GE RKPS VME Rack Power Supply

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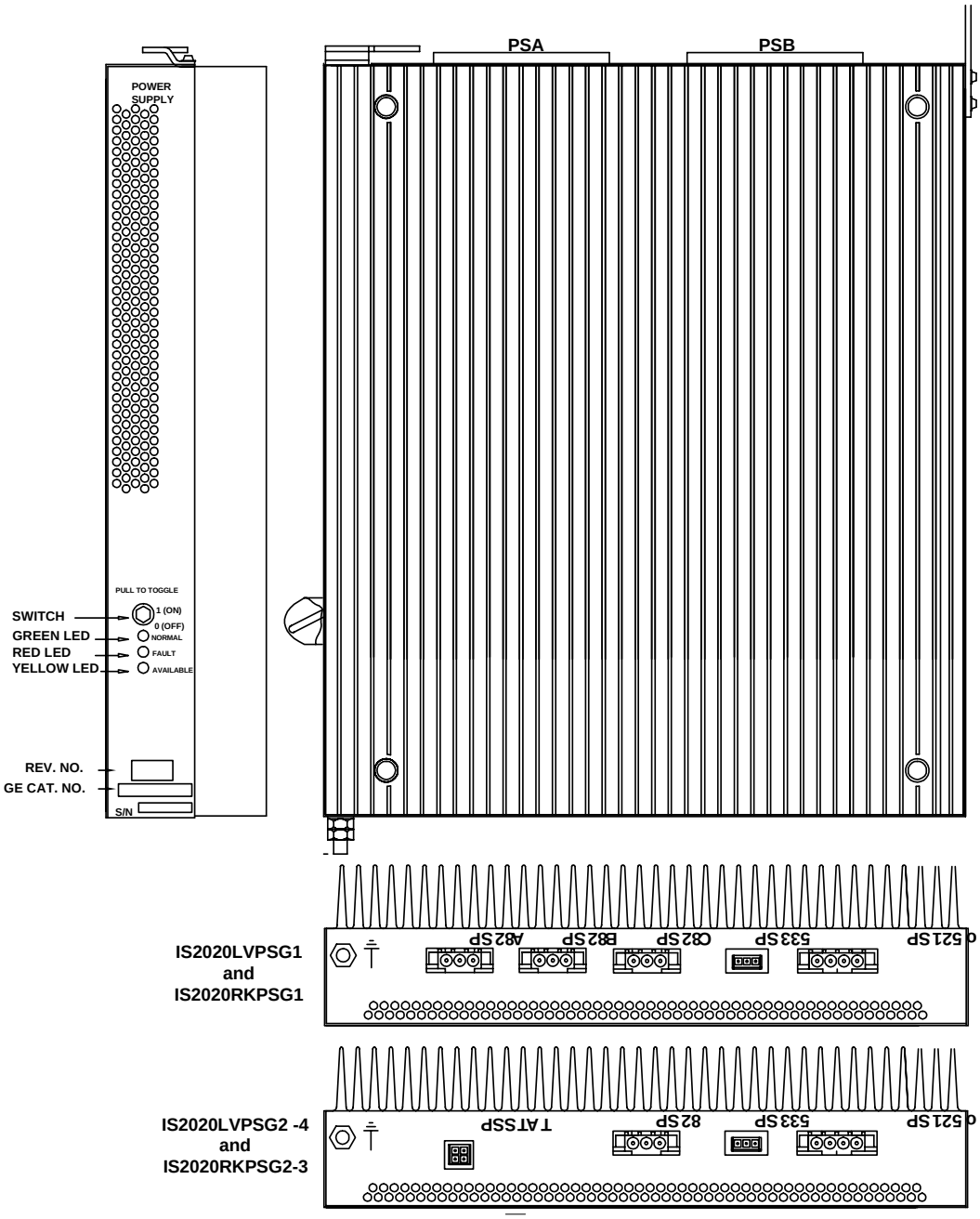
Functional Description

