

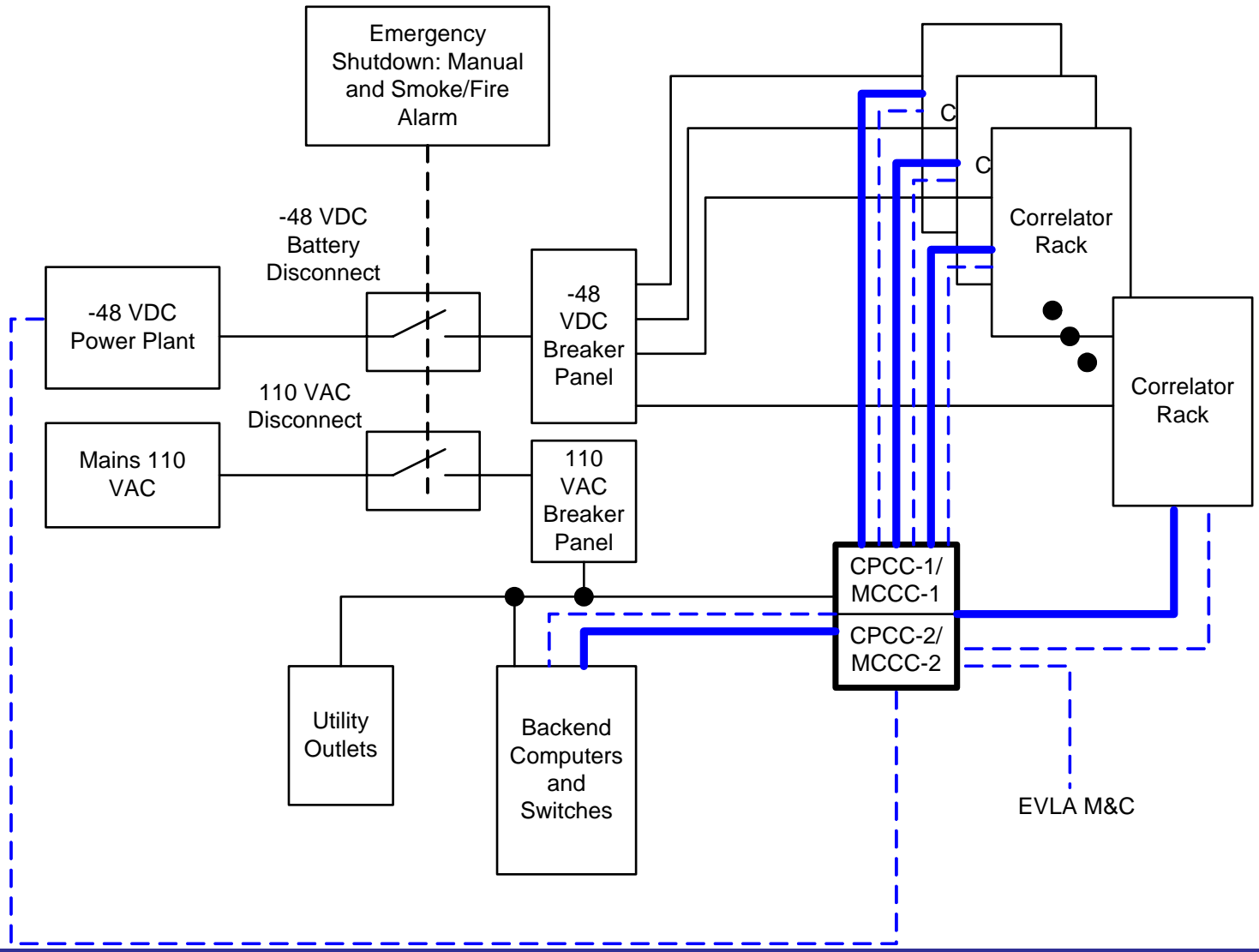
# Correlator Power Monitor Control System

