

D20/D200™

Substation Controller



Installation and Operations Guide

994-0078

Version 2.00 Revision 12



imagination at work



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Contents

Sections

Use this **D20/D200 Installation and Operations Guide** for installing, operating and maintaining your D20 or D200. The guide is divided into the following sections.

Topic	See Page
Section 1: Installation and Commissioning	2
Product Support and Safety	2
Specifications, Supported Standards	7
Specifications, Supported Standards	19
Getting Started: Required Steps	21
Familiarization	23
Physical Mounting	53
RS-232 Switch Panel: Active/Standby Switch	53
Power-up and Test	105
Downloading Firmware	115
Section 2: Operation and Maintenance	118
D20/D200 Software Configuration	118
Calibration	135
Re-Initialization	139
Operation	142
Servicing	144
Section 3: Security	148
Removing Configuration Data	148
Removing Hardcoded D20 Passwords	150
Section 4: Removing D20/D200 From Service	151
Section 5: Troubleshooting	152
Troubleshooting D20/D200 Serial Communications	152
Troubleshooting Firmware Version Mismatches	156
68K Monitor Commands	162
Modify pSOS Buffers	164
Appendices	
Appendix A: Product Combinations	166
Appendix B: D20 Spare Cross-Reference	171

1. Installation and Commissioning

Product Support and Safety

Getting help	If you need help with any aspect of your GE Digital Energy product, you can: • Access the GE Digital Energy Web site • Search the GE Digital Energy Technical Support library • Contact GE Digital Energy Technical Support
Search Technical Support	The GE Digital Energy Web site provides fast access to technical information, such as manuals, release notes and knowledge base topics. Visit us on the Web at: http://www.gedigitalenergy.com/
Contact Technical Support	GE Digital Energy Technical Support is open 24 hours a day, seven days a week for you to talk directly to a GE representative. In the U.S. and Canada, call toll-free: 1 877 547 8630 International customers, please call: +1 905 927 7070 Or e-mail to multilin.tech@ge.com Have the following information ready to give to Technical Support: • Ship to address (the address that the product is to be returned to) • Bill to address (the address that the invoice is to be sent to) • Contact name • Contact phone number • Contact fax number • Contact e-mail address • Product number / serial number • Description of problem Technical Support will provide you with a case number for your reference.
GE Digital Energy Address	GE Digital Energy is located at: GE Digital Energy 650 Markland Street Markham, Ontario Canada L6C 0M1
Product returns	Before you return a product, please contact GE Digital Energy Technical Support to obtain a Return Merchandise Authorization number and complete instructions for return shipments. A Return Merchandise Authorization (RMA) number must accompany all equipment being returned for repair, servicing, or for any other reason. Note: Product returns will not be accepted without a Return Merchandise Authorization number.
 CAUTION	Trying to resolve problems using methods that are not recommended by GE Digital Energy may result in damage or injury to persons and property.
Module Replacement	D20 EME 10Base-T Media Interface Card (526-2110) has been replaced by: D20 Media Interface Card EME 10Base-T (526-2116)

Product Support and Safety, continued

Warranty

GE Digital Energy warrants each D20 and D200 product to be free of defects in material and workmanship under normal use and service for a period of 18 months from the date of shipment from the factory.

In the event of a failure covered by warranty, GE Digital Energy will undertake to repair or replace the unit without charge, providing that the warrantor has determined that it is defective.

Warranty shall not apply to any unit which has been subject to:

- Misuse
- Negligence
- Accident
- Incorrect installation
- Use of this product in a manner not specified by GE Digital Energy in this Guide.
- Alterations by anyone other than GE Digital Energy, or an authorized representative.

GE Digital Energy is not liable for special, indirect or consequential damages, or for loss of profit or expenses sustained as a result of a product malfunction, incorrect application or adjustment.

Note

The above terms are subject to change at any time, or as stipulated in contractual agreements.

Safety Precautions

Follow all safety precautions and instructions in this manual:

- Only qualified personnel should work on the D20/D200. Maintenance personnel should be familiar with hazards associated with electrical equipment.
- All AC voltage and current terminals are protected from accidental contact by mechanical safety shields. The D20/D200 is designed so that field wiring does not have to be touched or disconnected when removing field-replaceable printed circuit boards (PCBs).
- All components within the D20/D200 are susceptible to damage from electrostatic discharge. Observe standard ESD precautions.

Product Support and Safety, continued

CAUTION

Hazardous Voltages

Hazardous Voltages can cause shock, burns or death.

- Due to the common bus architecture of D20 I/O peripherals, an energized condition may exist due to induced voltage or unrelated voltage backfeed even though specific parts of the circuit have been de-energized and presumed to be safe. Qualified personnel shall confirm the circuit is de-energized before commissioning or servicing the equipment
- Disconnect and lockout all power sources before servicing and removing components.
- Short all current transformer primaries before servicing.
- The D20/D200 is designed to allow peripherals to be hot-swapped: they can be safely removed and re-installed without powering down the unit.
- Connectors under plastic covers carry hazardous voltages. Removal of plastic cover will expose hazardous voltages.

Warning Symbols

CAUTION

Caution (refer to accompanying documentation)



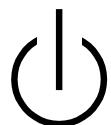
Caution Risk of electric shock



Earth/Ground Terminal



Protective Ground Terminal



Power Supply Off (Stand-by Mode)



Power Supply On



Direct Current



Alternating Current

Product Support and Safety, continued

Operating Environment

- The D20/D200's enclosure is intended for indoor use primarily to provide protection against accidental contact with the enclosed modules and voltages. Do not place the product in environments where unusual conditions exist (windblown dust and dirt, liquids, etc.) without a secondary protective enclosure.
- For proper fire protection, the D20/D200 must be installed in an enclosure that includes a metal floor with no openings.
- Never operate the D20/D200 in the field with any blanking panels removed. Operation with the front panel open may alter product performance specifications, and allow component damage from debris entering the unit.

CAUTION

Protection during Maintenance

Ensure that the D20/D200 is protected from falling debris during maintenance.

Small metallic particles (such as wire clippings) can fall through the ventilation holes on the top of the unit, possibly damaging or interfering with the safe and reliable operation of the D20/D200.

If you cover the unit for maintenance, remove cover before operating to provide adequate cooling airflow.

Operation in Residential Areas

The D20/D200 generates radio frequency energy. If it is not operated and used in accordance with the instructions provided in this guide, it may cause harmful interference to radio communications in a residential area. Users are required to correct interference at their own expense.

CAUTION

Rack Spacing for free airflow

When mounting multiple D20/D200s in a rack (or if mounting a D20/D200 in a rack with other equipment) verify that there is at least one rack unit (RU) space above and below the D20/D200 to allow for cooling airflow (1 RU = 1.75 inches).

CAUTION

WESMAINT Cable

Use only a standard PROMAINT cable (GE Digital Energy part number 977-0048) when you are connecting to the D20ME or ME II's front-panel WESMAINT connector. Use of any other cable may cause serious damage.

Product Support and Safety, continued

Do's and Don'ts

Follow these practices at all times:

1. Surge and noise suppression components used on the D20 and D200 are designed to conduct during transients to prevent nuisance operation or damage to internal components. To ensure shunting of transients from line to ground, the D20's and D200's earth ground stud must be connected to a low impedance ground using braided cable or heavy solid copper conductor (12 AWG recommended). When making ground connections, ensure that all surfaces that are used for grounding are free of dirt, residue and corrosion. A coating such as glyptol can be used to protect these connections from oxidation and dirt deposits.
2. Ensure that cable shields are grounded at either the D20 or D200 auxiliary ground stud or at the field equipment. Do not ground the shields at more than one point because a potential difference may exist between grounds causing ground loops and undesirable noise sources.
3. Ensure that all nuts and screws are properly tightened.
4. Always replace fuses with the same type and rating used by GE Digital Energy. For fuse types and ratings, see "Servicing", page 144.
5. When connecting to communications equipment such as modems or radios, always use appropriate surge protectors to protect the communication ports.
6. To prevent interference with communications, route all communication cables away from power-carrying cables.
7. Always fuse-protect field sources.
8. Always configure the jumpers in your D20 or D200 prior to connecting field I/O.
9. Follow all instructions in this guide as they are presented.
10. Do not operate the D20 or D200 if it has been dropped or damaged. Return it to GE Digital Energy for inspections and repair.
11. The D20 and D200 power supplies use switching technology. For proper operation, the input voltage must be within specified limits prior to turning on the D20's or D200's power switch.
12. Do not apply voltages outside the range of the product specifications. Voltages outside the specified range may lead to premature product failure.
13. Do not modify the D20 or D200 without prior written authorization from GE Digital Energy.

Make sure the D20 or D200 is grounded using the protective ground stud.

 CAUTION
**Protective
Earth/Ground**

Connection must be provided with separate green/yellow wire connected between the D20 or D200 and the protective earth system of the facility. Minimum 12 AWG is recommended.

Specifications, Supported Standards and Approvals

Overview	GE Digital Energy has tested the D20 product/accessories according to specifications and supported standards for: • Mechanical & Environmental • Safety • Emissions • Immunity • Approvals
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Mechanical & Environmental

Standard	Test	Test Specification	Modules Tested
IEC 60068-2-6	Sinusoidal Vibration	10Hz to 150Hz at a sweep rate of 1 octave/minute. Acceleration level of 1g. One sweep cycle	Low Voltage: D20A, D20S, D20K, D20C, D20AC High Voltage: D20A, D20S, D20K, D20C
IEC 60068-2-6	Sinusoidal Vibration	10Hz to 150Hz at a sweep rate of 1 octave/minute. Acceleration level of 1g. 20 sweep cycles	High Voltage: D20A, D20S, D20K, D20C
IEC 60068-2-1	Cold Test	-10°C for 16 hours	Low Voltage: D20S, D20K D20AC High Voltage: D20S, D20K, D20C D20 Power Supply and D20 CPUs
IEC 60068-2-2	Dry Heat	+55°C for 16 hours	Low Voltage: D20A, D20S, D20K, D20C, D20AC High Voltage: D20A
IEC 60068-2-2	Dry Heat	+70°C for 16 hours	Low Voltage: D20A, D20S, D20K D20 Power Supply, D20 CPUs
IEC 60068-2-30	Damped heat humidity	+25°C to +55°C for 3 hours at 95% Relative Humidity +55°C for 9 hours at 95% Relative Humidity +55°C to +25°C for 6 hours no less than 80% Relative Humidity +25°C for 6 hours at 95% Relative Humidity Repeated for 6 cycles	Low Voltage: D20A, D20S, D20K, D20C, D20AC High Voltage: D20A
IEC 60068-2-30	Damped heat humidity	+40°C at 95% Relative Humidity; 4 cycles	D20 Power Supply, D20 CPUs
	Drop Test	1 drop of 50 mm on rest surface	High Voltage: D20A, D20S, D20K, D20C
	Burn in test	+55°C for 100 hours	High Voltage: D20A, D20S, D20K, D20C
IEC 61672-1	Noise	0 dB(A)	unit
EN 60068-2-3	Damped Heat, Steady State	20°C to 0°C for 20min at 10% Relative Humidity 0°C to 20°C for 6 hours at 95% Relative Humidity Dwell at 20°C for 3 hours at 95% Relative Humidity 20°C to 40°C at 95% Relative Humidity Dwell at 40°C for 3 hours at 95% Relative Humidity 40°C to 55°C for 3 hours at 95% Relative Humidity Dwell at 55°C for 6 hours at 95 % Relative Humidity Return to 20°C with uncontrolled Relative Humidity in 35 minutes. Repeated for 2 cycles	High Voltage: D20A, D20S, D20C

Specifications, Supported Standards and Approvals, continued

Safety

Standard	Test	Test Specification	Modules Tested
IEC 60255-5: 2001	Impulse Voltage Withstand	500 to 2000V	Low Voltage: D20A, D20S, D20K, D20C High Voltage: D20A, D20S, D20K D20 Power Supply, D20 Chassis, D20 CPUs, D.20 Converter and D.20 DC Interface
IEC 60255-5: 2001	Dielectric test	710 to 1000VDC for D20 Analog Modules and D20 Status Modules 710 to 1500VDC D20 Control Modules	Low Voltage: D20A, D20S, D20K, D20C High Voltage: D20A, D20S, D20K D20 Power Supply, D20 Chassis, D20 CPUs, D.20 Converter and D.20 DC Interface
IEC 60255-5: 2001	Insulation resistance test	1.5 GOhm min	Low Voltage: D20A, D20S, D20K, D20C High Voltage: D20A, D20S, D20K D20 Power Supply, Chassis, D20 CPUs, D.20 Converter, D.20 DC Interface

Emissions

Standard	Test	Test Specification	Modules Tested
CISPR 11:2006	Conducted Emissions	150 kHz to 30 MHz	Low Voltage: D20A, D20S, D20K, D20C, D20AC D20KI, D20 Power Supply and D20 Chassis
CISPR 22: 2008-09 EN 55022: 2010"	Radio Disturbance Characteristics	Class A	D.20 Converter, D.20 DC Interface

Immunity

Standard	Test	Test Specification	Modules Tested
IEC 61000-4-2: 2001	Electrostatic Discharge	Criteria / Class: B	Low Voltage: D20A, D20S, D20K, D20C, D20AC High Voltage: D20A, D20S, D20K, D20C, D20KI, D20 Power Supply
EN 61000-4-2: 1995+A2:2000	Electrostatic Discharge	Levels 1,2,3 and 4; Criteria / Class: B	Low Voltage: D20A, D20S, D20K, D20C D20 CPU
IEC 61000-4-2: 2001	Electrostatic Discharge	Criteria / Class: B	D20 Power Supply, D20 Chassis
IEC 60255-22-2	Electrostatic Discharge	+/- 6 and 8kV	D.20 Converter, D.20 DC Interface
EN 61000-4-3: 2006	Radiated Immunity	80Mhz-1Hhz; Criteria / Class: A	Low Voltage: D20A, D20S, D20K, D20C High Voltage: D20K, D20C D20 CPU
IEC 60255-22-3	Radiated Electromagnetic Field Immunity	80 to 1000 Mhz: 10 V/m, 80% AM modulation with 1kHz Sine wave signal 1400 to 2700 Mhz: 10 V/m, 80% AM modulation with 1kHz Sine wave signal	D.20 Converter, D.20 DC Interface
IEC 61000-4-4: 2004	Electrical Fast Transients/Burst	Criteria / Class: B	Low Voltage: D20A, D20S, D20K, D20C, D20AC High Voltage: D20A, D20S, D20K, D20C D20KI, D20 Power Supply

EN 61000-4-4: 2004	Electrical Fast Transients/Burst	Levels 1,2,3 and 4; Criteria / Class: B	Low Voltage: D20A, D20S, D20K, D20C D20 CPU
EN 61000-4-4: 2004	Electrical Fast Transients/Burst	Criteria / Class: B	D20 Power Supply, D20 Chassis
EN 61000-4-4: 2004	Fast Transient	PS: 4kV, Comm: 2kV	D.20 Converter, D.20 DC Interface
EN 61000-4-5: 2006	Surge Immunity	Criteria / Class: B	Low Voltage: D20A, D20S, D20K, D20C High Voltage: D20K D20 Power Supply, D20 Chassis and D20 CPU
EN 61000-4-5: 1995	Surge Immunity	PS: 2kV, Comm: 1kV	D.20 Converter, D.20 DC Interface
EN 61000-4-6: 2005	Conducted Immunity	150kHz - 80MHz; Criteria / Class: A	Low Voltage: D20A, D20S, D20K, D20C D20 CPU
IEC 60255-22-6	Conducted RF Immunity	3	D.20 Converter, D.20 DC Interface
EN 61000-4-6: 1996	Conducted Immunity	0.15 to 80MHz, Performance Criterion: A	D20 Power Supply, D20 Chassis
EN 61000-4-6: 2007	Conducted Immunity	150kHz - 80MHz; Criteria / Class: A	D20K High Voltage Module
IEC 61000-4-8: 2001	Power Frequency Magnetic Field	Criteria / Class: A	Low Voltage: D20A, D20S, D20K, D20C, D20AC High Voltage: D20A, D20S, D20K, D20C D20KI, D20 Power Supply, D20 Chassis
IEC 61000-4-8: 2009	Power Frequency Magnetic Field	5	D.20 Converter, D.20 DC Interface
IEC 61000-4-11: 2004	Voltage Dips and Interruptions	Criteria / Class: B/C	Low Voltage: D20A, D20S, D20K, D20C, D20AC High Voltage: D20A, D20S, D20K, D20C D20KI, D20 Power Supply
EN 61000-4-11: 2004	Voltage Dips and Interruptions	30, 60 and 100% of UT: Voltage Dip of 70, 40 and 0% of UT: Duration 0.5, 5, 50 and 250 (periods) Criteria / Class: B&C	Low Voltage: D20A, D20S, D20K, D20C D20 CPU
EN 61000-4-11: 2004	Voltage Dips and Interruptions	Criteria / Class: B/C	D20 Power Supply, D20 Chassis
EN 61000-4-11: 2004	Voltage Dips and Interruptions	0, 40, 70 and 80% dips and 250/300 cycles interruption	D.20 Converter, D.20 DC Interface
IEC 61000-4-29	Voltage dips, short interruptions and variations to DC Power Immunity test	0% Interrupts 60%, 30% Dips 80% and 120% variation	D.20 Converter, D.20 DC Interface
IEC 61000-4-12: 2001	Damped Oscillatory 1Mhz Bursts	Criteria / Class: B	D20KI, D20 Power Supply
IEC 61000-4-12: 2001	Ring Wave	Criteria / Class: B	High Voltage: D20A, D20S, D20K, D20C D20 Power Supply, D20 Chassis
IEC 61000-4-16: 2006	Conducted Disturbances	Criteria / Class: A	High Voltage: D20A, D20S, D20K, D20C D20 Power Supply, D20 Chassis
IEC 61000-4-12: 2001	Damped Oscillatory 1Mhz Bursts	Criteria / Class: B	Low Voltage: D20A, D20S, D20K, D20C, D20AC
IEC 61000-4-17	Ripple on DC Input power port immunity test	4	D.20 Converter, D.20 DC Interface

Specifications, Supported Standards and Approvals, continued

Approvals

Compliance	Applicable council directive	According to ...
CE	Low voltage directive	IEC 61010-1
	EMC directive	EN 61326-1
EAC	Machines and Equipment	TR CU 010/201

Restriction of Hazardous Substances (RoHS)



The environmental protection use period (EPUP), as defined in PRC SJ/T11363-2006, for the D20/D200 hardware assemblies listed in the table below is in excess of 20 years.

The following table shows the RoHS Material Declaration Data Content by PCB Assembly

Table: RoHS Compliance

RoHS Material Declaration Data Content by PCB Assembly

Item Number	Description	Lead (Pb)	Mercury (Hg)	Cadmium (Cd)	Hexavalent Chromium (Cr6)	Polybrominated biphenyls (PBB)	Polybrominated diphenyl ethers (PBDE)
245-0004	R-NET DIP 3K3 ISO 16 Pin	0	0	0	0	0	0
245-0009	R NET DIP 1K ISO 16 Pin	0	0	0	0	0	0
245-0012	R-NET DIP 100 ISO 16 Pin	0	0	0	0	0	0
245-0014	R-NET DIP 10K ISO 16 Pin	0	0	0	0	0	0
245-0029	R-NET DIP 1K2 ISO 16 Pin	0	0	0	0	0	0
245-0030	R-NET DIP 1K5 ISO 16 Pin	0	0	0	0	0	0
245-0031	R-NET DIP 560R ISO 16 Pin	0	0	0	0	0	0
500-0280	Chassis Assy D20 M (VME 3U)	X	0	0	0	0	0
500-0305	Chassis, D20M+ Single SLOT	X	0	0	0	0	0
500-0306	6U CCU Chassis, D200 VME, Single 115/230VAC	X	0	0	0	0	0
500-0307	6U CCU Chassis, D200 VME, Single 48VDC	X	0	0	0	0	0
500-0307-ECC	6U CCU Chassis, D200 VME, Single 48VDC Epoxy Conformal Coat	X	0	0	0	0	0
500-0310	6U CCU Chassis, D200 VME, Dual 48VDC	X	0	0	0	0	0
504-0002	WESDAC D20C+	X	0	0	0	0	0
504-0003	WESDAC D20C HV	X	0	0	0	0	0
507-0101	WESDAC D20S TY1 Version 1	X	0	0	0	0	0
507-0101-CC	WESDAC D20S TY1 Version 1	X	0	0	0	0	0
507-0103	WESDAC D20S HV2	X	0	0	0	0	0
507-0103-CC	WESDAC D20S HV2	X	0	0	0	0	0
507-0103-ECC	WESDAC D20S HV2 Epoxy Conformal Coated	X	0	0	0	0	0
508-0101	WESDAC D20K Type 1 Version 1	X	0	0	0	0	0
508-0101-CC	WESDAC D20K Type 1 Version 1 (Conformal Coat)	X	0	0	0	0	0
508-0101-ECC	WESDAC D20K Type 1 Version 1 (Conformal Coat)	X	0	0	0	0	0
508-0102	WESDAC D20K HV	X	0	0	0	0	0
508-0102-CC	WESDAC D20K HV (Conformal Coated)	X	0	0	0	0	0
508-0102-ECC	WESDAC D20K HV (Conformal Coated)	X	0	0	0	0	0
511-0101	WESDAC D20A Type 1 Version 1	X	0	0	0	0	0
511-0101-CC	WESDAC D20A Type 1 Version 1 (Conformal Coat)	X	0	0	0	0	0
511-0103	WESDAC D20A HV2	X	0	0	0	0	0
511-0103-CC	WESDAC D20A HV2 (Conformal Coat)	X	0	0	0	0	0
511-0103-ECC	WESDAC D20 AHV2 – Epoxy Conformal Coat	X	0	0	0	0	0

Item Number	Description	Lead (Pb)	Mercury (Hg)	Cadmium (Cd)	Hexavalent Chromium (Cr6)	Polybrominated biphenyls (PBB)	Polybrominated diphenyl ethers (PBDE)
517-0143	WESTERM D20 KR	X	0	0	0	0	0
517-0163	WESTERM D20A Type 1 Version 1	X	0	0	0	0	0
517-0163-CC	WESTERM D20A Type 1 Version 1 (Conformal Coat)	X	0	0	0	0	0
517-0164	WESTERM D20K Type 1 Version 1	X	0	0	0	0	0
517-0164-CC	WESTERM D20K Type 1 Version 1 (Conformal Coat)	X	0	0	0	0	0
517-0164-ECC	WESTERM D20K Type 1 Version 1 (Conformal Coat)	X	0	0	0	0	0
517-0165	WESTERM D20S Type 1 Version 1	X	0	0	0	0	0
517-0165-CC	WESTERM D20S Type 1 Version 1	X	0	0	0	0	0
517-0169	WESTERM D20C Type 1 Version 1	X	0	0	0	0	0
517-0178	WESTERM D20 AD	X	0	0	0	0	0
517-0178-CC	WESTERM D20 AD (Conformal Coat)	X	0	0	0	0	0
517-0179	WESTERM D20 SD	X	0	0	0	0	0
517-0179-CC	WESTERM D20 SD	X	0	0	0	0	0
517-0180	WESTERM D20 CD	X	0	0	0	0	0
517-0216	WESTERM D20AX W/TB Plugs	X	0	0	0	0	0
517-0216-CC	WESTERM D20AX W/TB Plugs (Conformal Coat)	X	0	0	0	0	0
517-0217	WESTERM D20CX W/TB Plugs	X	0	0	0	0	0
517-0218	WESTERM D20KX W/TB Plugs	X	0	0	0	0	0
517-0218-CC	WESTERM D20KX W/TB Plugs (Conformal Coat)	X	0	0	0	0	0
517-0218-ECC	WESTERM D20KX W/TB Plugs (Conformal Coat)	X	0	0	0	0	0
517-0219	WESTERM D20SX W/TB Plugs	X	0	0	0	0	0
517-0219-CC	WESTERM D20SX W/TB Plugs	X	0	0	0	0	0
517-0220	WESTERM D20KR Type 2	X	0	0	0	0	0
517-0225	WESTERM D20M+, Panel Mount	X	0	0	0	0	0
517-0230	WESTERM D20 Assy, Chassis Mount	X	0	0	0	0	0
517-0235	WESTERM D20KR SSR MT/MC	X	0	0	0	0	0
517-0239	WESTERM D20 C4Z, 48V DI	X	0	0	0	0	0
517-0240	WESTERM D20 AZ	X	0	0	0	0	0
517-0240-CC	WESTERM D20 AZ (Conformal Coat)	X	0	0	0	0	0
517-0240-ECC	WESTERM D20 AZ – Epoxy Conformal Coat	X	0	0	0	0	0
517-0241	WESTERM D20 SZ 48V	X	0	0	0	0	0
517-0241-CC	WESTERM D20 SZ 48V	X	0	0	0	0	0
517-0242	WESTERM D20 K4Z	X	0	0	0	0	0
517-0242-CC	WESTERM D20 K4Z (Conformal Coated)	X	0	0	0	0	0
517-0242-ECC	WESTERM D20 K4Z (Conformal Coated)	X	0	0	0	0	0
517-0245	WESTERM D20M++ (NGC)	X	0	0	0	0	0
517-0245-ECC	WESTERM D20 M++ – Epoxy Conformal Coat	X	0	0	0	0	0
517-0249	WESTERM D20 SZ 110V	X	0	0	0	0	0
517-0249-ECC	WESTERM D20 SZ 110V Epoxy Conformal Coat	X	0	0	0	0	0
517-0250	WESTERM D20 OKR	X	0	0	0	0	0
517-0251	WESTERM D20 OAD	X	0	0	0	0	0
517-0252	WESTERM D20 SDI, 125V	X	0	0	0	0	0
517-0253	WESTERM D20 C4Z, 110V DI	X	0	0	0	0	0

Item Number	Description	Lead (Pb)	Mercury (Hg)	Cadmium (Cd)	Hexavalent Chromium (Cr6)	Polybrominated biphenyls (PBB)	Polybrominated diphenyl ethers (PBDE)
517-0262	WESTERM D20 SDI, 125V	X	O	O	O	O	O
517-0262-CC	WESTERM D20 SDI, 125V	X	O	O	O	O	O
517-0263	WESTERM D20 CDI, 130V	X	O	O	O	O	O
517-0266	WESTERM D20 S22 (110/220V)	X	O	O	O	O	O
517-0267	WESTERM D20 C4Z2	X	O	O	O	O	O
517-0300	WESTERM D20 Assy, Panel Mount (for AEP)	X	O	O	O	O	O
517-0325	WESTERM D20 C4Z2 48VDI	X	O	O	O	O	O
517-0326	WESTERM D20CB	X	O	O	O	O	O
517-0327	WESTERM D20SB	X	O	O	O	O	O
517-0327-CC	WESTERM D20SB	X	O	O	O	O	O
517-0328	WESTERM D20AB	X	O	O	O	O	O
517-0328-CC	WESTERM D20AB Conformal Coat	X	O	O	O	O	O
517-0330	WESTERM D20 SDI, 24V	X	O	O	O	O	O
517-0330-CC	WESTERM D20 SDI, 24V	X	O	O	O	O	O
517-0331	WESTERM D20 SDI, 48V	X	O	O	O	O	O
517-0331-CC	WESTERM D20 SDI, 48V	X	O	O	O	O	O
517-0333	WESTERM D20CDI, 48V	X	O	O	O	O	O
517-0362	WESTERM D20 C4Z2 24V DI	X	O	O	O	O	O
517-0364	WESTERM D20AZ Break Away W/TBS	X	O	O	O	O	O
517-0366	WESTERM D20 S22 (110/220V)	X	O	O	O	O	O
517-0377	WESTERM D20 S22 (110/220V)	X	O	O	O	O	O
517-0478	D25, 16 ADC Socketed I/P Card SMT	X	O	O	O	O	O
520-0120	WESDAC D20 202/V.23 Modem	X	O	O	O	O	O
520-0164	WESDAC Data Display Panel	X	O	O	O	O	O
526-2004	D20ME (non-VME) 2M Flash, 512kNVRAM, 1.5M SRAM	X	O	O	O	O	O
526-2005	D20ME (VME) 2M Flash, 512kNVRAM, 1.5M SRAM	X	O	O	O	O	O
526-2006	D20ME II w RS232/485 (non-VME) 2M FLASH, 512kNVRAM, 1.5M SRAM	X	O	O	O	O	O
526-2007	D20ME II w RS232/485 (VME) 2M Flash, 512kNVRAM, 1.5M SRAM	X	O	O	O	O	O
526-2007-ECC	WESDAC D20ME II (VME) – Epoxy Conformal Coat	X	O	O	O	O	O
526-2100	D20 EME Ethernet Memory Card, 8MB	X	O	O	O	O	O
526-2100-ECC	WESDAC D20 EME (Ethernet, 8MB) – Epoxy Conformal Coat	X	O	O	O	O	O
526-2101	D20 EME Ethernet Memory Card, 0MB	X	O	O	O	O	O
526-2102	D20 EME Ethernet Memory Card, 8MB, NO ETHERNET	X	O	O	O	O	O
526-2112	D20 EME 10BASE-FL Media Interface Card	X	O	O	O	O	O
526-2112-ECC	WESDAC D20 EME 10BASE-FL MIC – Epoxy Conformal Coat	X	O	O	O	O	O
526-2115	D20 EME 8MB Memory Expansion Card	X	O	O	O	O	O
526-2116	D20 Media Interface Card EME 10BASE-T	X	O	O	O	O	O
526-2117	D20 EME2 Ethernet Memory Card, 8MB	X	O	O	O	O	O
526-2118LF	D20 Media Interface Card EME2 10BASE-FL	O	O	O	O	O	O
530-0003	Analog Adaptor, I/P 20MA/1V	X	O	O	O	O	O
530-0004	Analog Adaptor, I/P VOLTAGE	X	O	O	O	O	O
530-0005	Analog Adaptor, I/P 1MA/1V	X	O	O	O	O	O
530-0025	1.2MA/1V I/P Analog Adaptor	X	O	O	O	O	O

Item Number	Description	Lead (Pb)	Mercury (Hg)	Cadmium (Cd)	Hexavalent Chromium (Cr6)	Polybrominated biphenyls (PBB)	Polybrominated diphenyl ethers (PBDE)
530-0030	1.5MA/1V I/P Analog Adaptor	X	O	O	O	O	O
530-0045	Analog Adaptor, I/P 2MA/1V	X	O	O	O	O	O
530-0050	1MA/5V I/P Analog Adaptor	X	O	O	O	O	O
530-0051	Analog Adaptor, I/P (2MA/5V)	X	O	O	O	O	O
530-0052	Analog Adaptor, I/P 20MA/5V	X	O	O	O	O	O
530-0073	5MA/1V I/P Analog Adaptor	X	O	O	O	O	O
530-0079	Analog Adaptor, O/P 1MA	X	O	O	O	O	O
530-0080	5 MA Current Regulator	X	O	O	O	O	O
530-0081	10MA Current Regulator	X	O	O	O	O	O
530-0082	Analog Adaptor, O/P 20MA	X	O	O	O	O	O
530-0083	Analog Adaptor, O/P Voltage	X	O	O	O	O	O
530-0085	2.5MA/5V I/P Analog Adaptor	X	O	O	O	O	O
530-0086	50MA/5V I/P Analog Adaptor	X	O	O	O	O	O
530-0087	0.1MA/5V I/P Analog Adaptor	X	O	O	O	O	O
530-0088	0.3MA/5V I/P Analog Adaptor	X	O	O	O	O	O
530-0089	0.5MA/5V I/P Analog Adaptor	X	O	O	O	O	O
530-0090	Analog Adaptor, I/P 1MA/5V	X	O	O	O	O	O
530-0091	1.1MA/5V I/P Analog Adaptor	X	O	O	O	O	O
530-0094	Analog Adaptor, I/P 1.25MA/5V	X	O	O	O	O	O
530-0095	Analog Adaptor, I/P 1.5MA/5V	X	O	O	O	O	O
530-0108	Analog Adaptor, 2MA/5V I/P .01%	X	O	O	O	O	O
530-0124	Analog I/P Adaptor, 301R	X	O	O	O	O	O
530-0131	Analog Adaptor 12.8MA/5V	X	O	O	O	O	O
530-0133	Digital Input Adapter, 125V	X	O	O	O	O	O
540-0159	WESDAC D20C Analog I/P	X	O	O	O	O	O
540-0162	WESDAC D20C WESMAINT I/F	X	O	O	O	O	O
540-0166	WESDAC D20C Analog I/O	X	O	O	O	O	O
540-0205	WESDAC D20C Analog I/P (HV)	X	O	O	O	O	O
540-0207	WESDAC D20 ASK D.20 I/F	X	O	O	O	O	O
540-0209	WESDAC D20C D.20/WESMAINT I/F	X	O	O	O	O	O
540-0227	WESDAC D20 CHV Analog I/O DB	X	O	O	O	O	O
560-0008	Duct Panel Type 1 (no holes)	O	O	O	O	O	O
560-0009	Duct Panel Type 2 (with holes)	O	O	O	O	O	O
560-0046	Duct Panel - LANCE	O	O	O	O	O	O
580-0298	PSU,VERO +/-12V@2A 115/230VAC	O	O	O	O	O	O
580-0299	PSU,VERO +5V@12A 115/230VAC	O	O	O	O	O	O
580-0300	PSU,VERO +/-12V@2A 36-72VDC	O	O	O	O	O	O
580-0301	PSU, VERO +5V@12A 36-72VDC	O	O	O	O	O	O
580-0771	Modem Telenetics 14.4K Dialup	X	O	O	O	O	O
580-0772	Modem Telenetics 14.4K L/L	X	O	O	O	O	O
580-2004	D20 Power Supply, 20-60VDC Input, 24V ISO Output	O	O	O	O	O	O
580-2005	D20 Power Supply, 20-60VDC Input, 48V ISO Output	O	O	O	O	O	O
580-2006	D20 Power Supply, 100-300VDC/85-264VAC Input, 24V ISO Output	O	O	O	O	O	O

Item Number	Description	Lead (Pb)	Mercury (Hg)	Cadmium (Cd)	Hexavalent Chromium (Cr6)	Polybrominated biphenyls (PBB)	Polybrominated diphenyl ethers (PBDE)
580-2007	D20 Power Supply, 100-300VDC/85-264VAC Input, 48V ISO Output	O	O	O	O	O	O
581-0002	DE SAS Product Documentation CD	O	O	O	O	O	O
953-3016	Cover Plate, 10.3" Standard	O	O	O	O	O	O
953-3018	Cover Plate, 5" Standard	O	O	O	O	O	O
953-3304	D20 solid top for retrofit (includes mounting hardware)	O	O	O	O	O	O
965-0012	WESDAC D20M I/F Cable Assy 245 inch	O	O	O	O	O	O
970-0182	Wire 12GA GRN/YEL STR	O	O	O	O	O	O
977-0049	D.20 Terminator	X	O	O	O	O	O
977-0089/12	Cable Assy, D.20 (M+) 12 inch	X	O	O	O	O	O
977-0089/120	Cable Assy, D.20 (M+) 120 inch	X	O	O	O	O	O
977-0089/18	Cable Assy, D.20 (M+) 18 inch	X	O	O	O	O	O
977-0089/24	Cable Assy, D.20 (M+) 24 inch	X	O	O	O	O	O
977-0089/36	Cable Assy, D.20 (M+) 36 inch	X	O	O	O	O	O
977-0089/48	Cable Assy, D.20 (M+) 48 inch	X	O	O	O	O	O
977-0089/72	Cable Assy, D.20 (M+) 72 inch	X	O	O	O	O	O
977-0089/96	Cable Assy, D.20 (M+) 96 inch	X	O	O	O	O	O
977-0098/36	Cable WT-D20M-D20 202 Modem	X	O	O	O	O	O
977-0190/18	Cable Assy, DB9J-DB9J (TELE BIN)	X	O	O	O	O	O
977-0190/36	Cable Assy, DB9J-DB9J (TELE BIN)	X	O	O	O	O	O
977-0227/12	Cable, DATA DISPLAY 12 inch	X	O	O	O	O	O
977-0298	D20 EME Internal Interconnect Cable	X	O	O	O	O	O
977-0300/192	Cable, D20 WESMAINT 15 foot DB9-DB9	X	O	O	O	O	O
977-0300/96	Cable, D20 WESMAINT 8 foot	X	O	O	O	O	O

O Indicates that this toxic or hazardous substance contained in all of the homogeneous materials for this item is below the limit required in PRC SJ/T11363-2006 and EU Directive 2002/95/EC (RoHS)

X: Indicates that this toxic or hazardous substance contained in at least one of the homogeneous materials used for this item is above the limit requirement in PRC SJ/T11363-2006 and EU Directive 2002/95/EC (RoHS)

The maximum concentration limits (MCV's) apply.

