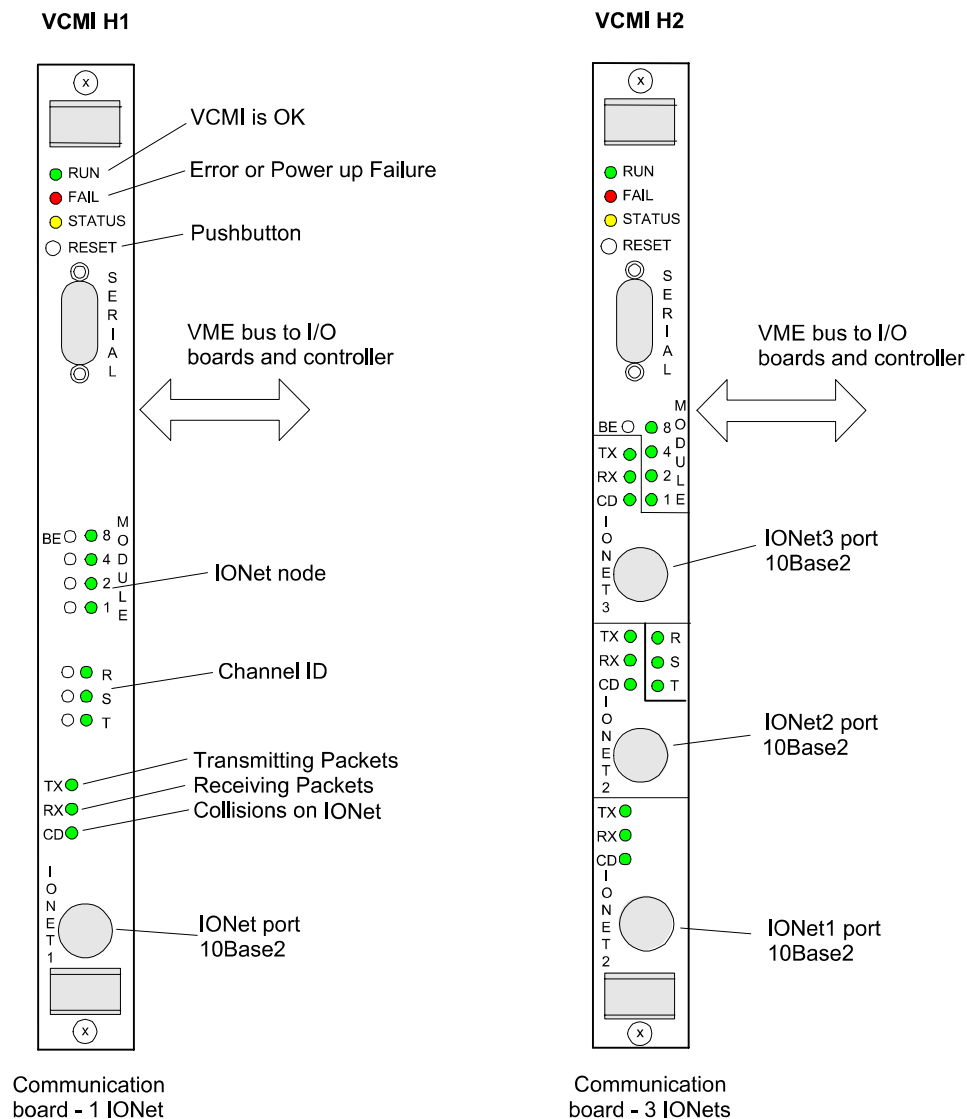


VCMI Bus Master Controller

VCMI Bus Master Controller

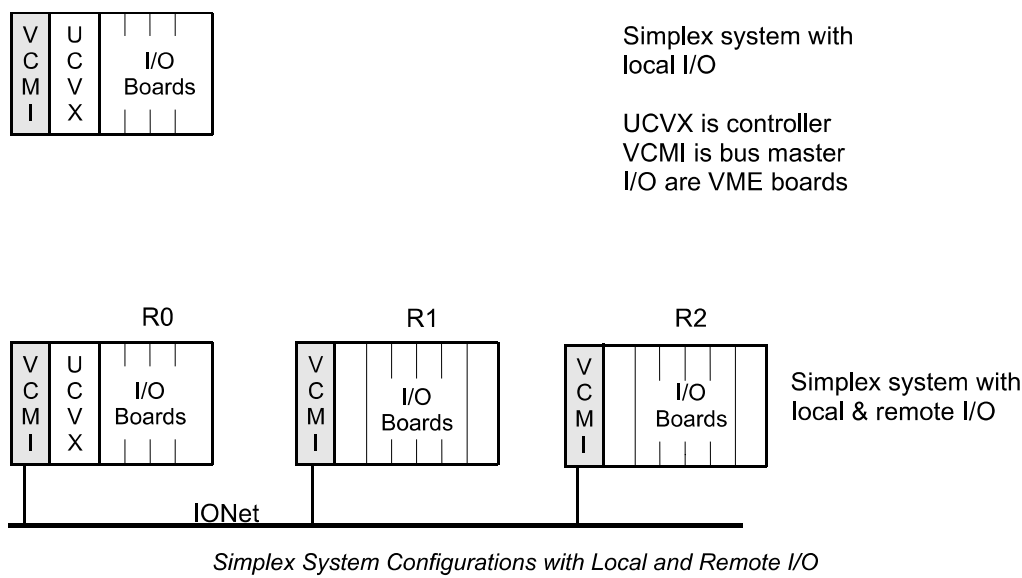
Functional Description

The VME Bus Master Controller (VCMI) board is the communication interface between the controller and the I/O boards, and the communication interface to the system control