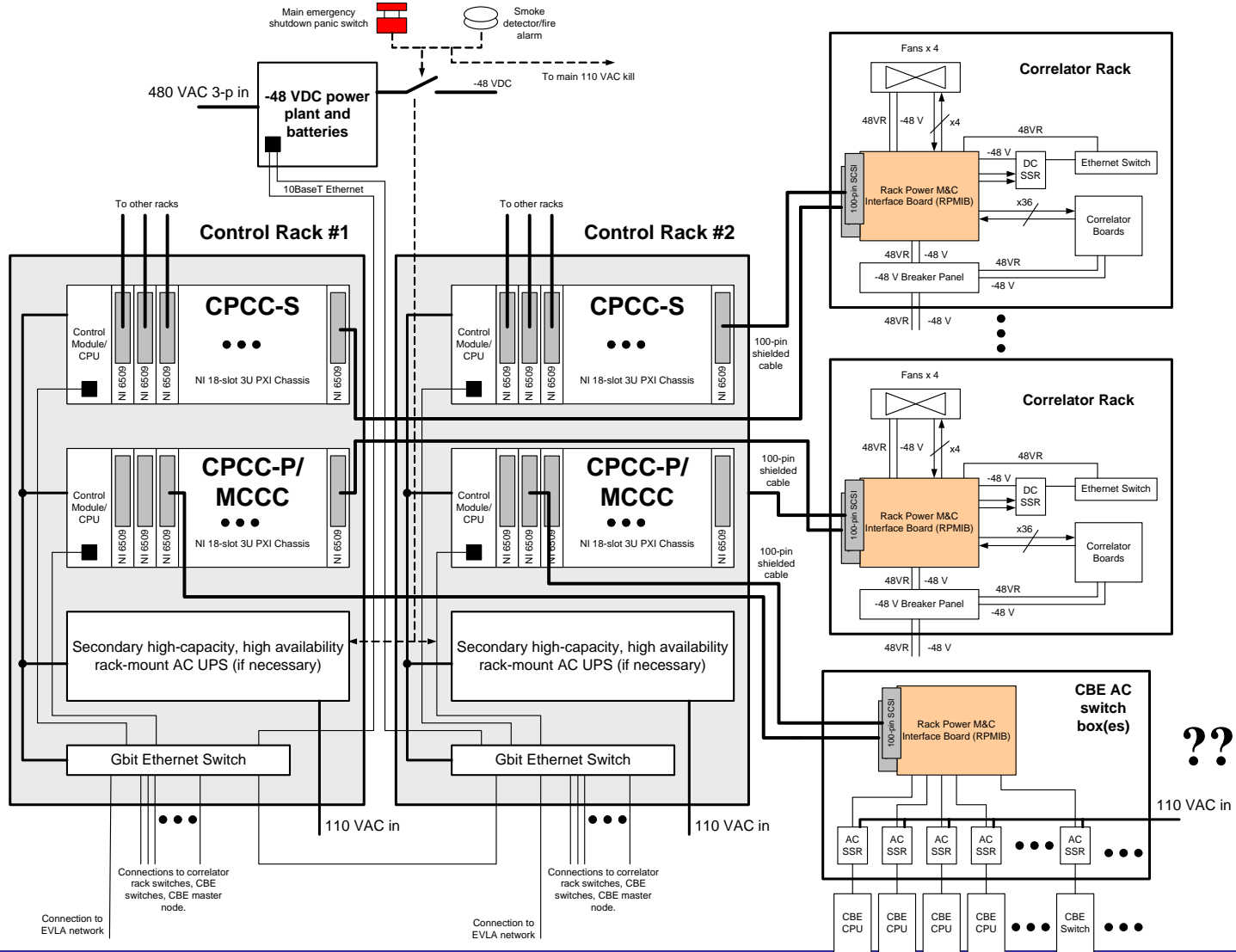
*B. Carlson*

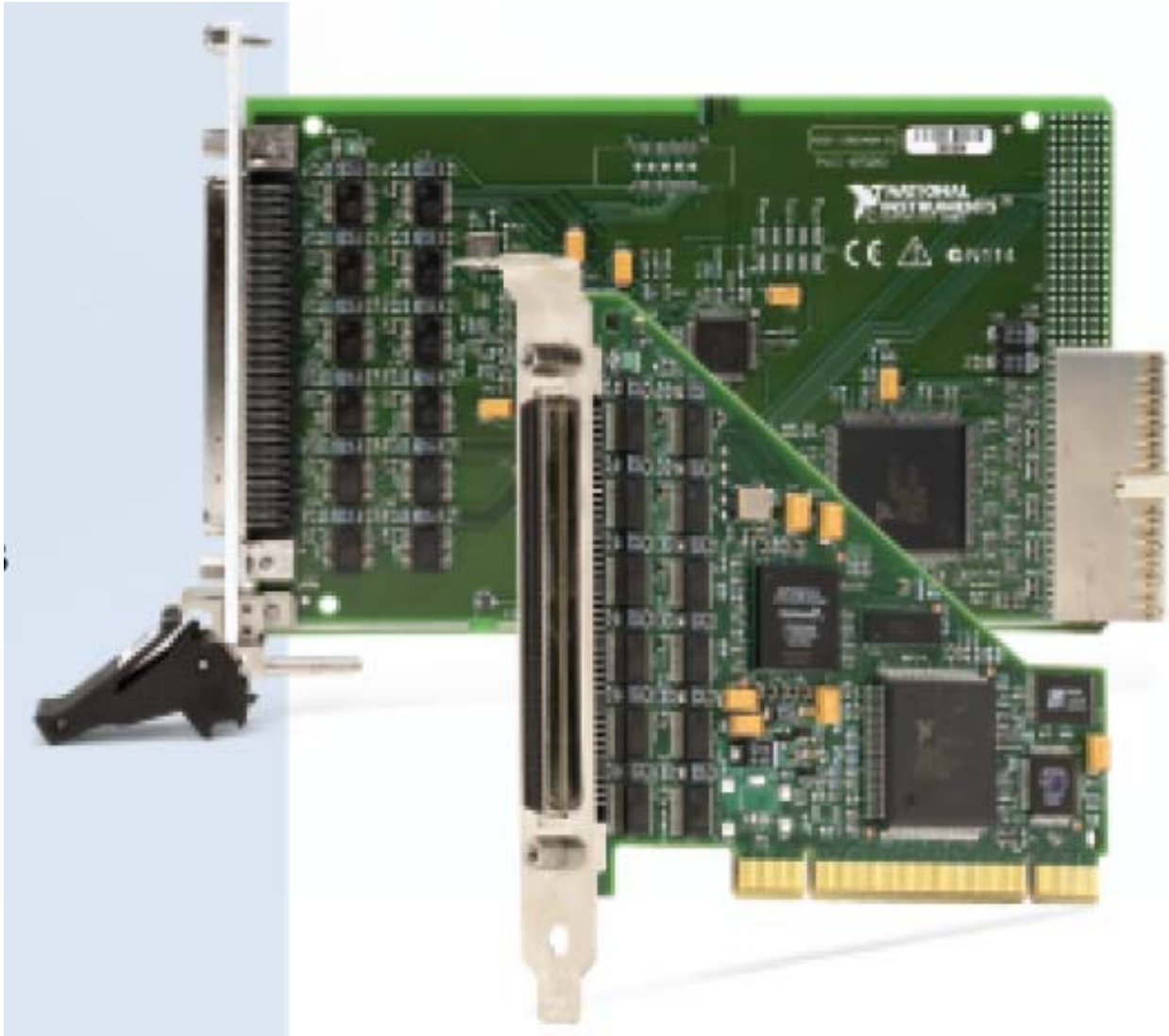