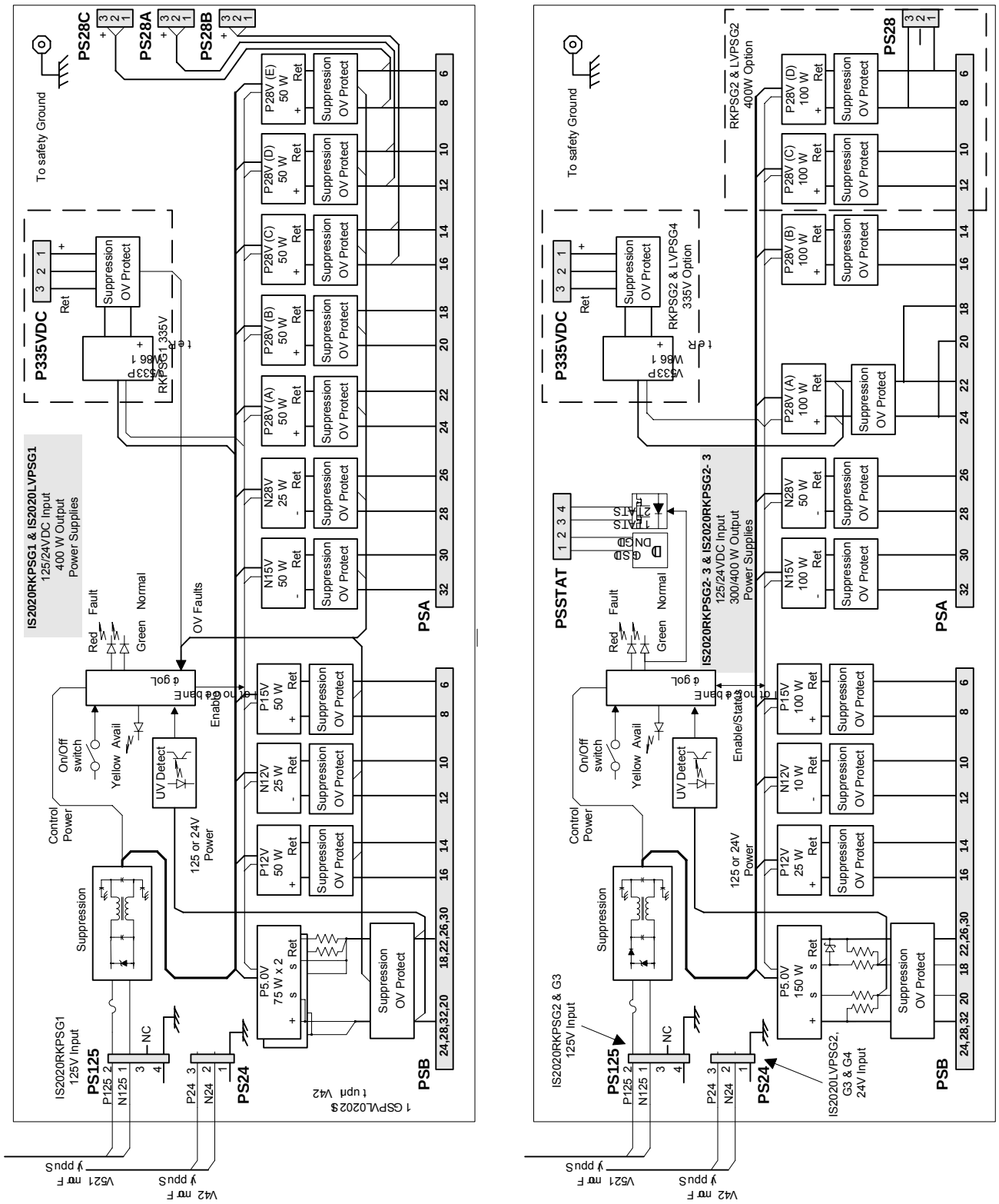
The Mark* VI VME rack power supply mounts on the side of the VME control and interface racks. It supplies +5, ±12, ±15, and ±28 V dc to the VME backplane, and an optional 335 V dc output for powering flame detectors connected to TRPG.

Two supply input voltage selections are available. There is a 125 V dc input supply that is powered from a Power Distribution Module (PDM) and a low voltage version for 24 V dc operation.

Note A different power supply is used on the stand-alone control rack which only powers the Mark VI controller, VDSK, and VCMI.



VME Rack Power Supply types G1 and G2, Front, Side, and Bottom Views



Block Diagram of RKPS and LVPS versions of VME Power Supply

There are currently seven major variations of the VME rack power supply. These variations provide different power supply input and output requirements. The following table defines these variations.

VME Rack Power Supply Option Definitions

IS2020 Part Number	Input Voltage	Output Rating	+28V PSA Outputs	+28V Remote Outputs	PS335 Output	Status ID Output	Support Redundant Operation
LVPSG1	24 V dc	400W	Qty. 5	Qty. 3	No	No	No
RKPSG1	125 V dc	400W	Qty. 5	Qty. 3	Yes	No	No
RKPSG2*	125 V dc	400W	Qty. 5	Qty. 1	Yes	Yes	Yes
RKPSG3*	125 V dc	400W	Qty. 5	Qty. 1	No	Yes	Yes
LVPSG2*	24 V dc	400W	Qty. 5	Qty. 1	No	Yes	Yes
LVPSG3*	24 V dc	300W	Qty. 3	None	No	Yes	Yes
LVPSG4*	24 V dc	300W	Qty. 3	None	Yes	Yes	Yes

* Newer design power supplies

With the exception of the number of remote 28 V outputs, the RKPSG2 and LVPSG2 are designed to be direct replacements for the RKPSG1 and LVPSG1 respectively. These two supplies have been replaced with the newer designs (marked with asterisk in the table above).

Installation

The power supply is mounted to the right-hand side of the VME rack on a sheet metal bracket. The dc input, 28 V dc output, and 335 V dc output connections are at the bottom. The newer design also has a status connector on the bottom. Two connectors, PSA and PSB, at the top of the assembly mate with a cable harness carrying power to the VME rack.

Each of the five 28 V dc power modules supplies a section of the VME rack. These sections are labeled A, B, C, D, E, and F. The P28C output or PS28 at the bottom of the power supply can be used to power an external peripheral device. To do this the jumper plug shown on the bracket to the left of the rack must be moved from the *Normal* position to the *Isolated* position below.