network, known as IONet. VCMI is also the VME bus master in the control and I/O racks, and manages the IDs for all the boards in the rack and their associated terminal boards. The two versions of the VCMI are shown in the following figure:



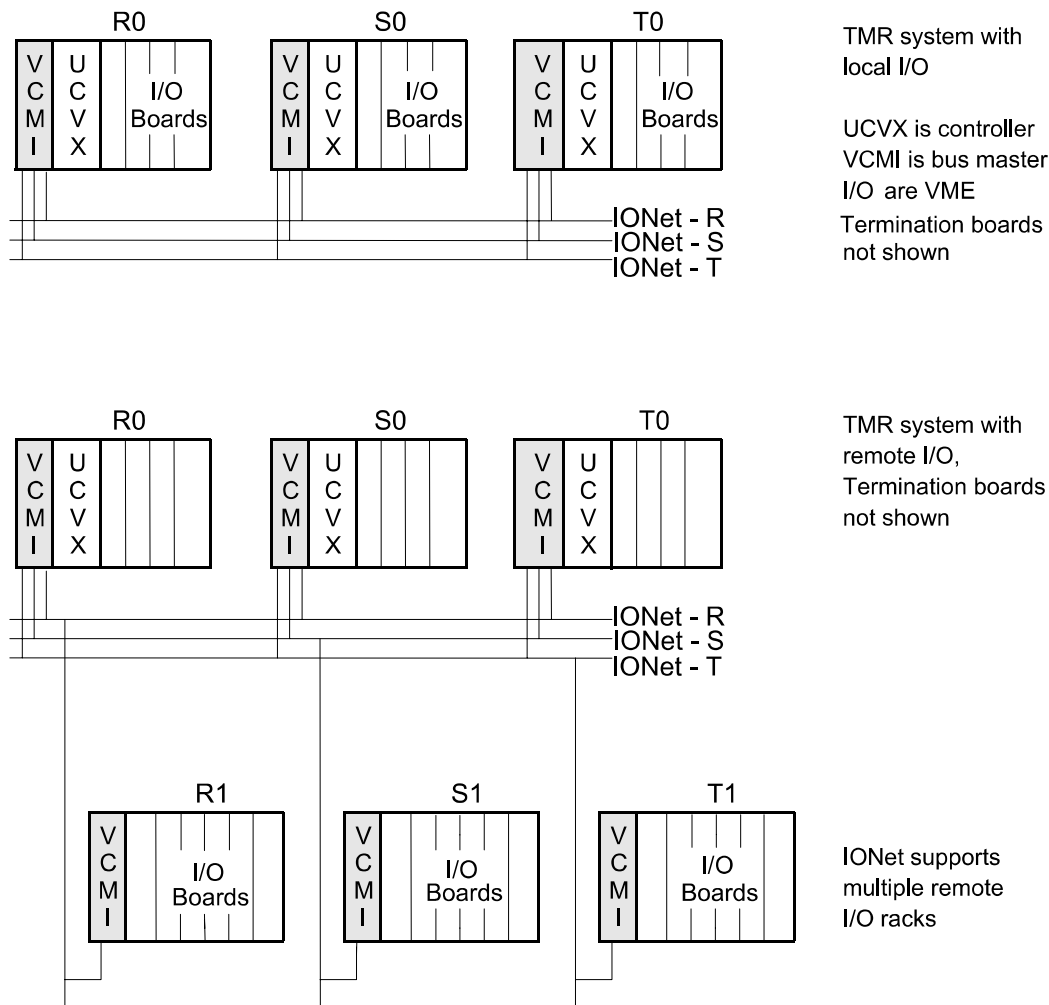
VCMI Boards, Single, and Triple Network Versions