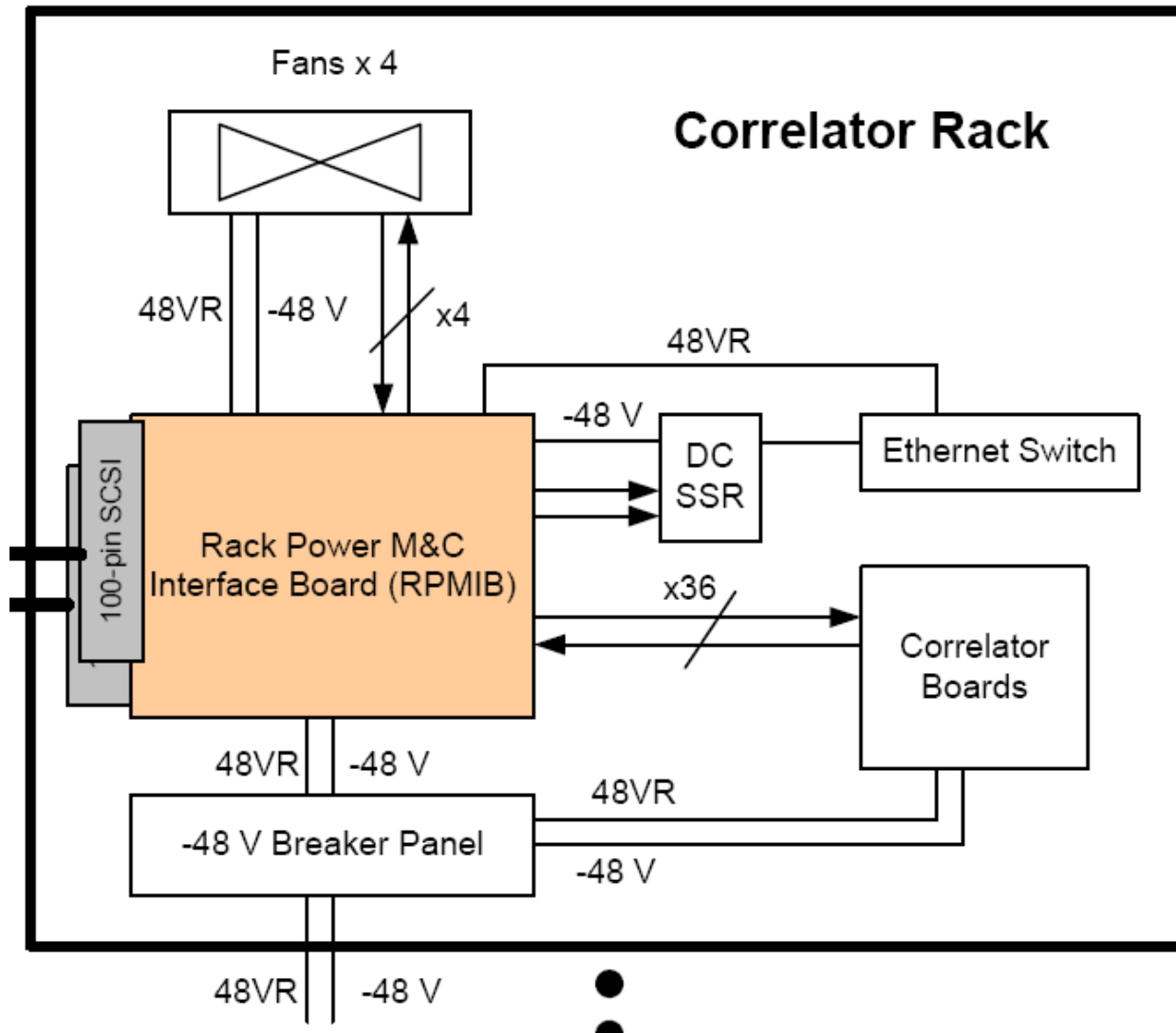
## Outline