Lead (Pb)	0.1% by weight	=	1000 mg/kg	=	1000 ppm
Mercury (Hg)	0.1% by weight	=	1000 mg/kg	=	1000 ppm
Cadmium (Cd)	0.01% by weight	=	100 mg/kg	=	100 ppm
Chromium VI (Cr6)	0.1% by weight	=	1000 mg/kg	=	1000 ppm
PBB, PBDE	0.1% by weight	=	1000 mg/kg	=	1000 ppm

CE Mark Compliance Information

Overview	Individual products of the D20 and D200 automation product family are classified according to EU Directive 2004/108/EC as subassemblies / finished appliances exclusively intended for an industrial assembly operation for incorporation into other apparatus. They are not apparatus in the sense of the EMC Directive. To achieve CE mark compliance, the end user shall be responsible for ensuring the final system/installation conforms to all requirements of the European Union Electromagnetic Compatibility (EMC) and Low Voltage (LV) Directives. Products installed in secondary EMC grade protection metallic cabinets and following proper installation practices depicted in D20/D200 User Manual should meet CE mark requirements. For information regarding current regulatory compliance status of your order, please contact your local sales representative or email us at energy.salescalgary@ge.com.
Classification of D20/D200 Products from the EMC Directive Perspective	The D20 and D200 line of products are intelligent, industrial grade control devices targeted for automation and control of electrical substations. These products are designed as modular and scalable devices allowing the non-consumer end user to build a system of virtually any size and complexity. The number of options and configurations can be large; therefore, trained personnel must be involved in the design and integration of the final system. Refer to the explanatory note below. Due to the inherent complexity and almost limitless variations of final systems, it is not possible for the manufacturer to guarantee compliance in the factory of individual D20/D200 modules in a final system, with the exception of pre-assembled RTU cabinets. Therefore, the end user shall be responsible for ensuring the final system/installation complies with all requirements of the EMC and LV Directives.
Radiated Emissions and Radiated Immunity Considerations	The D20 and D200 products have been designed and hardened to operate in the harsh industrial environment of electrical substations. When placed in service, the final system must conform to the objectives of the EMC Directive. To meet RF emissions and RF susceptibility according to CISPR 11 Class “A”, all D20 and D200 products must be installed in an EMC grade secondary metallic protective enclosure/cabinet. Additional EMC countermeasures may have to be applied depending on complexity and size of the system.

CE Mark Compliance Information, continued**Electrical
Immunity to
Electrical
Transients
Considerations**

The D20 and D200 products have been designed and hardened to operate in the industrial and harsh environment of electrical substations.

Immunity to electrical transients was tested on representative samples according to the following standards:

EMC Standards

EN61000-4-2	EN61000-4-5	EN61000-4-10	EN61000-4-16
EN61000-4-3	EN61000-4-6	EN61000-4-11	EN61000-4-17
EN61000-4-4	EN61000-4-8	EN61000-4-12	EN61000-4-29

Proper installation and wiring practices must be observed to achieve designed protection levels for immunity to electrical transients defined by the individual standards. Refer to the product installation guide.

**Low Voltage
Directive
Considerations**

To meet essential safety requirements of the LV Directive 2006/95/EC, selected D20 and D200 products must be installed in a secondary cabinet if an operating voltage on any of the terminals is equal to or higher than 50 VAC or 75 VDC. Proper wiring practices and applicable local safety standards defining protection against electrical shock must be observed at all times.

Term	Description
CE mark	A mark affixed to a finished product signifying its compliance with relevant European Union (EU) directives.
Direct function	Defined as any function of a component or a finished product that fulfils the intended use specified by the manufacturer in the instructions for use for an end user. This function can be available without further adjustment or connections, other than simple ones that can be performed by any person not fully aware of the EMC implications.
DoC (Declaration of Conformity)	The Declaration of Conformity states which CE mark directive(s) has been met and includes a signature of a company official indicating the company's responsibility for its CE mark compliance claim.
EMC Directive	Electromagnetic Compatibility Directive (2004/108/EC)
Finished appliance	A finished appliance is any device or unit that delivers a function and has its own enclosure. A finished appliance is considered as apparatus in the sense of the EMC Directive, if it is intended for the end-user and thus has to fulfill all the applicable provisions of the Directive. When the finished appliance is intended exclusively for an industrial assembly operation for incorporation into other apparatus, it is not apparatus in the sense of the EMC Directive and consequently the EMC Directive does not apply.
Fixed installation	A combination of several equipment, systems, finished products and/or components assembled and/or erected by an assembler/installer at a given place to operate together in an expected environment to perform a specific task, but not intended to be placed on the market as a single functional or commercial unit (e.g., entire substation).
LV Directive	Low Voltage Directive (2006/95/EC)
System or installation	A combination of several equipment, finished products, and/or components combined, designed and/or put together by the same person (system manufacturer) intended to be placed on the market for distribution as a single functional unit for an end user and intended to be installed and operated together to perform a specific task.

CE Mark Compliance Information, continued

Explanatory Note

Consumer products (those sold to the public through retail) are designed to be installed by “untrained” personnel in the standard functional environment (e.g. PC enclosure), using only basic tools and a provided user’s manual. Additional adjustments to achieve EMC or LVD compliance are not required. Such products must bear the CE mark logo.

GE products are industrial grade products and are not available for sale through retail. These products require trained personnel for installation and may require additional adjustments, configuration or placement in a protective environment to meet requirements of EMC or LV Directives. Such products typically are not required to bear the CE mark logo.

Example

A clear distinction exists between a digital input card for a PC and the D20 digital input module. A PC digital input card is a consumer product, sold over the counter. An untrained person can install this card without specialized knowledge of EMC using only the supplied user ‘s manual. This PC digital input card should meet the intent of EMC & LV Directives when installed in a standard PC enclosure, for which it was designed and tested. Whereas, the D20 digital input module can be installed in numerous configurations and environments but by trained personnel.

EAC Compliance Information

Overview The EAC Technical Regulations (TR) for Machines and Equipment apply to the Customs Union (CU) of the Russian Federation, Belarus, and Kazakhstan.

Details

Item	Description
Country of origin	Assembled in Canada; see label on rear of D20/D200 / D25 / D400
Date of manufacture	See label on rear of D20/D200/D25/D400
Declaration of Conformity and/or Certificate of Conformity	Available upon request

About this Guide

The D20 and D200

The D20 and D200 remote terminal units belong to the same product family.

Using this Guide

Use this guide for installing, operating and maintaining your D20 or D200. The guide applies to both products. Separate sections are provided where there are significant differences between the two.

Many optional add-ons are available for customizing the D20 or D200 for specific operational requirements. This guide is restricted to a standard D20/D200 assembly with peripherals.

Getting Started: Required Steps

Installation Steps

Follow these steps to install and set up your D20 or D200 system.

Step	Action
1	Unpack the system components.
2	Using the Familiarization section of this guide, inspect the D20/D200 for damage. Note: Report any damage immediately to GE Digital Energy. See “Installation and Commissioning” on page 2 for contact details.
3	Install the D20/D200.
4	Carry out all field wiring connections and jumper settings as set out in “Connections and Configuration” on page 54: • Power • Serial and Ethernet cabling • Field input and output connections
5	Power-up the D20/D200 and check for normal operation. See “Power-up and Test” on page 105. Some testing requires that code and configuration files have been downloaded to the D20/D200.
6	If the FLASH memory has been deleted or corrupted, then you need to download the code and configuration files. See “Operation and Maintenance”. on page 118.
7	If you downloaded code and configuration files, then go back to step 5 and verify that the D20/D200 is now operating correctly.

Getting Started: Required Steps, continued

Installation Tools, Equipment and Accessories

Before you begin to install your D20/D200, gather the required tools, equipment and accessories:

- Flathead screwdriver with 0.6 x 3.5 mm blade (for terminal block wiring)
- #2 Phillips screwdriver (for rack mounting the unit)
- Wire cutters (for field wiring)
- Wire strippers (for field wiring)
- Wire crimping tool (for field wiring)
- Tie-wraps (for organizing wiring and cables)
- Multimeter (for testing voltages and I/O points)
- Needle nose pliers (for setting jumpers, for example)
- PROM puller (only required if you are going to be upgrading or installing PROMs in the field)

Depending on how you are going to be labeling your cables and wires, you may need:

- Heat shrink label printer
 - Heat gun (for shrinking)
-

Familiarization

Introduction	Use this section to become familiar with the various components that make up a D20 or D200 system.
What are the D20 and D200?	The D20 is a standalone remote terminal unit (RTU). It consists of one or more main processor boards, peripheral I/O modules, termination panels, power supply, and communication equipment. These components, combined with software applications, form the D20 RTU System. The D20 acts as a data concentrator and central processor. Field data gathered through the peripheral modules and external Intelligent Electronic DeVICES (IEDs) are stored in the system database and can be accessed by the application programs loaded into the D20. The D20 design has horizontally mounted processor boards, with multiple boards in some versions. The D200 shares the same overall design concept as the D20 but it has vertically mounted processor boards. The D200 can use multiple D20ME/ME II processor boards, up to a maximum of eight nodes. The D20 and D200 are available in a Kit form, for self-assembly, and as factory-assembled RTUs.
Separate Peripherals	Peripheral I/O boards operate independently of the main chassis and main processors. This means that: • You can use a D20 or a D200 without direct connection to peripheral boards so that it acts as a Master Data Concentrator to other RTUs. • You can hot-swap the peripherals without powering down the main processor.
Assembling a D20	Many add-on options are available for the D20 & D200 systems, to provide different operational performance and functions. Typically, the D20 and D200 systems will consist of a Main Chassis with required Peripheral I/O boards.

Familiarization, continued

D20 Chassis

The D20 chassis is available in two versions:

- Standard single slot with one horizontal Eurocard slot for mounting the D20ME/ME II board for the non-VME compatible version.
- Full VME equipped with five horizontal expansion slots for VME compatible printed circuit boards.

Table

The D20 has a 3U horizontal slot chassis for 19" rack mounting. There are two types of chassis:

Chassis Type	Part #	Description
D20 non-VME (1 slot horizontal)	500-0305	Single Slot MX Chassis with backplane, external power connections, and 7 serial I/O ports
D20 VME (5 slot horizontal)	500-0280	MX Chassis with 5 card VME backplane

Chassis Compatibility

See Appendix A: Product Combinations, for the possible matching of main processor board, Ethernet and memory expansion card combinations with Chassis types.

D20 Kit Components

D20 Main Chassis kit contains:

- Chassis
- Main processor board
- Power supply
- WESMAINT maintenance port cable
- Software loaded into the main processor, See "D20ME/ME II Factory Fitted Software" on page 35.
- Termination panel: included on the 500-0305 single-slot, not included on the 500-0280 MX with VME backplane.

Modems are options for the Main Chassis kit.

Familiarization, continued

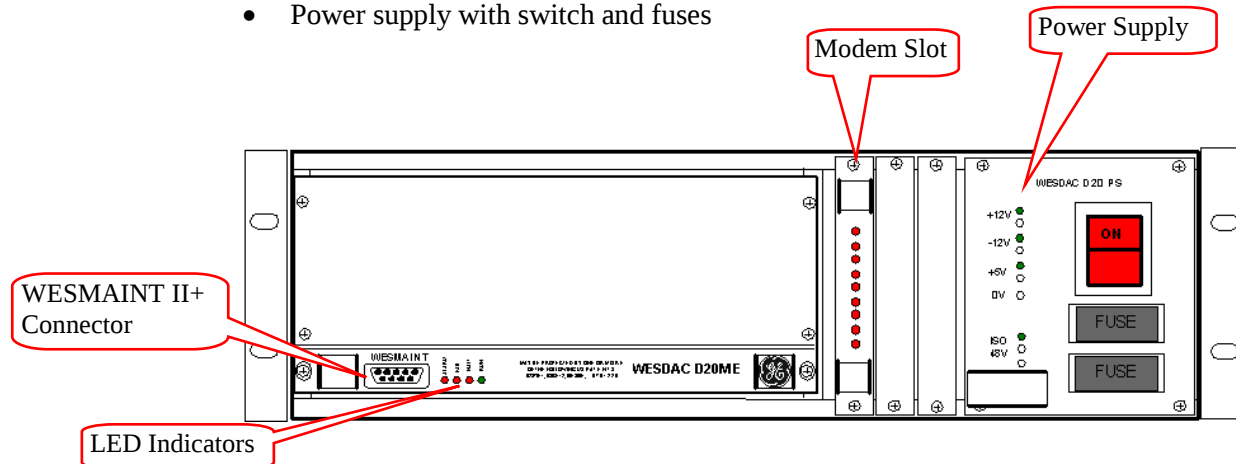
Other Components	To complete a basic D20 implementation, several other components are required: • Peripheral I/O modules • D.20 Link for communication between the main board and the peripherals • Interposing Relay Panels, the need for which depends upon the load characteristics of the device that is controlled by the D20K or D20C control peripherals. If this rating exceeds the contact rating of the D20K or D20C control peripheral boards, then an Interposing Relay Panel is required. See “Interposing Relays” page 44. • When using bit-based synchronous protocols a Universal Protocol Converter (UPC) board is required to convert from byte to bit and back. The D20/D200 communicates asynchronously over its serial ports. Note: The jumper settings on the UPC are protocol-specific. See “Universal Protocol Converter” page 44.
Other System Configurations	• If you are building a redundant system, you will need additional cables to link the active and standby units. See “D20/D200 Redundancy”, page 50.

Familiarization, continued

D20 Front Panel: non-VME Single Slot

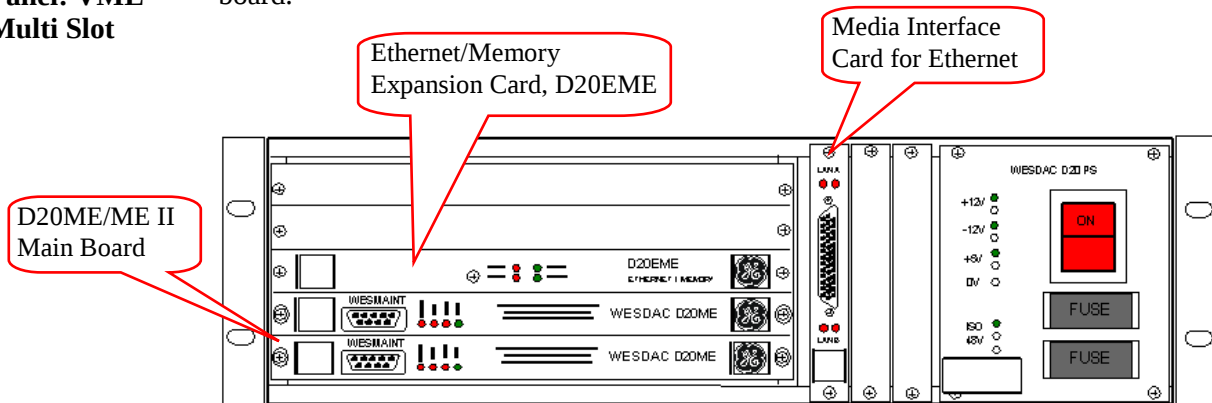
The D20 non-VME single-slot chassis, illustrated below, consists of the following:

- D20ME/ME II Main Board with WESMAINT II+ connector, LEDs for operational status and patents listing
- Modem slots
- Power supply with switch and fuses



D20 Front Panel: VME Multi Slot

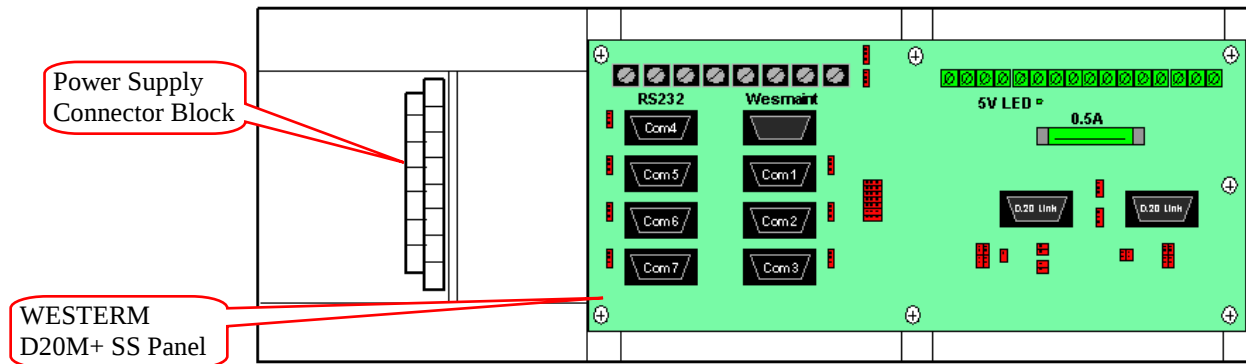
The D20 VME-compatible chassis can have additional main boards and a D20EME board.



Note: A Media Interface Card is only required if the D20EME provides Ethernet capability.

Familiarization, continued**D20 Rear
Panel:
non-VME**

The Single Slot non-VME chassis has the **WESTERM D20M+ SS Termination** Panel attached directly to the chassis:

**D20 Rear
Panel: VME**

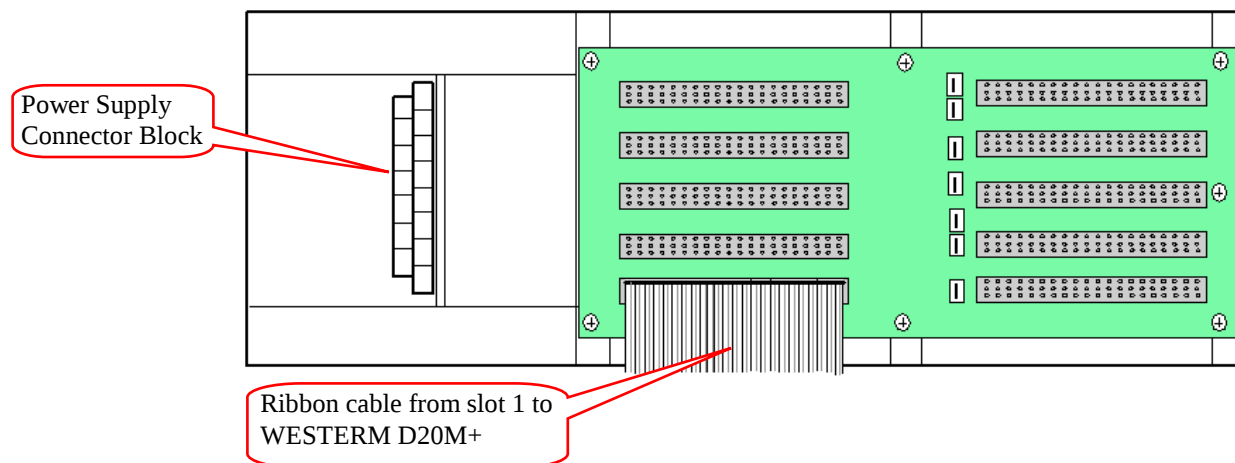
The Termination panel for the VME version for the D20ME/ME II is the **WESTERM D20M+**. A D20M+ is required for each D20ME/ME II board.

Termination panels are mounted separately to the D20 chassis. The VME chassis kit is supplied with a VME bus backplane, called the **WESTERM D20VME**.

The VME bus backplane connects to the Termination panels using ribbon cables:

- Single D20ME/ME II to the D20M+ Termination panel with a ribbon cable from Slot 1 on the bus backplane
- Multiple D20ME/ME II boards to D20M+ Termination panels from multiple slots on the bus backplane

The **WESTERM D20VME** bus backplane for single D20ME/ME II board:



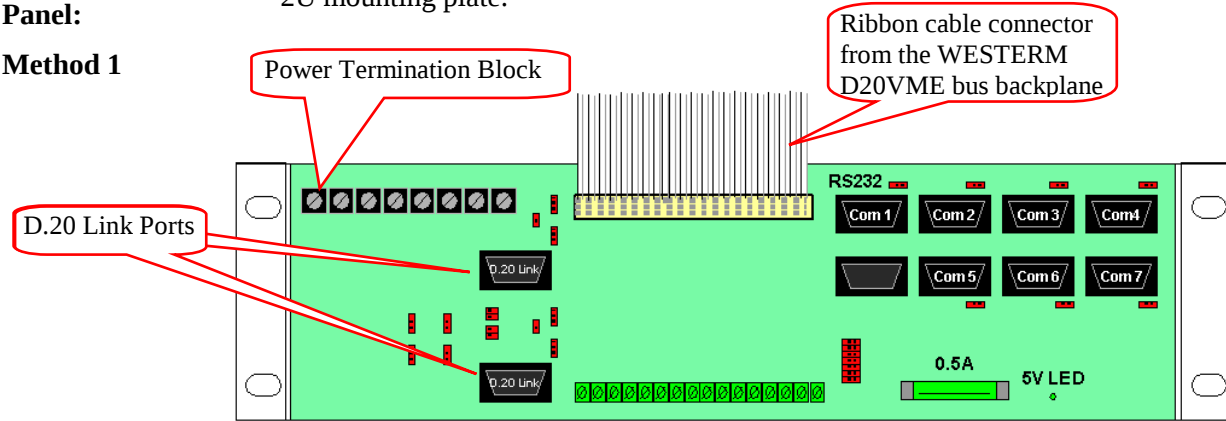
Familiarization, continued

WESTERM D20M+ Termination Panel:

Method 1

The WESTERM D20M+ can be mounted in two ways:

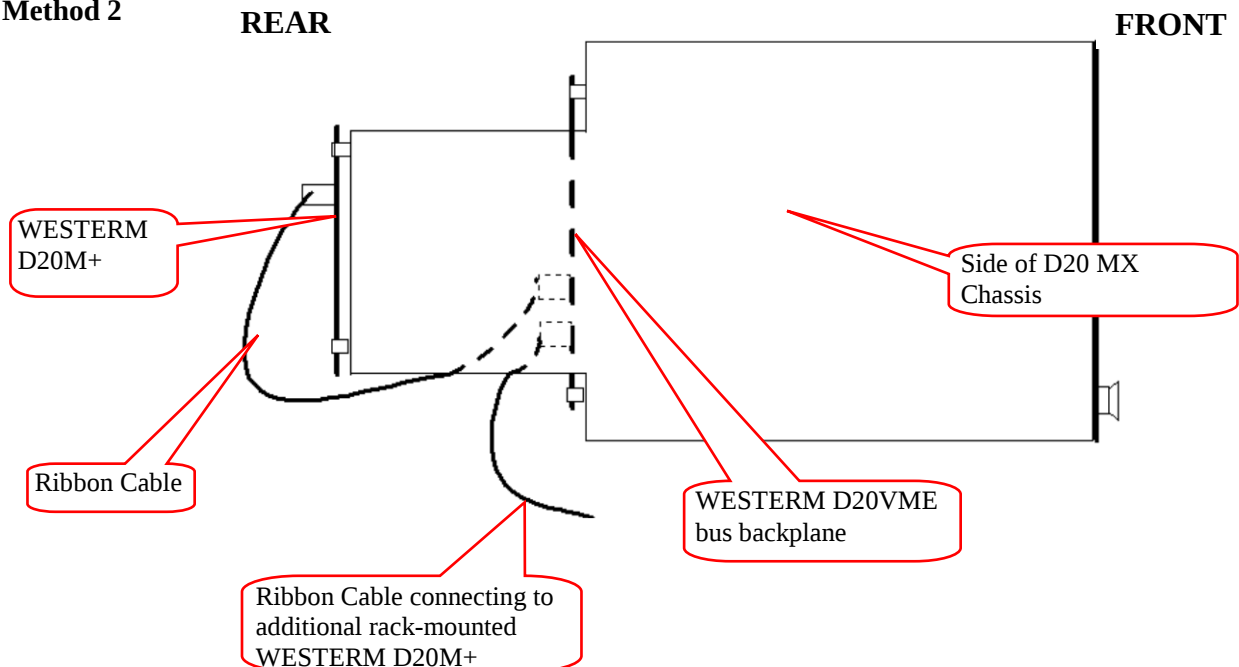
1. With the standard chassis it is mounted separately into the 19" standard rack on a 2U mounting plate:



WESTERM D20M+ Termination Panel:

Method 2

2. With the MX chassis it is mounted behind the WESTERM D20VME bus backplane. This leaves more room on the rack for multi-node installations:



Familiarization, continued**D200**

The D200 is available in a vertical-slot chassis. A D200 chassis typically contains:

- Chassis with six feet of 12AWG Green/Yellow ground wire
- Main processor board
- Power supply
- WESMAINT maintenance port cable
- Software loaded into main processor, see “D20ME/ME II Factory Fitted Software” on page 35.
- D20EME Ethernet/Memory expansion board, see “D20EME”, page 45
- D20M++ Termination panel

Modems are options for the Main Chassis kit.

Table

The D200 has a 6U 9 vertical slot chassis for 19” rack mounting. There are seven types of chassis:

Chassis Type	Part #	Description
D200 VME 6U 240 VAC	500-0306	Chassis for 120/240 Volts AC Power Supply in
D200 VME 6U 48VDC	500-0307	Chassis for 48 Volts DC Power Supply in
D200 6U VME 48 VDC WO Term Board	500-0308	Chassis for 48 Volts DC Power Supply in without termination panel
D200 VME 6U Dual 48VDC	500-0310	Chassis for dual 48 Volts DC Power Supplies in
D200 VME, DUAL 48VDC, DUAL TERM	500-0311	Chassis for dual 48 Volts DC Power Supplies in and dual termination boards
D200 VME, SINGLE 48VDC with 24VDC ISO	500-0312	Chassis for single 48 Volts DC Power Supply in and 24 Volts DC out to system components
D200 VME, Dual 48VDC, Dual Term, with 4 D.20 Links	500-0317	Chassis for dual 48 Volts DC Power Supplies in, dual termination panel and 4 D.20 Links

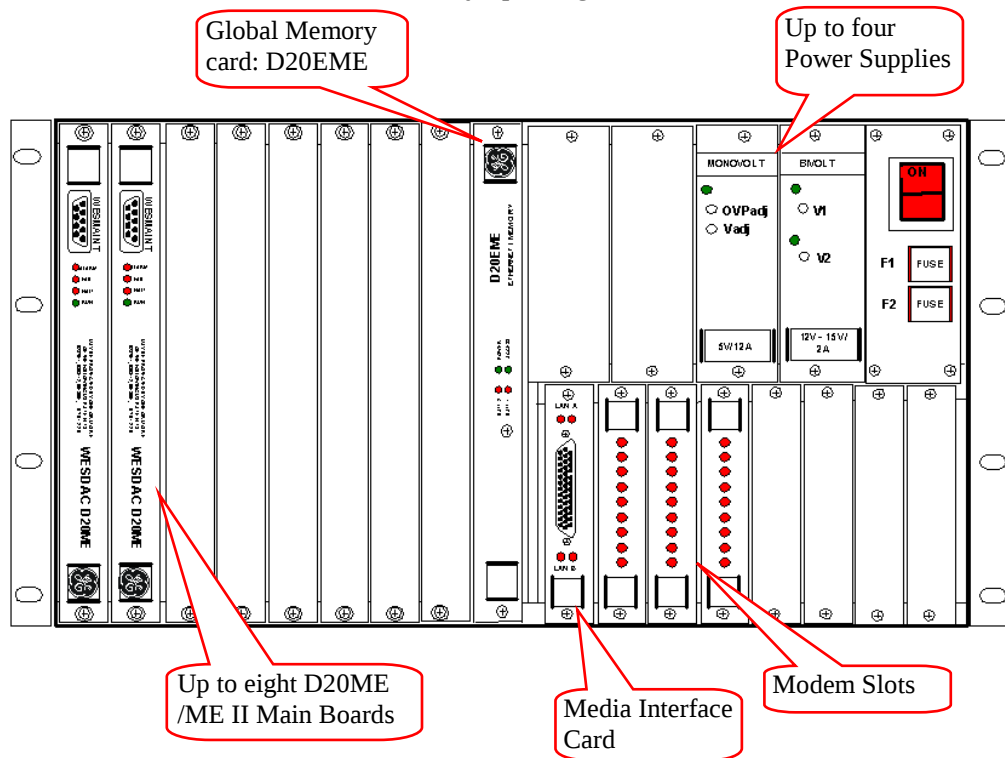
**Chassis
Compatibility**

See Appendix A: Product Combinations, for the possible matching of main processor board, Ethernet and memory expansion card combinations with Chassis types.