Multiple I/O racks can be connected to the IONet, each rack with its own VCMI board. The following figure shows three simplex system configurations with local and remote I/O using the VCMI.



The following figure shows two sizes of triple modular redundant (TMR) systems. The first example is a small system where all the I/O is mounted in the VME control rack so no remote I/O racks are required. Each channel (R, S, T) has its own IONet, and the VCMI has three IONet ports.

The second example is a larger system with remote I/O racks. Each IONet supports multiple I/O racks, but only one rack is shown here. All I/O channels (R, S, T) are identical in terms of I/O boards and points.



TMR System Configurations with Local and Remote I/O

The VCMi card receives analog and digital feedback of power status through the J301 backplane connector. J301 connections are as follows:

| Backplane | | VCMi Hardware | | VCMi Software | |
|-----------|----------|---------------|-------------------------------|---------------|-----------------------------|
| J301 Pin | Signal | VCMi Signal | Description | Signal Space | Signal Space Description |
| 1 | P28AA | | +28 V Power out | | |
| 2 | PCOM | | Power common | | |
| 5 | SG201C28 | AIN4P | Analog input 4 + | Spare 02 | Analog spare 02 |
| 6 | SG201C27 | AIN4N | Analog input 4 - | Spare 01 | Analog spare 01 |
| 7 | SG201C26 | AIN3P | Analog input 3 + | | |
| 8 | SG201C25 | AIN3N | Analog input 3 - | | |
| 9 | SG201C24 | DINRET | Digital input Power common | | |
| 10 | SG201C23 | DINPWROUT | Digital input Power output | | |
| 11 | SG201C22 | DIN12 | Digital input 12 | Logic_In_12 | Spare 05 |
| 12 | SG201C21 | DIN11 | Digital input 11 | Logic_In_11 | Spare 04 |
| 13 | SG201C20 | DIN10 | Digital input 10 | Logic_In_10 | Spare 03 |
| 14 | SG201C19 | DIN9 | Digital input 9 | Logic_In_9 | Spare 02 |
| 15 | SG201C18 | DIN8 | Digital input 8 | Logic_In_8 | Spare 01 |
| 16 | SG201C17 | DIN7 | Digital input 7 | Logic_In_7 | Fuse 29, J17 Fault |
| 17 | PCOM | | Power common | | |
| 18 | P28AA | | +28 V Power out | | |
| 19 | SIGCOM02 | | SCOM-DCOM JP2 Select | | |
| 20 | N28 | | -28 V Power out | | |
| 21 | PCOM | | Power common | | |
| 26 | SG201A26 | AIN2P | Analog input 2 + | N125_Grd | N125 with respect to ground |
| 27 | SG201A25 | AIN2N | Analog input 2 - | | |
| 28 | SG201A24 | AIN1P | Analog input 1 + | P125_Grd | P125 with respect to ground |
| 29 | SG201A23 | AIN1N | Analog input 1 - | | |
| 30 | SG201A22 | DIN6 | Digital input 6 | Logic_In_6 | Fuse 32, J20 Fault |
| 31 | SG201A21 | DIN5 | Digital input 5 | Logic_In_5 | Fuse 31, J19 Fault |
| 32 | SG201A20 | DIN4 | Digital input 4 | Logic_In_4 | Miscellaneous contact |
| 33 | SG201A19 | DIN3 | Digital input 3 | Logic_In_3 | AC2 source fault |
| 34 | SG201A18 | DIN2 | Digital input 2 | Logic_In_2 | AC1 source fault |
| 35 | SG201A17 | DIN1 | Digital input 1 | Logic_In_1 | Battery bus fault |
| 36 | SIGCOM01 | | SCOM-DCOM JP1 Select | | |
| 37 | CBL301ID | CBL301ID | ID Cable signal | | |