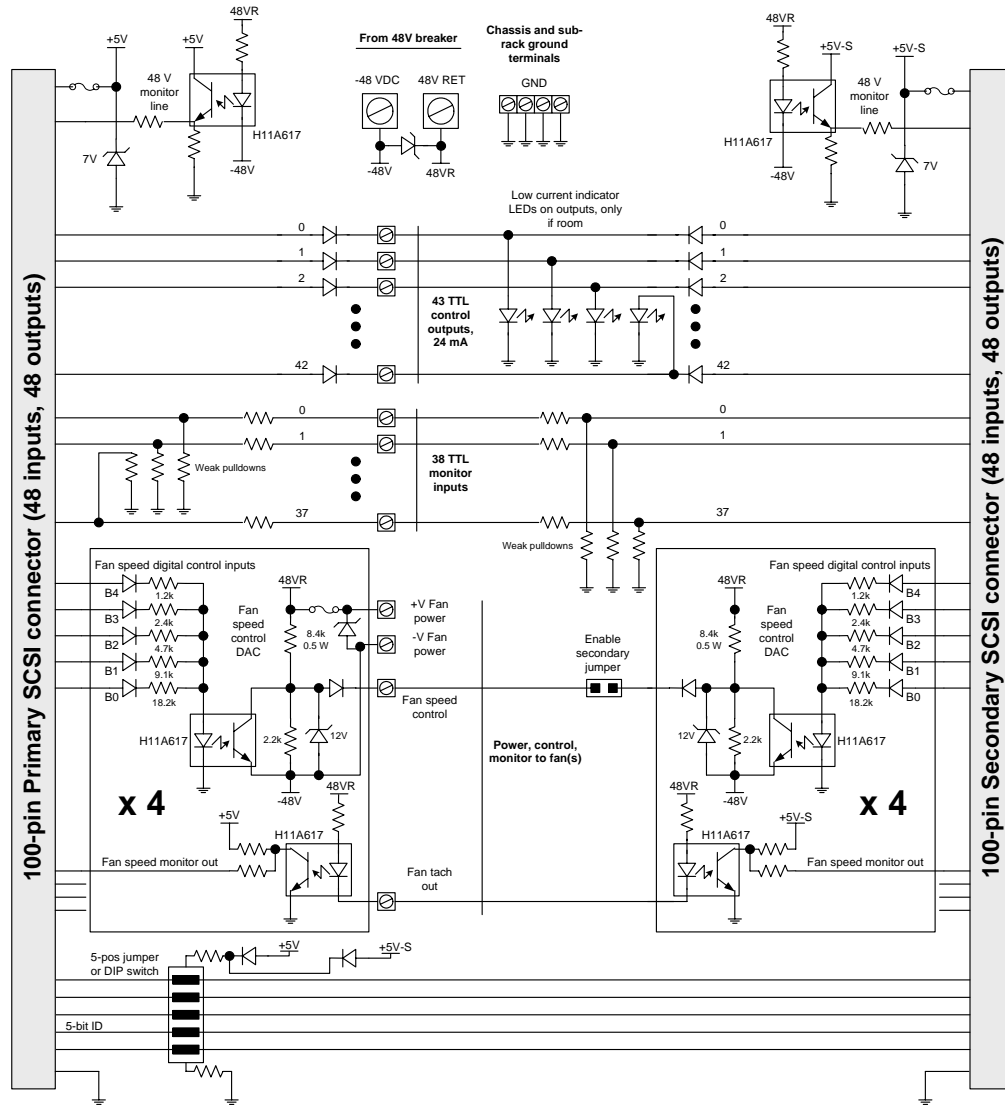
- Overview; based on A25026N0000
- RPMIB
- FMEA of redundant system
- CPCC/MCCC chassis...reliability
- Power up/down sequence
- S/W requirements