Familiarization, continued

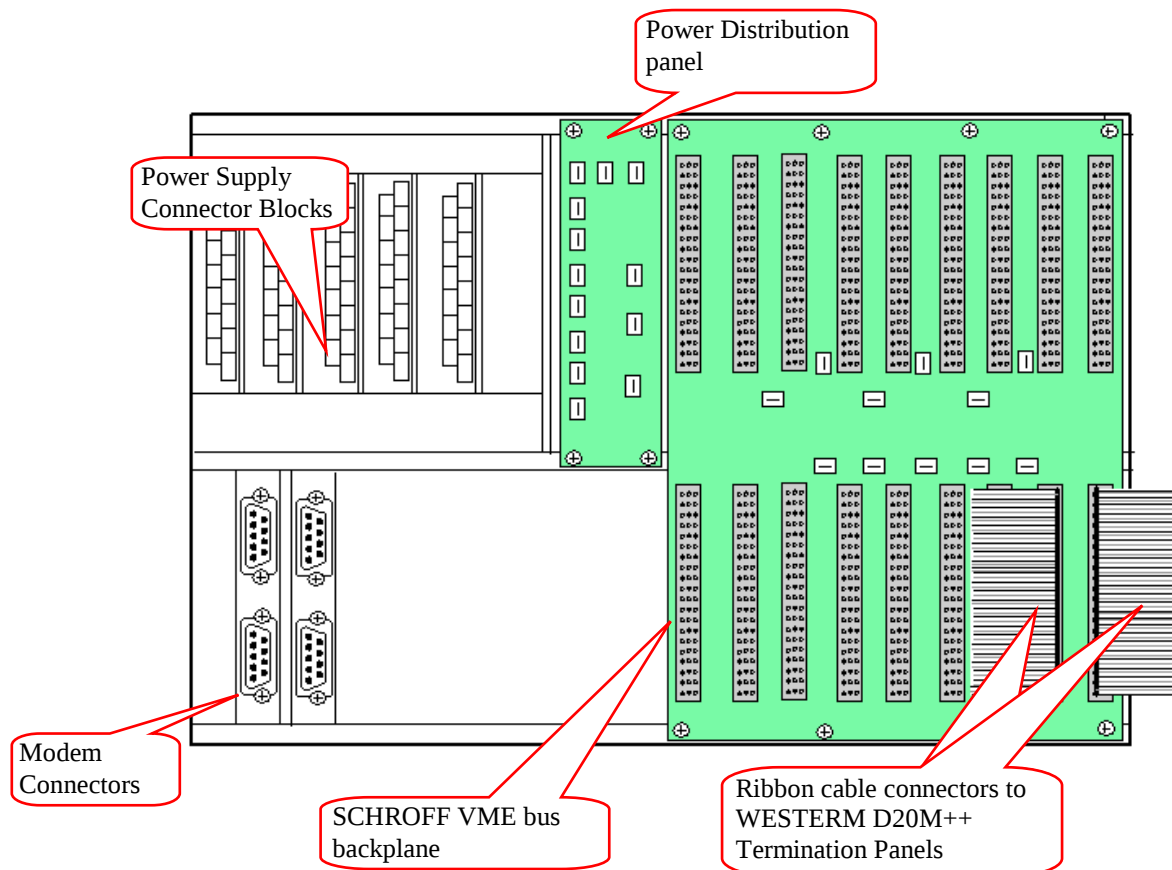
D200 Front Panel

The D200 vertical-slot chassis can carry up to eight main boards:



Familiarization, continued**D200 Rear Panel**

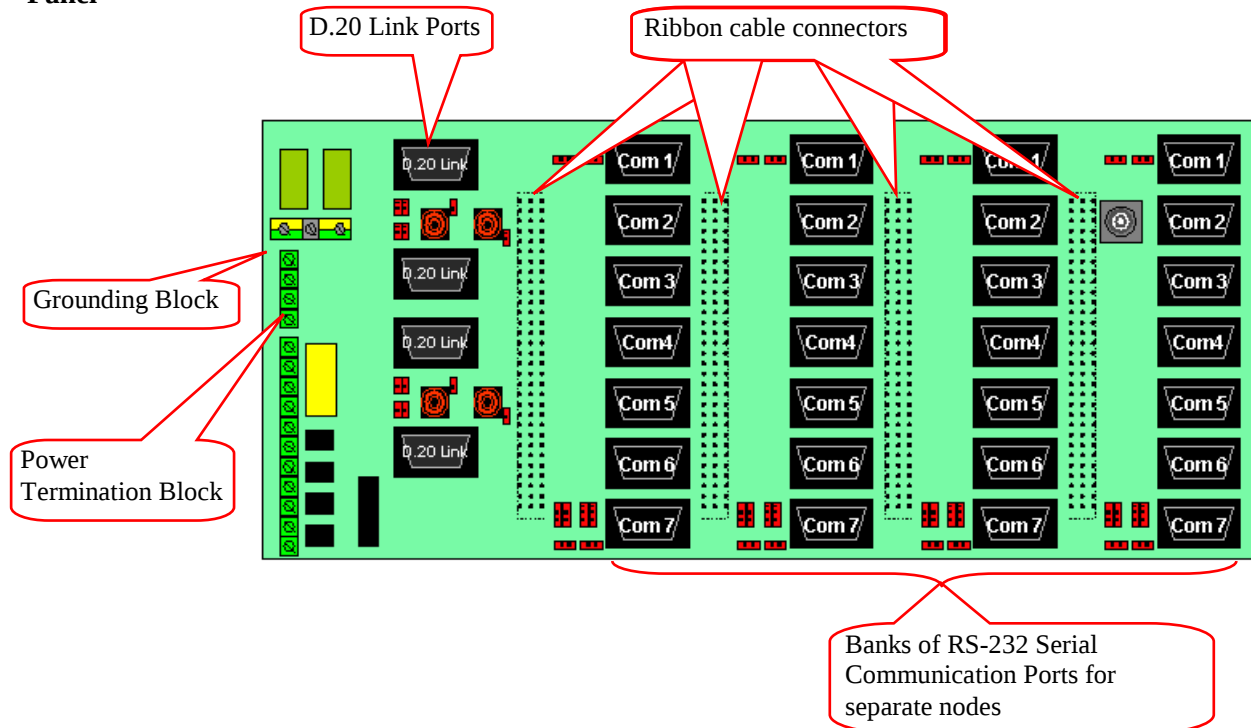
The D200 vertical-slot chassis uses a Schroff® VME bus backplane with ribbon cables connecting to WESTERM D20M++ Termination Panels. The VME Power Distribution Panel distributes power from power supplies to main boards, termination panels and peripherals.



Familiarization, continued

WESTERM D20M++ Termination Panel

The D200 uses the WESTERM D20M++ Termination Panel. Up to **four** D20ME/ME II boards can be connected to each Termination Panel.



Note

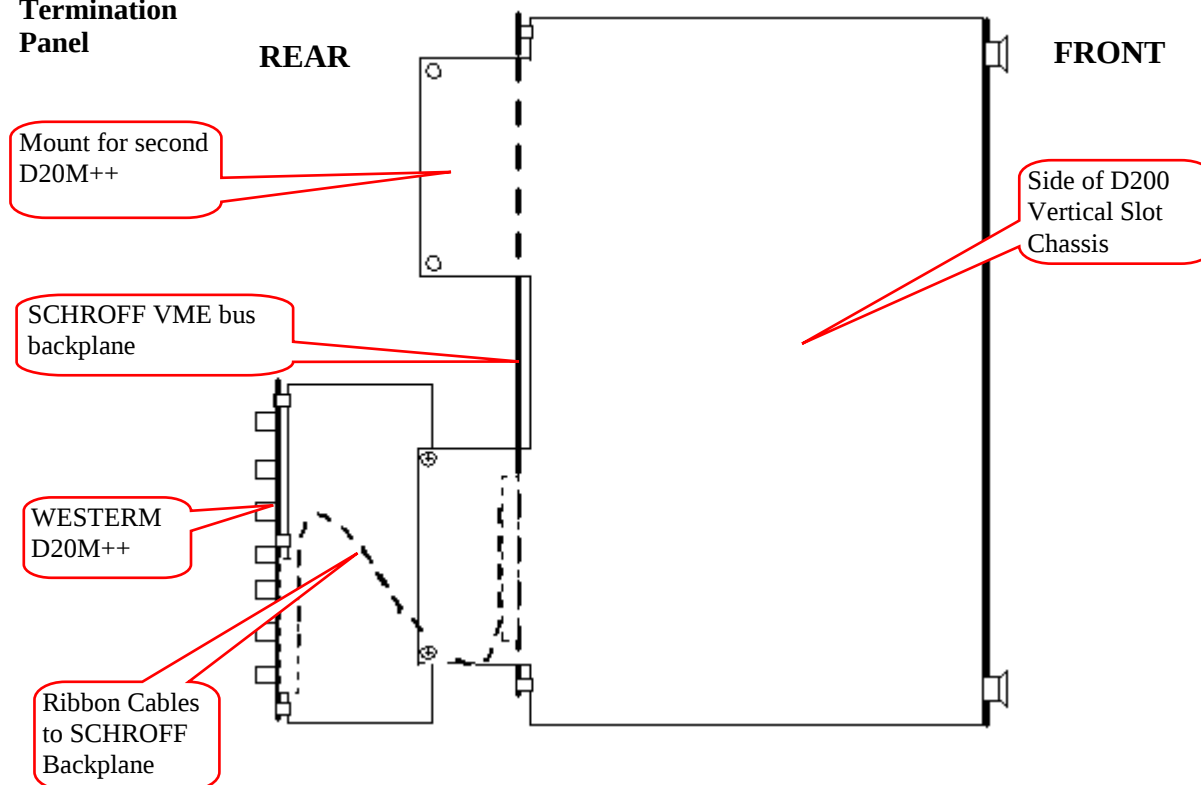
There are cases when you will need a second termination panel:

- If you have more than four main boards and you want to utilize at least one serial communication port for each board
- If more than 28 serial ports are required

Contact GE Digital Energy for further information.

Familiarization, continued**WESTERM
D20M++
Termination
Panel**

WESTERM D20M++ Termination Panels are mounted behind the VME bus backplane:



Familiarization, continued

D20ME Main Module

The D20ME is the:

- Main module of the D20/D200. It functions as a data concentrator and central processor of field data, and
- Acts as a master controller over other D20 peripheral I/O modules, which act as slaves.

The D20 I/O peripheral modules perform the primary processing of data. This increases the speed and efficiency of the D20 by reducing the workload on the main processor.

D20ME: Four Versions

- The D20ME non-VME is designed for use in single-processor D20 devices
- The D20ME VME is designed to fit in a standard D20 or D200 VME chassis and has access to:
 - External global memory
 - VME-based peripherals, such as Ethernet cards
- The D20ME II is available in VME and non-VME versions. It is functionally identical to the D20ME; however, it has the added capability to select, on a per-channel basis, RS-232 or RS-485 interfacing.

Table

The following table lists D20ME/ME II part numbers and typical applications.

Board Type	Part #	Description
D20ME	526-2004	D20ME module suitable for non-VME D20 (single processor) applications.
D20ME – VME	526-2005	D20ME module suitable for VME D20 and D200 applications requiring multiple processors and/or Ethernet support.
D20ME II (non VME)	526-2006	D20ME II module, supporting RS-232 and RS-485 interfaces, suitable for non-VME (single processor) applications.
D20ME II (VME)	526-2007	D20ME II module, supporting RS-232 and RS-485 interfaces, suitable for VME D20 and D200 applications requiring multiple processors and/or Ethernet support.

Note

All D20ME module types can be used with D20 Base firmware or CCU Base firmware.

You must select which base system to use when choosing the module type in Config Pro.

LED Indicators

See “Operations: D20ME/ME II Main Board” on page 141 for information about LED indicators.

Familiarization, continued

D20ME II RS-485 port transient suppression

You can make use of the built-in RS-485 communication capability of the D20ME II processor in a new or upgraded D20* RTU system.

The D20ME II main processor can be configured to support RS-485 communications on any of seven serial ports. Through each of the RS-485 serial ports, a D20/D200* can communicate point-to-multipoint with a large number of end devices over much greater distances than with RS-232.

The RS-485 circuitry on the D20ME II processor provides no electrical isolation and offers only limited built-in transient suppression. If you plan on using the D20ME II in an environment where longer cable runs with larger transients are expected, GE recommends the installation of an external transient suppression device to protect the RTU.

In addition, GE recommends the installation of an external transient suppression device when the RS-485 communication cable must be run to devices located outside of the RTU cabinet containing the D20ME II.

GE will not provide warranty support on D20ME II processors damaged by field wiring installed contrary to this recommendation.

D20ME/ME II Factory Fitted Software

The D20ME/ME II has Base software, which resides on the BootROM installed at the factory.

Each D20ME/ME II board undergoes factory testing. The level of testing depends on the type of system you have ordered. See “Operation and Maintenance - D20/D200 Software Configuration” page 118.

D20ME: Serial I/O Architecture

- Supports eight serial channels, and utilizes a serial I/O (SIO) chip (called the "Octart")
- Serial channels are routed to the DB-9 connectors on the back of the chassis
- One channel (COM0) from the rear panel is also routed to the WESMAINT DB-9 connector on the face plate of the processor card.

Note: Use only a standard PROMAINT cable (GE Digital Energy part number 977-0048) when you are connecting to the D20ME or ME II's front-panel WESMAINT connector. Use of any other cable may cause serious damage.

Familiarization, continued

Serial Performance

The following table gives the serial communication performance of the D20ME. The information below is provided **only** as a guideline for comparison.

Note 1: The aggregate limits of the modules are dependent on the quantity and processing load of other applications running in the modules.

Note 2: The actual communication speed of any port is defined by and limited to speeds that individual applications support. Some applications and base systems may not support baud rates higher than 9600.

Parameter	D20ME/ME II Limit
Aggregate serial communications limit of module, half-duplex	7 ports at 38.4 kbps, plus WESMAINT

Enhanced Feature: 68K Monitor Speed Change

Using the Monitor's *BAUD* command, the communication speed of the WESMAINT port can be changed to a higher or lower rate. The most common reasons for increasing the WESMAINT port speed are to reduce the time required to:

- Download application code file to the flash memory, and to
- Carry out a configuration download.

Refer to section: *68K Monitor Commands*, page 162 for more information.

D20: Supplying Power

There are various power supply options for a D20 system:

- Standard Chassis-mounted Power Supplies
- Auxiliary Power Supplies
- Redundant Power Supplies

D20 Power Supply

The chassis-mounted power supply modules are switch-mode converters that provide output power for the D20ME/ME II board, VME cards, modems and D20 Peripheral I/O modules, as required.

External Power Supplies

If you have an extended system with more than five peripherals, then the chassis-mounted D20 Power Supply will not be adequate. You will need to install an external power supply.

Redundant Power Supplies

A redundant power supply provides fail-over protection and ensures continuous power to the unit.

Familiarization, continued

Standard Power Supplies The following table gives details of the standard chassis-mounted, auxiliary and redundant power supplies that are available. Other power supplies are available for specific requirements. Contact GE Digital Energy for details.

Type	Part Number	Input	Output	Mounting
Chassis-mounted	580-2004	20 – 60 VDC	+5 V, 7 A +12 V, 2 A -12 V, 1 A 24 VDC, 3 A	
Chassis-mounted	580-2005	20 – 60 VDC	+5 V, 7 A +12 V, 2 A -12 V, 1 A 48 VDC, 1.5 A	
Chassis-mounted	580-2006	100 – 300 VDC or 85 – 264 VAC	+5 V, 7 A +12 V, 2 A -12 V, 1 A 24 VDC, 3 A	
Chassis-mounted	580-2007	100 – 300 VDC or +85 – 264 VAC	+5 V, 7 A +12 V, 2 A -12 V, 1 A 48 VDC, 1.5 A	
Auxiliary	521 - 0103	20 – 60 VDC	24 VDC, 75 W	Rack-mounted
Auxiliary	521 - 0104	100 – 300 VDC	24 VDC, 75 W	Rack-mounted
Auxiliary	521 - 0105	90 – 250 VAC	24 VDC, 75 W	Rack-mounted
Auxiliary	521 - 0106	100 – 350 VDC	48 VDC, 120 W	Rack-mounted
Auxiliary	521 - 0107	90 – 250 VAC	48 VDC, 120 W	Rack-mounted
Redundant	580 - 0719	110 VAC/125 VDC	24 VDC	
Redundant	580 - 0741	220 VAC/48 VDC	48VDC	
Redundant	580 - 0789	110 VAC/ 48 VDC	48 VDC	
Redundant	510 - 0241	115 VAC $\pm$ 15% 30 – 60 VDC	48 VDC, 2.5 A	Rack-mounted
Redundant	510 - 0242	115 VAC $\pm$ 15% 40 – 144 VDC	48 VDC, 2.5 A	Rack-mounted

D20/D200 Overcurrent Protection Make sure your D20/D200 power input is externally protected for overcurrent. The fuse rating that is required depends on the specific power consumption of your system.

Familiarization, continued

Modems	Two D20 modems are available for communications to a host computer or to other IEDs: • WESDAC 202/V.23 is a 1200-baud Bell 202 or CCITT V.23 standard modem designed for 300 to 1200 baud asynchronous operation on unconditioned lines and supports the majority of SCADA/EMS applications. It is available in a 19" rack mount or 3U vertical mount configuration in the D20 chassis. • WESDAC 212/V.23 is a 1200-baud Bell 212 standard modem, (auto answer only), used for dial-up access to the D20. This modem is available for mounting only as a 3U vertical mount.
Third-party Modems	Third-party modems can be used to meet specific customer requirements. These modems are connected to the D20/D200 via standard RS-232 connections.
WESMAINT Cable	For maintenance work on a D20 or D200 you will need a WESMAINT port cable to connect to the D20 and D200. These are available in either 8' or 15' lengths. Also use this type of cable to connect to Promaint for maintenance work on the D20 Peripheral I/O modules. For WESMAINT cable DB-9 connector pinouts, see "WESMAINT Cable Pinouts", page 104.
I/O Peripherals	Peripheral I/O modules are intelligent modules containing an on-board microprocessor. They are configured as slaves to the D20ME/ME II main processor. In this way, specific I/O processing is distributed throughout the RTU to the appropriate I/O module. There are five types of I/O peripherals: • D20A analog input • D20S digital inputs • D20K digital output • D20C combination input/output • D20AC alternating current analog input Optional High Voltage peripherals are available for the D20 and D200.

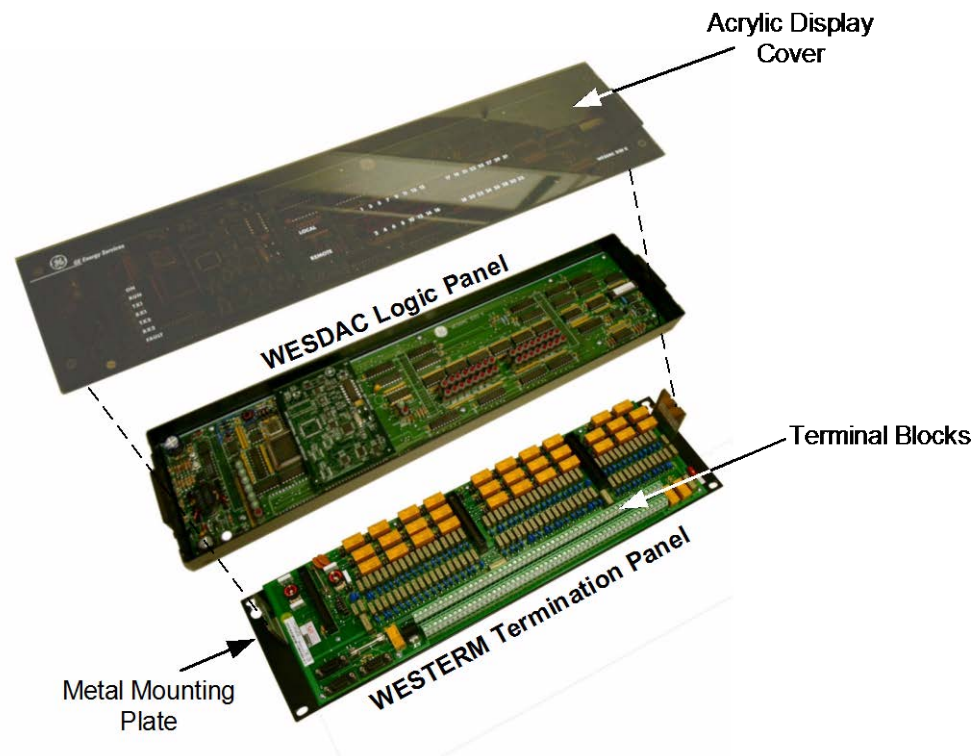
Familiarization, continued

I/O Peripheral Module Assembly

Each D20 peripheral I/O module consists of two separate assemblies:

- WESDAC logic panel, for **Data Acquisition and Control**
- WESTERM panel, for field **Termination**

The logic panel contains the logic circuitry and active components. The termination panel provides terminations for all field I/O, power, the local WESMAINT port, and the HDLC port for the D.20 Link.



The logic board sits in a metal enclosure and plugs directly into the termination panel. The termination panel sits on a 5.25" wide metal panel designed for flat or rack mounting. The logic panel enclosure is faced with semi-transparent acrylic, through which the user can monitor LED displays for various peripheral functions and all field I/O points.

Hot-swap Peripherals

The WESDAC board can be hot-swapped off the WESTERM board without disconnecting the power. A module failure is indicated on the LED displays. If a unit fails, you can unplug the failed WESDAC unit and replace it with a working unit while the power remains on. Once the new unit is installed, the D20ME/ME II automatically downloads the appropriate database parameters to the module to make it operational.

Note: This can be done without removing power from the peripheral, hence “hot-swap”.

Familiarization, continued

D20A Analog Input Peripheral

The D20A peripheral is a 32-point analog input interface module for the D20.

The D20A WESDAC logic module plugs directly into a D20A WESTERM termination panel, which provides three screw compression type terminals for each input (+, -, shield) and sockets for analog scaling networks. DB25 and barrier strip termination options are also available. Provision is made for configuring analog loop supply from the D20A or externally. Loop voltage is fused and can be monitored.

An on/off-line indication is passed to the D20/D200, where it can be used as a pseudo status.

D20S Digital Input Peripheral

The D20S can accept up to 64 digital inputs.

The WESDAC D20S logic module plugs directly into a WESTERM D20S termination panel equipped with screw compression type terminals for field terminations. DB25 and barrier strip termination options are also available.

The D20S termination panel is jumper-configurable for contact wetting supplied from the D20S or an external source. Wetting voltage is fused and monitored.

An on/off-line indication is passed to the D20/D200, where it can be used as a pseudo status.

D20K Control Output Peripheral

The D20K is a 32-point control output interface module for the D20. It supports up to 32 trip/close pairs, 32 individual controls and/or 16 raise/lower pairs.

The D20K logic module plugs directly into a D20K termination panel, which is equipped with screw compression type field terminations. DB25 and barrier strip termination options are also available.

A Local/Remote switch and control output fusing are also provided. The Local/Remote switch is a manually operated switch used to disable D20K relay coil power during maintenance. An on/off-line indication is passed to the D20/D200, where it can be used as a pseudo status. Fuse protection complete with monitoring of fuse status is provided for control output power supplied from an internal source.

Interposing relays can be supplied using D20KI panels.

Familiarization, continued**D20C
Combination
I/O Peripheral**

The D20C is a combination I/O module that is used for small-point-count applications. The D20C can be configured with:

- 16 digital inputs
- 8 momentary or dual function trip/close control outputs
- 16 analog inputs
- 8 analog inputs and 8 analog outputs.

The D20C performs all the I/O processes similar to the other D20 I/O modules, but uses a faster clock speed to meet the increased processing power demand.

Interposing relays may be supplied using a WESTERM D20KI, as with the D20K.

A Local/Remote switch is provided to turn off relay coil power, and put the module off-line. An on/off-line indication is sent to the D20/D200, which is available to the host as a pseudo-status.

**D20C Daughter
Boards**

D20C1 and D20C2 daughter boards are available as options for the D20C peripheral. They are mounted on the D20C WESDAC to give additional analog inputs and analog outputs, as shown below:

**Table: D20C
Options**

WESDAC Board	Digital Inputs	Digital Outputs	Analog Inputs	Analog Outputs
D20C	16	8		
D20C with D20C1 Daughter Board	16	8	16	
D20C with D20C2 Daughter Board	16	8	8	8

**D20AC Analog
Input
Peripheral**

The D20AC peripheral, which is the alternating current analog input module for the D20 product line, provides:

- Up to six 50/60Hz voltage inputs
- Up to nine 50/60Hz current inputs
- One DC input

To provide isolation, the termination panel uses current and potential transformers on the AC inputs, and an isolation transformer on the DC input. The current inputs utilize a compressor to achieve an eight-times reduction of the input signal. The AC current and voltage inputs, and the DC input are buffered before being multiplexed into the analog-to-digital (A/D) converter section.

Promaint

Promaint is the maintenance facility for the peripheral modules. Use it to:

- View data
- Force control points to verify that the board is functioning correctly
- Calibrate a D20A or a D20C board

Note Promaint access to the D20C board requires an additional daughter card, the WESDAC D20C WESMAINT Interface: 540 -0162.

Familiarization, continued

D.20 Peripheral Link

Communications between the D20 main processor and the D20 peripheral I/O modules are carried over a high-speed, high-level data link (HDLC) called the D.20 Link. The D.20 Link has the following features:

- RS-485 serial link, half duplex, 250 kbps
- D.20 protocol using HDLC format with Manchester encoding
- Supports up to 31 D20 I/O peripheral modules in a standard configuration
- Repeater/extension modules may be used to extend this limit to a maximum of 128 (D20) and 256 (D200) peripheral I/O modules

Media options:

- RS-485, 24 AWG twisted pair, for applications up to 330 meters
- Multi-Mode Glass Fiber (GFO), up to 2 km
- Plastic Fiber (PFO), up to 60 meters

Notes: If you are using the D20 or D200 as a Master Data Concentrator, then the D.20 Link connectors are **not** used.

The D.20 Link can also be used to supply power to peripherals on smaller D20 horizontal slot chassis systems. See “Peripherals: Supplying Power”, page 67.

Second D.20 Link

Redundant D.20 communication channels are available on all peripherals. Daughter boards are required to support this functionality:

- Part number: 540-0207, for the A, S and K boards
 - Part number: 540-0209 for the C board
-

Familiarization, continued

Extended Communications	To extend communications to multiple peripherals, use the D.20 Communications Interface or the D.20 Splitter, each of which will allow peripherals to be sited remotely from the D20. In conjunction with the D.20 RS-485 Adaptor, the D.20 Communications Interface acts as a communication repeater to overcome the limit of 31 peripherals on a single RS-485 link. The D.20 Communications Interface can be used in conjunction with any of the following plug-in adaptors: • D.20 RS-485 Interface • GFO/PFO Adaptors The D.20 Splitter can be used only with the GFO/PFO adaptors.
D.20 Comm Interface	Use the D.20 Communication Interface module when you require one-to-one communication links with peripherals.
D.20 Splitter	Use the D.20 Splitter when you require one-to-four communication links with peripherals, especially if peripherals are clustered in different areas of the substation.
D.20 RS-485 Interface	The D.20 RS-485 Interface provides the repeater function, which can only be implemented on the D.20 Communications Interface.
GFO and PFO Adaptors	Glass Fiber Optic (GFO) and Plastic Fiber Optic (PFO) adaptors are used to provide either glass or plastic fiber optical cable extensions to the D.20 Link. These allow interference free links to peripherals that are sited at a remote distance from the main D20 installation.
Extended Power	When power requirements for multiple peripherals exceed the base system limitations, use the D.20 DC Interface module.
D.20 DC Interface	The D.20 DC Interface module is used: • As power input for additional peripherals on a D.20 Link • For power supply to peripherals on a D200 vertical slot multi-node implementation which cannot use the D20 Link for peripheral power supply

Familiarization, continued

Interposing Relays

The required rating of the relays on the K and C boards is determined by the loading characteristics of the device that the boards control.

If the load rating of the controlled device exceeds the K or C board relay rating, then you will need an Interposing Relay panel.

Universal Protocol Converter

A Universal Protocol Converter (UPC) is required when the D20/D200 has to communicate with a device that uses a synchronous communications format. The function of the UPC is to convert between the D20/D200's asynchronous format, and the device's synchronous format.

See "Universal Protocol Converter", page 104 for UPC configuration.

Familiarization, continued

D20EME The D20 Ethernet/Memory Expansion (EME) kit can be installed in a D20 or D200 to add expanded (Global) memory and/or Ethernet capability.

D20EME kits are offered in a variety of options to address common requirements for D20 and D200 systems, including:

- **Ethernet** *only* systems
- Expanded (or Global) memory *only* applications
- Combined Ethernet *and* Global memory systems

Applications of the D20EME The D20EME kit can be used in two main applications:

- New installations
- Upgrade or replacement applications.

Upgrades and Replacements

- When upgrading a D20 VME or D200 from a GreenSpring Ethernet card to an Ethernet EME card, you need to re-install software into the D20ME/ME II processor.
- Upgrading a D200 to use a memory-only EME does not require new firmware, but may require a new configuration.
- If you are adding Ethernet capability to an existing D20 VME, first verify that the D20 power supply is capable of handling the additional load. For further advice, contact GE for assistance.
- The interconnect cable that links the EME main board to the MIC card *must* be routed *inside* the D20 or D200 chassis. Routing the cable outside the chassis may cause excessive EMI radiation and/or interfere with operation.

Table: Chassis Compatibility Some types of D20 VME chassis *cannot* be used for EME applications:

D20 Chassis Part Number	Compatible with D20EME?
500-0305	No
500-0280 with 953-3061 (MX) Sub-assembly	Yes
500-0280 without 953-3061 (MX) Sub-assembly (older version)	No

Familiarization, continued

Table:
D20EME and
MIC
Compatibility

This table lists the compatibility between D20EME Main Boards and Media Interface Cards (MIC):

D20EME Main Board		Media Interface Cards	
GE Part Number	Description	GE Part Number	Description
526-2100	D20EME - Memory and Ethernet	526-2110	D20EME, 10Base-T Ethernet
		526-2111	D20EME, 10Base2 Ethernet
		526-2112	D20EME, 10Base-FL Ethernet
526-2101	D20EME - Ethernet only	526-2110	D20EME, 10Base-T Ethernet
		526-2111	EME, 10Base2 Ethernet
		526-2112	D20EME, 10Base-FL Ethernet
526-2102	D20EME - Memory	None	
526-2117	D20EME2 - Memory and Ethernet	526-2116	D20EME, 10Base-T Ethernet
		526-2118	D20EME, 10Base-FL Ethernet

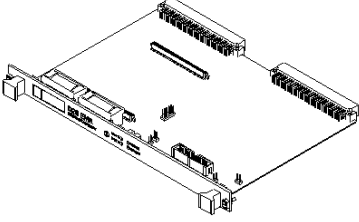
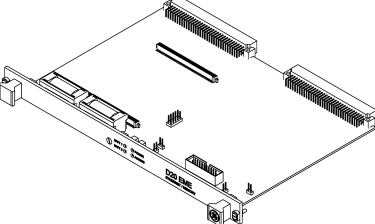
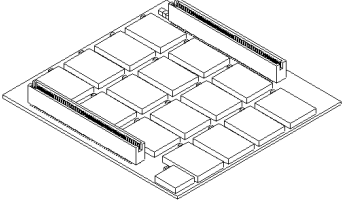
Familiarization, continued**D20EME Kit Components**

A D20EME kit consists of up to four main components:

- D20EME main board (Ethernet/Memory Card)
- Optional Memory Expansion Card (daughter board)
- Media Interface Card (MIC)
- Interconnect Cable

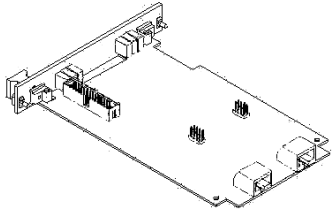
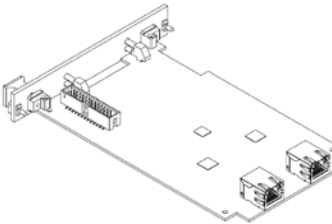
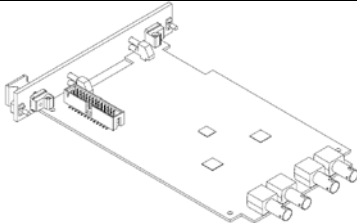
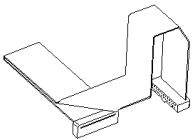
**Table:
Available
Options**

The following table lists the D20EME options and applications.

Component	Part #	Description	Application
D20EME Main Board			
	526-2100	8 MB EME with Ethernet	8 MB Global memory <i>and</i> Ethernet in D200
	526-2101	0 MB EME with Ethernet	Ethernet <i>only</i> in D20/D200
	526-2102	8 MB EME, no Ethernet	8 MB Global memory <i>only</i> in D200
	526-2117	8 MB EME with Ethernet	8 MB Global memory <i>and</i> Ethernet in D200
Memory Expansion Card			
	526-2115	8 MB Memory Expansion Card	Upgrade an 8 MB D20EME main card to 16 MB in D200 and multi-node D20 Note: Cannot be used to add memory to a main card that does not have memory installed.

Familiarization, continued

Table: Available Options (continued)

Component	Part #	Description	Application
Media Interface Card			
	526-2110	10BASE-T, Ethernet	Twisted-pair Ethernet dual interface used with <i>Ethernet</i> EME card in D20/D200.
	526-2111	10BASE2, Ethernet	Coaxial Ethernet dual interface used with <i>Ethernet</i> EME card in D20/D200.
	526-2112	10BASE-FL, Ethernet	Fiber-optic Ethernet dual interface used with <i>Ethernet</i> EME card in D20/D200.
	526-2116	10BASE-T, Ethernet	Twisted-pair Ethernet dual interface used with <i>Ethernet</i> EME2 card in D20/D200.
	526-2118	10BASE-FL, Ethernet	Fiber-optic Ethernet quad interface used with <i>Ethernet</i> EME2 card in D20/D200.
Interconnect Cable			
	977-0298	Interconnect Cable for Ethernet kits	Included <i>only</i> with “Ethernet” kits. Carries power and Ethernet signaling from the main EME card to the MIC card.

Notes

- A *Memory Expansion only* kit contains the Memory Expansion Card *only*
- The main boards used in D20s or D200s must have CCU (Central Control Unit, term used to describe the D200 multi-processor system) base software to access either the Ethernet or global memory facilities over a VME backplane

Familiarization, continued

Ethernet Capability The Ethernet and global memory options that are available depend on the D20/D200 base software, as shown in the following table.

Base Software	Ethernet Capability Only	Global Memory Expansion Only	Ethernet Capability AND Global Memory Expansion
D20 with D20 Base	No	Yes	No
D20 with CCU Base	Yes, with VME Backplane	Yes, with VME Backplane	Yes, with VME Backplane
D200 with CCU Base	Yes, with VME Backplane	Yes, with VME Backplane	Yes, with VME Backplane

Media Interface Cards If your D20/D200 system is enabled for Ethernet using the D20EME board, then you need a Media Interface Card (MIC). There are three types of media interface cards, all of which are two-channel modules. For Jumper Settings on the various cards, see “MIC Jumper Options”, page 97.

For LED operational indicators, see “Media Interface Cards LED Indicators”, page 143.

Interconnect Cable The interconnect cable links an “Ethernet” D20EME main card to a MIC card. The cable carries two channels of Ethernet traffic and power for the MIC card.