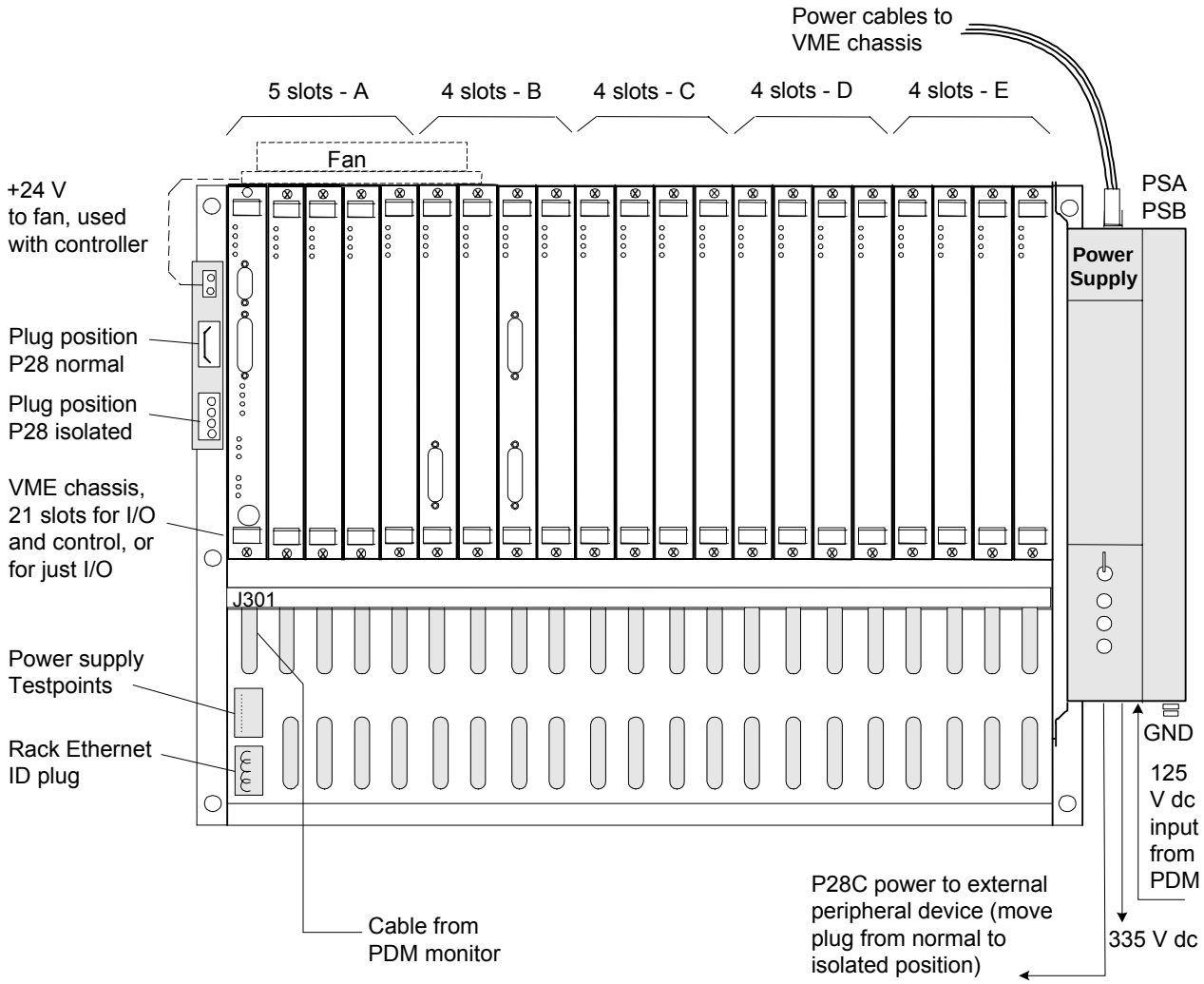
The fan is only used when the controller is mounted in the rack. It is powered from the top connector on the same bracket, located on the left side of the rack.

Warning

To prevent electric shock, turn off power to the RPSM to be replaced, then test to verify that no power exists on the module before touching it or any connected circuits.

Caution

To prevent equipment damage, do not remove, insert, or adjust any connections while power is applied to the equipment.