Specifications

| Item | Specification |
|---------------|---|
| Board Type | 6U high VME board, 0.787 inch wide |
| Processor | Texas Instruments TMS320C32 32-bit digital signal processor |
| Memory | Dual-port memory, 32 Kbytes in 32-bit transfer configuration SRAM, 256k x 32 Flash memory, 512k x 8-VCMIH_B; 4096K x 8-VCMIH_C |
| Communication | H1 version: One IONet 10Base2 Ethernet port, BNC connector, 10 Mbps/sec H2 version: Three IONet 10Base2 Ethernet ports, BNC connectors, 10 Mbps/sec VME bus block transfers 1 RS-232C Serial port, D-style plug connector, 9600 (only) |
| Frame Rate | 10 ms (100 Hz) for simplex 40 ms (25 Hz) for TMR 20 ms, 80 ms application dependent |

Diagnostics

The internal +5 V, ± 12 V, ± 15 V, and ± 28 V power supply buses are monitored and alarmed. The alarm settings are configurable and usually set at 3.5%, except for the 28 V supplies, which are set at 5.5%.

Diagnostic signals from the power distribution module (PDM), connected through J301, are also monitored. These include ground fault and over/under voltage on the P125 V bus, two differential ± 5 V dc analog inputs, P28A and PCOM for external monitor circuits, and digital inputs.

Configuration

VCMI Toolbox Configuration (Part 1 of 2)

| Parameter | Description | Choices |
|------------------|---|-----------------------------|
| Configuration | | |
| System Limits | Enable or disable all system limits | Enable, disable |
| PS_Limit1 | \pm Power supply limits for P5, P15, N15 in % | 0 to 10 |
| PS_Limit2 | \pm Power supply limits for P12, N12, P28, N28 in percent | 0 to 10 |
| PwrBusLimits | Enable or disable power bus diagnostics | Enable, disable |
| 125 vBusHlim | High limit for 125 V dc bus in volts | 0 to 150 |
| 125 vBusLlim | Low limit for 125 V dc bus in volts | 0 to 150 |
| 125 vBusGlim | Low volts to ground limit for 125 V dc bus (diagnostic) | 0 to 150 |
| J3 Power Monitor | PDM monitor | Connected, not connected |
| Logic_In_1 | First of 12 logical inputs – board point signal | Point edit (input BIT) |
| Logic_In | Configurable item | Used, unused |
| P125_Grd | P125 with respect to ground – board point signal | Point Edit (Input FLOAT) |
| Input_Type | Type of analog input | Used, unused |
| Low_Input | Input volts at low value | -10 to +10 |
| Low_Value | Input value in engineering units at low MA | -3.4082e+038 to 3.4028e+038 |

| Parameter | Description | Choices |
|-----------------|---|---|
| High_Input | Input volts at high value | -10 to +10 |
| High_Value | Input value in engineering units at high MA | -3.4082e+038 to 3.4028e+038 |
| Input_Filter | Bandwidth of input signal filter in Hz | Unused, 0.75 Hz, 1.5 Hz, 3 Hz, |
| TMR_DiffLimit | Difference limit for voted TMR inputs in % of high-low values | 0 to 10 |
| Sys_Lim_1_Enabl | Enable system limit 1 fault check | Enable, disable |
| Sys_Lim_1_Latch | Input fault latch | Latch, unlatch |
| Sys_Lim_1_Type | Input fault type | Greater than or equal Less than or equal |
| Sys_Lim_1 | Input limit in engineering units | -3.4082e+038 to 3.4028e+038 |
| Sys_Lim_2 | Same as above for Sys Lim 1 | Same as for Sys_Lim_1 |
| N125_Gnd | Same as for P125_Grd – board point signal | Same as for P125_Grd |
| Spare 01 | Similar to P125_Grd – board point signal | Similar to P125_Grd |
| Spare 02 | Similar to P125_Grd – board point signal | Similar to P125_Grd |