Familiarization, continued

D20/D200 Redundancy

D20/D200 equipment redundancy requires:

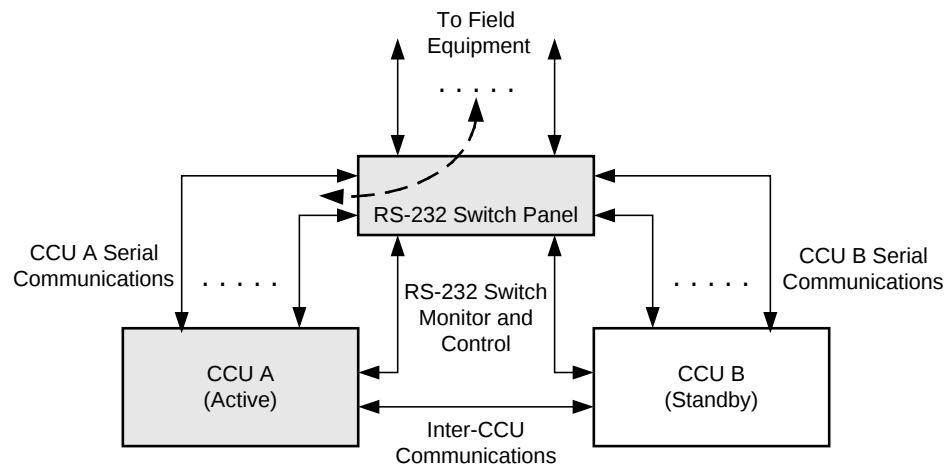
- A second CCU (Central Control Unit, a term used to describe the D200 multi-processor system), and
- One or more RS-232 Switch Panels.

Note: The quiescent current of the +12 V power supply input on the RS-232 Switch Panel is 15 mA. The maximum power requirement on the +12 V input during operation is 230 mA.

Through a toggle switch on the RS-232 Switch Panel, you designate one of the CCUs as the Active unit. If the Active unit hardware or software fails, the Active CCU is automatically switched offline, and the Standby unit is switched through to the field equipment (i.e., it is made Active).

The RS-232 Switch Panel is not equipped with EMI protection circuitry. If the connection length exceeds 3m, a Serial Surge Protection Panel (GE item number 540-0249) or equivalent protection device should be installed.

The following diagram illustrates a redundant D20/D200 system, with CCU A active:



See “Redundant D20/D200 Systems” on page 99 for:

- Requirements for implementing a redundant D20/D200 system
- Instructions for physically assembling a redundant D20/D200 system

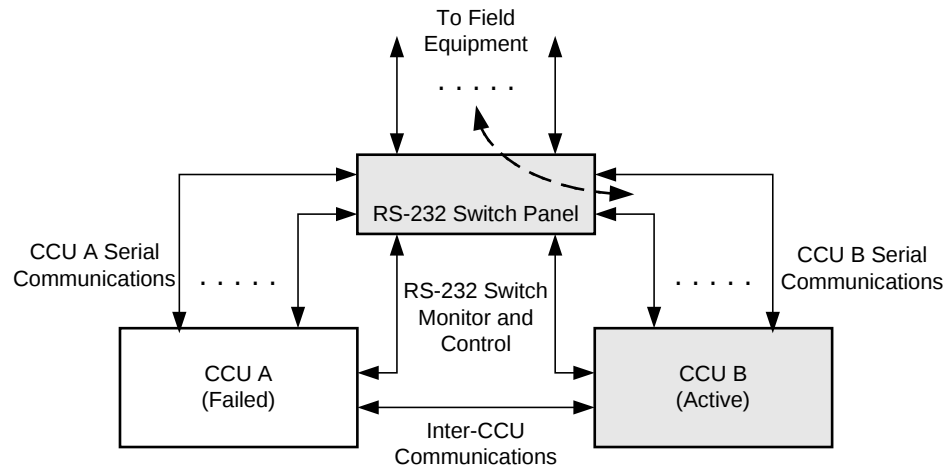
Failover Sequence

If the Active CCU fails:

1. The Standby CCU detects the failure through the inter-CCU communications link.
2. The Standby CCU commands the RS-232 Switch Panel to switch over all serial connections.
3. The RS-232 Switch Panel switches all serial field connections to the Standby CCU, which now becomes the Active CCU.

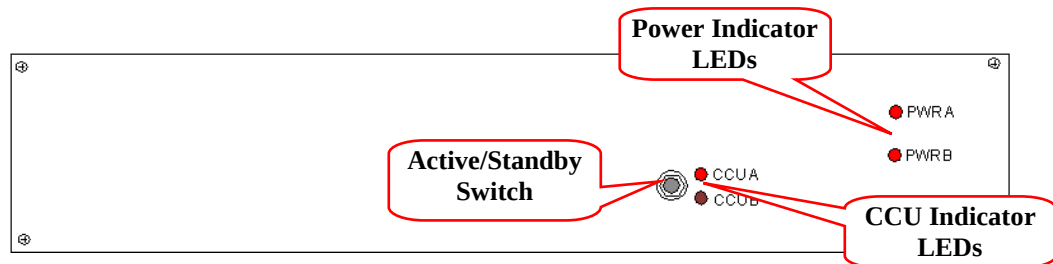
Familiarization, continued**D20/D200
Redundancy
Failover**

In the example on page 50, if CCU A fails, CCU B becomes active, as shown below:

**RS-232 Switch
Panel:
Indicators**

The RS-232 Switch Panel has two sets of indicator LEDs:

- PWR A/PWR B: When lit, power and communications are received from the designated CCU. Normally, both LEDs are lit.
- CCU A/CCU B: Normally, one LED is lit, indicating the Active CCU.

**RS-232 Switch
Panel:
Active/Standby
Switch**

The Active/Standby switch on the front of the RS-232 Switch Panel is used to:

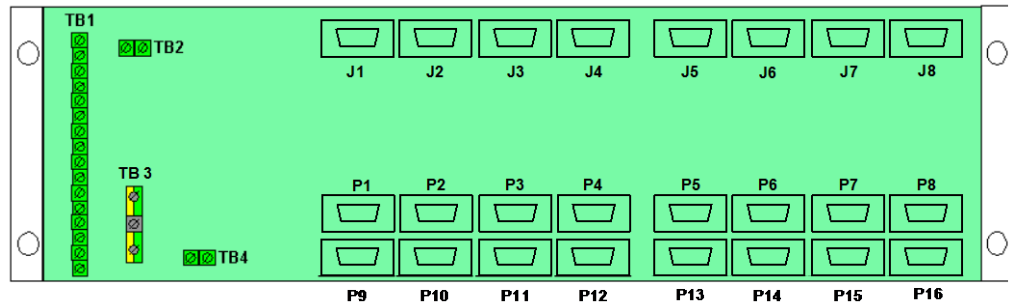
- Restore a previously failed CCU to Active status, once it has been repaired.
- Manually force a CCU to Active status, so routine maintenance can be performed on the other CCU.

For instructions on operating the Active/Standby switch, refer to “RS-232 Switch Panel: Active/Standby Switch Operation” on page 143

Familiarization, continued

RS-232 Switch Panel: Connectors

RS-232 Switch Panel connectors, accessible from the rear of the panel, are illustrated below:



The connectors have the following functionality:

P1 through P16	Provide serial connections to each of the two CCUs. P1 through P8 are connected to CCU A, and P9 through P16 are connected to CCU B.
J1 through J8	Connect to field equipment. If CCU A is active, serial connections P1 through P8 are switched to J1 through J8. If CCU B is active, serial connections P9 through P16 are switched to J1 through J8.
TB1	Connect the monitor and control cables (referred to as the Watchdog cables) from each of the CCUs.
TB2, TB4	In systems with more than eight serial port connections, TB2 and TB4 are used to interconnect multiple RS-232 Switch Panels. A maximum of eight RS-232 Switch Panels can be cascaded.

Physical Mounting

19" Rack Physical Mounting

To mount the D20/D200 in a rack:

1. Align the D20/D200 in the desired position in a 19-inch mounting rack.
2. Holding the D20/D200 firmly in place in the rails of the mounting rack, install and tighten the four rack screws.

You are now ready to connect all power and field wiring to the back of the D20/D200.

Rack Spacing

When mounting multiple D20/D200s in a rack (or if mounting a D20/D200 in a rack with other equipment) verify that there is at least one rack unit (RU) space above and below the D20/D200 to allow for cooling airflow.

1 RU = 1.75 inches (44.5mm)

Required Clearances

The exterior dimensions of the standard D20 enclosure are:

- 19" wide (483 mm)
- 9" deep (227mm)
- 5.23" high (133 mm)

The exterior dimensions of the standard D200 enclosure are:

- 19" wide (483 mm)
- 9.3" deep (237mm)
- 10.5" high (266 mm)

Clearance:

- Allow approximately 14 inches (356 mm) of total cabinet depth to provide clearance for hardware on the front panel, and interface cables on the rear.

Connections and Configuration

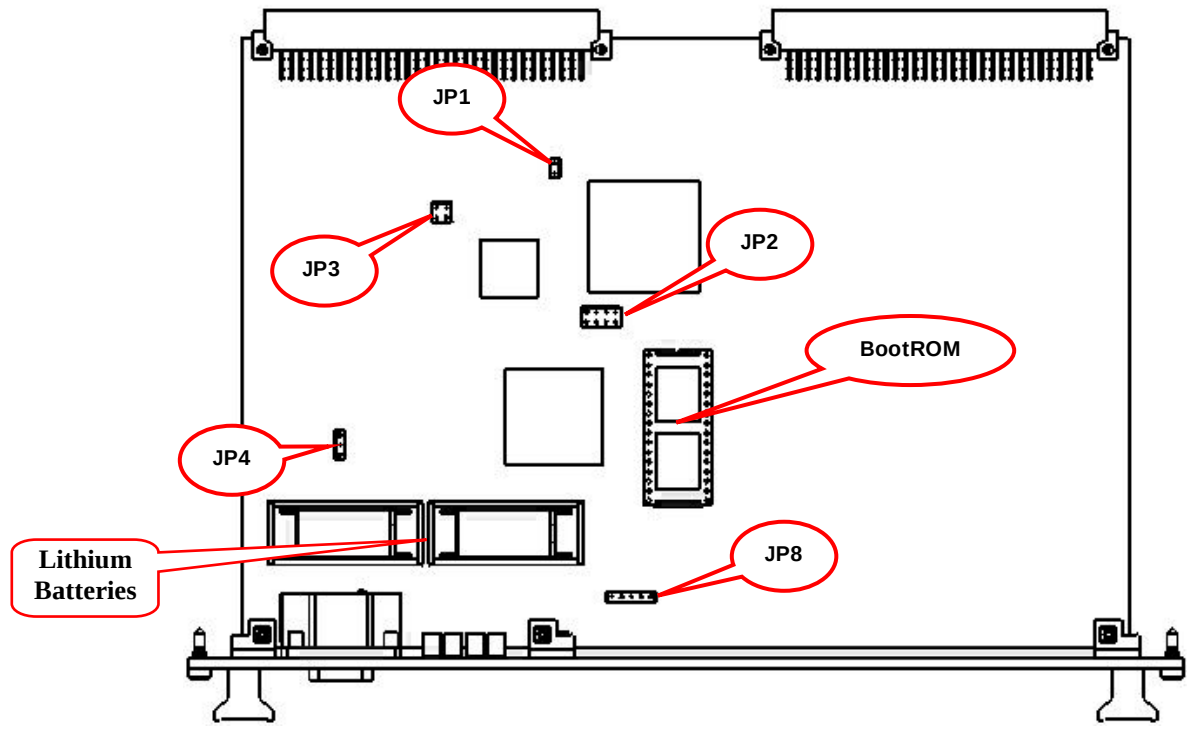
This Section

Use this section to:

- Set external jumper configurations
- Make field wiring connections

D20ME Main Module: Board Layout

Some of the option jumpers and components found on the 526-2004 and 526-2005 D20ME cards:



Connections and Configuration, continued

D20ME Jumpering, continued

D20ME Jumper Options

The following tables summarize the jumper settings for the D20ME main processor board.

Note: Single Node D20 is the factory default configuration.

Board Function	JP1 Master / Slave	JP2 VME Address Bits				JP3-1 RTC - SERCLOCK	JP3-2 RTC - BTRC
		4	3	2	1		
Single Node D20 (see note above)	OUT	IN	IN	IN	IN	OUT	IN
Lead Node of D200	OUT	IN	IN	IN	OUT	IN	IN
Non-lead Node #2	IN	IN	IN	OUT	IN	IN	OUT
Non-lead Node #3	IN	IN	IN	OUT	OUT	IN	OUT
Non-lead Node #4	IN	IN	OUT	IN	IN	IN	OUT
Non-lead Node #5	IN	IN	OUT	IN	OUT	IN	OUT
Non-lead Node #6	IN	IN	OUT	OUT	IN	IN	OUT
Non-lead Node #7	IN	IN	OUT	OUT	OUT	IN	OUT
Non-lead Node #8	IN	OUT	IN	IN	IN	IN	OUT

JP1 - VME Control

This jumper sets the Master or Slave role of the board on the VME bus.

Note: Single-node (D20) systems are *always* set to Master

JP2 - VME Address

JP2 is a group of four jumpers that set the VME bus address of the board. The address should reflect the board location in a D200 CCU chassis.

Example: The board with address 1 will be the lead node, with nodes 2 through 8 positioned to the right of the lead node.

Note: Single-node D20s are set to address 0 (all jumpers IN)

JP3-1 and JP3-2 RTC Options

These two jumpers determine the **Real Time Clock** (RTC) source for each D20ME board in a CCU.

- Single-node D20s and the first, or *Lead*, node of a D200 will use their internal clock.
- Non-lead nodes of a D200 must synchronize their clocks to node 1's clock.

Connections and Configuration, continued

D20ME Jumpering, continued

JP4 - Watchdog This 2-position jumper enables or disables the hardware Watchdog.

Note: The Watchdog should *never* be left disabled during normal operation of the D20ME.

JP4 Pins	Jumper Position	Function
Pin 1 = SLOWCK Pin 3 = /WD	pin 1 to 2 (center)	disables the hardware Watchdog.
	pin 3 to 2 (center)	enables the hardware Watchdog.

JP8 – Battery Backup Enable/disable

The D20ME card has two 3.6V lithium batteries to maintain NVRAM contents in the event of a power failure.

Important: Disconnect the batteries if the board is to be stored for extended periods.

Jumper	Position	Function
JP8	pin 1 to 2	disconnects the batteries from the NVRAM
	pin 3 to 2	connects the batteries to the NVRAM
	pins 4 to 5	always jumpered

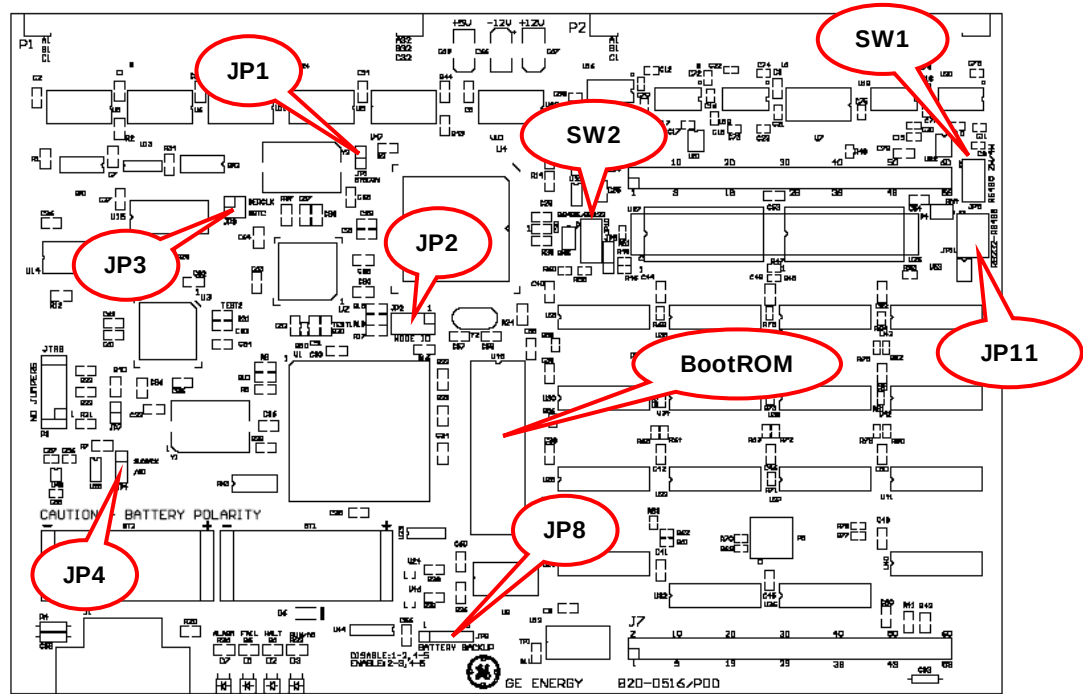
Other Jumpers Jumpers JP5, JP6 and JP7 *are not* user configurable. They are for factory test *only*.

Connections and Configuration, continued

D20ME II Jumpering

D20ME II Board Layout

This diagram shows the location of some of the optional jumpers and components found on the D20ME II cards (Part # 526-2006 and 526-2007).



The WESDAC D20ME II is functionally identical to the WESDAC D20ME except for the added capability to select, on a per-channel basis, RS-232 or RS-485 (RS-422) interfacing.

Connections and Configuration, continued

D20ME II Jumpering, continued

Table: VME Jumper Options

The following tables summarize the jumper settings for each board function and position that is installed in a CCU for D20 or D200:

Single Node

For D20 or D200:

Board Function	JP1 Master / Slave	JP2 VME Address Bits				JP3-1 RTC - SERCLOCK	JP3-2 RTC - BRTC
		4	3	2	1		
Single Node	OUT	IN	IN	IN	IN	OUT	IN

Multi-Node

For D20 or D200:

Board Function	JP1 Master / Slave	JP2 VME Address Bits				JP3-1 RTC - SERCLOCK	JP3-2 RTC - BRTC
		4	3	2	1		
Node #1	OUT	IN	IN	IN	OUT	IN	IN
Node #2	IN	IN	IN	OUT	IN	IN	OUT
Node #3	IN	IN	IN	OUT	OUT	IN	OUT
Node #4	IN	IN	OUT	IN	IN	IN	OUT
Node #5	IN	IN	OUT	IN	OUT	IN	OUT
Node #6	IN	IN	OUT	OUT	IN	IN	OUT
Node #7	IN	IN	OUT	OUT	OUT	IN	OUT
Node #8	IN	OUT	IN	IN	IN	IN	OUT

Notes:

- Single Node is the factory default configuration.
- If you have a single-node implementation with Ethernet or Memory expansion or both, configure jumpers as Single Node.

Connections and Configuration, continued

D20ME II Jumpering, continued

JP1 - This jumper sets the Master or Slave function of the board on the VME bus.

VME Control

Note: Single-node D20 systems are *always* set to Master.

JP2 - JP2 is a group of four jumpers that set the VME bus address of the board. The
VME Address address should reflect the board location in a D200 CCU chassis.

Example: The board with address 1 will be the lead node, with nodes 2 through 8 positioned to the right of the lead node.

Note: Single-node D20s are set to address 0 (all jumpers IN).

JP3-1 and These two jumpers determine the **Real-Time Clock (RTC)** source for each D20ME
JP3-2 II board in a CCU:
RTC Options

- Single-node D20s and the first, or *lead*, node of a D200 both use an internal clock.
- Non-lead nodes of a D200 synchronize the clocks to the clock of the lead node.

Table: JP4 -
Watchdog
Enable/Disable

This two-position jumper enables or disables the hardware Watchdog.

Note: Never leave the Watchdog disabled during normal D20ME II operation.

Jumper	Position	Function
JP4 Pin 1 = SLOWCK Pin 3 = /WD	pin 1 to 2 (center)	Disables the hardware Watchdog.
	pin 3 to 2 (center)	Enables the hardware Watchdog.

Table: JP8 –
Battery Backup
Enable/Disable

The D20ME II card has two 3.6V Lithium batteries, Tadiran® TL-2150 or equivalent, to maintain NVRAM contents in the event of a power failure.

Important: Disconnect the batteries if you are storing the board for extended periods of time.

Jumper	Position	Function
JP8	pin 1 to 2	Disconnects the batteries from the NVRAM
	pin 3 to 2	Connects the batteries to the NVRAM
	pins 4 to 5	Always jumpered

Connections and Configuration, continued

D20ME II Jumpering, continued

SW1

RS-485 2W/4W

When set for RS-485 mode (see SW2), each serial communication port channel must be set for either RS-485 2-wire with the switch ON, or RS-485 4-wire (RS422) with the switch OFF. RS-232 is the factory default setting for the D20ME Processor with the switch OFF.

Note: In order for RS485 (2-wire/4-wire) to operate, the RTS ON/OFF setting must be enabled and both DCD and CTS must be disabled in Config Pro specific to the protocol being used for that serial port. RTS must be toggled ON for RS485 2-wire transmissions and may be set continuously ON for RS485 4-wire data transmissions..

Note: When operating a serial communication channel in RS-232 mode always have the corresponding switch OFF.

SW1 (pins)	Serial Comm Port	RS-485 2-wire	RS-485 4-wire	RS-232
1-16	1	ON	OFF	OFF
2-15	2	ON	OFF	OFF
3-14	3	ON	OFF	OFF
4-13	4	ON	OFF	OFF
5-12	5	ON	OFF	OFF
6-11	6	ON	OFF	OFF
7-10	7	ON	OFF	OFF

SW2

RS-485/RS-232 Mode Selection

SW2 allows each serial communication port channel to be set for either RS-485 (RS-422) mode with the switch ON, or for the default setting of RS-232 mode with the switch OFF.

JP10 (pins)	Serial Comm Port	RS-485(RS-422) mode	RS-232 mode
1-16	1	ON	OFF
2-15	2	ON	OFF
3-14	3	ON	OFF
4-13	4	ON	OFF
5-12	5	ON	OFF
6-11	6	ON	OFF
7-10	7	ON	OFF

Connections and Configuration, continued

D20ME II Jumpering, continued

JP11**RS-232/RS-485
Operation**

A JP11 jumper is always installed in conjunction with a serial communications port channel. The jumper's position depends on whether the channel has been mode selected as either RS-232 or RS-485 (see SW2).

Note: In order for RS485 (RS422) to operate, the RTS ON/OFF setting must be enabled and both DCD and CTS must be disabled in Config Pro specific to the protocol being used for that serial port. RTS must be toggled ON for RS485 transmissions and may be set continuously ON for RS422 data transmissions.

Serial Comm Port	JP11 (pins) RS-232	JP11 (pins) RS-485(RS-422) Enabled
1	1-2	2-3
2	4-5	5-6
3	7-8	8-9
4	10-11	11-12
5	13-14	14-15
6	16-17	17-18
7	19-20	20-21

**Table: Serial
Port Pinouts**

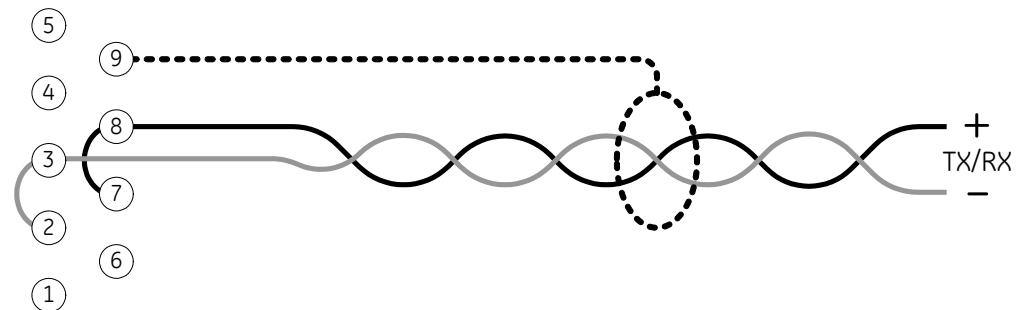
Pinouts for serial ports for both RS-232 and RS-485 configurations.

DB-9 Pin	RS-232	RS-485
1	CD	N/C
2	RX	RX-
3	TX	TX-
4	N/C	N/C
5	GND	Com GND
6	N/C	N/C
7	RTS	TX+
8	CTS	RX+
9	EARTH GND	EARTH GND

Connections and Configuration, continued

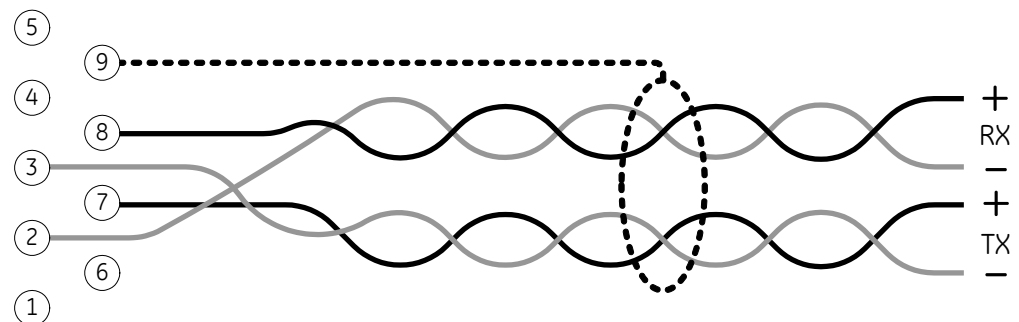
2-Wire RS-485 Cable

Schematic of the cable wiring necessary for 2-wire RS-485 operation. The pin pattern is as seen from the back of the DB9-F connector.



4-Wire RS-485 Cable

Schematic of the cable wiring necessary for 4-wire RS-485 operation. The pin pattern is as seen from the back of the DB9-F connector.



Transient Suppression

The RS-485 port on the D20ME II provides no isolation and offers limited built-in transient suppression. If you are using the D20ME II in an environment where longer cable runs with larger transients are expected, installation of an external transient suppression device is recommended to protect the RTU. In addition, GE recommends the installation of an external transient suppression device when the RS-485 communication cable must be run to devices located outside of the RTU cabinet containing the D20ME II. Contact GE Digital Energy Technical Support for additional information.

Connections and Configuration, continued

D20ME/ME II Power Connections

Power is supplied to the D20ME/ME II Main Boards through the backplane:

- WESTERM D20M+ SS for non-VME. See Module Layout *517-0224-ML*
- WESTERM D20 VME bus backplane. See Module Layout *517-0123-ML*
- SCHROFF VME bus backplane. See Module Layout *500-0307-ML*

D200 Power Supply

The D200 uses two power supply units, one for 5V and one for +12/-12V supply. Power is supplied through the CCU Switch and Fuse Assembly. Each unit can be switched to accommodate 110V or 220V mains power supply. There is also a version with a 48 VDC input.

There may be two of each power supply for redundancy: two 5V and two +12/-12V.

Procedure

To replace a 5V power supply:

Step	Action
1	Remove the 5V Power Supply from the D200 Chassis. Inspect the right side of the casing. Note: In the middle of the right side a slotted dial is visible through one of the casing apertures. This dial indicates the mains supply voltage setting: 115V or 220V.
2	Set the voltage by carefully inserting a small screwdriver through the aperture to turn the dial approximately 45°. Result: The mains power supply rating has been set for the Power Supply.

Connections and Configuration, continued

D200 Power
Supply Switch
(115/230 VAC
input voltage
selection on +5V
VERO power
supply)

The VERO +5 V power supply (GE part number 580-0299) has a small selector switch on the left side that must be set according to the AC input voltage being used (either 115 or 230 VAC).

Selecting 230 VAC on the selector switch and applying 115 VAC to the input will drop the output voltage of the power supply to approximately 3.5 VDC. Since the D20 processor card(s) require 5 VDC to operate, they will not function correctly in this configuration. Either moving the selector switch to 115 VAC to match the input voltage or changing the input voltage to 230 VAC will resolve the problem.

Selecting 115 VAC at the selector switch and applying 230 VAC to the input will cause permanent damage to the power supply and possibly other components installed in the chassis. GE will not provide warranty support for any components damaged due to setting the input voltage selector switch to the incorrect position.

There is no corresponding selector switch on +12 V VERO power supplies.



115/230 VAC
input voltage
selector switch

Connections and Configuration, continued

Procedure To switch +12/-12V power supply:

Step	Action
1	Remove the +12/-12V Power Supply from the D200 Chassis. Inspect the right side of the casing. Note: In the middle at the bottom of the right side a toggle switch is visible through one of the casing apertures. This switch indicates the mains supply voltage setting: 220V/110V.
2	Set the voltage as required by carefully toggling the switch through an aperture in the underside of the casing. Result: The mains power supply rating has been set for the Power Supply.

Connections and Configuration, continued

Termination Panels: Jumper Settings

There are three WESTERM Termination Panels. For jumper configuration settings for each of these boards see the Module Layout drawings:

- WESTERM D20M+ SS for non-VME see 517-0224-ML
- WESTERM D20M+ for VME see 517-0225-ML
- WESTERM D20M++ for VME see 517-0245-ML

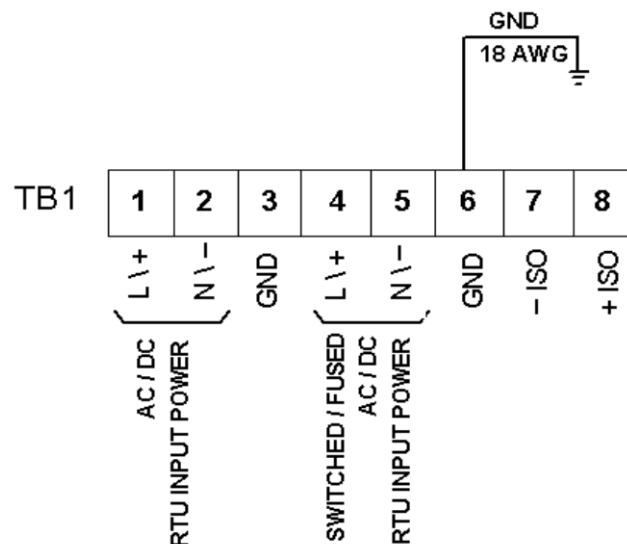
Termination Panels: Power Supply

Power connections to the WESTERM Termination Panels are made on connector blocks:

- TB1 on the WESTERM D20M+ SS and WESTERM D20M+
- TB2 on the WESTERM D20M++

WESTERM D20M+SS: Power Supply

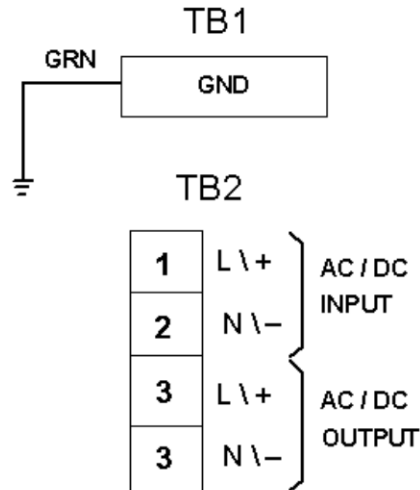
Power Supply connections on WESTERM D20M+ SS and WESTERM D20M+:



- 1 & 2 are used for input power connections based on the WESDAC D20 Power Supply
- 4 & 5 can be used as a switched auxiliary power supply source
- 7 & 8 can be used externally for status wetting, contact wetting and/or miscellaneous power connections, if applicable.

Connections and Configuration, continued

WESTERM D20M++: Power Supply connections on the WESTERM D20M++:
Power Supply



- 1 & 2 are used for input power connections based upon the WESDAC D20 Power Supply

Peripherals: Supplying Power

Power supply to the WESDAC/WESTERM peripheral pairings is through the WESTERM boards.

If you have the D20 horizontal slot chassis for a VME or non-VME installation, then power supply to the I/O Peripherals **can** be run through the D.20 Link. This is also possible for a D20 two-node implementation of this chassis assembly. If you have the D200 vertical slot chassis for multi-node, then you **cannot** run the power supply to the I/O Peripherals through the D.20 Link; you require the D.20 DC Interface module: See “D.20 Interface Modules: connect for power using D.20 Link”, page 74

In RTU systems using more than five peripherals, an external power supply is required and this supply is wired directly onto the WESTERM board. Typical power consumption for D20 I/O peripherals is as follows:

D20A	20 – 60 VDC, 8 W typical
D20C	20 – 60 VDC, 5 W typical
D20K	20 – 60 VDC, 4 W typical, 11 W with all relays energized
D20S	20 – 60 VDC, 3 W typical

Connections and Configuration, continued

Peripherals: connect for power using D.20 Link

Connect power to A, S, K, C, and AC peripheral boards using the D.20 HDLC Link using a daisy-chain series of connections from peripheral to peripheral.

Procedure

Connect peripherals using the D.20 Link:

Step	Action
1	Connect the D.20 link DB9 connector to the J1 input on WESTERM peripheral board number one.
2	Connect the D.20 link DB9 connector out from the J2 connector and into the J1 connector on WESTERM peripheral board number two.
3	Repeat steps 1 and 2 for each WESTERM peripheral board in series. Result: The peripherals are connected for power using the D.20 Link.