Power Supply, VME Chassis, and Cabling to External Devices

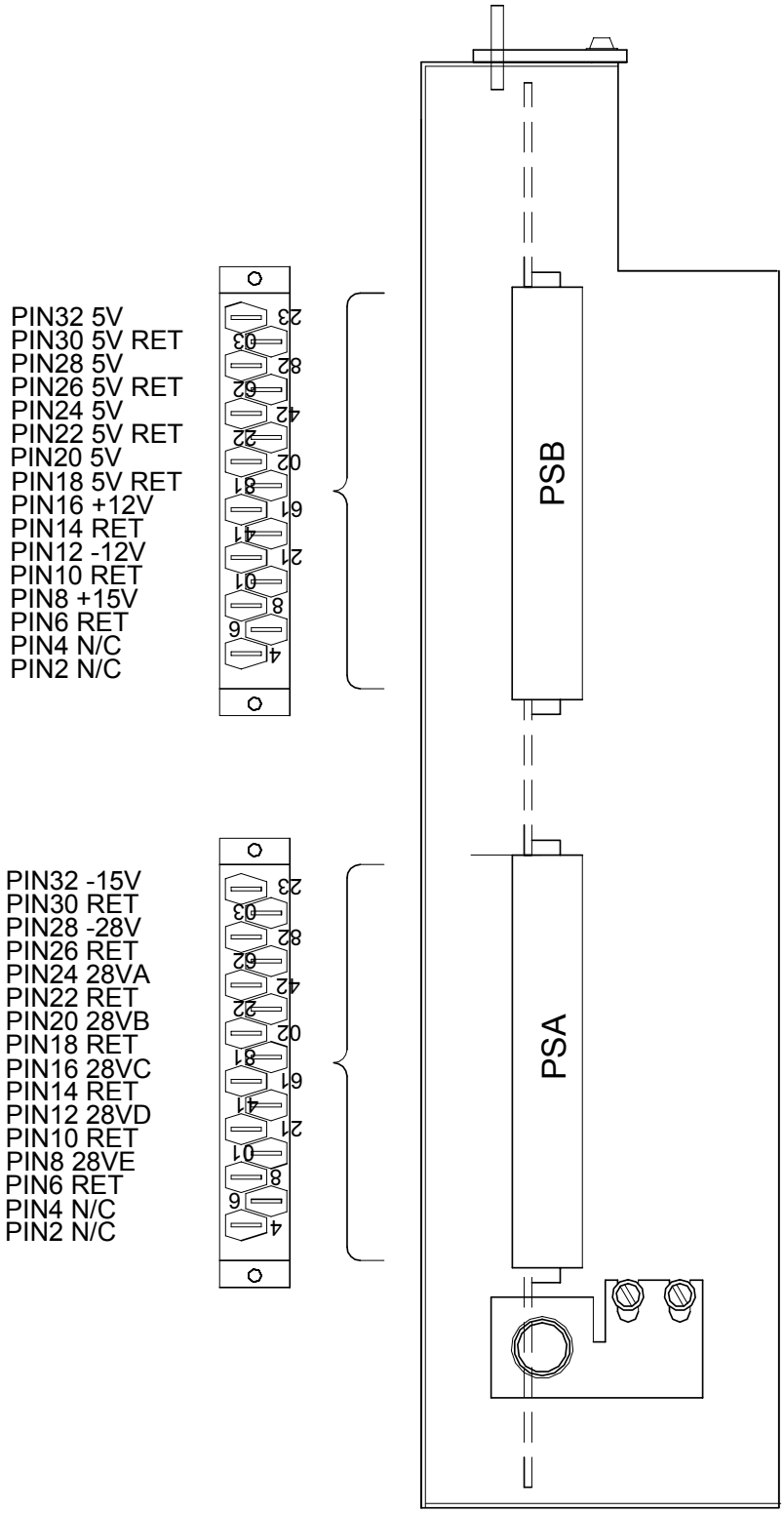
➢ To remove the power supply

1. Loosen the PSA/PSB bracket captive fastener at the top front of the module.
2. Separate the PSA/PSB bracket assembly from the RPSM.
3. Disconnect the bottom connectors.
4. Loosen the two front sheet metal bracket captive fasteners.
5. Pull the sheet metal bracket/power module assembly forward, disconnect the four rear side connectors and then slide the assembly off of the control rack.
6. Remove the four mounting screws that hold the RPSM to the bracket and remove it.