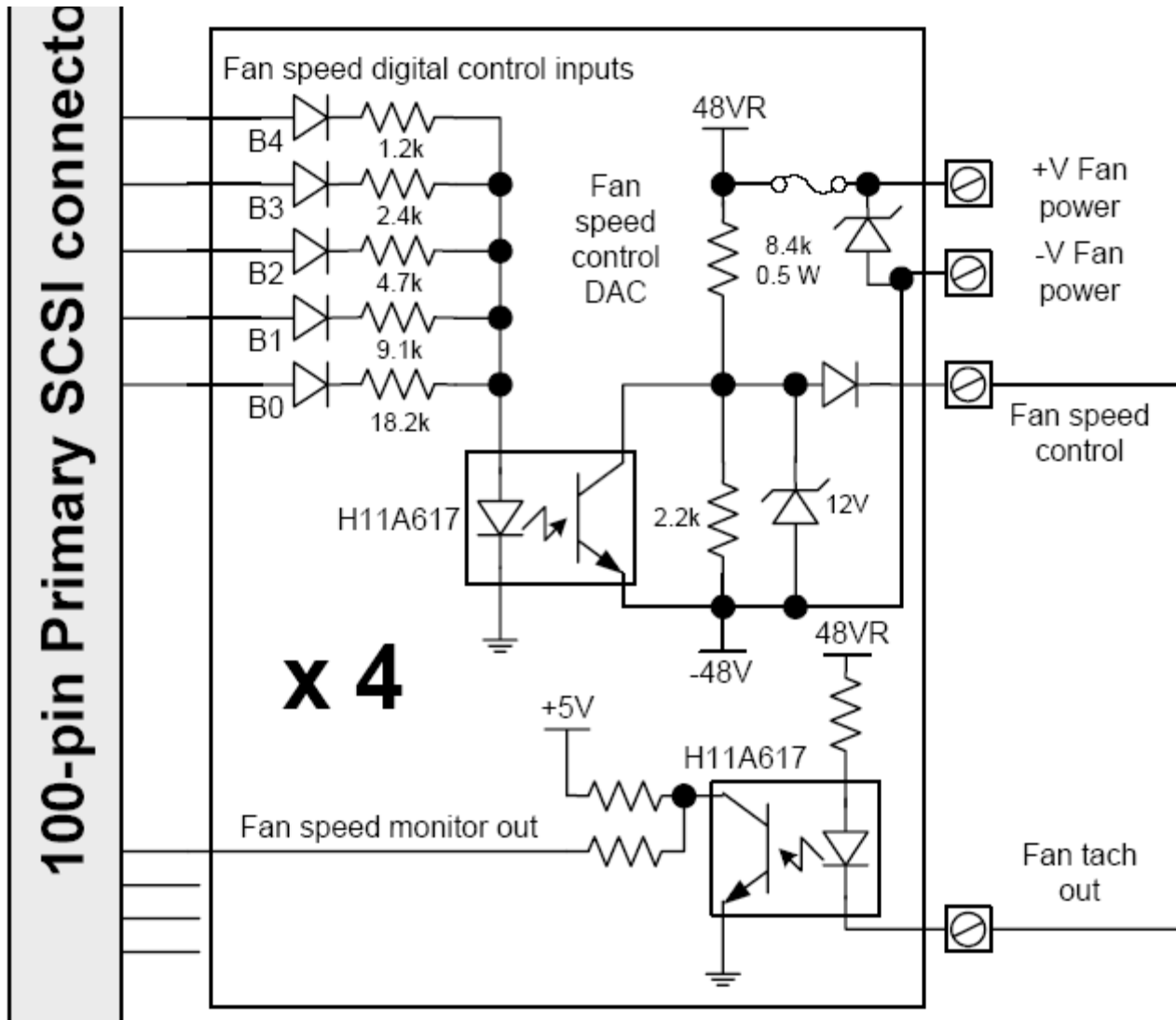




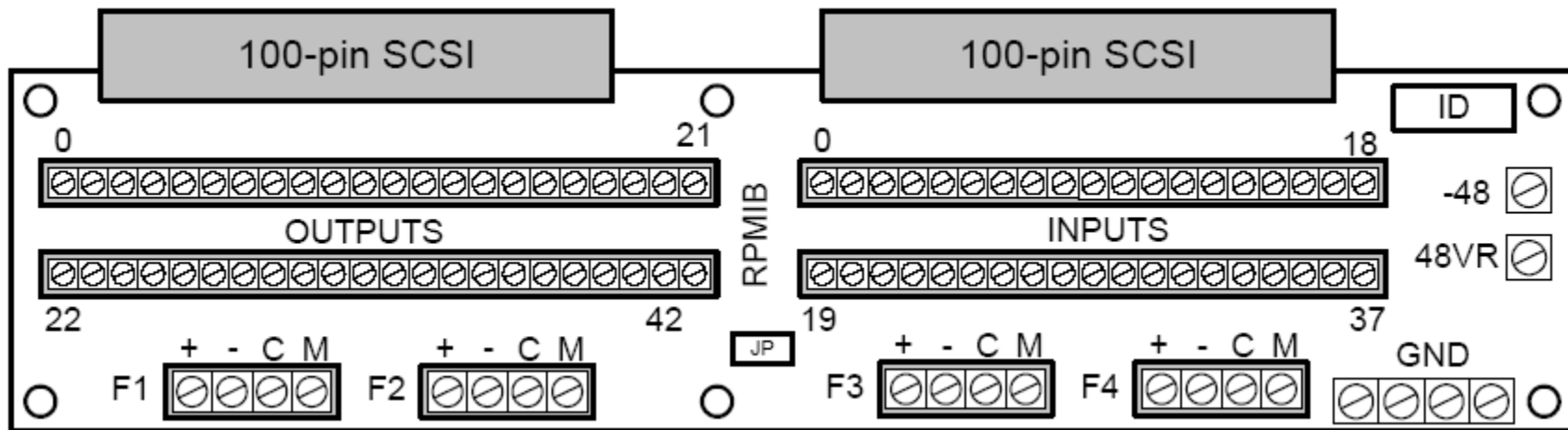












## PMCS notes

- 100-pin cables custom-made to length. 20 m costs about \$250 ea in Qty=50.
- May not need CBE AC switch boxes...new generation blades/crates coming out with power control features.