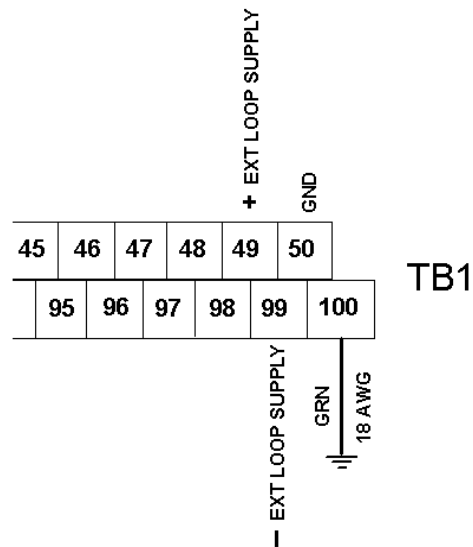
Table: J1 pinouts on WESTERM Peripherals

The following table gives DB9 Connector pinouts for J1 input on the WESTERM boards:

Pin Number	Function	Signal Direction	
		INPUT	OUTPUT
1	GND		
2	TX/RX1	√	√
3	$\overline{\text{TX/RX1}}$	√	√
4	+ DC1	√	
5	- DC1	√	
6	TX/RX2	√	√
7	$\overline{\text{TX/RX2}}$	√	√
8	+ DC2	√	
9	- DC2	√	

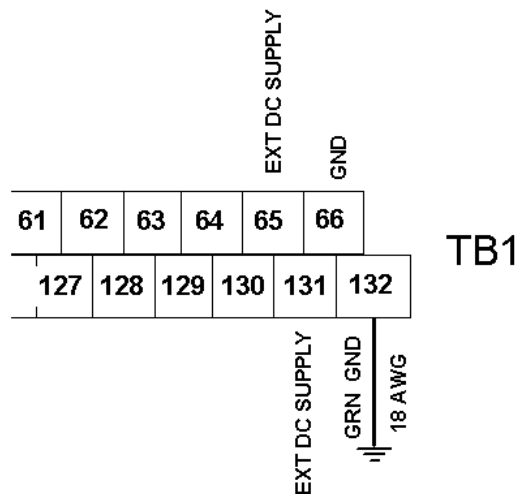
Connections and Configuration, continued

WESTERM D20A: External Loop Supply For connections to an external power supply for current loop powered transducers, use TB1-49 and TB1-99 on the WESTERM D20A:



Jumpers Z3 and Z4 must be set for loop supply routing. Fuse F2 provides overcurrent protection on the positive leg of the selected loop supply. See “WESTERM D20A: Jumpers”, page 79.

WESTERM D20S: External DC Supply For connections to an external DC power source for status input wetting, use TB1-65 and TB1-131 on the WESTERM D20S:

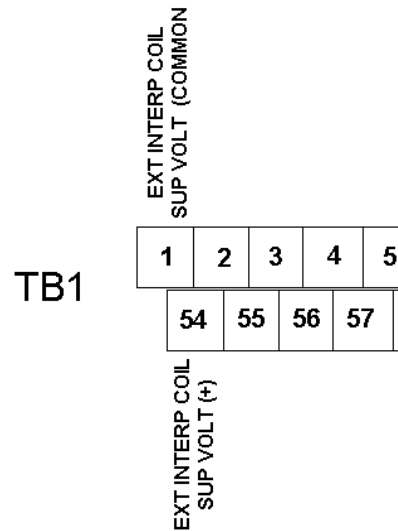


Jumpers Z2 and Z3 must be set for external supply source. Since bipolar status inputs are allowed, the polarity of the external supply can be connected either way, depending on the application. Fuses F2 and F3 provide fusing on each leg of the supply. See “WESTERM D20S: Jumpers”, page 80.

Connections and Configuration, continued

WESTERM D20K: External Control Output Supply

For connections to an external power supply for control output to interposing relay panels, use TB1-1 and TB1-54 on the WESTERM D20K:

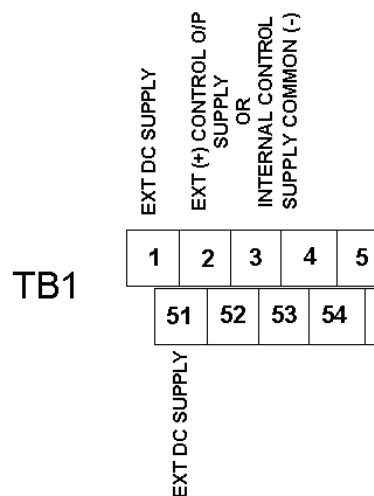


Jumpers Z2 and Z3 must be set for external supply source. Fuse F2 provide fusing on the positive leg of the power supply. See “WESTERM D20K: Jumpers”, page 82.

Connections and Configuration, continued

WESTERM D20C: External DC & Control Output Supply

For connections to the WESTERM D20C for status input wetting, use TB1-1 and TB1-51. TB1-2 is for either a connection accepting an external positive supply for control outputs or as an output connection for sourcing the internal control output common:



Jumpers Z2 and Z3 must be set for external supply source. Jumpers Z4 and Z17 must be set for TB-2: for either and external (+) polarity supply for control outputs to interposing relays or for outputting the internal supply common (-).

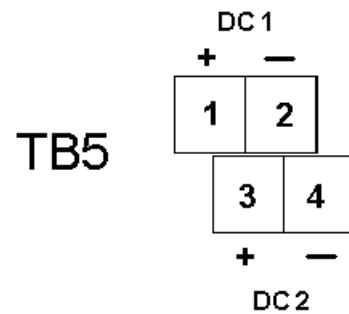
Since bipolar status inputs are allowed, the polarity of the external supply is irrelevant. Fuses F2 and F3 provide fusing on each leg of the supply.

See “WESTERM D20C: Jumpers”, page 84.

Connections and Configuration, continued

WESTERM D20AC: DC Power Supply

Redundant DC power supply connections to the WESTERM D20AC are provided on TB5-1 (DC1+), TB5-2 (DC1–), TB5-3 (DC2+) and TB5-4 (DC2–):



Fuses F1 and F2 provide fusing on each leg of the supply.

Connections and Configuration, continued

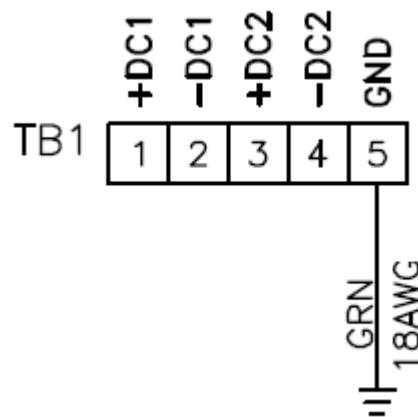
D.20 Interface Modules: DC Power Supply

Power can be supplied to the D.20 Communications Interface, D.20 Splitter or D.20 DC Interface modules using:

- D.20 Link
- Externally through terminal connector block TB1.

Each power source has two connection points, allowing for redundant supplies for greater reliability. A switching Power Supply generates the +5 VDC required by the on-board logic.

External Power Supply connections:



Connections and Configuration, continued

D.20 Interface Modules: connect for power using D.20 Link

Connect power to the D.20 Communications Interface, D.20 Splitter or D.20 DC Interface modules using D.20 HDLC:

- Use J1 & J7 on the D.20 Communications Interface and D.20 DC Interface modules. See board diagrams on page 87 and page 94
- Use J1 on the D.20 Splitter. See board diagram on page 89

Table: J1 pinouts on D.20 Interface Modules

The following table gives DB9 Connector pinouts for J1 and J7 input on the D.20 Interface modules:

Pin Number	Function	Signal Direction	
		INPUT	OUTPUT
1	GND		
2	TX/RX1	√	√
3	$\overline{\text{TX/RX1}}$	√	√
4	+ DC1	√	
5	- DC1	√	
6	TX/RX2	√	√
7	$\overline{\text{TX/RX2}}$	√	√
8	+ DC2	√	
9	- DC2	√	

Connections and Configuration, continued

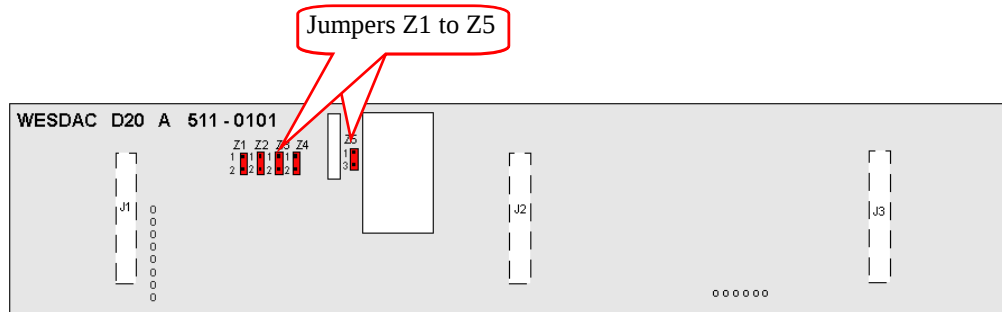
I/O Peripheral Boards: Jumper Settings

Jumper location and configuration settings are given below. You can also refer to the Module Layouts for these boards:

- D20A Analog Input
 - WESDAC D20A see *511-0101-ML*
 - WESTERM D20A see *517-0163-ML*
 - D20S Digital Input
 - WESDAC D20S see *507-0101-ML*
 - WESTERM D20S see *517-0165-ML*
 - D20K Control Output
 - WESDAC D20K see *508-0101-ML*
 - WESTERM D20K see *517-0164-ML*
 - D20C Combination I/O
 - WESDAC D20C see *504-0002-ML*
 - WESTERM D20C see *517-0169-ML*
 - D20AC (Alternating Current) Analog Input
 - WESDAC D20AC see *511-0104-ML* for 40 – 150V power and *511-0106-ML* for 20 – 60V power
-

Connections and Configuration, continued

WESDAC Board Jumpers There are five jumpers on the WESDAC A, S, K and C boards, located in similar positions on each of the boards:



Notes: The WESDAC D20A board is shown as an example.
The WESDAC D20AC board has no jumpers.

WESDAC Jumpers Z1-Z5 Jumpers Z1 to Z5 are used to set the Base software compatibility on the WESDAC boards.

Check what Base the D20/D200 main board is using and set the jumpers accordingly. There are two possible settings:

- For Base 3.11 or older
- For any other base.

Note: If you are replacing a WESDAC peripheral board, you will not see these jumpers on older versions of the board.

Checking the Base Version

Use the following table to determine which Base version you have. Inspect the BootROM labels on D20M, D20M+ and D20M++ main boards.

BootROM labels on BASE 3.11 or older boards	
D20M & D20M+ Boards	D20M++ Boards
0.41X	3.02 (SBD006/00)
1.01	3.03 (SBD007/00)
2.00	3.03A (SBD008/00)
2.01	
3.00	
3.01 (SBD004/00)	
3.02 (SBD003/00)	
3.03 (SBD005/00)	
3.03A (SBD000/00)	

Connections and Configuration, continued**WESDAC
Jumper
Settings**

The following table shows jumper settings for the different Base software.

Jumper Number	Jumper Position	Jumper Setting	Option		Jumper Definition – S/W Compatibility
			1A	1B	
Z1 – Z4	1 – 2	ALL OUT	√		ALL OTHER BASES
Z5	1 – 2	IN	√		
Z1 – Z4	1 – 2	ALL IN		√	BASE 3.11 OR OLDER (D20M, D20M+ & D20M++)
Z5	1 – 2	IN		√	

Note

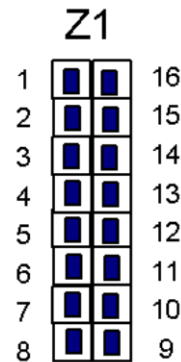
If you have the D20ME main board, then set the jumper definition to: ALL OTHER BASES.

Connections and Configuration, continued

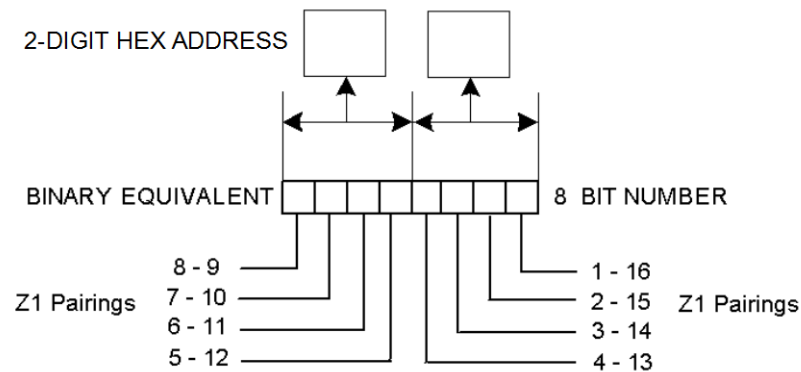
WESTERM Addressing: jumper Z1

Jumper Z1 on each of the five WESTERM boards (A, S, K, C and AC) is used to set the module address. A valid module address consists of a two-part hexadecimal value.

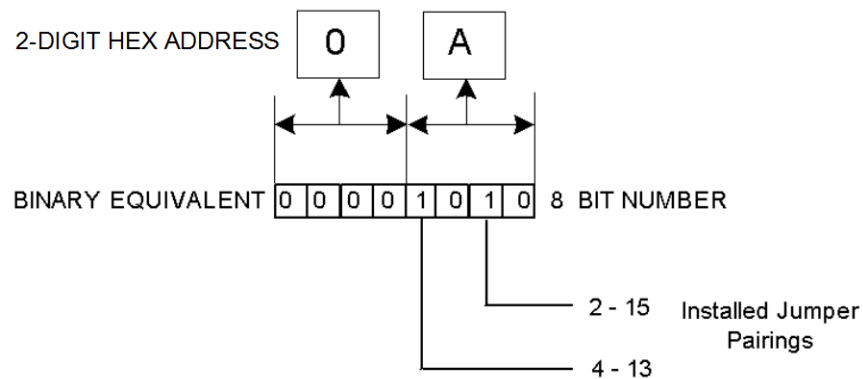
Jumper Z1 has eight pairings:



The two-digit hexadecimal number is expressed via binary using the eight pairings on the jumper according to the schema:

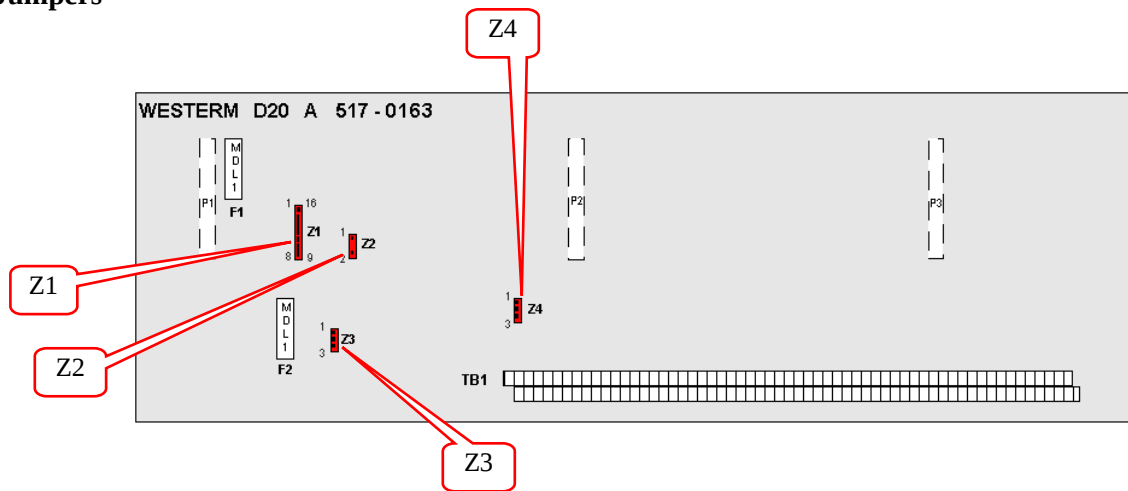


Example: Suppose you want a Hex address of **0A**, which is decimal 10. Then you need to install jumpers to express 0 for the first Hex digit and A for the second Hex digit. You do this by jumpering for decimal 10 in binary, which is 00001010 for an eight-bit number:



Connections and Configuration, continued

WESTERM D20A: Jumpers



To set Module address jumpering on Z1, see “WESTERM Addressing”, page 78.

Use jumpers:

- Z2 to enable/disable low loop supply voltage sensing
- Z3 and Z4 to set Analog loop supply.

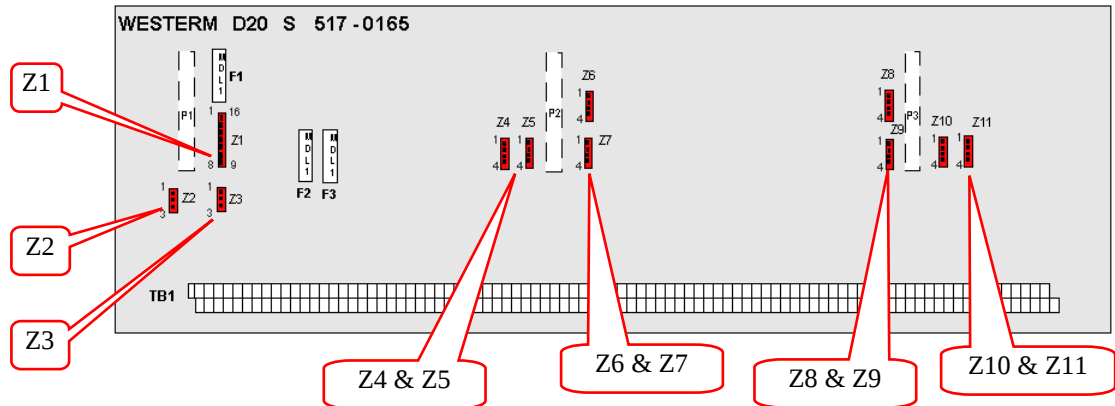
WESTERM D20A: Jumper Settings

The following table gives jumper settings for Z2, Z3 and Z4.

Jumper Number	Jumper Position	Jumper Setting	Option 1		Jumper Definition – Low Loop Supply	
			1A	1B		
Z2	1 – 2	IN		√	Enable bypass for low loop supply sensing	
	1 – 2	OUT	√		Disable bypass for low loop supply sensing	
			Option 2		Jumper Definition – Analog Loop Supply	
			2A	2B		2C
Z3 & Z4	1 – 2	IN			√	Internal Analog loop supply provided by DC1 or DC2
	2 – 3	IN		√		External Analog loop supply on TB1-1 & 3
	1 – 2 & 2 – 3	OUT	√			Not required

Connections and Configuration, continued

WESTERM D20S: Jumpers



To set Module address jumpering on Z1, see “WESTERM Addressing”, page 78.

Use jumpers:

- Z2 and Z3 for supply voltage setting
- Z4 to Z11 to set wetting configuration for 64 digital inputs (DI) in groups of eight

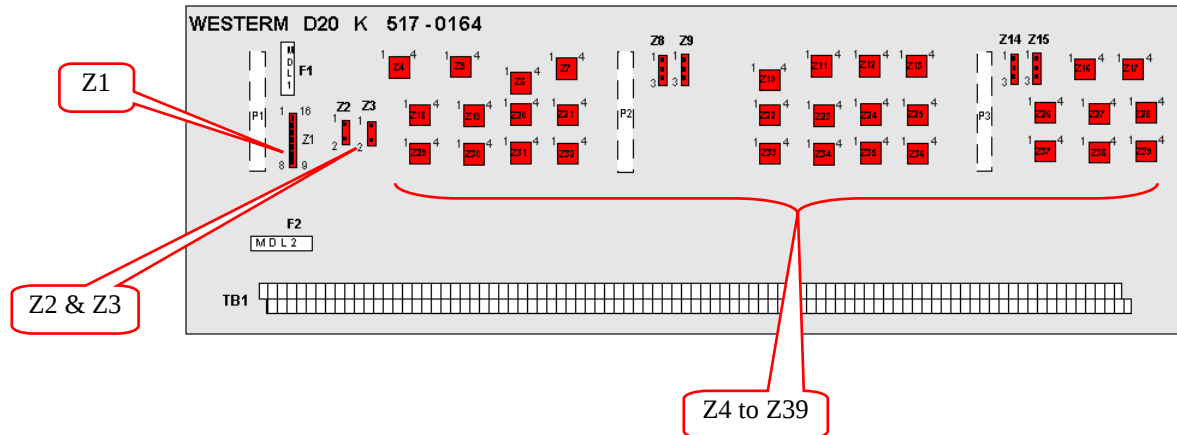
See table below, next page.

Connections and Configuration, continued**WESTERM** The following table gives jumper settings for Z2 to Z11.**D20S: Settings**

Jumper Number	Jumper Position	Jumper Setting	Option					Jumper Definition – Status
			1A	1B	1C	1D	1E	
Z2 & Z3	1 – 2	IN	√			√		D20 Peripheral DC Supply Voltage
	2 – 3	IN		√		√		External DC Supply Voltage on TB1-65 and 131
Z4	1 – 2 & 3 – 4	IN			√	√		Contact Wetting Configuration (DI 1 – 8)
	2 – 3	IN	√	√				Group Common Configuration with Voltage Input (DI 1 – 8)
Z5	1 – 2 & 3 – 4	IN			√	√		Contact Wetting Configuration (DI 9 – 16)
	2 – 3	IN	√	√				Group Common Configuration with Voltage Input (DI 9 – 16)
Z6	1 – 2 & 3 – 4	IN			√	√		Contact Wetting Configuration (DI 25 – 32)
	2 – 3	IN	√	√				Group Common Configuration with Voltage Input (DI 25 – 32)
Z7	1 – 2 & 3 – 4	IN			√	√		Contact Wetting Configuration (DI 17 – 24)
	2 – 3	IN	√	√				Group Common Configuration with Voltage Input (DI 17 – 24)
Z8	1 – 2 & 3 – 4	IN			√	√		Contact Wetting Configuration (DI 33 – 40)
	2 – 3	IN	√	√				Group Common Configuration with Voltage Input (DI 33 – 40)
Z9	1 – 2 & 3 – 4	IN			√	√		Contact Wetting Configuration (DI 41-48)
	2 – 3	IN	√	√				Group Common Configuration with Voltage Input (DI 41-48)
Z10	1 – 2 & 3 – 4	IN			√	√		Contact Wetting Configuration (DI 49 – 56)
	2 – 3	IN	√	√				Group Common Configuration with Voltage Input (DI 49 – 56)
Z11	1 – 2 & 3 – 4	IN			√	√		Contact Wetting Configuration (DI 57 – 64)
	2 – 3	IN	√	√				Group Common Configuration with Voltage Input (DI 57 – 64)

Connections and Configuration, continued

WESTERM Jumper locations on the WESTERM D20K: D20K: Jumpers



To set Module address jumpering on Z1, see “WESTERM Addressing”, page 78.

Use jumpers:

- Z2 and Z3 for supply voltage setting
- Z4 to Z39 to set Trip/Close, Raise/Lower and Control Outputs

See table below, next page.

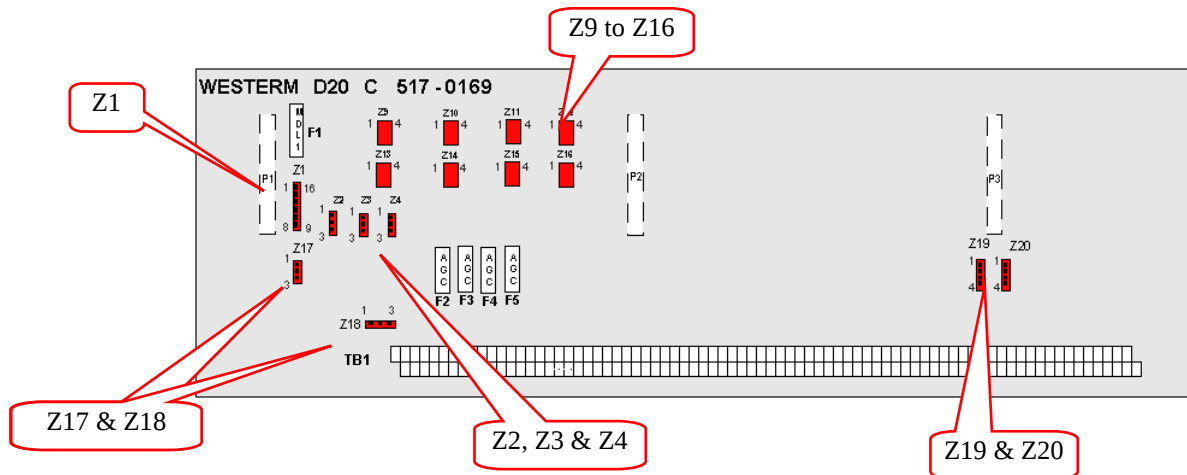
Connections and Configuration, continued

WESTERM The following table gives jumper settings for Z2 to Z39.
D20K: Settings

Jumper Number	Jumper Position	Jumper Setting	Option			Jumper Definition	
			1A	1B	1C		
Z2 & Z3	1 – 2	IN	√			Control O/P Source = D20 Peripheral DC Supply Voltage	
	2 – 3	IN		√		Control O/P Source = External Source Supplied to TB1 – 1 & 54	
			Option				
			2A	2B	2C		
Z8	1 – 2	IN	√			T/C Configuration for Control O/P 1 – 8 = (T/C 1 – 8)	
	2 – 3	IN		√		R/L Configuration for Control O/P 1 – 8 = (R/L 13 – 16)	
Z9	1 – 2	IN	√			T/C Configuration for Control O/P 9 – 16 = (T/C 9 – 16)	
	2 – 3	IN		√		R/L Configuration for Control O/P 9 – 16 = (R/L 9 – 12)	
Z14	1 – 2	IN	√			T/C Configuration for Control O/P 17 – 24 = (T/C 17 – 24)	
	2 – 3	IN		√		R/L Configuration for Control O/P 17 – 24 = (R/L 5 – 8)	
Z15	1 – 2	IN	√			T/C Configuration for Control O/P 25 – 32= (T/C 25 – 32)	
	2 – 3	IN		√		R/L Configuration for Control O/P 25 – 32 = (R/L 1 – 4)	
Jumper Number	Jumper Position	Jumper Setting	Option				Jumper Definition
			3A	3B	3C	3D	
Z5 – Z7 Z19 – Z21 Z30 & Z31	1 – 2 & 3 – 4	IN	√				T/C Configuration (T/C 1 – 8)
	1 – 2	IN		√			R/L Configuration (R/L 13 – 16)
	2 – 3	IN			√		Form C or Open Collector Control Outputs 1 – 8
Z4, Z10, Z11, Z18, Z22, Z29, Z32, Z33	1 – 2 & 3 – 4	IN	√				T/C Configuration (T/C 9 – 16)
	1 – 2	IN		√			R/L Configuration (R/L 9 – 12)
	2 – 3	IN			√		Form C or Open Collector Control Outputs 9 – 16
Z12, Z13, Z23, Z24, Z25, Z34, Z35, Z36	1 – 2 & 3 – 4	IN	√				T/C Configuration (T/C 17 – 24)
	1 – 2	IN		√			R/L Configuration (R/L 5 – 8)
	2 – 3	IN			√		Form C or Open Collector Control Outputs 17 – 24
Z16, Z17, Z26, Z27, Z28, Z37, Z38, Z39	1 – 2 & 3 – 4	IN	√				T/C Configuration (T/C 25 – 32)
	1 – 2	IN		√			R/L Configuration (R/L 1 – 4)
	2 – 3	IN			√		Form C or Open Collector Control Outputs 25 – 32

Connections and Configuration, continued

WESTERM D20C: Jumpers



To set Module address jumpering on Z1, see “WESTERM Addressing”, page 78.

Use jumpers:

- Z2 and Z3 for supply voltage setting
- Z19 and Z20 for contact wetting configuration
- Others to set Trip/Close, Raise/Lower and Control Outputs

See table below, next page.

Connections and Configuration, continued

WESTERM The following table gives jumper settings for Z2 to Z20.
D20C: Settings

Jumper Number	Jumper Position	Jumper Setting	Option 1						Jumper Definition – Status
			1A	1B	1C	1D			
Z2 & Z3	1 – 2	IN	√		√				D20 Peripheral DC Supply Voltage
	2 – 3	IN		√		√			External DC Supply Voltage on TB1 – 1 & 51
Z19 & Z20	1 – 2, 3 – 4	IN	√	√					Contact Wetting Configuration
	2 – 3	IN			√	√			Group Common Configuration
			Option 2						Jumper Definition – Control Wetting Source/Relay Common
			2A	2B					
Z4 & Z17	1 – 2	IN	√						Internal Control Common Supplied on TB1 – 2
	2 – 3	IN		√					External Control O/P Voltage Source to be Supplied on TB1 – 2
			Option 3						Jumper Definition – Control O/P Configuration
			3A	3B	3C	3D	3E	3F	
Z5	1 – 2	IN	√		√	√	√	√	Master T/C source to C control O/P 1 & 2 = (T/C 1 & 2)
	2 – 3	IN		√					R/L source to C control O/P 1 & 2 = (R/L 4)
Z6	1 – 2	IN	√		√	√		√	Master T/C source to C control O/P 3 & 4 = (T/C 3 & 4)
	2 – 3	IN		√			√		R/L source to C control O/P 3 & 4 = (R/L 3)
Z7	1 – 2	IN	√		√			√	Master T/C source to C control O/P 5 & 6 = (T/C 5 & 6)
	2 – 3	IN		√		√	√		R/L source to C control O/P 5 & 6 = (R/L 2)
Z8	1 – 2	IN	√					√	Master T/C source to C control O/P 7 & 8 = (T/C 7 & 8)
	2 – 3	IN		√	√	√	√		R/L source to C control O/P 7 & 8 = (R/L 1)
Z9 & Z13	1 – 2, 3 – 4	IN	√		√	√	√		T/C Configuration (T/C 1 & 2)
	1 – 2	IN		√					R/L Configuration (R/L 4)
	2 – 3	IN						√	From C Control Outputs 1 & 2
Z10 & Z14	1 – 2, 3 – 4	IN	√		√	√			T/C Configuration (T/C 3 & 4)
	1 – 2	IN		√			√		R/L Configuration (R/L 3)
	2 – 3	IN						√	Form C Control Outputs 3 & 4

Connections and Configuration, continued

WESTERM D20C: Settings (continued)

Jumper Number	Jumper Position	Jumper Setting	Option 3						Jumper Definition – Control O/P Configuration
			3A	3B	3C	3D	3E	3F	
Z11 & Z15	1 – 2 & 3 – 4	IN	√		√				T/C Configuration (T/C 5 & 6)
	1 – 2	IN		√		√	√		R/L Configuration (R/L 2)
	2 – 3	IN						√	From C Control Outputs 5 & 6
Z12 & Z16	1 – 2 & 3 – 4	IN	√						T/C Configuration (T/C 7 & 8)
	1 – 2	IN		√	√	√	√		R/L Configuration (R/L 1)
	2 – 3	IN						√	Form C Control Outputs 7 & 8

WESTERM D20AC

There is only the Z1 jumper on the WESTERM D20AC. It is located in a similar position to Z1 on the A, S, K, and C boards.

Connections and Configuration, continued

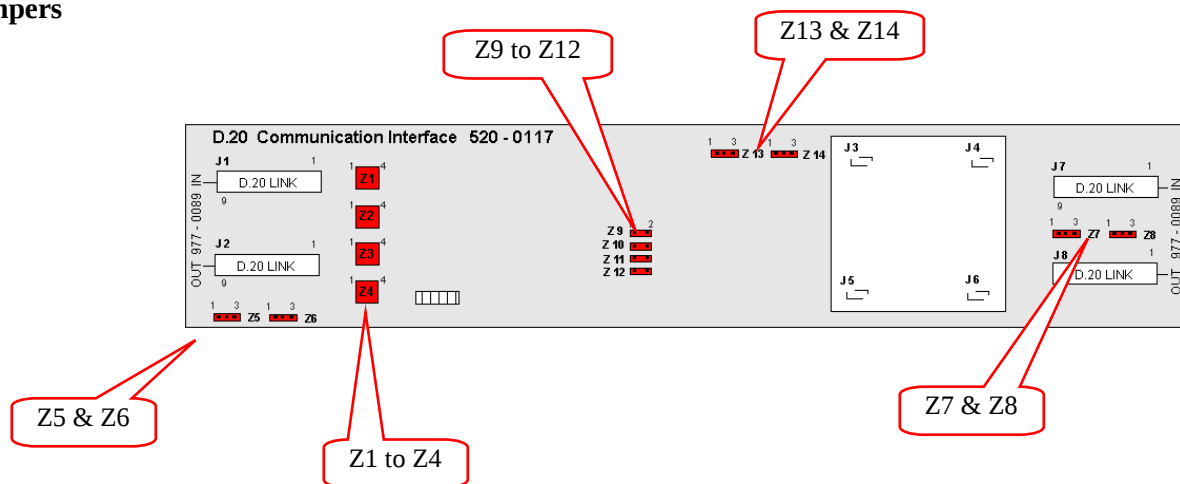
D.20 Interface Modules

Jumper location and configuration settings for the D.20 Communication Interface and D.20 DC Interface are given below. You can also refer to the Module Layouts for these boards:

- D.20 Communications Interface and D.20 RS-485 Adaptor
 - see 520-0117-ML
- D.20 Splitter
 - see 520-0118-ML
- D.20 DC Interface
 - see 520-0154-ML

D.20 Comm Interface: Jumpers

Jumper locations on the D.20 Communications Interface:



Use jumpers:

- Z1 to Z4 for external power setting
- Z5 and Z6 for D.20 channel used
- Z7 and Z8 for Repeater channel used
- Z9 to Z14 for SW base compatibility setting

See table below, next page.