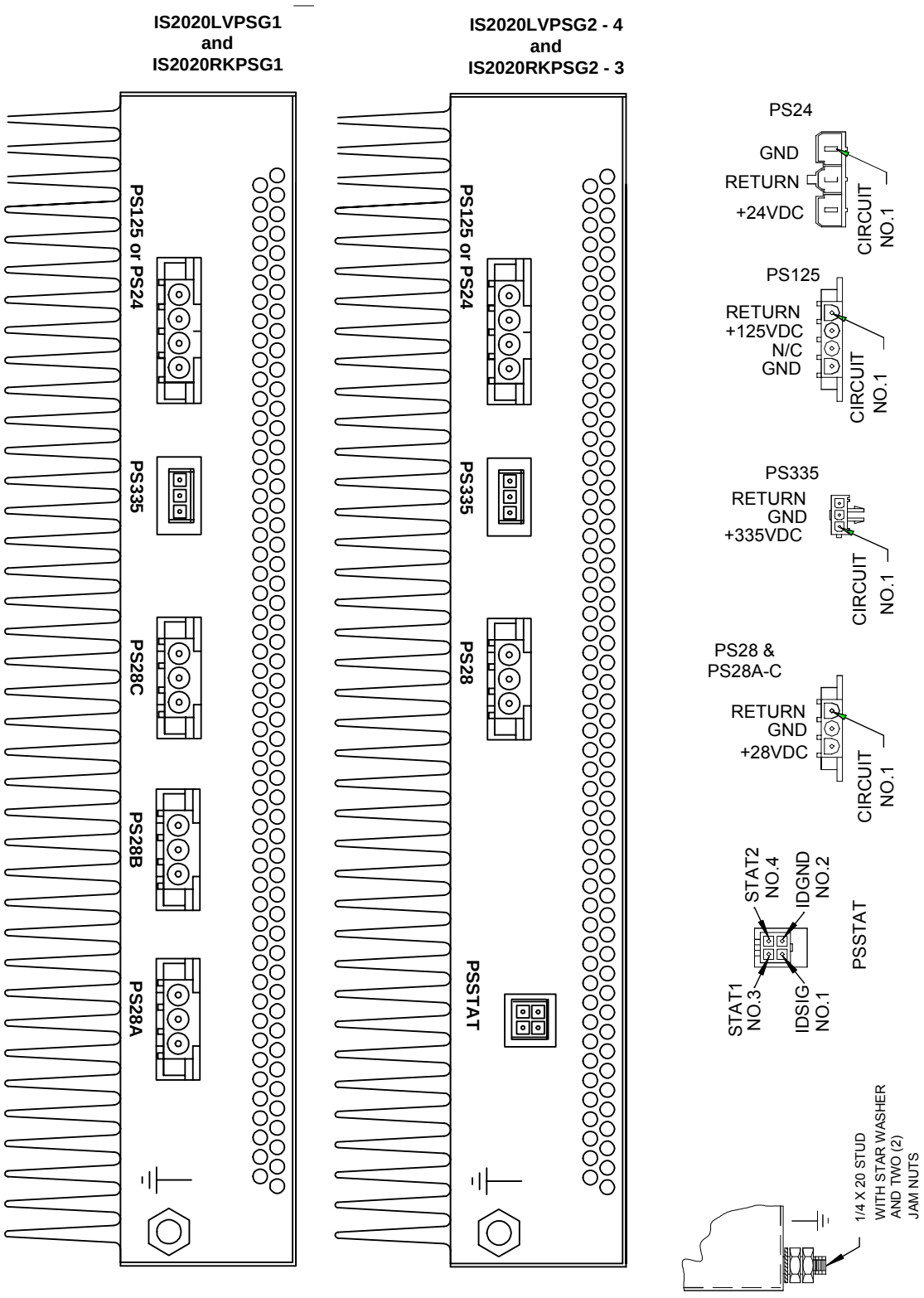
Note Reinstall the screws and bracket on the control rack if a replacement module is not going to be installed.

➢ To install the power supply

1. Locate the supply mounting sheet metal bracket and four mounting screws.
2. Position the module on the bracket with the front of the module at the captive fasteners, then install the four mounting screws and tighten.
3. Slide the module bracket assembly on to the control rack, connect the four rear side connectors and then push the assembly in to tighten the two front captive fasteners.
4. Slide the PSA/PSB assembly rear tab into the slot on the bracket located at the top rear of the RPSM.
5. Push the connector assemble into the mating connectors on the top of the RPSM.
6. Tighten the PSA/PSB bracket captive fastener.
7. Connect the power supply bottom connectors.



Power Supply, Top Connectors



Power Supply, Bottom Connectors

Operation

The VME Rack power supply has only one user control, the power switch, and three status LED indicators. The power switch provides front-panel control of the power supply output voltages and when toggled serves as a fault reset. The yellow, red and green LEDs indicate the status of the input power, fault presence, and normal operation.

Note Newer supply designs also have a status output that mimics the status of the green LED and an ID output that uniquely identifies the supply back to the system.

Power Switch

The front panel power switch is a locking type that must be pulled out to change position. This switch is a low voltage control to enable or disable the output voltages. If the red LED is ON indicating a fault condition the power switch can be toggled OFF and then back ON again to clear the fault. The fault will only be cleared if the condition that caused it no longer exists.

Yellow LED

When the power switch is OFF the yellow LED will indicate the status of the input power. If this LED is ON there is power present on the supply input connector. For the newer design, the yellow LED will only turn ON if the input voltage is above the input under-voltage fault threshold.

Red LED

This LED will only be ON if there is input power, the power switch is ON, and a fault has been detected.

Green LED/Status Output

If there is input power, the power switch is ON, and there are no detectable faults, the Green LED will be ON. The newer designs also have a status output that mimics the status of this LED. The status output is a NO solid-state relay contact that will be CLOSED when the green LED is ON.

Fault Conditions

There are three classes of power supply faults:

- Those that transiently shutdown an output
- Those that require some reset action to clear
- Permanent failures that require the replacement of the supply.

This section describes the first two fault classes and assumes the cause of the fault is external. For a detailed fault diagnostics, refer to the section, *Diagnostics and Troubleshooting*.

Note When the external condition causing the current limit condition is corrected, the output voltage will return to normal.