VCMI Toolbox Configuration (Part 2 of 2)

| Parameter | Description | Choices | |
|--------------------|---|-----------|-------|
| Board Point Signal | Description - Point Edit (Enter Signal Connection) | Direction | Type |
| L3Diag_VCM1 | Board diagnostic | Input | BIT |
| L3Diag_VCM2 | Board diagnostic | Input | BIT |
| L3Diag_VCM3 | Board diagnostic | Input | BIT |
| SysLimit1-1 | P125_Grd (Input exceeds limit) | Input | BIT |
| SysLimit1-2 | N125_Grd (Input exceeds limit) | Input | BIT |
| SysLimit1-3 | Spare 01 (Input exceeds limit) | Input | BIT |
| SysLimit1-4 | Spare 02 (Input exceeds limit) | Input | BIT |
| SysLimit1_125 | P125 bus out of limits (Input exceeds limit) | Input | BIT |
| SysLimit2-1 | P125_Grd (Input exceeds limit) | Input | BIT |
| SysLimit2-2 | N125_Grd (Input exceeds limit) | Input | BIT |
| SysLimit2-3 | Spare 01 (Input exceeds limit) | Input | BIT |
| SysLimit2-4 | Spare 02 (Input exceeds limit) | Input | BIT |
| SysLimit2_125 | P125 bus out of limits (Input exceeds limit) | Input | BIT |
| P125Bus | Calc 125 V dc bus voltage (P125Grd - N125Grd) | Input | FLOAT |
| ResetSYS | System limit reset (Special VCMI output to I/O bds) | Output | BIT |
| ResetDIA | Diagnostic reset (Special VCMI output to I/O bds) | Output | BIT |
| ResetSuicide | Suicide reset (Special VCMI output to I/O bds) | Output | BIT |
| MasterReset | Master reset L86MR (Special VCMI out to I/O bds) | Output | BIT |
| Logic_In_1 | Battery bus fault | Input | BIT |
| Logic_In_2 | AC1 source fault | Input | BIT |
| Logic_In_3 | AC2 source fault | Input | BIT |
| Logic_In_4 | Misc contact | Input | BIT |
| Logic_In_5 | Fuse 31, J19 fault | Input | BIT |
| Logic_In_6 | Fuse 32, J20 fault | Input | BIT |
| Logic_In_7 | Fuse 29, J17 fault | Input | BIT |
| Logic_In_8 | Spare 01 | Input | BIT |
| Logic_In_9 | Spare 02 | Input | BIT |
| Logic_In_10 | Spare 03 | Input | BIT |
| Logic_In_11 | Spare 04 | Input | BIT |
| Logic_In_12 | Spare 05 | Input | BIT |
| P125_Grd | P125 with respect to ground, P3 – 28 to 29 | Input | FLOAT |

| Parameter | Description | Choices | |
|-----------|---|---------|-------|
| N125_Grd | N125 with respect to ground, negative number, P3 – 26 to 27 | Input | FLOAT |
| Spare01 | Analog spare 01, P3 – 07 to 08 | Input | FLOAT |
| Spare02 | Analog spare 02, P3 – 05 to 06 | Input | FLOAT |

Alarms

| Fault | Fault Description | Possible Cause |
|-------|--|--|
| 1 | SOE Overrun. Sequence of Events data overrun | Communication problem on IONet |
| 2 | Flash Memory CRC Failure | Board firmware programming error (board will not go online) |
| 3 | CRC Failure Override is Active | Board firmware programming error (board is allowed to go online) |
| 4 | Watchdog circuitry is not armed | Board firmware programming error (board is allowed to go online) |
| 16 | System Limit Checking is Disabled | System checking was disabled by configuration |
| 17 | Board ID Failure | Failed ID chip on the VME I/O board |
| 18 | J3 ID Failure | Failed ID chip on connector J3, or cable problem |
| 19 | J4 ID Failure | Failed ID chip on connector J4, or cable problem |
| 20 | J5 ID Failure | Failed ID chip on connector J5, or cable problem |
| 21 | J6 ID Failure | Failed ID chip on connector J6, or cable problem |
| 22 | J3A ID Failure | Failed ID chip on connector J3A, or cable problem |
| 23 | J4A ID Failure | Failed ID chip on connector J4A, or cable problem |
| 24 | Firmware/Hardware Incompatibility | Invalid terminal board connected to VME I/O board |
| 25 | Board inputs disagree with the voted value | A problem with the input. This could be the device, the wire to the terminal board, the terminal board, or the cable. |
| 30 | ConfigCompatCode mismatch; Firmware: #, Tre: # The configuration compatibility code that the firmware is expecting is different than what is in the tre file for this board | A tre file has been installed that is incompatible with the firmware on the I/O board. Either the tre file or firmware must change. Contact the factory. |
| 31 | IOCompatCode mismatch; Firmware: #, Tre: # The I/O compatibility code that the firmware is expecting is different than what is in the tre file for this board | A tre file has been installed that is incompatible with the firmware on the I/O board. Either the tre file or firmware must change. Contact the factory. |
| 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. |