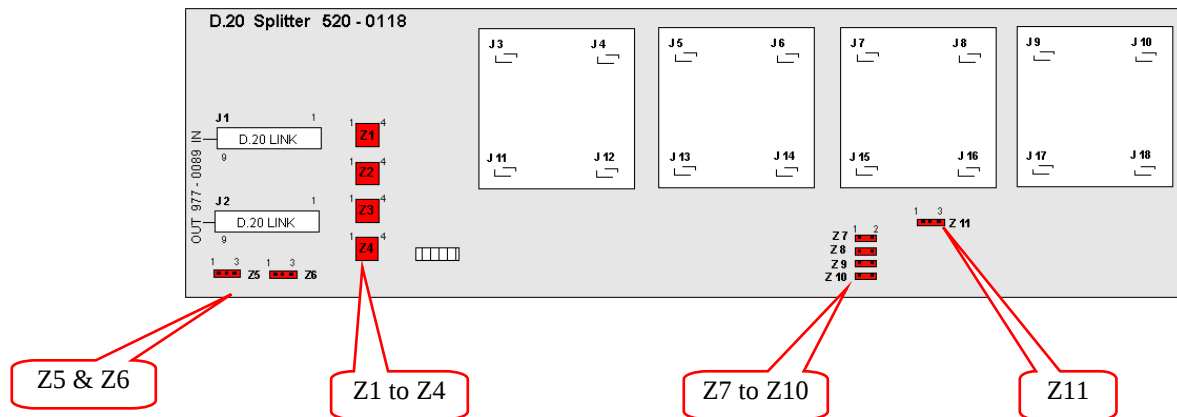
Connections and Configuration, continued

D.20 Comm The following table gives jumper settings for Z1 to Z14.
Interface:
Settings

Jumper Number	Jumper Position	Jumper Setting	Option 1			Jumper Definition – External Power
			1A	1B	1C	
Z1 to Z4	2 – 3	IN	√			D.20 Link Power Supplies J8 & Comm. I/F
	3 – 4	IN			√	External Power on TB1 supplies J8 only and D.20 Link power supplies Comm. I/F
	1 – 4 & 2 – 3	IN		√		External Power on TB1 supplies D.20 Link, J8 and Comm. I/F
			2A	2B		Jumper Definition – D.20 Channel Used
Z5 to Z6	1 – 2	IN	√			D.20 Channel 1 Used
	2 – 3	IN		√		D.20 Channel 2 Used
			3A	3B		Jumper Definition – Repeater Channel (N/A)
Z7 to Z8	1 – 2	IN	√			RS-485 Interface Connected to D.20 Channel 1
	2 – 3	IN		√		RS-485 Interface Connected to D.20 Channel 2
			4A	4B		Jumper Definition – S/W Base Compatibility
Z9 to Z12	1 – 2	ALL IN	√			Base 3.11, Pre-Win or Older
Z13 & Z14	1 – 2	IN	√			
Z9 to Z12	1 – 2	ALL OUT		√		ALL OTHER BASES
Z13 & Z14	2 – 3	IN		√		

Connections and Configuration, continued

D.20 Splitter: Jumper locations on the D.20 Splitter: Jumpers



Use jumpers:

- Z1 to Z4 for external power setting
- Z5 and Z6 for D.20 channel used
- Z7 to Z11 for SW base compatibility setting

D.20 Splitter: Settings

The following table gives jumper settings for Z1 to Z11.

Jumper Number	Jumper Position	Jumper Setting	Option 1			Jumper Definition – External Power
			1A	1B	1C	
Z1 to Z4	1 – 4 & 2 – 3	OUT		√		D.20 Link Power Supplies Splitter
	1 – 4 & 2 – 3	IN	√			External Power on TB1 supplies D.20 Link and Splitter
			2A	2B		Jumper Definition – D.20 Channel Used
Z5 to Z6	1 – 2	IN	√			D.20 Channel 1 Used
	2 – 3	IN		√		D.20 Channel 2 Used
			3A	3B		Jumper Definition – S/W Base Compatibility
Z7 to Z10	1 – 2	ALL OUT	√			ALL OTHER BASES (DEFAULT)
Z11	2 – 3	IN	√			
Z7 to Z10	1 – 2	ALL IN		√		Base 3.11, Pre-Win or Older
Z11	2 – 3	IN		√		

Connections and Configuration, continued

D.20 Link Power Options

This section describes the jumper settings that are available for powering D20 peripherals (A, S, K or C). The jumpers must be set correctly for proper operation and to avoid damage to the peripheral.

There are three styles of Westerm D20M+ boards available:

- The D20 single slot chassis (GE part number 500-0305) uses a Westerm D20M+ backplane board (GE part number 517-0224) that is located at the rear of the chassis.
- The D20 horizontal multi-slot VME chassis (GE part number 500-0280) uses GE part numbers 517-0225 and 517-0230. The 19" panel mount board (GE part number 517-0225) is secured to the RTU beneath the chassis and the other component (GE part number 517-0230) is mounted on a panel that is secured to the back of the D20 chassis.

Jumpers Z22 and Z23 on each type of Westerm D20M+ board determine the voltage applied to the D.20 link.

Z22 & Z23 Jumper Position	Jumper Definition
1-2	Switched/fused RTU input power feeds the D.20 link (i.e. voltage that is generated from the input applied to the D20 chassis)
2-3	Isolated power feeds the D.20 link (i.e. voltage that is generated from the output of the D20 power supply located in the D20 chassis)

For example, if Z22 and Z23 are set to position 1-2 and the switched/fused power source is a station battery operating at 125 VDC then 125 VDC will be routed into the D.20 link, potentially causing damage to connected peripheral devices.

NOTICE

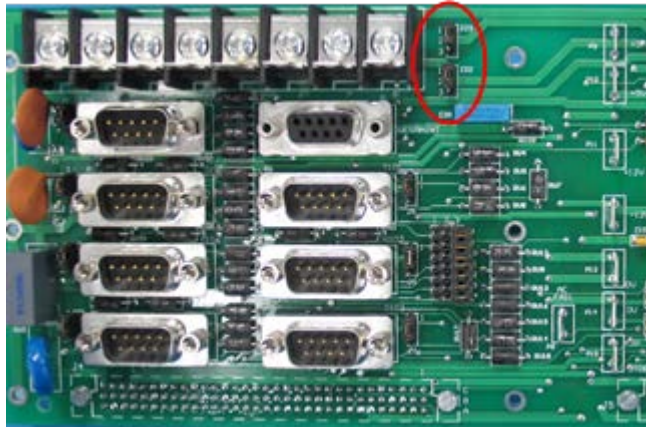
It is your responsibility to ensure that jumpers Z22 and Z23 are set correctly to avoid damage to peripherals present on the D.20 link. GE will not provide warranty service on any D20 peripherals that have been subject to an overvoltage due to incorrect jumper settings.

Connections and Configuration, continued

D.20 Link Power Options (continued)

Location of Z22 and Z23

Consult the Module Layout documentation for the specific Western D20M+ board being used for full explanation of all jumper settings.



517-0224 (single slot backplane)



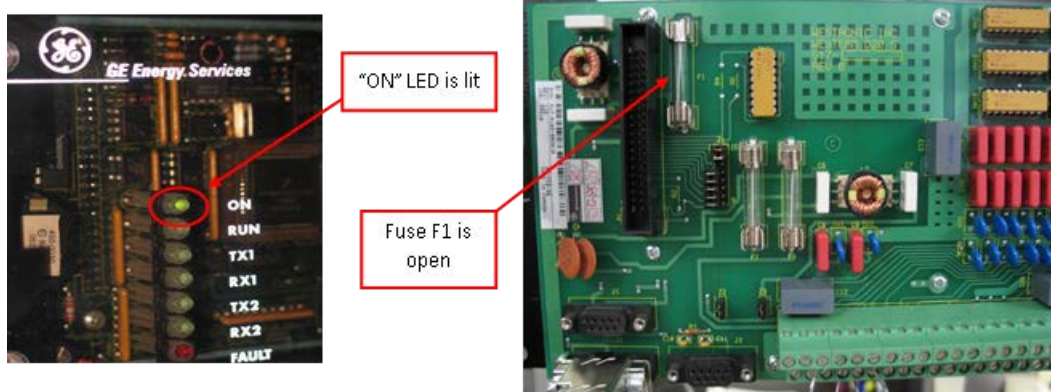
517-0225 and 517-0230 (panel mounts)

Connections and Configuration, continued

D.20 Link Power Options (continued)

How to determine if excessive voltage has been applied to a peripheral

Normal symptoms of an overvoltage being applied to the peripheral are the ON LED on the WESDAC panel being lit with no other LEDs lit and fuse F1 on the WESTERM panel is open.



If these symptoms are present it is likely that high voltage has been applied to the board. Normally, D20 peripherals powered through the D.20 link only accept inputs between 20-60 VDC. When voltage above this is present, internal circuitry on the WESDAC senses the overvoltage condition, causing fuse F1 to blow on the WESTERM. Depending on the nature of the overvoltage, the electronics inside the peripheral may or may not be permanently damaged.

Remedy

To determine if the peripheral has been damaged, ensure that jumpers Z22 and Z23 are set appropriately, replace open fuse F1 on the WESTERM and try to power up the D20/D200 again. If the peripheral still does not function correctly or blows fuse F1 on the WESTERM again, even with the jumpers set correctly, then the peripheral will need to be repaired or replaced.

Repeaters

If you are using more than 31 peripherals or are running peripherals remotely then you will most likely be using one of the following boards as a repeater:

- 520-0117 (D.20 Communication Interface)
- 520-0118 (D.20 Splitter)
- 520-0154 (DC Interface)

Similar care should be taken when setting the jumpers for these boards to ensure that the correct power is being supplied to your downstream peripherals.

Module Layouts

517-0224 Module Layout (GE part no. 517-0224-ML)

517-0225 Module Layout (GE part no. 517-0225-ML)

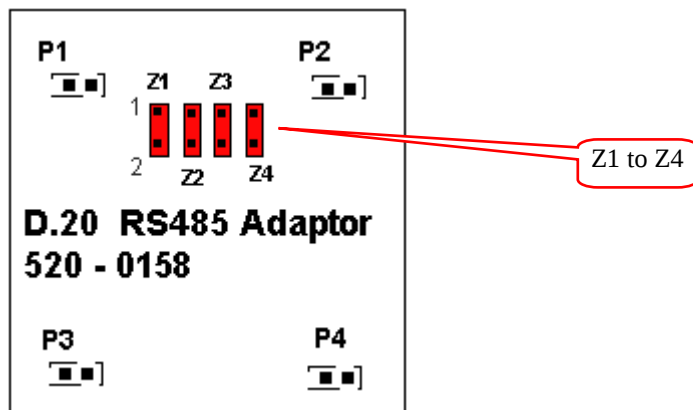
520-0117 Module Layout (GE part no. 517-0117-ML)

520-0118 Module Layout (GE part no. 517-0118-ML)

520-0154 Module Layout (GE part no. 517-0154-ML)

Connections and Configuration, continued

D.20 RS-485 Jumper locations on the D.20 RS-485 Adaptor:
Adaptor:
Jumpers



Use jumpers:

- Z1 to Z4 for SW base compatibility setting

D.20 RS-485 The following table gives jumper settings for Z1 to Z4.
Adaptor:
Settings

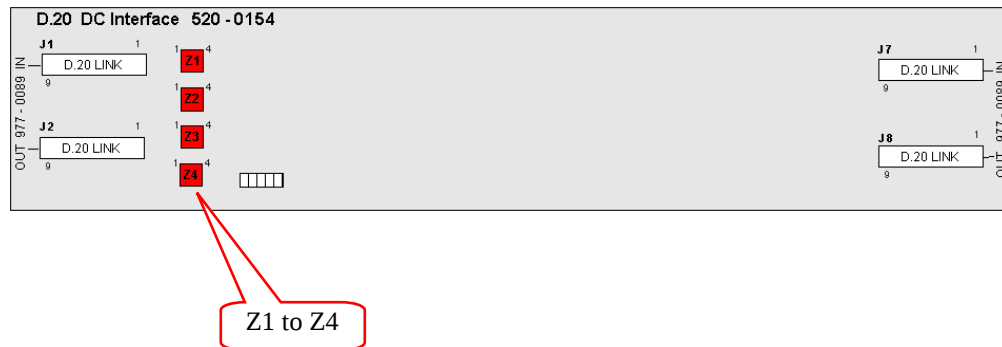
Jumper Number	Jumper Position	Jumper Setting	Option			Jumper Definition – S/W Base Compatibility
			5A	5B		
Z1 to Z4	1 – 2	ALL IN	√			Base 3.11, Pre-Win or Older
Z1 to Z4	1 – 2	ALL OUT		√		ALL OTHER BASES (DEFAULT)

Note The D.20 RS-485 Adaptor is used only in conjunction with the D.20 Communications Interface module.

Connections and Configuration, continued

D.20 DC Interface: Jumpers

Jumper locations on the D.20 DC Interface:



Use jumpers:

- Z1 to Z4 for external power setting

D.20 DC Interface: Settings

The following table gives jumper settings for Z1 to Z4.

Jumper Number	Jumper Position	Jumper Setting	Option			Jumper Definition – External Power
			1A	1B	1C	
Z1 to Z4	2 – 3	IN			√	D.20 Link Supplies Power to J8
	3 – 4	IN		√		External Power on TB1 supplies J8 only
	1 – 4 & 2 – 3	IN	√			External Power on TB1 supplies D.20 Link and power to J8

Connections and Configuration, continued

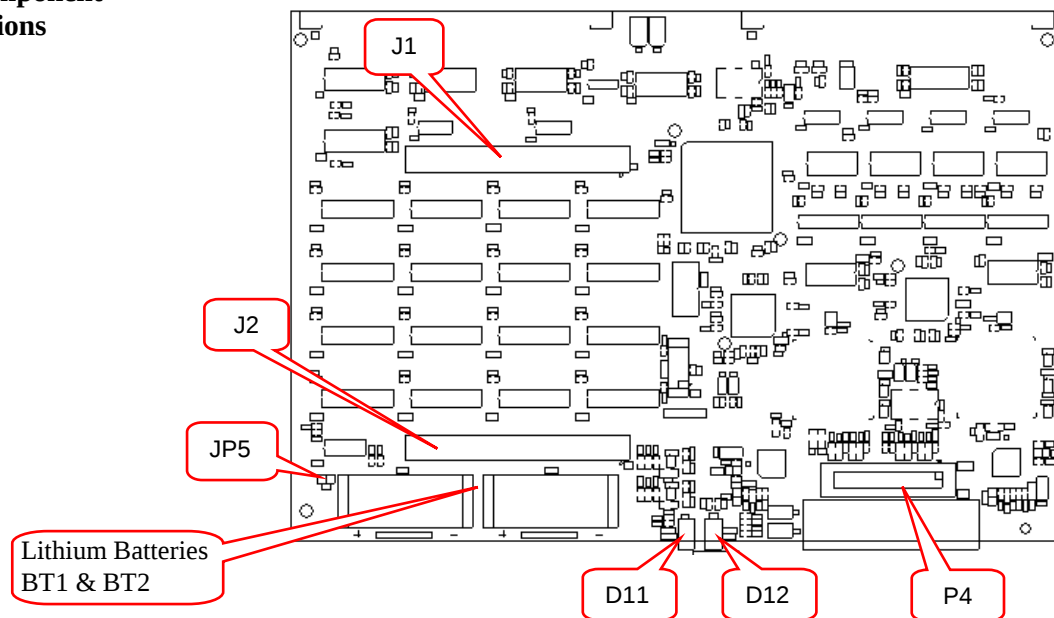
D20EME

The D20EME is a **self-configuring** product. That is, the D20EME main board has no jumpers or switches to define parameters such as:

- VME interrupts
- Ethernet bus address
- Global memory starting address
- Global memory size

EME Main Board Jumper & Component Locations

The following diagram identifies the location of the key components:



Connections and Configuration, continued

Table: Main Components

This table identifies some of the D20EME main board's important components.

Component	Name	Function
JP5	Battery disconnect jumper	Removable jumper when storing board for extended periods.
BT1, BT2	Lithium batteries	Maintain NVRAM in the event of a power failure.
J1, J2	Connectors	To connect the optional memory expansion daughter board.
P4	Connector	Power and communication link to MIC.
D11-A	BATT 1 LED	Lights when battery voltage drops below 3 Volts. Replace battery immediately.
D11-B	BATT 2 LED	
D12-A	POWER LED	+5 Volts power is available.
D12-B	ACCESS LED	Indicates D20EME is being accessed from VME bus.

D20EME LEDs For LED operation See "D20EME LEDs", page 142.

Memory Expansion Card

The Memory Expansion card has no user-configurable options.

Connections and Configuration, continued**MIC Jumper Options**

Each of the two channels on the MIC includes a set of jumpers to enable or disable various operational modes.

Note: The three module types have different jumper configurations, so be sure to use the correct table for your module.

10BASE-T MIC Jumper Settings

The following table specifies the jumper settings to enable or disable the various operational modes of each of the two channels of the 10BASE-T MIC:

Note:: The default jumper setting is: JP1 and JP2 jumpers 7-8 *In*, all other jumpers *Out*, disabling the SQE Test mode.

This is the mode usually used with 10BASE-T Ethernet hub networks.

Jumper JP1 (Ch 1) and JP2 (Ch 2)				Mode of Operation		
1-2	3-4	5-6	7-8	SQE Test	Link Test	Jabber
Out	Out	Out	In	Disabled	Enabled	Enabled
Out	Out	In	Out	Disabled	Disabled	Disabled
Out	In	Out	Out	Enabled	Disabled	Enabled
In	Out	Out	Out	Enabled	Enabled	Enabled

10BASE2 MIC Jumper Settings

Each of the two channels of the 10BASE2 MIC includes a jumper to enable and disable SQE Test.

Note: The default setting is SQE Test Enabled for both channels.

Jumper Position	Mode of Operation
Channel 1 Mode Jumpers	
JP1 – Out	SQE Test Enabled
JP1 – In	SQE Test Disabled
Channel 2 Mode Jumpers	
JP2 – Out	SQE Test Enabled
JP2 – In	SQE Test Disabled

Connections and Configuration, continued

10BASE-FL MIC Jumper Settings

Each of the two channels of the 10BASE-FL MIC includes a set of three jumpers to enable and disable various operational modes.

Note: The default jumpering is all jumpers *out*, enabling SQE test and Jabber, disabling loop back.

Jumper			Mode of Operation		
Channel 1 Mode Jumpers – JP1					
1-2	3-4	5-6	SQE Test	Jabber	Loop back
Out	Out		Enabled	Enabled	
In	Out		Disabled	Enabled	
Out	In		Disabled	Disabled	
		In			Enabled
		Out			Disabled
Channel 2 Mode Jumpers – JP2					
1-2	3-4	5-6	SQE Test	Jabber	Loop back
Out	Out		Enabled	Enabled	
In	Out		Disabled	Enabled	
Out	In		Disabled	Disabled	
		In			Enabled
		Out			Disabled

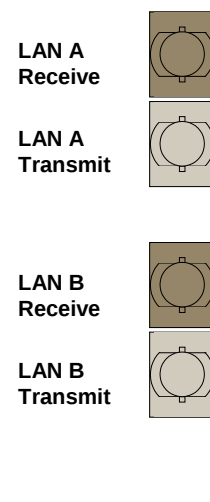
10BASE-FL Fiber Cable Connectors

The 10BASE-FL module has four ST-Type bayonet fiber-optic cable connectors on the rear edge of the card.

The positions of the input and output connectors for each channel are shown in the diagram to the right.

Note: Labels can be seen on the PCB stencil, beside each of the connectors.

Rear View of
10BASE-FL MIC



Connections and Configuration, continued

Redundant D20/D200 Systems

To implement a redundant D20/D200 system, you need:

- A second CCU, built and configured the same as the first CCU
- RS-232 Switch Panel(s)
- Two RS-232 Switch Panel Monitor and Control cables, referred to as Watchdog cables, connecting each CCU to the RS-232 Switch Panel. Refer to “Procedure: Installing Watchdog Cables” on page 101 for details.
- One inter-CCU communications cable, providing either a Ping connection, or a (D.20) HDLC connection, between CCUs A and B. The method used depends on the availability of serial and D.20 ports. As appropriate, refer to:
 - “Procedure: Installing a Ping Cable” on page 101
 - “Procedure: Installing an HDLC Cable” on page 102.
- Serial communication cables. The number of serial cables depends on your system configuration. Serial connections from CCUs to your field equipment are cabled and switched through the RS-232 Switch Panel. The RS-232 Switch Panel switches up to eight communications links to the Standby CCU, in the event of a failure of the Active CCU. See “Procedure: Connecting Serial Communication Cables” on page 102 for details.

Note: Refer to “Required Components” on page 100 for component part numbers and functions.

Note: Refer to “D20/D200 Redundancy” on page 50 for a description of D20/D200 redundancy.

Note: The RS-232 Switch Panel is not equipped with EMI protection circuitry. If the connection length exceeds 3m, a Serial Surge Protection Panel (GE item number 540-0249) or equivalent protection device should be installed.

Connections and Configuration, continued

Required Components

To implement a redundant D20/D200 system, you need the following components and cables:

Component	Function	Part Number
RS-232 Switch Panel	Communication switch.	517-0247
Watchdog Cable Assembly (D20)	For VME and non-VME D20 systems, two cable assemblies are required, one connecting CCU A to the RS-232 Switch Panel, the other connecting CCU B to the RS-232 Switch Panel.	977-0160
Watchdog Cable Assembly (D200)	For D200 systems, two cable assemblies are required, one connecting CCU A to the RS-232 Switch Panel, the other connecting CCU B to the RS-232 Switch Panel.	977-0161
Ping Cable Assembly	Connects CCU A to CCU B, when a ping connection is used for communication between the two CCUs.	977-0146
HDLC Cable Assembly	Connects CCU A to CCU B, when a D.20 HDLC connection is used for communication between the two CCUs.	977-0089

Redundant System: Mounting the Hardware

Step	Action
1	Mount the second CCU and connect power and ground, as shown in the module layout drawing.
2	Mount the RS-232 Switch Panel.

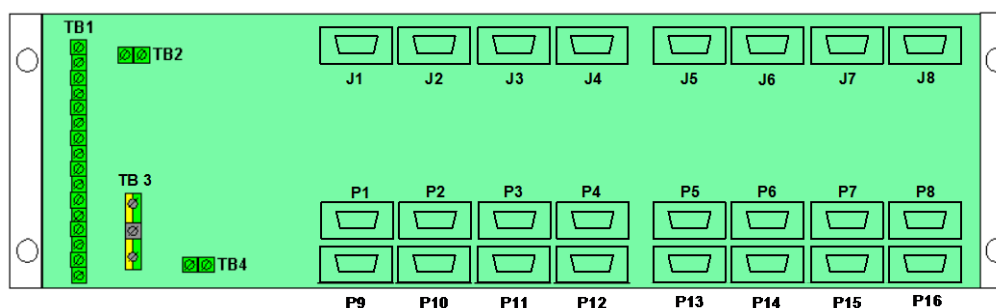
Redundant System: Software Configuration

Configure your CCUs for redundancy, using Config Pro. Refer to the Config Pro online help for instructions.

Connections and Configuration, continued

RS-232 Switch Panel: Connectors

Locate the following connections on the rear of the RS-232 Switch Panel:



- **P1 through P16:** The RS-232 Switch Panel can switch up to eight serial connections from each of the two CCUs - P1 through P8 are connected to CCU A, and P9 through P16 are connected to CCU B.
- **J1 through J8:** Field equipment is connected to these ports. If CCU A is active, serial connections P1 through P8 are switched to J1 through J8. If CCU B is active, serial connections P9 through P16 are switched to J1 through J8.
- **TB1:** Connector block for connection of the monitor and control cables (referred to as the Watchdog cables) from each of the CCUs. Refer to Assembly Drawing 977-061-AD
- **TB2, TB4:** In systems with more than eight serial connections, used to interconnect multiple RS-232 Switch Panels, as described in “Redundant Multi-Node Systems” on page 102.

Procedure: Installing Watchdog Cables

Connect CCUs A and B to the RS-232 Switch Panel using Watchdog cables, as follows:

Step	Action
1	Connect the connectorized end of one of the Watchdog cables to serial connector 6 on CCU A.
2	Connect the connectorized end of the other Watchdog cable to serial connector 6 on CCU B.
3	Connect the non-connectorized ends of both Watchdog cables to TB1 on the RS-232 Switch Panel, as shown in Assembly Drawing 977-0161-AD.

Procedure: Installing a Ping Cable

To connect the two CCUs using a Ping cable:

- Connect one end of the Ping cable to serial connector 7 on CCU A, and the other end to serial connector 7 on CCU B. Refer to Assembly Drawing: 977-0146-AD for further details.

Connections and Configuration, continued

Procedure: Installing an HDLC Cable

To connect the two CCUs using a D.20 HDLC connection:

- Connect one end of the HDLC Cable to the D.20 port you have selected for redundancy communications on CCU A (see “Selecting an HDLC Port” below), and the other end to the D.20 port on CCU B. See Assembly Drawing 977-0089-AD for further details.

Selecting an HDLC Port

If you use a D.20 HDLC connection for inter-CCU communications, configure both CCUs, using Config Pro, to select either HDL0 or HDL1, as appropriate.

Procedure: Connecting Serial Communi- cation Cables

To connect CCU serial communication ports to the serial ports on the RS-232 Switch Panel, use standard RS-232 cables, with DB9 female connectors at both ends. See “Redundant Multi-Node Systems” on page 102 for instructions on how to cable serial communications in multi-node redundant systems.

Serial Port Pin- Outs

Depending on the type of D20/D200 main processor board (D20ME or D20ME II), CCU serial ports can be configured as RS-232, RS-485 2-wire, or RS-485 4-wire. The pin-outs for each of these options is as follows:

DB9 Connector	RS-232	RS-485 2-wire	RS-485 4-wire (RS-422)
1	DCD	NC	NC
2	RXD	RX- (see note)	RX-
3	TXD	TX- (see note)	TX-
4	+V	+V	+V
5	Common Ground	Common Ground	Common Ground
6	-12V	-12V	-12V
7	RTS	TX+ (see note)	TX+
8	CTS	RX+ (see note)	RX+
9	Chassis Ground	Chassis Ground	Chassis Ground
Note: For RS-485 2-wire operation, RX- must be connected to TX-, and RX+ must be connected to TX+.			

Redundant Multi-Node Systems

If you have a multi-node system, you may require multiple RS-232 Switch Panels, depending on the number of serial connections your configuration supports.

In multi-node systems, one D20ME/ME II board is designated as the Master and other D20ME/ME II boards are designated as Slaves. Normally, serial communications are connected to one or more of the slave processor boards, in which case, all seven of the slave’s serial ports can be connected to the RS-232 Switch Panel and used for serial communications.

Connections and Configuration, continued

Redundant Multi-Node Systems: Example

If your D20/D200 multi-node system supports more than eight serial communication links, you need a second RS-232 Switch Panel to switch the additional serial links. This is illustrated in the following example:

Consider the case where you connect seven serial links to the first slave node, and four serial links to the second slave node, for a total of eleven serial links. In this case, you need two RS-232 Switch Panels. One RS-232 Switch Panel is designated the Master RS-232 Switch Panel and the second the Slave RS-232 Switch Panel.

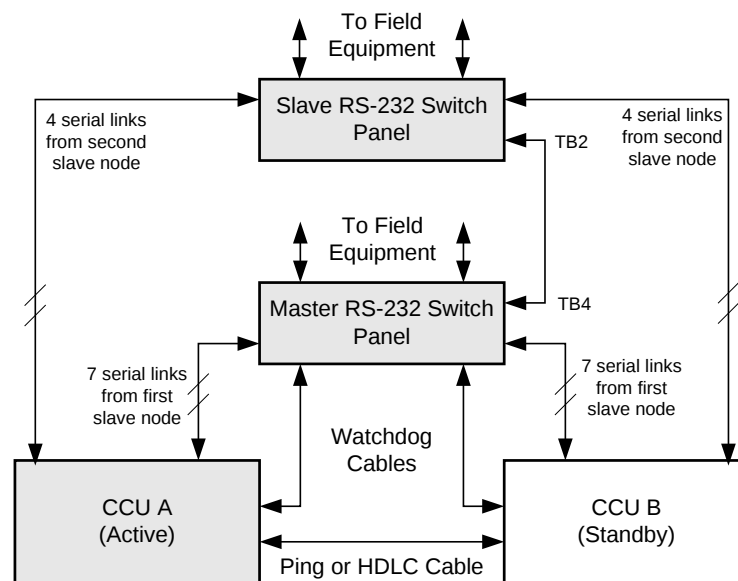
Cable the Master RS-232 Switch Panel as follows:

- Connect the Master RS-232 Switch Panel to both CCUs, using Watchdog cables.
- Connect the seven serial links from the first slave node Termination Panel to the Master RS-232 Switch Panel.
- Connect TB4 pins 1 and 2 (SET and RESET respectively) on the Master RS-232 Switch Panel to TB2 pins 1 and 2 on the Slave RS-232 Switch Panel.

Cable the Slave RS-232 Switch Panel as follows:

- Connect the four serial links from the second slave node Termination Panel to the Slave RS-232 Switch Panel.

This example configuration is illustrated below:



Note: Since RS-232 Switch Panels support eight serial connections, for efficiency, you could also cable one serial link from the second D20 slave node to the Master RS-232 Switch Node, and the remaining three links to the Slave RS-232 Switch Panel.

Note: A maximum of eight RS-232 Switch Panels can be cascaded. The total cable length between the master and slaves can not exceed 3 meters.

Connections and Configuration, continued

Testing Redundancy

Once you have correctly connected and configured your D20/D200 redundant system, power up and test the system for fail over.

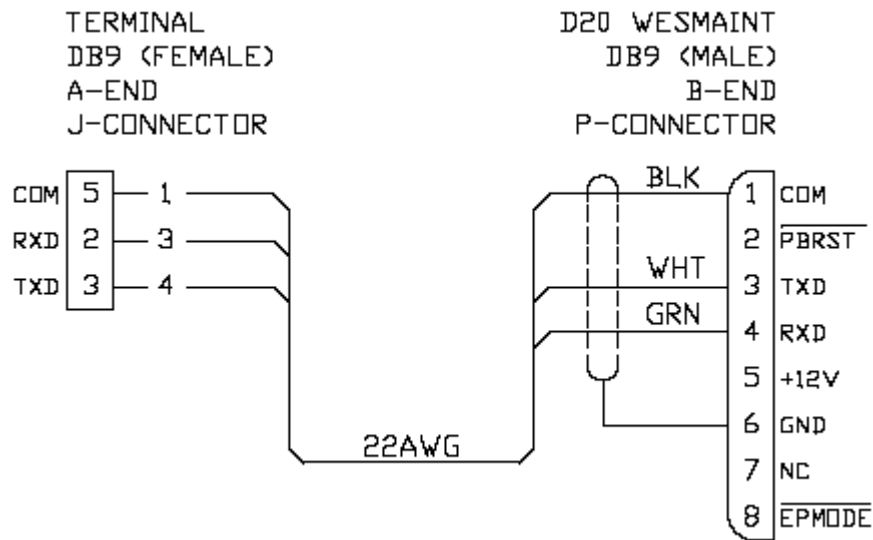
Universal Protocol Converter

The UPC contains a jumper field that is configured specifically for each protocol. Jumpers are pre-set at the factory and should not have to be changed.

See the *Configuration Guide* for the protocol for the jumper settings that are required.

WESMAINT Cable Pinouts

WESMAINT cable DB-9 connectors pinouts:



Power-up and Test

Power-up and test the D20/D200

Once you have made all field wiring and communication connections and have completed the necessary hardware configuration, the next step is to power-up the D20/D200 and verify that it is functioning properly.

Use this section of the guide to prepare for powering-up and learn how to correctly perform the power-up and other tests:

- What is needed to test: WESMAINT II+ facility, 68K Monitor and Config Pro
- How to power-up the D20/D200 and conduct the BOOT Test: Power On Self-Test
- How to carry out a redundant system test

Note

Before any of the tests and procedures in this section can be performed, a valid configuration file must be loaded into the D20/D200's NVRAM.

If you have replaced the main board of the D20/D200, then you will need to restore the configuration file so that diagnostic tests can be performed.

If this power-up and test procedure reveals that your D20/D200 is not functioning properly due to software malfunction, then you need to download code and configuration files.

See "Operation and Maintenance - D20/D200 Software Configuration", page 118 and refer to the *Config Pro* On Line Help.

Required for Testing

The system components that are required for configuring and testing the D20/D200 are:

- WESMAINT II+ facility
- 68K Monitor
- Config Pro system

CAUTION

Important Checks

To prevent burning out the main processor board, make two important checks before switching on the D20 or D200:

- Check that the external power supply input level is correct for the Power Supply fitted to the chassis. See "Standard Power Supplies", page 37
- If you have 125VDC or 110VAC input, then jumpers Z22 and Z23 on the WESTERM D20M+: 517 – 0225 or 517 – 0224 **must** be jumpered 2 – 3.

Power-up and Test, continued

Accessing WESMAINT II+ Using a Terminal

You can use a VT100-compatible terminal or a terminal emulation program to directly access the WESMAINT II+ facility. Config Pro's Terminal Emulator is an example of a suitable terminal emulation program.

Note: For further information about using WESMAINT II+ software to perform any of the test procedures in this section, refer to the *WESMAINT II+ User's Guide*.

Note

Microsoft Windows™ **HyperTerminal** can be used for terminal emulation but it is **NOT** recommended because code and configuration file download times are considerably increased.

68K Monitor

The 68K Monitor is a debugging and diagnostics tool that is accessible as a menu selection in WESMAINT II+, or from a basic login prompt if WESMAINT is not available.

Note: For further information about using the 68K Monitor, refer to the *68K Monitor User's Guide*.

Power-up and Test, continued

Procedure: Set up Terminal Steps to set up a PC to act as a WESMAINT II+ terminal.