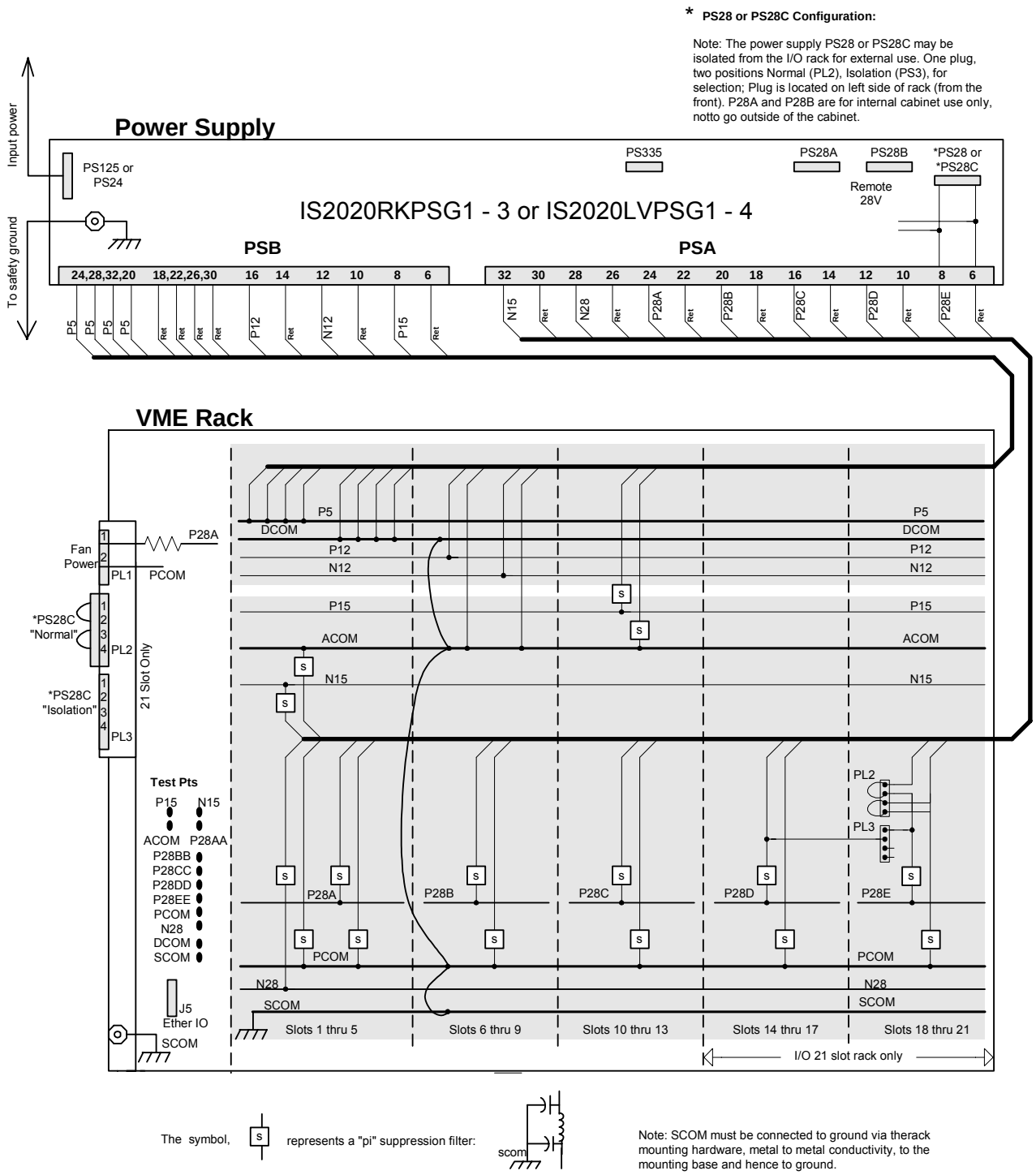
If an overcurrent condition exists on an output, the voltage on that output will fold back as required to maintain the constant current limit output. For every output other than the 5 V supply, this condition is not detectable at the supply and the green LED will remain ON. Detection of a low output voltage due to excessive output current has to be detected at the system level through the power supply voltage monitoring. The newer design also has an over temperature monitor of the output modules and a current limit detector on the optional 335V supply. These additional fault detectors may cause the red LED to come on when an output is in current limit but the red LED will also go out when the output voltage returns to normal.

The 5 V current limit is a special case due to the 5 V under-voltage detector. If the current limit causes the 5 V output voltage to fold back below the UV threshold, all of the other outputs will be disabled until the 5 V output voltage returns to a voltage above the UV threshold.

All of the other faults will shut down one or all of the outputs until the external cause of the fault condition is removed and the supply is reset. A reset can be initiated through the front panel power switch or by removing and reapplying input power to the supply. Output over-voltage faults on the newer design require the removal of input power for a minimum of one minute to reset the fault once the source of the fault has been removed. Below is a power supply fault summary.

- Input under-voltage (Latched)
- Input over-voltage (Newer Design Only)
- P5 output under-voltage
- Output over-voltage (Latched)
- Over temperature (Newer Design Only)

The following figure shows the power supply connections to the VME rack and the distribution of the power supply outputs.