## FMEA of redundant Control Racks:

<b>Failure</b>	<b>Effect</b>	<b>Action Required/Taken</b>
Fan control opto-coupler fails (CE open)	Fan runs at full speed. Fan speed monitor indicates full speed.	Maintenance day debug to find problem. Could be RPMIB, cable, or NI 6509.
Fan speed monitor opto-coupler fails	CPCC senses that fan has quit. Redundant CPCC sees that fan is ok. No manual inspection required.	Maintenance day the RPMIB, cable, or NI 6509 need checking and possible replacement.
Correlator board power control line fails/disconnects	Correlator module continues to run, and no immediate indication of failure condition.	Maintenance day check finds problem. Debug to determine if RPMIB, cable, or NI 6509 failure.
Correlator board power monitor line fails	Indication is that power on the module is off. Redundant CPCC sees its ok, and CMIB responds.	Maintenance day debug required to determine if it is the RPMIB, cable, or NI 6509 card.
-48 V monitor line fails	Indication is that -48 VDC has failed. Redundant CPCC says ok. Fan speed is still ok, CMIBs responding <sup>3</sup> . Conclude that monitor line has failed.	Maintenance day debug required to determine if it is the RPMIB, cable, or NI 6509.

5-bit ID changes	No operational effect. Redundant CPCC sees same problem. Software must be designed to be robust to this failure.	Manual debug required to determine if it is the RPMIB, cable, or NI 6509.
SCSI-100 cable connector comes loose.	Fans may run at full speed. Correlator boards continue to run. Indication is that one or more fans have quit and that one or more modules have quit. -48 VDC monitor could indicate -48 VDC power lost. Redundant CPCC says everything is ok, but fans are running too fast.	Maintenance day debug required to determine if RPMIB has massively failed, cable is bad/disconnected, or NI 6509 card is dead. No lost correlator time.
NI 6509 card PCI bus interface fails.	Rack keeps running ok. Indication is that rack is experiencing multiple failures. Redundant CPCC says everything ok. Power control may be lost <sup>4</sup> .	Maintenance day debug to determine problem. Requires power-cycle of affected CPCC to replace NI 6509 card. No correlator interruption.
CPCC CPU fails.	Auto-reboot may or may not restore CPCC. NI 6509 "safe mode" is all control outputs hi-Z. All racks continue to operate normally, all fans at full speed. Full monitor and control provided by redundant CPCC.	Manual debug to find problem...continuous reboot cycles of the processor reasonably quickly diagnosed. Requires defective CPCC power down and CPU replacement. No lost correlator time.
CPCC power supply fails.	Redundant CPCC provides M&C functions. Correlator remains on-line.	Replace defective power supply or entire unit the next day to bring failed CPCC back on line. No lost correlator time.



## CPCP Reliability

- With MTBF of rack-mount PC of 1800 hours, and 24 hour repair time, the MTBF of the 1+1 redundant system is ~4 years.
  - Based on Telcordia 2200 hour MTBF for PC...could be higher?
  - 124,000 hour MTBF of the NI-PCI-6509 card.
  - Higher reliability if repair time is faster.
  - Could use CompactPCI instead...more expensive.

## Power up sequence

- -48 VDC plant self starts with 480 VAC mains available.
  - All correlator –48 VDC modules are off.
- 110 VAC power is restored...Control Rack CPUs power up+boot.
- Establish network comms with EVLA M&C...verify –48 VDC status.
- Timed sequence startup of correlator modules...CMIBs boot.
- MCCCs “find out about” correlator modules.
- Timed sequence boot of FPGAs.....execute BIST functions, test correlator connectivity etc.
- CPCCs operating normally. MCCCs ready for commands.

## Power down/fail sequence

- -48 VDC power failure indication via RPMIBs and/or power plant. 5 min at full power available.
- $t=TSLEEP$ : hit reset lines on all chips on all boards...processing stops. Slow fans down...possibly turn off HVAC blowers. Monitor on-board temps...try to maintain temp.
- $t=TPDWN$ : automatically reached when -48 VDC power goes away. All modules off. All cooling stops. Control Racks still on.
- $t=T\_CNTRL\_PDWN$ : Control Racks power off as 110 VAC UPS is lost.



## Software Requirements

- Possible commands/responses:
  - sysPowerOn/sysPowerOff
  - modulePowerCycle
  - modulePowerOff/modulePowerOn
  - checkTemp/checkVoltageRange
  - ...also autonomous overvoltage/overtemp messages.
  - Must be built for 1+1 redundancy.
- PMCS S/W RFS required, based on PMCS RFS A25026N0000 and EVLA Memo 107 (Bob Broilo).
  - CPCCs must operate autonomously and intelligently.