Step	Action												
1	Open the VT100 compatible terminal emulation software you are going to use.												
2	Verify (or set) terminal communications settings as follows:<table><tr><td>Data Rate</td><td>9600 bps</td></tr><tr><td>Data Bits</td><td>8</td></tr><tr><td>Stop Bits</td><td>1</td></tr><tr><td>Parity</td><td>Non</td></tr><tr><td>Flow Control</td><td>Xon/Xoff (software)</td></tr><tr><td>Connector Settings</td><td>COM1 or COM2, as required by the computer you are using</td></tr></table> Result: Your terminal emulator settings are now configured.	Data Rate	9600 bps	Data Bits	8	Stop Bits	1	Parity	Non	Flow Control	Xon/Xoff (software)	Connector Settings	COM1 or COM2, as required by the computer you are using
Data Rate	9600 bps												
Data Bits	8												
Stop Bits	1												
Parity	Non												
Flow Control	Xon/Xoff (software)												
Connector Settings	COM1 or COM2, as required by the computer you are using												

Power-up and Test, continued

Procedure: Follow these steps to power up the D20 and check for correct functioning of the components.
Powering-up the D20

Step	Action
1	Check that all field wiring, grounding wires and fuses are in place and secure on your D20 system.
2	Turn the chassis-mounted Power Supply switch to ON . Result: The unit is powered-up.

Software Corruption on Power-up On start-up, inspect the D20ME/ME II LED indicators on the front panel. If the code file resident on the Flash memory or the configuration file downloaded to the NVRAM is corrupted, then:

- The **RUN** and **FAIL** LEDs illuminate alternately, which means the board is resetting continuously, *OR*
- The **FAIL** LED is constantly illuminated.

There is a workaround available for these problems using WESMAINT II+.

Procedure: Follow these steps to login to the 68K Monitor and restore the default configuration when the **FAIL** LED is constantly illuminated:
Workaround

Step	Action
1	Set up your PC to act as a WESMAINT II+ terminal. See “Procedure: Set up Terminal”, page 107.
2	For serial communication, connect a WESMAINT cable from the PC running your terminal emulation software to the DB9 connector on the front panel of the D20ME.
3	Open your WESMAINT II+ terminal emulation software.
4	Restart your D20 or D200.
5	Use the 68K Monitor to download a fresh code file to the Flash memory and a fresh configuration file to the NVRAM. See “Operation and Maintenance - D20/D200 Software Configuration”, page 118.

Power-up and Test, continued

Procedure: Follow these steps to login to the 68K Monitor and restore the default configuration when the board is resetting continuously:
Workaround

Step	Action
1	Set up your PC to act as a WESMAINT II+ terminal. See “Procedure: Set up Terminal”, page 107.
2	For serial communication, connect a WESMAINT cable from the PC running your terminal emulation software to the DB9 connector on the front panel of the D20ME.
3	Open your WESMAINT II+ terminal emulation software.
4	Restart your D20 or D200.
5	Press the Esc key on your keyboard, within 5 seconds. Result: The D20ME/ME II stops resetting continuously and you are prompted with the message: “Are you sure you wish to generate a default configuration? (y/n)” Note: If nothing happens in WESMAINT II+ when you press the Esc key, then you cannot use this procedure as a workaround. Remove the board and return it to GE Digital Energy for inspection and repair.
6	Type y. Results: The current configuration file is overwritten with the default configuration. The login prompt for the 68K Monitor appears.
7	Use the 68K Monitor to download a fresh code file to the Flash memory and a fresh configuration file to the NVRAM. See “Procedure: Code Download”, page 122.

Power-up and Test, continued

On-Line Start-up Test

The D20 and D200 automatically boots up when the power is switched on. Internal processes perform a series of routines. Self-diagnostic tests are performed followed by the spawning of all the software applications that reside in the unit's memory.

The self-diagnostic tests generate **PASS** or **FAIL** messages that can be viewed in your terminal emulator WESMAINT II+ screen. You can also see the results of the application spawning process.

Pass/Fail tests are carried out on the:

- BootROM
- User RAM
- NVRAM
- EPROM memory
- Root process

The self-diagnostics also return measures on memory sizes for:

- RAM
- EPROM
- NVRAM

The board ID address is returned, which is useful for multi-node systems.

The LNVRAM CRC test verifies that the configuration header is valid. If this fails, then the D20ME/ME II starts using only the BootROM applications and operating system. See "Configuration File Download", page 127.

Code and Configuration files

If the code and configuration files compiled for your specific system are already downloaded, then you can login straightaway to WESMAINT II+ for powering-up and testing.

If your system-specific code and configuration files are not downloaded, then you need to power-up with the default configuration. You can then login to the 68K Monitor, download your system-specific files and restart the D20 or D200 for testing.

See "Operation and Maintenance - D20/D200 Software Configuration" page 118 and Config Pro On Line Help.

Further Testing

For further specific testing, log in to WESMAINT II+. See the *WESMAINT II+ Users Guide* and WESMAINT user guides for specific applications.

Power-up and Test, continued

Testing Redundancy

If you have a D20/D200 redundant system, you must test:

- CCU A and CCU B are communicating
- fail-over is functioning correctly.

Procedure

Follow these steps to check that CCU A and CCU B are communicating once you have powered-up the Primary and Secondary units:

Step	Action
1	On the front of the RS-232 Panel, check that CCU A LED is illuminated, which shows that CCU A is Active. Note: Both the PWR A and PWR B LEDs should be illuminated.
2	Connect a WESMAINT II+ cable to the female DB-9 WESMAINT II+ port on the front panel of the Active D20ME/ME II Master board.
3	Attach the other end of the WESMAINT II+ cable to the serial communications port of the PC or terminal.
4	Login to WESMAINT through the emulator you are using. Result: The WESMAINT Main Menu is displayed.
5	Check to see that STNBY shows at the top-left of this WESMAINT screen. Result: If this text shows, then the Primary and Secondary CCU are communicating. If this text does not show, then the Primary and Secondary are not communicating.

Note:

STNBY will appear on the Active CCU WESMAINT Main Menu display approximately one minute after power-up of the two units. Wait for this message to appear before using this procedure.

Power-up and Test, continued

Procedure Follow these steps to check that fail-over is functioning correctly for the event of hardware failure:

Step	Action
1	On the front of the RS-232 Panel, check that CCU A LED is illuminated, which shows that CCU A is Active. Note: Both the PWR A and PWR B LEDs should be illuminated.
2	To simulate hardware failure, switch off the Active D20/D200 at the main power switch on the front of the unit. Result: If the RS-232 is functioning correctly, then it will switch over to the Standby unit and the CCU B LED will illuminate and the CCU A LED will go off.
3	Verify the fail-over. See “Procedure”, page 114.

Power-up and Test, continued

Procedure Follow these steps to check that switch-over is functioning correctly for the event of software failure:

Step	Action
1	On the front of the RS-232 Panel, check that CCU A LED is illuminated, which shows that CCU A is Active. Note: Both the PWR A and PWR B LEDs should be illuminated.
2	Connect a WESMAINT cable to the female DB-9 WESMAINT II+ port on the front panel of the CCU A D20ME/ME II Active board.
3	Attach the other end of the WESMAINT II+ cable to the serial communications port of the PC or terminal.
4	Login to WESMAINT on CCU A using your the emulator. Result: The WESMAINT Main Menu is displayed.
5	Select System Functions on the Main Menu and press ENTER . Result: The WESMAINT Function Menu is displayed.
6	Select SWITCH-OVER on the Function Menu and press ENTER . Result: A password prompt is displayed.
7	Enter your password and press ENTER . The default is “control”. Result: The CCU Switch-Over display shows: “choose switch-over (<ctrl>-V) to begin”.
8	Press CTRL-V . Result: A confirmation message shows: “Confirm Yes/No”.
9	Type Yes and press ENTER . Result: Fail over occurs
10	Verify the switch-over: see “Procedure”, page 114.

Power-up and Test, continued

Procedure Follow these steps to verify either hardware or software switch-over.

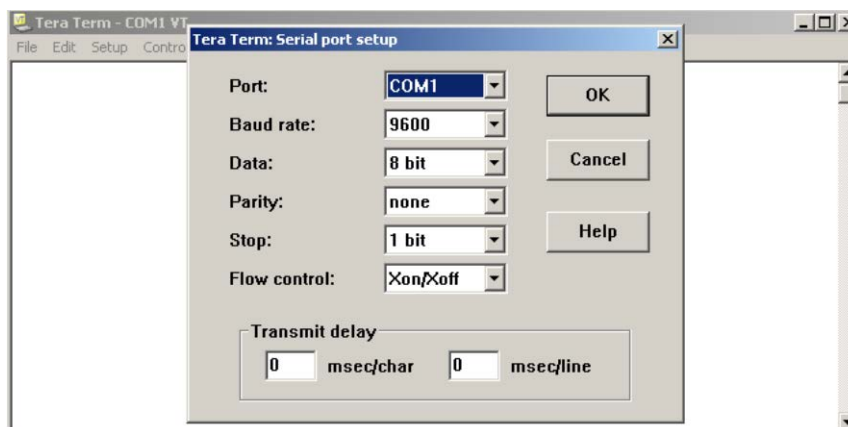
Step	Action
1	Connect a WESMAINT cable to the female DB-9 WESMAINT II+ port on the front panel of the CCU B D20ME/ME II board, which was originally the Standby unit.
2	Attach the other end of the WESMAINT II+ cable to the serial communications port of the PC or terminal.
3	Login to WESMAINT through the emulator you are using. Result: The WESMAINT Main Menu is displayed.
4	If you can login to WESMAINT, this indicates that CCU B is the Active CCU. Result: Fail over has occurred. Note: If the previously Active A CCU powers-up after a fail over from CCU A to CCU B, then you will see STNBY at top left when you login to WESMAINT on CCU B. This can take up to a minute to occur.

Note: If you cannot login to WESMAINT on a CCU, then the unit is powered down. A **D20MEA>** or **D20MEB>** prompt is seen on your emulator screen.

Downloading Firmware

Prerequisites	Download and install Tera Term Pro, a free terminal emulator program from http://ttssh2.sourceforge.jp/ . Tera Term Pro is included with ConfigPro* 6.0 SP2 and greater, and is also included with SGConfig. Tera Term Pro is recommended by GE because of the greater functionality it offers when downloading firmware to RTUs.
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Procedure	1. Launch Tera Term Pro and initiate a serial connection. 2. On the menu bar, select Setup > Serial port. 3. Change Port to match the COM port you are using and set the baud rate to 9600. The other fields should be set as shown below.
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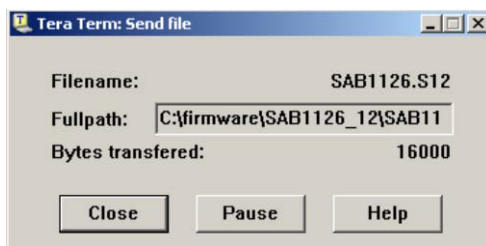
4. Boot the RTU and press the Y key repeatedly. When the screen stops at the Are you sure you wish to abort to the flash boot [y/n]? prompt, press the Y key again. This aborts the flash boot from occurring and starts the system monitor process.
5. When you see the message CCUME is DISABLED!, press the **Enter** key.
6. Enter the username and password for a user account with maintenance-level access or greater. If no users have been configured on this device, you will automatically be logged in with maintenance-level access. Your device may be preprogrammed with the default user account; if so, the username is **westronic** and the password is **rd**.
7. Ensure that you are at the system prompt. The system prompt for each RTU appears as: D20/D200: D20MES>

Note: Firmware can only be downloaded from the system prompt and not the application prompt (for example, D20MES>).
8. Type the command **sp** and press **Enter**. This suspends all active processes running on the RTU in preparation for the upgrade.
9. Type the command **erase** and press **Enter** to clear the flash memory. When prompted to confirm this action, press **Y** then **Enter**.
10. Type the command **baud** <rate> and press **Enter**. The baud rate for the D20/D200 is 115200 (**command: baud 115200**)

Downloading Firmware, continued

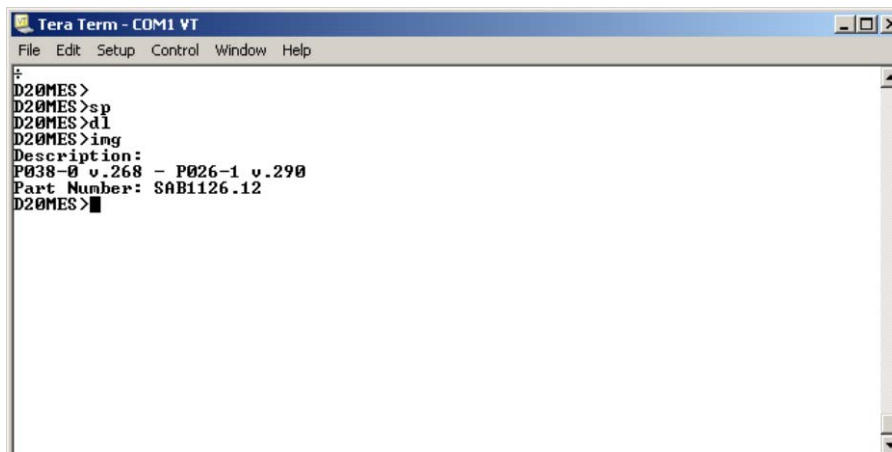
Procedure (continued)

11. You must change the baud rate of the terminal emulator to match the setting on the RTU. In Tera Term Pro, select **Setup > Serial port**.
12. Change the baud rate to 115200. Click **OK** and press **Enter**. You should see the system prompt appear again.
13. Erase the error log by entering the command **el /r** and press **Enter**.
14. Enter the command **dl** and press **Enter** to initiate the download. The RTU now waits for the file to be sent by the terminal emulator.
15. In Tera Term Pro, select **File > Send File**.
16. Select the firmware file on your PC and click **Open**. Usually, the firmware is called down.shx but you may encounter the SABzzzz.Szz file type as well. Note that z represents a number.
17. The firmware download begins.



If the download fails for any reason, you will see garbled text behind the **Tera Term: Send file** dialog box. If this occurs, click **Close** to stop the download and press the **Enter** key several times. When the system prompt (D20MES>) appears, return to step 8 and repeat the procedure.

18. After the firmware download is completed, type the command **img** and press **Enter** to verify that firmware has been downloaded successfully



19. Type the command **boot** and press **Enter** to reboot the RTU. The RTU reboots with the new firmware that was downloaded. Because the RTU will reset the baud rate back to 9600, you will need to change the terminal emulator baud setting back to 9600 to see the boot up information.

2. Operation and Maintenance

D20/D200 Software Configuration

This Section

Use this section as a guide for:

- An introduction to the software components used in the D20ME/ME II module
- How to identify the type of Base software installed on your D20ME/ME II module
- An overview of the software tools you will use
- How to download code and configuration files to the Flash memory on your D20ME/ME II module or modules on your system using a serial connection

D20 and D200 Software: Introduction

The D20ME has Base software installed at manufacture, which resides in the BootROM. When the D20ME is first powered up, the Base system builds a default configuration header file in the NVRAM memory. The default configuration allows the D20ME to start and run the 68K Monitor. You use the 68K Monitor to perform the necessary software download to the D20ME.

The D20/D200 is factory tested. The level of software testing that is performed on the D20 or D200 before it leaves the factory depends upon the type of delivery and system:

- If you have not ordered software, then the D20ME has been powered-up in the factory and checked to see that the 68K Monitor login comes up
- If you have ordered software, then your project-specific code and configuration files have been downloaded
- For multi-node systems, a default code and configuration file has been loaded to carry out further tests.

To meet the full operational requirements of a specific RTU system, the D20ME main processor board requires two valid files to be loaded:

- A code file, which resides in the EPROM or Flash memory
- A configuration file, which consist of applications and which resides in the NVRAM

Use this section to load the project-specific code and configuration files that have been built for the specific operational needs of your RTU system.

When to Download	Instances where you may need to download code and configuration files to your D20/D200: • When you want to change firmware or configuration settings. • If the D20 or D200 has performed self-diagnostics and determined that the FLASH memory is either erased or corrupted. • When test messages indicate that the FLASH memory has been erased or corrupted or that a valid configuration file header cannot be found in the NVRAM. • After maintenance or replacement work that has deleted the FLASH code files.
-------------------------	---

D20/D200 Software Configuration, continued

Base Types	There are two types of Base system software: D20 Base and CCU Base .
-------------------	--

Identification of Base Type	The D20ME module <i>Base Type</i> is determined by the version of BootROM installed, which identifies how the module will be used. Since the download method depends on which BootROM is installed, the Base type of the module <i>must</i> be known before downloading flash code. The BootROM label indicates which type you have:
------------------------------------	--

Module Base Type	BootROM Label
D20ME D20 Base	SBU0000/xx
D20ME CCU Base	SBU0001/xx

Note	The /xx suffix in the BootROM Label is the revision number of the software
-------------	--

Alternate Identification Method	If the D20ME module is already installed into a device and difficult to remove, you can identify the Base Type through the WESMAINT monitor. See “Procedure: Identify Base”, page 121.
--	--

Prerequisites for Code Download	The items following must be available before a flash code file can be loaded into a D20ME: • Windows PC with terminal emulation communication software loaded. • The code file, in the Motorola® S-record format, preferably located on a local hard drive. – If the file is located on a network or floppy drive, the download may be significantly slower. – This file typically will be named: <i>down.shx</i> or <i>salxxxx.shx</i> • A WESMAINT cable for connecting the PC to the D20ME WESMAINT port on the front-panel. • The D20ME module must: – have its hardware option jumpers set – be installed into a D20 or D200 chassis, ready to power-up
--	--

Note: If you are upgrading from a D20M++ board to a D20ME board, you must use the .shx file for the ME board, *not* the .bin file.

D20/D200 Software Configuration, continued**Setup
WESMAINT
II+ terminal**

To set up a PC to act as a WESMAINT II+ terminal, see “Power-up and Test”, page 105.

**Procedure:
Identify Base**

If the D20ME BootROM Base Type is already known, skip this procedure.

Step	Action	
Configure and Connect PC to D20ME		
1	Connect a WESMAINT cable from the PC’s com port to the D20ME front panel WESMAINT port.	
Identify D20ME Type		
2	Restart the D20ME (power off-on cycle) while watching the PC monitor.	
	If the first line of output text is:	Board type is:
	P149-0 D20ME BOOTROM	D20 Base
	P130-0, GE Digital Energy Services CCUME BootROM	CCU Base

**D20ME: Flash
Memory**

The following table shows possible allocation of the 2 MB FLASH memory. Check that the settings for memory mapping in Config Pro match the allocation.

Software	Allocation	Typical Allocation
D20 Base	1MB or 2MB	1MB is the typical allocation for this Base
CCU Base	1MB or 2MB	2MB is the typical allocation for this Base

D20/D200 Software Configuration, continued

Procedure: To download a flash code file to a **D20 Base** type of D20ME module.
Code Download
D20 Base

Step	Action
Code Download for D20 Base type D20ME	
1	Restart the D20ME.
2	As soon as messages display on the monitor, press the Esc key within 5 seconds . Result: You are prompted with the message: "Are you sure you wish to generate a default configuration? (y/n)".
3	Type y (or Y). Result: The current configuration file is overwritten with the default configuration. The 68K Monitor is initiated.
4	Press ENTER . Result: The 68K Monitor login dialog screen appears
5	To login: for Login: type westronic and press ENTER , then for Password: type rd and press ENTER . Result: A Welcome message appears, followed by the D20M> prompt.
6	Type sp to suspend all processes running on the D20ME
7	Type erase to clear the flash. This will take several seconds. Result: Flash Erased will be displayed when completed
Optional Step 1: Speed-up communications to shorten download time.	
8	Type Baud 38400 and press ENTER . Note: Speeds up to 230.4 kbps, or lower speeds may be chosen based on ambient EMI, WESMAINT cable length, PC and communication software limitations, etc. Refer to section: Changing the Baud Rate on page 162 for supported speeds. Result: The monitor will now be communicating at 38.4 kbps
9	Configure the terminal emulator software to communicate at the same speed, and reconnect to the 68K monitor.

D20/D200 Software Configuration, continued**Procedure** (continued)

Step	Action
Optional Step 2: Provide feedback during download	
10	If the communication software you are using <i>does not</i> have any “progress indicator”, then echo can be enabled to visually display the code file on your monitor as it is transferred. This option can be usually found in the communication settings or properties of the communication program. Note: Enabling echo may slow transfer slightly.
Download Code File	
11	Press ENTER to verify that communication is active. Result: The D20M> prompt will return, if connection is active.
12	Type dl and press ENTER to put the D20ME into the state where it is ready to receive the downloadable code file.
13	Click Transfer Send Text File from menu bar. Result: A dialog box will open, prompting you to locate the <i>Down.shx</i> file that you wish to download.
14	Select the correct file, and click Open to start the transfer. Caution: <i>Do not</i> press any keys on keyboard during download. Result: The file transfer may take from less than 10 to over 30 minutes, depending on communication speed selected. When complete, the D20M> prompt will return.

D20/D200 Software Configuration, continued

Procedure (continued)

Step	Action
Download Code File (continued)	
15	Type el /p to display the error log. Result: The D20M> prompt should return, indicating no errors found. Errors? Record error(s), and re-try download. If errors persist, contact GE Digital Energy for support.
16	Type el /r to clear the error log, even if there are no errors displayed in the previous step.
17	Type Boot to restart device.

Result: Code File Load Completed

The flash memory of the D20ME now has a fully operational code, or firmware, file loaded.

Note: You will now have to download a configuration file, since it was overwritten at Step 3. See “Configuration File Download”, page 127.

D20/D200 Software Configuration, continued

Procedure: To download of a flash code file to a **CCU** type of D20ME module.
Code Download
CCU Base

Step	Action
Code Download for CCU Base type D20ME	
1	Restart the D20ME.
2	When messages appear on the monitor, press SPACEBAR <i>within 5 seconds</i> . Result: You are prompted with the message: "Are you sure you wish to abort the flash boot? (y/n)".
3	Type y (or Y) to abort the normal startup.
4	Press ENTER . Result: The login dialog appears.
5	To login: for Login: type westronic and press ENTER , then for Password: type rd and press ENTER . Result: After a Welcome message, the D20MES> prompt will appear.
6	Type sp to suspend all processes running on the D20ME
7	Type erase to clear the flash. This will take several seconds. Result: The monitor will display, before returning the D20MES> prompt: <i>Erasing FLASH memory < \ Checking FLASH contents... \</i>

Continued on next page

D20/D200 Software Configuration, continued

Procedure (continued)

Step	Action
Optional Step 1: Speed-up communications to shorten download time.	
8	Type Baud 38400 and press ENTER . Note: Speeds up to 230.4 kbps, or lower speeds may be chosen based on ambient EMI, WESMAINT cable length, PC and communication software limitations, etc. Refer to section: Changing the Baud Rate on page 162 for supported speeds. Result: The monitor will now be communicating at 38.4 kbps
9	Configure the terminal emulator software to communicate at the same speed, and reconnect to the 68K monitor.
Optional Step 2: Provide feedback during download	
10	If the communication software you are using <i>does not</i> have any “progress indicator”, echo can be enabled to visually display the code file on your monitor as it is transferred. This option can be usually found in the communication settings or properties of the communication program. Note: Enabling echo may slow transfer slightly.
Download Code File	
11	Press ENTER to verify that communication is active. Result: The D20MES> prompt will return if connection is active
12	Type dl and press ENTER to put the D20ME into the state where it is ready to receive the downloadable code file
13	Click Transfer Send Text File from menu bar Result: A dialog box will open, prompting you to locate the <i>Down.shx</i> file that you wish to download.
14	Select the correct file, and click Open to start the transfer Caution: <i>Do not</i> hit any keys on keyboard during download. Result: The file transfer may take from less than 10 to over 30 minutes, depending on communication speed selected. When complete, the D20MES> prompt will return.

Continued on next page

D20/D200 Software Configuration, continued**Procedure** (continued)

Step	Action
15	Type el /p to display the error log. Result: The D20MES> prompt should return, indicating no errors found. Errors? Record error(s), and re-try download. If errors persist, contact GE Digital Energy for support.
16	Type el /r to ensure that log is clear.
17	Type Boot to restart device.

**Result: Code
File Load
Completed**

The flash memory of the D20ME now has a fully operational code, or firmware, file loaded.

**Configuration
File Download**

While the D20ME is running on the BootROM, you will be prompted to log in to the **68K Monitor**, where standard Config Pro procedures can then be used to download a configuration file.

**Multi-Node
Downloads**

D20ME VME modules can be used in a multi-node VME system D20 or D200.

The application code for each D20ME module in a multi-node system can be either the same, or different for one or more of the modules.

You must repeat the download procedure for each of the nodes in a multi-node system.

Note: *Do not* re-start (Boot) the multi-node system until the code files for *all* D20ME cards have been downloaded.

D20/D200 Software Configuration, continued

Introduction Before you can put a D20ME II module into service, it must have a *firmware* application code loaded into memory.

All D20ME II boards use *Flash* memory to store the application code.

Serial Download You can load the Flash code file serially into the memory of the D20ME II via the 68K Monitor using most types of Windows communication software, such as **HyperTerminal**.

Table: Identify the D20ME II Type The D20ME II module *type* is determined by the version of BootROM installed, which identifies how the module will be used. Because the download method depends on which BootROM is installed, you need to determine the type of D20ME II module *before* downloading the Flash code.

Note: The /xx in the *Label* column is the software revision number.

Module Type	BootROM Label
D20ME II D20 Base	SBU0000/xx
D20ME II ME CCU	SBU0001/xx

Prerequisites for Code Download You need the following items to successfully load a Flash code file into a D20ME II module:

- Windows PC with **HyperTerminal** (or equivalent) communication software loaded.
- The code file, in the Motorola S-record format, located on a local hard drive. If the file is located on a network or floppy drive, the download may be significantly slower.
 - This file is typically named: *down.shx*.
- A WESMAINT cable for connecting the PC to the D20ME II WESMAINT serial port
- The D20ME II card:
 - with the hardware option jumpers set
 - installed in a D20 or D200 chassis and ready to power-up.

D20/D200 Software Configuration, continued**Software Configuration – D20ME II**, continued**Upgrading
From D20M or
1 MB Flash
D20ME?**

Code files for previous D20M modules are created in a *binary* format, usually called *PROM.BIN* files.

- If you are upgrading a device running a D20M to use a D20ME II, you must convert the binary code file to a *down.shx* format before you can download it to Flash memory.
- You must also use Config Pro to adjust the device's **Device Properties** so that the new processor will run the converted code file.

If you are upgrading from a D20ME II with 1 MB Flash (Part # 526-2003), you must modify the **Device Properties** of the new configuration in ConfigPro/SGConfig to use the existing code file.

For more information on upgrading from earlier versions, refer to the *D20ME Processor Module Installation and Operations Guide*.

Procedure

To set up the equipment for downloading code files to the D20ME II:

Step	Action
Configure and Connect PC to D20ME II	
1	Connect a WESMAINT cable from the PC's COM port to the D20ME II's front panel WESMAINT serial port.
2	Start Windows' HyperTerminal communication software on the PC, and configure it as follows: – 9600 bps / 8 bit / no parity / VT100 emulation/ Xon/Xoff flow control enabled
Identify the D20ME II Type	
3	If you already know the D20ME II BootROM "type", proceed to: • "D20ME II - D20 Base Code Download" on page 130, or • "D20ME II - CCU Code Download" on page 132.
4	Restart the D20ME II (power off-on cycle) and watch the monitor.
	If the first line of output text is:
	P149-0, D20ME BootROM
	P130-0, GE Digital Energy Services CCUME BootROM
	The D20ME II type is:
	D20 Base
	CCU

D20/D200 Software Configuration, continued

Software Configuration – D20ME II, continued

Procedure: The following steps demonstrate the serial download of a Flash code file to a **D20ME II - D20 Base** type of D20ME II module using the 68K Monitor.

Step	Action
D20ME II - D20 Base Code Download	
1	Restart the D20ME II, again.
2	As soon as messages display on the monitor, press the ESCAPE key within 5 seconds. Result: A message displays, asking if you wish to mark the configuration as “bad”.
3	To proceed with the download, type <i>y</i> . Result: The current configuration file is overwritten with a default configuration. The 68K Monitor is initiated.
4	Press ENTER. In the login dialog, type <i>westronic</i> and press ENTER, then type <i>rd</i> and press ENTER. Result: After a Welcome message, the D20M> prompt displays.
5	Type <i>sp</i> to suspend all processes running on the D20ME II.
6	Type <i>erase</i> to clear the Flash. This will take several seconds. Result: <i>Flash Erased</i> is displayed when completed.
Optional Step 1: To speed-up communication to shorten download time	
7	Type <i>Baud 38400</i> and press ENTER (speeds up to 230.4 Kbps, or lower speeds may be chosen based on ambient EMI, cable length, PC limits etc.) Result: The communication speed of the 68K Monitor is set to 38.4 Kbps.

D20/D200 Software Configuration, continued**Software Configuration – D20ME II**, continued**Procedure: D20ME II - D20 Base** (continued)

Step	Action
Optional Step 2: To receive feedback during download	
8	Configure the HyperTerminal to communicate at the same speed, and reconnect to the 68K Monitor.
9	If the communication software you are using <i>does not</i> have a “progress indicator”, you can enable echo to display the code file on the monitor as it is transferred. The echo option can be usually found in the Communication Settings or Properties of the communication program. Note: Enabling echo may slow the transfer speed.
Download Code File	
10	Type <i>dl</i> and press ENTER to ready the D20ME II to receive the downloadable code file.
11	Click Transfer Send Text File from menu bar. Result: A dialog box opens, prompting you to locate the <i>Down.shx</i> file that you wish to download.
12	Select the correct file, and click Open to start the transfer. Result: The file transfer may take from less than 10 minutes to over 30 minutes, depending on the communication speed selected. When complete, the D20M> prompt returns.
13	Type <i>el /p</i> to display the error log. Result: The D20M> prompt should return, indicating no errors found. Errors? Record error(s), and re-try download. If errors persist, contact GE for support.
14	Type <i>el /r</i> to clear the error log, even if there are no errors displayed in the previous step.
15	Type <i>Boot</i> to restart device. Result: The D20ME II code download is complete.

D20/D200 Software Configuration, continued

Software Configuration – D20ME II, continued

Procedure: The following steps demonstrate the serial download of a Flash code file to a CCU type of D20ME II module using the 68K Monitor.
D20ME II - CCU

Step	Action
D20ME II - CCU Code Download	
1	Restart the D20ME II, again.
2	As soon as messages display on the monitor, press the SPACEBAR key within 5 seconds. Result: A message displays, asking if you wish to abort the Flash boot.
3	Type <i>y</i> .
4	Press ENTER. In the login dialog, type <i>westronic</i> and press ENTER, then type <i>rd</i> and press ENTER. Result: After a Welcome message, the D20MES> prompt displays.
5	Type <i>sp</i> to suspend all processes running on the D20ME II.
6	Type <i>erase</i> to clear the Flash. This will take several seconds. Result: The monitor displays the messages below and then returns the D20MES> prompt: <i>Erasing FLASH memory <</i> <i>\ Checking FLASH contents... \</i>
Optional Step 1: To speed-up communication to shorten download time	
7	Type <i>Baud 38400</i> and press ENTER (speeds up to 230.4 Kbps, or lower speeds may be chosen based on ambient EMI, cable length, PC limits etc.) Result: The communication speed of the 68K Monitor is set to 38.4 Kbps.

D20/D200 Software Configuration, continued**Software Configuration – D20ME II**, continued**Procedure: D20ME II - CCU** (continued)

Step	Action
Optional Step 2: To receive feedback during download	
8	Configure the HyperTerminal to communicate at the same speed, and reconnect to the 68K Monitor.
9	If the communication software you are using <i>does not</i> have a “progress indicator”, you can enable echo to visually display the code file on the monitor during transfer. The echo option can be usually found in the Communication Settings or Properties of the communication program. Note: Enabling echo may slow the transfer speed.
Download Code File	
10	Type <i>dl</i> and press ENTER to ready the D20ME II to receive the downloadable code file.
11	Click Transfer Send Text File from menu bar Result: A dialog box opens, prompting you to locate the <i>Down.shx</i> file that you wish to download.
12	Select the correct file, and click Open to start the transfer. Result: The file transfer may take from less than 10 minutes to over 40 minutes, depending on the communication speed selected. When complete, the D20M> prompt returns.
13	Type <i>el /p</i> to display the error log. Result: The D20ME> prompt should return, indicating no errors found. Errors? Record error(s), and re-try download. If errors persist, contact GE for support.
14	Type <i>el /r</i> to ensure that log is clear, then type <i>Boot</i> to restart. Result: The D20ME II code download is complete.

D20/D200 Software Configuration, continued

About Multi-Node Downloads

D20ME II VME modules can be used in a multi-node VME system, known as a D200. The application code for each D20ME II module in a multi-node system can be the same or different for one or more of the modules.

The download procedure is the same for a multi-node system as for a single node; repeat the procedure for each node.

Note: *Do not* restart (i.e. Boot) the multi-node system until you have finished downloading code to *all* the D20ME II cards.

D20EME Global Memory Expansion

If you have installed the D20EME for global memory expansion of your D20/D200 system, you must configure the parameters for this in Config Pro:

- Memory starting address
- Size of Global Memory

Consult the On Line Help in Config Pro for how to do this.

D20EME Ethernet Interface

If you have installed the D20EME for Ethernet interface capability on your D20/D200 system, you must enable the LAN interface and configure the parameters for this in Config Pro:

- IP and Ethernet addressing
- BootP settings
- Single or dual LAN selection

Consult the On Line Help in Config Pro for how to do this.