VME I/O Rack Power Supply and Cables

Specifications

Item	Description					
Input voltage						
125 V input	70 V to 145 V dc floating supply			Up to 10 V pp ripple		
24 V input	18.5 V to 32 V dc floating supply			Up to 2 V pp ripple		
Input under-voltage	Under-voltage protection provided to prevent supply operation when the input voltage is below the minimum operating level.					
Input over-voltage*	Over-voltage protection provided to prevent supply operation when the input voltage is above the maximum operating level.					
Isolation	True isolation from input to output, 1500 V					
Output voltages	**Output Voltage**	**Voltage**	**Voltage Regulation**		**Capacity**	**Typical Over**
For the RKPSG1 and LVPSG1 supplies	P5	+5 V dc	Less than ± 3%		150 W	120% ± 5%
	P15	+15 V dc	Less than ± 3%	50 W		120% ± 5%
	N15	-15 V dc	Less than ± 3%		50 W	120% ± 5%
	P12	+12 V dc	Less than ± 3%	50 W		120% ± 5%
	N12	-12 V dc	Less than ± 3%		25 W	120% ± 5%
	P28	+28 V dc	Less than ± 5%	50 W		120% ± 5%
	N28	-28 V dc	Less than ± 5%		25 W	120% ± 5%
	P335	+335 V dc	Less than ± 5%		1.68 W	110% to 120%
For the RKPSG2 -3 and LVPSG2 - 4 supplies* Note: P5 on these supplies has remote voltage sensing.	P5	+5 V dc	Less than ± 3%		150 W	130% ± 5%
	P15	+15.35 V dc	Less than ± 3%		100 W	120% ± 5%
	N15	-15.35 V dc	Less than ± 3%		100 W	120% ± 5%
	P12	+12.3 V dc	Less than ± 3%		25 W	120% ± 5%
	N12	-12.3 V dc	Less than ± 3%		10 W	120% ± 5%
	P28	+28 V dc	Less than ± 5%	100 W		120% ± 5%
	N28	-28 V dc	Less than ± 5%		50 W	120% ± 5%
	P335	+335 V dc	Less than ± 5%		1.68 W	110% to 120%
Power sequencing	The 5 V dc supply comes up first, then all the others					
Total Output	Maximum of 400 W					
Total output LVPSG3 & 4 only*	Maximum of 300 W					
Short circuit	Short circuit protection on all power supplies, with self-recovery. Note: A 5 V short circuit on the new design will cause a latched fault.					
Temperature	Ambient air convection cooling 0 to 60ºC					
Indicating lights	Green:	Normal	Status is OK			
	Red:	Fault	Power is applied, but one or more outputs off due to a fault.			
	Yellow:	Available	Power is applied, but switch is OFF			
Status output*	NO SSR contact .5 A @ 55 V dc - Closed when the green indicating light is on					
ID tag output*	Dallas DS2502 output. 2502 data = Week and year tested, unit number, part number and revision					

*Only pertain to the newer design power supplies

Diagnostics

Incoming and outgoing voltages and currents are monitored for control and protection purposes. If the red LED is ON, this is not a direct indication that the power supply has failed and has to be replaced. The LED ON could indicate that something is wrong in the system and the fault LED is latched on. The following is a description of the power supply parameters that are monitored and the conditions that can cause faults.

Input Under-voltage (below the minimum operating voltage)

The input voltage has to be above the under-voltage threshold or operation of the supply will be inhibited. For the newer design this is indicated by no LEDs ON. The red LED will come ON and remain on until the input voltage is above the under-voltage threshold and the power switch is toggled. If an under-voltage fault occurs during normal operation, the outputs will be disabled and the red LED will come ON and remain ON until the input voltage is above the under-voltage threshold and the power switch is toggled.

Note If the supply power switch is turned on in this condition there will be no output voltages.

Input Over-voltage (newer design above maximum operating voltage)

If the supply power switch is turned on in this condition there, will be no output voltages and the red LED will come ON and remain on until the input voltage is below the over-voltage threshold and the power switch is toggled. If an over-voltage fault occurs during normal operation, the outputs will be disabled and the red LED will come ON and remain ON until the input voltage is below the over voltage threshold and the power switch is toggled.

Note The input voltage has to be below the over-voltage threshold or operation of the supply will be inhibited and the yellow LED will be ON.

5 V Output Under-voltage (typically below 4.7 V)

The P5 output voltage has to be above the under-voltage threshold or operation of the supply will be inhibited, all supply outputs will be turned off, and the red LED will be ON. If an under-voltage fault occurs during normal operation, the outputs will be disabled and the red LED will come ON and remain ON until the output voltage is above the under-voltage threshold.

5 V Output Over-voltage (typically above 6 V)

The P5 output voltage has to be below the over-voltage threshold or operation of the supply will be inhibited. All supply outputs will be latched OFF and the red LED will be ON until the power switch is toggled. For the newer design, this fault must be reset by removing input power to the supply (wait for one minute and re-apply input power).

Output Over-voltage other than P5 (typically above 120%)

The output voltage has to be below the over-voltage threshold or operation of the supply output that is above the threshold will be inhibited (latched OFF) until the power switch is toggled. The red LED will be ON during this fault. For the newer design, this fault must be reset by removing input power to the supply (wait for one minute and re-apply input power).

