of the ECS controller from Step-2 into the left side of the 1U Vector, insuring that sufficient slack exists to permit the drawer to slide open and closed when securing this cabling with wire ties or 12-cord. Terminate this cabling onto TB1 to TB8 of the 1U Vector as detailed on Fig. 2-7 of its product manual. Reconnect any additional ABS circuits previously assigned to the ECS CP5 LVD/Fuse card

onto replacement assignments of the Vector Fuse Board. Mount additional standoffs and the rear cover from the retrofit kit to protect the inside of the Vector Fuse Board. Install the Vector Fuse Board retrofit label from the retrofit kit onto the front of the distribution door, taking care to cover the two open holes in the door used previously for additional fuse blocks on the replaced ECS CP5 LVD/Fuse card. Cover the LVD/R stenciling of this label with the Vector Fuse Board spare parts portion of the label if the LVD option is not equipped in the plant.



Vector Fuse Board Retrofit Label

If temperature compensation thermistors or 210E thermal probe multiplexer(s) are being added to monitor battery temperatures, connect and wire them to their terminations on J1 or J3 of the 1U Vector BUJ card or to TB5 or TB6 of its Alarm Board, and complete the Temperature Compensation configuration as described in the 1U Vector product manual.

21. Test and observe alarms (RFA, ACF, MJF, BD, etc.) and features for the retrofitted power plant as specified by the customer's requirements. Verify that alarms are transmitted properly to the alarm monitoring center. Test the operation of the LVBD contactor (if equipped) through a combination of temporarily raising the programming for the LVD disconnect & reconnect thresholds and lowering of the plant voltage. Return all programming to normal levels when completed and remove any temporary LVD contactor busbar strap or cable(s) added previously in Step-9.
22. Remove the circuit pack(s) from the retired ECS controller and replace its door with the blank cover furnished in the retrofit kit. The 1U Vector product manual and any other site documentation may be conveniently stored in the right half of the emptied ECS controller shell.

If temporary chargers were connected or any office loads were turned down in Step-1, they may be disconnected or returned to service as is appropriate.

5.0 Modifications Made Between Versions

Table 1: MOP Modifications

Version	Changes Made Between Versions
1.0	Initial release.