| Fault | Fault Description | Possible Cause |
|--------------|---|--|
| 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. |
| 43 | 125 Volt Bus=####.## Volts is Outside of Limits. The 125-Volt bus voltage is out of the specified operating limits | A source voltage or cabling problem; disable 125 V monitoring if not applicable. |
| 44 | 125 Volt Bus Ground =####.## Volts is Outside of Limits. The 125-Volt bus voltage ground is out of the specified operating limits | Leakage or a fault to ground causing an unbalance on the 125 V bus; disable 125 V monitoring if not applicable. |
| 45 | IONet-1 Communications Failure. Loss of communication on IONet1 | Loose cable, rack power, or VCMI problem |
| 46 | IONet-2 Communications Failure. Loss of communication on IONet2 | Loose cable, rack power, or VCMI problem |
| 47 | IONet-3 Communications Failure. Loss of communication on IONet3 | Loose cable, rack power, or VCMI problem |
| 48 | VME Bus Error Detected (Total of #### Errors). The VCMI has detected errors on the VME bus | The sum of errors 60 through 66 - Contact the factory. |
| 49 | Using Default Input Data, Rack R.#. The VCMI is not getting data from the specified rack | IONet communications failure - Check the VCMI and/or IONet cables. |
| 50 | Using Default Input Data, Rack S.#. The VCMI is not getting data from the specified rack | IONet communications failure - Check the VCMI and/or IONet cables. |
| 51 | Using Default Input Data, Rack T.#. The VCMI is not getting data from the specified rack | IONet communications failure - Check the VCMI and/or IONet cables. |
| 52 | Missed Time Match Interrupt (## uSec). The VCMI has detected a missed interrupt | Possible VCMI hardware failure |
| 53 | VCMI Scheduler Task Overrun. The VCMI did not complete running all its code before the end of the frame | Possibly too many I/O |
| 54 | Auto Slot ID Failure (Perm. VME Interrupt). The VCMI cannot perform its AUTOSLOT ID function | I/O board or backplane problem |
| 55 | Card ID/Auto Slot ID Mismatch. The VCMI cannot read the identity of a card that it has found in the rack | Board ID chip failed |
| 56 | Topology File/Board ID Mismatch. The VCMI has detected a mismatch between the configuration file and what it actually detects in the rack | ID chip mismatch - Check your configuration |
| 57 | Controller Sequencing Overrun | Too much application code used in controller. Reduce the code size. |
| 58 | Controller PCODE Version Mismatch between R,S,and T. R, S, and T have different software versions | Error during controller download - revalidate, build, and download all 3 controllers. |
| 59 | IONet Communications Failure. Loss of communications on the slave VCMI IONet | Loose cable, rack power, or VCMI problem (VCMI slave only) |
| 60-66 | VME Error Bit # (Total ## Errors). The VCMI has detected errors on the VME bus | VME backplane errors - Contact factory. |
| 67 | Controller Board is Offline. The VCMI cannot communicate with the controller | Controller failed or is powered down. |
| 68-87 | I/O Board in Slot # is Offline. The VCMI cannot communicate with the specified board | I/O board is failed or removed. You must replace the board, or reconfigure the system and redownload to the VCMI, and reboot. |

| Fault | Fault Description | Possible Cause |
|--------------|--|--|
| 88 | U17 Sectors 0-5 are not write protected | Sectors not write protected in manufacturing. Contact the factory. |
| 89 | SRAM resources exceeded. Topology/config too large | The size of the configured system is too large for the VCMI. You must reduce the size of the system. |
| 90 | U54 Flashsectors #-## not write protected | Sectors not write protected in manufacturing. Contact the factory |

Notes