Output Over-temperature (newer design typically above 100 degrees C)

The modules that supply the output voltage have to be operated below the over-temperature threshold. A specific supply output module operated above the threshold will be inhibited until the temperature is lowered below the threshold. The red LED will be ON during this fault. An over-temperature of the 5 V module will cause a 5 V under-voltage fault.

Troubleshooting

The supply has no field serviceable components. If a supply is found to be defective it must be replaced. The power supply cover should not be removed in the field.

There are only two indications of a problem on the power supply itself. A problem is indicated when there are no LEDs ON or the red LED is ON. Both conditions will be annunciated on the newer designs through the status output.

No LEDs ON is a good indication of an input voltage problem or a defective supply. If the red LED is ON, the cause could be any of the fault conditions listed above or a defective supply. Below is a list of troubleshooting hints.

Note Over-voltage faults on the newer design must be reset by removing input power to the supply, waiting for one minute, and re-applying input power.

No LEDs ON

Verify that the input connector and voltage to the supply are correct. If they are, then replace the supply. Use caution when powering on the replacement supply because the failure could have been caused by a problem in the system.

Red LED ON and system up

This condition indicates that the 5 V power is OK. Use the system diagnostics and or testpoints on the left bottom of the control rack or at the supply connectors to find the faulted outputs. Try and clear the fault with the input power or switch reset. If the green LED comes ON, the fault was a transient one and may come back. If the red LED is still ON, remove the connector supplying the faulted output and reset the supply. If the red LED is still ON, then a defective supply is the most probable cause. If the green LED comes ON, then the problem is most likely in the system.

Red LED ON and system down

This condition indicates that the 5 V power is not OK. In this case, all of the supply outputs should be off. Try and reset the fault with the input power. If the green LED comes on the fault was a transient one and may come back. If the red LED is still ON, remove the PSA/PSB output connector at the top of the supply and reset the supply. If the red LED is still ON, then a defective supply is the most probable cause. If the green LED comes ON, then the problem is most likely in the system.

Green LED ON and system up but one or more of the voltages out of specification

This condition indicates that the 5 V power is OK. Each supply output has a current limit and short circuit protection. This condition could be caused by a short or failed component in the system. Remove the connector supplying the failed output voltage. If the voltage returns to normal this is an indication of a system problem. If the voltage does not return to normal then the most probable cause is a defective supply.

Thermal over-temperature faults (new design only)

Even in the worst case ambient conditions, a thermal fault should not occur if the outputs are not overloaded. A sustained current limit on a supply output will be the most likely cause of a thermal fault.

Configuration

The P28C output or PS28 at the bottom of the power supply can be used to power an external peripheral device. To do this the jumper plug on the bracket to the left of the rack must be moved from the *Normal* position to the *Isolated* position below.

Alarms

Fault	Fault Description	Possible Cause
32	P5=###.## Volts is Outside of Limits. The P5 power supply is out of the specified operating limits	A VME rack backplane wiring problem and/or power supply problem
33	P15=###.## Volts is Outside of Limits. The P15 power supply is out of the specified operating limits	If "Remote Control", disable diagnostic and ignore; otherwise probably a back plane wiring or VME power supply problem
34	N15=###.## Volts is Outside of Limits. The N15 power supply is out of the specified operating limits	If "Remote Control", disable diagnostic and ignore; otherwise probably a VME backplane wiring and/or power supply problem
35	P12=###.## Volts is Outside of Limits. The P12 power supply is out of the specified operating limits	If "Remote I/O", disable diagnostic and ignore; otherwise probably a VME backplane wiring and/or power supply problem
36	N12=###.## Volts is Outside of Limits. The N12 power supply is out of the specified operating limits	If "Remote I/O", disable diagnostic and ignore; otherwise probably a VME backplane wiring and/or power supply problem
37	P28A=###.## Volts is Outside of Limits. The P28A power supply is out of the specified operating limits	If "Remote Control", disable diagnostic and ignore; otherwise probably a VME backplane wiring and/or power supply problem
38	P28B=###.## Volts is Outside of Limits. The P28B power supply is out of the specified operating limits	If "Remote Control", disable diagnostic and ignore; otherwise probably a VME backplane wiring and/or power supply problem
39	P28C=###.## Volts is Outside of Limits. The P28C power supply is out of the specified operating limits	If "Remote Control" disable diagnostic. Disable diagnostic if not used; otherwise probably a backplane wiring and/or power supply problem
40	P28D=###.## Volts is Outside of Limits. The P28D power supply is out of the specified operating limits	If "Remote Control" disable diagnostic. Disable diagnostic if not used; otherwise probably a backplane wiring and/or power supply problem
41	P28E=###.## Volts is Outside of Limits. The P28E power supply is out of the specified operating limits	If "Remote Control" disable diagnostic. Disable diagnostic if not used; otherwise probably a backplane wiring and/or power supply problem
42	N28=###.## Volts is Outside of Limits. The N28 power supply is out of the specified operating limits	If "Remote Control" disable diagnostic. Disable diagnostic if not used; otherwise probably a backplane wiring and/or power supply problem