Calibration

D20A & D20C - Calibrating Analog Inputs & Outputs

This section describes how to calibrate the analog inputs and outputs on the D20A board (GE part number 511-0101, analog input only) and the D20C board (GE part number 504-0002, analog inputs and/or outputs depending on which daughter card option is installed).

Peripheral boards need to be calibrated whenever:

- Re-initialization has been performed
- Analog input and output adapters have been changed/moved in WESDAC
- System points show the out-of-range indicator (>) instead of a raw count value

Prerequisites:

- Serial connection to PC and WESMAINT cable (GE part no. 977-0300).
- A terminal emulator. Tera Term Pro is recommended and is available free for download from <http://ttssh2.sourceforge.jp/>. Tera Term is included with ConfigPro* and SGConfig and is recommended by GE because of the functionality it offers when interfacing with RTUs.
- For D20C boards only, the WESMAINT interface board must be installed (GE part number 540-0162). When calibrating for current regulating adapters only (not voltage output), a 12-60 VDC power supply is also required. It is preferable to use a 24 VDC power supply.

These instructions assume that the peripherals have already been initialized and that the fault LED is not on. For assistance on initialization, please see Technical Note TN0032.

Connecting to the D20P Prompt & PROMAIN:

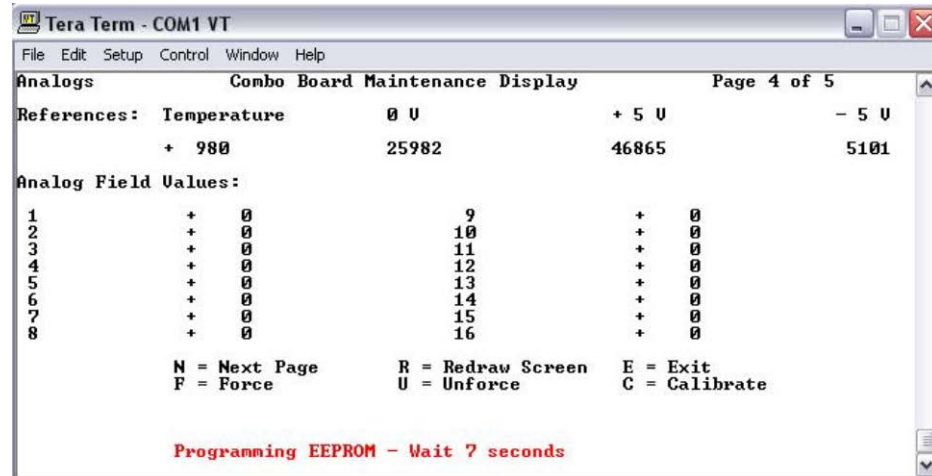
1. Connect the WESMAINT cable to your PC and to the PROMAIN port (J3) on the WESTERM board.
2. Open your terminal emulator application and connect to the appropriate COM port on the PC. Configure the communications for 9600 baud, 8 bits, no parity, 1 stop bit and xon/xoff flow control.
3. Power up the peripheral by connecting the D.20 cable and turning on the RTU.
4. You will be prompted to log into the peripheral. Login using the username "d20p" and password "rd"
5. You are now at the D20P prompt. Enter PROMAIN by typing **promaint** at the D20P prompt and then press **Enter**.

Calibrating Analog Inputs

1. Ensure all analog adapters have been correctly installed in the WESTERM board. Refer to the appropriate module layout document for additional information.
2. Connect to PROMAIN. Refer to Connecting to the D20P Prompt & PROMAIN, above.

Calibration, continued

- D20A & D20C - Calibrating Analog Inputs & Outputs (continued)**
3. Navigate to the analog input page by typing n. This is page 2 for the D20A board and page 4 for the D20C board.
 4. Type c to begin the calibration process and program the reference values into the EEPROM.



5. Once the programming process finishes, the analog input calibration is complete. Typical reference values are shown below.

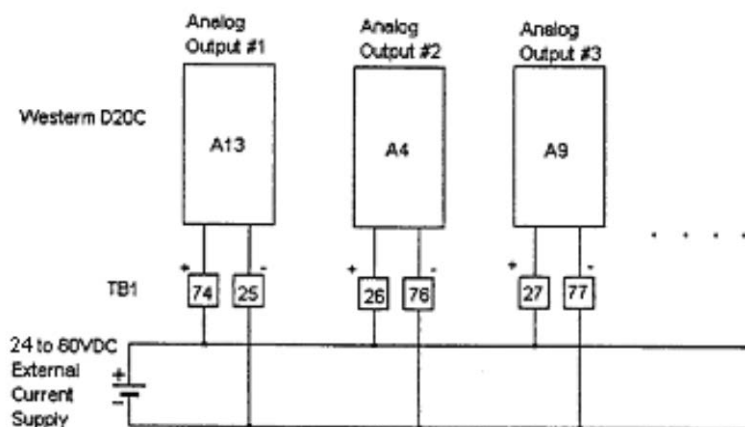
Typical Reference Values		
Reference type	Analog Input Board	Combination Input Board
Temperature	970	970
Low (-5V)	5000	5310
Zero (0V)	26000	26173
High (+5V)	47000	47037

Calibration, continued

D20C - Calibrating Analog Outputs

Calibrating Analog Outputs (D20C2 board only)

1. Ensure all the analog adapters have been correctly installed in the WESTERM board. Refer to the appropriate module layout document for more information
2. To calibrate analog current regulators, you will need to connect the power supply to the outputs. If you are using voltage output adapters skip this step and go on to step 3. To connect the power supply, daisy chain all the positive (+) terminal outputs of TB1 (connectors number: 74, 26, 27, 78, 79, 31, 32 & 34) to the positive output of the 12-60V power supply. Connect the negative (-) output of the power supply to connector 25 on TB1 or any of the common outputs. The common outputs are internally connected so it is only necessary to connect to one or them. The following is a diagram of what the connections should look like:



3. Connect to PROMAINT. Refer to Connecting to the D20P Prompt & PROMAINT, above.
4. If you are using current output adapters, you must erase the EEPROM. To do this type **eeerase** and press **Enter**. If you are using voltage output adapters only, you may skip this step.
5. Navigate to the analog output page by typing n (this is page 5).
6. Turn on the power source. Double-check the voltages and the wiring before doing so!

Calibration, continued

D20C - Calibrating Analog Outputs (continued)

7. Type c to begin the calibration process. Each analog output point takes approximately 1.5 minutes to complete. You should see a screen similar to the following:

Point	Raw References				Output	
	- 5 U	0 U	+ 0.5 U	+ 5 U	Normalized	Raw
1	17473	32936	34462	48360	+ 0	32936
2	17475	32938	34464	48363	+ 0	32938
3	17472	32938	34464	48362	+ 0	32938
4	17468	32933	34460	48357	+ 0	32933
5	17468	32933	34460	48357	+ 0	32933
6	17470	32933	34461	48358	+ 0	32933
7	17473	32938	34464	48363	+ 0	32938
8	17478	32944	34470	48367	+ 0	32944

N = Next Page R = Redraw Screen E = Exit
 F = Force U = Unforce C = Calibrate

Calibrating D to A Point Number 1

8. The D20C board will automatically program the EEPROM. Once this finishes the calibration process is complete.
9. If you are using current output adapters, you should try forcing a point. If, for example, you force a point to 50% output, and the resulting value does not equal 50%, then you need to re-calibrate the board from step 8. Press c again, and once the calibration is complete, test another point. When the forced output and the resulting value correspond, the calibration is complete.

Re-Initialization

D20 Peripheral Boards

Peripheral boards require re-initialization when:

- The peripheral board is alternating its indicator LEDs between run and fail, even though the addressing is correct and the D20 RTU is communicating with the peripheral (indicated by activity on the peripheral RX1 or RX2 LEDs)
- You replace the HC11 main processor on the WESDAC board to resolve an issue or if directed by GE Digital Energy Technical Support
- If calibration or any **eeerase/ewrite** operation is interrupted.

Prerequisites:

- Serial connection to PC and WESMAINT cable (GE part no. 977-0300).
- A terminal emulator. Tera Term Pro is recommended and is available free for download from <http://ttssh2.sourceforge.jp/>. Tera Term is included with ConfigPro* and SGConfig and is recommended by GE because of the functionality it offers when interfacing with RTUs.
- For D20C boards only, the WESMAINT interface board must be installed (GE part no. 540-0162).

Re-Initializing a Peripheral

1. The peripheral needs to be powered, but D.20 communications to the RTU must be disabled. To do this, either type sp at the D20ME 68K monitor prompt in WESMAINT (this will suspend the RTU's processes) or connect the peripheral to an empty chassis (that is, a D20 chassis with only a power supply installed and no processor cards present).

Note: If you suspend the RTU's processes at this step, remember to restart the RTU after you have finished re-initializing the peripheral(s).

2. Connect the WESMAINT cable to your PC and to the PROMAINT port (J3) on the WESTERM board.
3. Open your terminal emulator application and connect to the appropriate COM port on the PC. Configure the communications for 9600 baud, 8 bits, no parity, 1 stop bit and xon/xoff flow control.
4. Power up the peripheral by connecting the D.20 cable and turning on the RTU.
Result: You are prompted to log into the peripheral.
5. Login typing the username **d20p** and password **rd**.
Result: The D20P prompt appears.
6. Erase the EEPROM by typing **eeerase** and pressing **Enter**.

Re-Initialization, continued

- D20 Peripheral Boards (continued)**
7. Type **s 101 <X>** where the value of X depends on the type of peripheral you are re-initializing:

Command to issue according to peripheral type	
Peripheral type	Analog Input Board
S (Status Input) Board	s 101 1
A (Analog Input) Board	s 101 2
K (Control) Board	s 101 3
C (Combination) Board	s 101 4

8. Program the EEPROM by typing **ewrite** and pressing **Enter**.
9. Reboot the peripheral by typing **boot** and pressing **Enter**, or you can disconnect and reconnect the power.

To verify that the peripheral has been re-initialized correctly, at the D20P prompt type **d 101** and it should echo back the value you have programmed into the peripheral. If you are using analog inputs or outputs, you will need to calibrate them. Refer to section: D20A & D20C - Calibrating Analog Inputs & Outputs.

Operation

D20ME/ME II Main Board

The front panel has four LED indicators, providing a visual indication of the operational status of the unit:

- ALARM: LED is not implemented
- FAIL: driven by a programmed signal. Indicates that diagnostics are running or have failed
- HALT: driven by the halt line input of the microprocessor. Indicates that MPU has stopped
- RUN: driven by the address strobe line on the microprocessor. Indicates any microprocessor activity

I/O Peripherals Common LEDS

The WESDAC/WESTERM Peripheral pairs have a common section made up of components on the WESDAC and WESTERM boards. There are seven LED indicators on this common section.

LED Name	Designation	Normal RUN	Not Initialized
DS1	Power On	On	On
DS2	MPU Run	Flash 10/sec	See Next Table
DS3	Tx1	Flickers Constantly	Depends on Nature of Fault
DS4	Rx1	Flickers Constantly	Depends on Nature of Fault
DS5	Tx2	Configuration Dependent	Depends on Nature of Fault
DS6	Rx2	Configuration Dependent	Depends on Nature of Fault
DS7	Fault	Off	See Next Table

Operation, continued

LEDs vs. MCU Status The MPU Run and Fault LEDs, DS2 and DS7, together indicate the MCU's operating status.

MPU Run LED	Fault LED	Flash Period (s)	MCU Operating Status
Flash	Off	0.1	Applications downloaded and operating
Flash	Off	0.75	Applications downloaded but not operating
Flash (alternating)	Flash (alternating)	0.75	Applications not downloaded and only ROM operating
Off	Flash	0.5	EPROM checksum error
Flash (simultaneously)	Flash (simultaneously)	0.5	RAM error: device address error

D20 Power Supply LEDs On the chassis-mounted D20 Power Supplies there are LED indicators for each of the supply voltages. The indicators are illuminated green when that voltage is present.

D20EME LEDs The following table explains the operational function of the four LED indicators:

Name	Function
BATT 1 LED	Lights when battery voltage drops below 3 Volts. Replace battery immediately.
BATT 2 LED	
POWER LED	+5 Volts power is available.
ACCESS LED	Indicates D20EME is being accessed from VME bus.

Operation, continued

Media Interface Cards LED Indicators The 10BASE-T and 10BASE-FL modules have six indicators on the front panel for each channel.

Note: The 10BASE2 module has no indicators.

Indicator	Function	Description
10BASE-T		
XMT	Transmit	Flashes when transmit traffic present
CLS	Collision	Flashes on when a collision is detected
LTF	Link Test Fail	On when link is operational
RCV	Receive	Flashes when receive traffic detected
$\overline{\text{POL}}$	Polarity	On when receive polarity is reversed
JAB	Jabber	On when jabber detected, transmitter disabled
10BASE-FL		
XMT	Transmit	Flashes when transmit traffic present
CLS	Collision	Flashes on when a collision is detected
LMO	Link Monitor	On when link optical signal is normal
RCV	Receive	Flashes when receive traffic detected
JAB	Jabber	On when jabber detected, transmitter disabled
PWR	Power	On when power supplied to the MIC

RS-232 Switch Panel:
Active/Standby Switch Operation

Refer to “RS-232 Switch Panel: ” on page 52 for a description of the function of the Active/Standby switch on the front of the RS-232 Switch Panel.

The Active/Standby switch has a center “locked” position. To operate the switch, pull it straight out, then switch it down to make CCU B active, or up to make CCU A active. If the Active CCU is not working properly, the system will automatically initiate a failover to the Standby CCU.

Servicing

D20/D200 Maintenance The D20/D200 does not require any scheduled maintenance. Periodic inspection is suggested to ensure that:

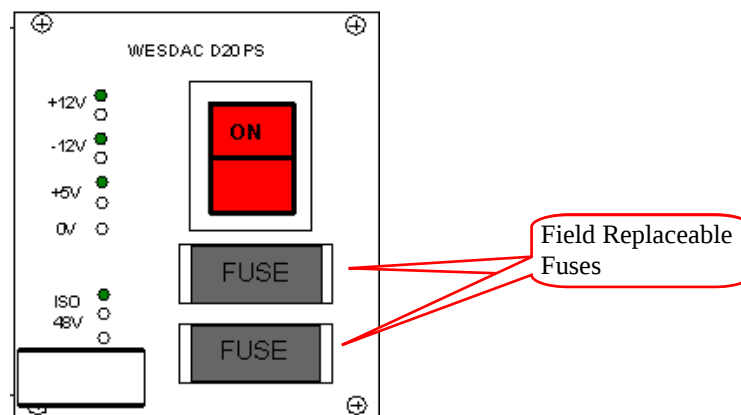
- Unit has sustained no accidental physical damage
- Airflow is not obstructed
- Connectors and cables are intact and firmly attached
- Fuses are intact
- Battery condition is good

D20/D200 Service Life The expected service life of a D20/D200 is 20 years when the environment and electrical conditions are within stated specifications.

Servicing Tasks Use this section of the guide for regular servicing and preventative maintenance inspection tasks:

- Locations and standard values of all fuses
- How to inspect and replace batteries on the D20ME/ME II main board

D20 Power Supply Fuses The D20 Power Supply has one or two field-replaceable fuses.

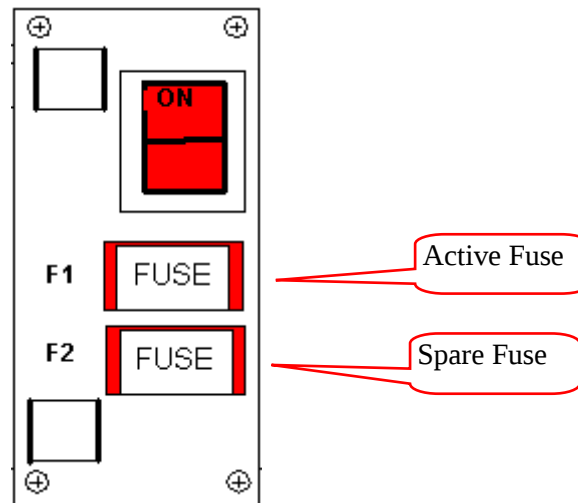


Replaceable Fuses Field-replaceable fuses for the standard chassis-mounted Power Supplies:

Power Supply	Fuse	Fuse Function	Replacement Fuse	Fuse Part Number
580-2004	F1	+DC Input	LITTLEFUSE 0326012.MXP	940-0425: Fuse, SLO-BLO, 12A/250V
	F2	-DC Input	LITTLEFUSE 0326012.MXP	940-0425: Fuse, SLO-BLO, 12A/250V
580-2005	F1	+DC Input	LITTLEFUSE 0326012.MXP	940-0425: Fuse, SLO-BLO, 12A/250V
	F2	-DC Input	LITTLEFUSE 0326012.MXP	940-0425: Fuse, SLO-BLO, 12A/250V
580-2006	F1	Line/+DC Input	LITTLEFUSE 0313004.MXP	940-0424: Fuse, SLO-BLO, 4A/250V
	F2	Neutral/-DC Input	LITTLEFUSE 0313004.MXP	940-0424: Fuse, SLO-BLO, 4A/250V
580-2007	F1	Line/+DC Input	LITTLEFUSE 0313004.MXP	940-0424: Fuse, SLO-BLO, 4A/250V
	F2	Neutral/-DC Input	LITTLEFUSE 0313004.MXP	940-0424: Fuse, SLO-BLO, 4A/250V

Servicing, continued

Fuse Locations: The D200 has one field replaceable fuses located on the Power Supply together with a spare fuse:



Replaceable Fuses

The following table shows the standard replaceable fuses that are used in the various hardware options for the D200.

Fuse	PS Board Type	Replacement	Where Used	Fuse Part Number
F1	520-0150	MDL 10A SLO BLO	48VDC Field Supply	940-0074
	520-0151	MDQ 5A 250VAC	110/250VAC Field Supply	940-0028

Note

Fuses listed in the tables above are the *standard* fuses that are factory installed, unless otherwise specified.

Fuse ratings may differ due to:

- Unique customer-specific configurations or requirements, or
- Product specification changes

When changing fuses, *always* check the original fuse for value and type, and ensure the replacement fuse you use is of that value and type. Do not assume that installed fuse is of the correct value.

Servicing, continued

Batteries The D20ME/ME II Main board has two lithium batteries located near the front of the board. These maintain the contents of the NVRAM in the event that power is removed from the module. See “D20ME Main Module: Board Layout” page 54.

Battery life should exceed five years:

- If the D20ME is never powered down, or
- If the batteries are disconnected, by removing jumper JP8

Battery life is shortened if they are left connected while the D20ME is powered down for extended periods.

Battery Checking To check battery voltage, use a meter or other measuring device that has high input impedance. (10MΩ or higher)

The batteries have a nominal voltage of 3.6 volts. Batteries with a voltage of 3.0 volts or less should be changed.

NOTICE

- If you remove one or both of the batteries from the D20ME, configuration data and any other database information stored in NVRAM is lost.
- You have to download the configuration file after battery changing to restore operation.

Cleaning & Handling of Batteries

- Use non-conductive cleaning solution to prevent battery performance deterioration.
- Dry batteries at a temperature below 85° C to prevent seal deformation, which may result in leakage.
- Avoid:
 - inversion of polarity
 - exposure to high temperatures, such as soldering or spot-welding
 - excessive force to terminals
- Wear gloves or finger caps when handling batteries to keep them clean.
- For long-term storage,
 - keep at temperatures and humidity below normal
 - avoid shorting or loading while stored.

⚠ CAUTION

- There are many electronic components near the battery that are sensitive to electrostatic discharge
- Observe extreme caution and proper procedures when servicing components that are sensitive to electrostatic discharge

Servicing, continued**⚠ CAUTION**

Do not disassemble, crush, puncture, or incinerate the battery.

Handle a damaged or leaking battery with extreme care. If you touch the electrolyte, wash the exposed skin with soap and water. If the electrolyte contacts your eye, flush the eye with water for 15 minutes. If you have inhaled the electrolyte, move to fresh air, and monitor breathing and circulation. In each case, seek immediate medical attention.

**Recycling of Batteries**

The D20ME lithium battery is recyclable and does not contain mercury, cadmium, or lead in levels above those regulated by the European Union. Recycle the battery according to local waste management regulations.

In accordance with European Directive 2006/66/EC, batteries are marked with the crossed out wheeled bin, which indicates that they cannot be disposed of as unsorted municipal waste in the European Union. Users of batteries must use the collection points available to customers for the return, recycling, and treatment of batteries. Customer participation is important to minimize the negative effects of batteries to the environment and sustain available natural resources. For more information see www.weeerohsinfo.com.

Procedure:
Change Battery

To change each D20ME battery, follow these steps:

Note: It is recommended that both batteries be changed as a set.

Step	Action
Battery Removal	
1	Using a plastic or other non-conductive tool, pry the black plastic retaining clip holding the battery away from the battery holder.
2	When free, the battery and clip can be removed together. Result: The battery and clips are removed.
3	Remove the clip from the battery.
Battery Replacement	
4	Place new battery into battery holder, carefully noting proper polarity.
5	Replace retaining clip across the center of the battery, and press down until it clicks into the retaining notches in the battery holder.
6	Repeat steps 1 through 5 for other battery. Result: New batteries are installed.

3. Security

Removing Configuration Data

Overview

In the event that it is necessary to remove the configuration data and sensitive information from the D20 (for example, the D20 is being disposed of or being returned for maintenance [i.e., RMA]), this section provides the data removal procedure.

It may also be necessary to remove data from a PC that has run ConfigPro or SGConfig for the purpose of configuring a D20. Again, this section provides the data removal procedure.

From a D20MEII or a D20EME

The configuration data can be removed from these devices by either:

- Removing the battery from the device for at least 5 minutes.
Result: The configuration data which was backed up in NVRAM is removed, since the NVRAM is powered by a battery.
Note: This does not remove the firmware running in the flash memory.
OR
- Restarting the device:
 1. Restart the device by either:
 - o Turning the power off and on, or
 - o Typing the **boot** command at the 68K monitor prompt.
 2. When messages appear on the 68k monitor prompt, press the **Esc** key a few times within 5 seconds.
Result: The message: “Are you sure you wish to generate a default configuration? (y/n)” appears.
 3. Type **y** (or **Y**).
Result: The current configuration file is overwritten with the default configuration. The 68k monitor is initiated. The configuration has been defaulted to a factory-based configuration and the user’s configuration has been deleted.
 4. Remove the firmware from the flash memory:
 - a. Login to the device through the 68K monitor (if not already logged in).
 - b. Type **sp** to suspend all processes running on the device.
 - c. Type **erase** to clear the flash.
Result: This takes several seconds to complete.
Result: The Flash Erased message appears when the erase operation is completed.
 5. Confirm the flash has been erased by typing **img** at the prompt to view the image file.
Result: No firmware information should appear.

Security

Removing Configuration Data, continued

**From a PC
running
ConfigPro or
SGConfig**

If ConfigPro or SGConfig has been used to configure the D20 processor, configuration data resides on the data storage media (e.g., hard drives, memory cards, etc.) of the PC running ConfigPro or SGConfig.

The D20 configuration data can be removed from the PC by either:

- Recommended: Physically removing and destroying the data storage media, or
 - Using a program to securely wipe (i.e., completely erase) the data storage media; that is, not just reformat or remove the names of the files from the file allocation table.
-

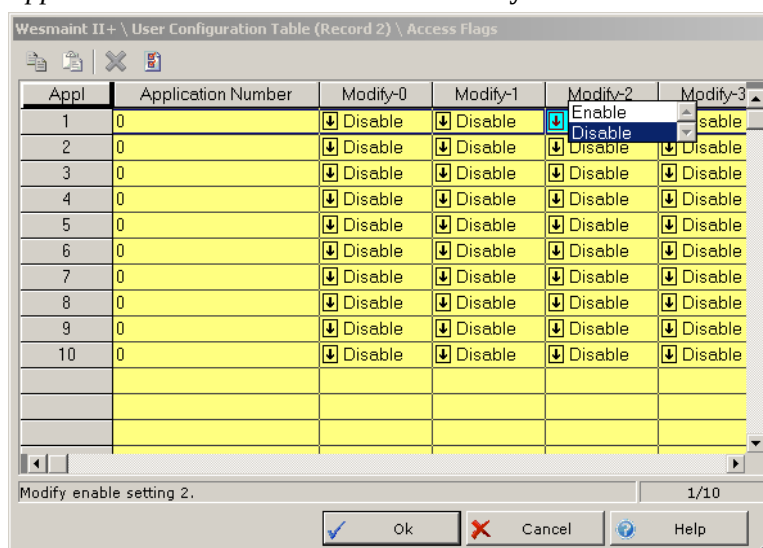
Removing Hardcoded D20 Passwords

Overview

D20 devices running WESMAINT version 4.11 to 4.15 contain hardcoded username and password combinations, which may constitute a security risk for system operators. This procedure explains how to remove these user accounts from your D20 device to prevent them from being used. Versions older than 4.11 and newer than 4.15 do not contain hardcoded user accounts.

Procedure

1. Open the ConfigPro project containing the device you wish to modify.
2. Expand the device. On the **System Point Data Base Applications** tab, double-click **WESMAINT II+**.
3. Double-click the **User Configuration Table**.
4. Create a new row in the table and configure the fields as follows:
 - User Name: **supervisor**
 - Password: **rtu**
 - Application Control: Open the sub-table. In all the rows shown, change the **Application Number** to **0** and set all **Modify-x** fields to **Disable**.



5. Click **OK** when finished editing the **Application Control** sub-table.
6. Click the **Close** icon and confirm that you want to save the changes that have been made.
7. Right-click the device and select **Generate > All Tables**.
8. Once the device successfully compiles, open the terminal window and select **68k Mode**.
9. Download the configuration to the device by pressing **F7**. You must use 68k mode to download the new configuration.

The hardcoded passwords are now removed and cannot be used to access the device.

4. Removing D20/D200 From Service

Overview	Removing the D20/D200 from service comprises: • Removing configuration data • Removing hardcoded D20 passwords • Disposing of the unit.
Removing Configuration Data	See section: <i>Removing Configuration Data</i> on page 151.
Removing Hardcoded D20 Passwords	See section: <i>Removing Hardcoded D20 Passwords</i> on page 152.
Unit Disposal	To prevent non-intended use of the unit, remove the modules, dismantle the unit, and recycle the metal when possible. Other than the battery, there are no special requirements for disposal of the unit at the end its service life.

5. Troubleshooting

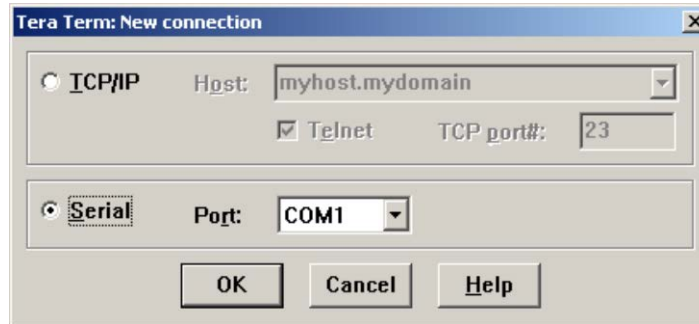
Troubleshooting D20/D200 Serial Communications

Overview	This section describes how to troubleshoot D20/D200 serial communications using SA COM. A serial analyzer captures and displays serial communications in hexadecimal format to assist in troubleshooting communications between an IED or SCADA master and the D20/D200. GE Digital Energy has incorporated this powerful feature into the firmware of the D20* and D200 via the SA COM (Serial Analyze Communications) command, allowing for the capture of serial communications from any of the serial ports normally used for RS232, RS485 or RS422 communications.
Serial Analyzer	A serial analyzer displays every character (including framing and parity errors) of the raw communication between an RTU and IEDs in the field or a SCADA master station. Test sets do not always display all of the data, as they normally parse the data and if there is a problem, that message is ignored. Normally a serial analyzer is used to verify communications between two or more devices to see if a correct response is sent for a particular request. The captured messages can then be parsed and examined for their integrity. Any problems with the request or response can then be analyzed. In the case of when a device fails or does not respond, the serial analyzer may have captured the message that triggered the problem. It will also show the quality of the communications link by displaying any noise, framing errors (FR), parity errors (PA) or echoes in the message.
Prerequisites	The following items are required: • WESMAINT cable (GE part number 977-0048/xxx, where xxx is the length of the cable) • Windows* PC running a terminal emulator (e.g., TeraTerm Pro) that has a log-to-file feature.
Procedure	The instructions below assume that TeraTerm Pro is being used as the terminal emulator. The steps may differ slightly if a different terminal emulator program is used. To capture a serial analysis file: 1. Connect the computer's serial communications port to the WESMAINT port of the D20/D200 using the WESMAINT cable.

Troubleshooting D20/D200 Serial Communications, continued

Procedure (continued)

2. Select **Serial** and the appropriate COM port for the computer, and then click **OK**.

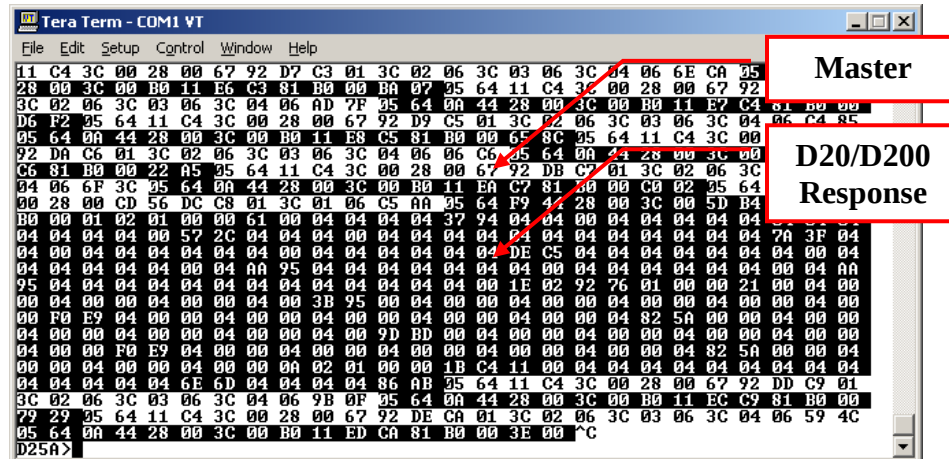


3. Press Enter and a log in screen is shown. Type in your user name and password and press Enter.
4. The Main Menu is shown. Use the down arrow key to select option 2. System Functions and then press Enter (or press the number 2 key on the keyboard).
5. The System Functions menu is shown. Use the down arrow to select option 3. 68K Monitor and then press Enter (or press the number 3 key on the keyboard).
6. Before starting to capture a serial analysis file, it is recommended to increase the WESMAINT baud rate so that the display buffer does not overflow. A display buffer overflow will occur when the data is coming in faster than WESMAINT can display it.
A communications port running at a higher baud rate than the WESMAINT port usually causes this. Examples of buffer overflow are shown at the end of this document.
To change the baud rate, type baud xxxxx (where xxxxx is the desired baud rate for your device) at the system prompt and press **Enter**.
The recommended baud rates for different devices are shown below:
D20/D200: 115200
D25/iBOX: 19200
7. Change the baud rate in the terminal emulator to match the baud rate selected in the previous step. If using TeraTerm, click **Setup > Serial port** and then change the baud rate and change the flow control to be Xon/Xoff. Click **OK** and press **Enter** to get the system prompt to appear.
8. Before starting to log data, a log file must be created. If using TeraTerm, select **File** and click on **Log** then type in or select a file to log to and then select a folder to store it in so it can easily be found later. Click **Open** when finished.
9. Type **sa comx** (where x is the communications port number you want to monitor) and then press **Enter**.

Troubleshooting D20/D200 Serial Communications, continued

Procedure (continued)

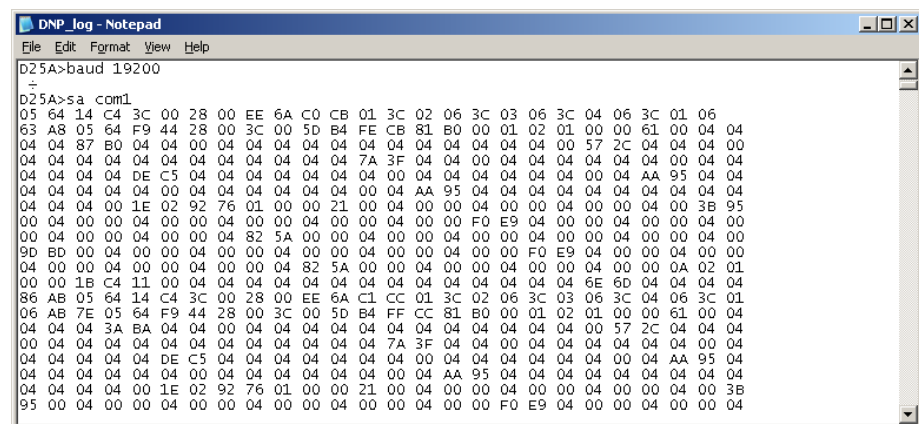
10. The D20/D200 messages always appear in inverse text (white text on a black background) and the master request or the slave response always appears in regular text (black text on a white background).



In this example the D20/D200 is acting as the slave and information is being sent out from the D20/D200 in inverse text. To stop the capture when the appropriate data has been captured, press **CTRL-C** to return to the system prompt.

11. When the data capture is finished, close the log file in TeraTerm by clicking **Close**.
12. The log file can now be found in the folder it was stored in and can be opened using a text editor. The file can be parsed by copying this information into a computer-based automated parser or done manually by using a protocol description document.

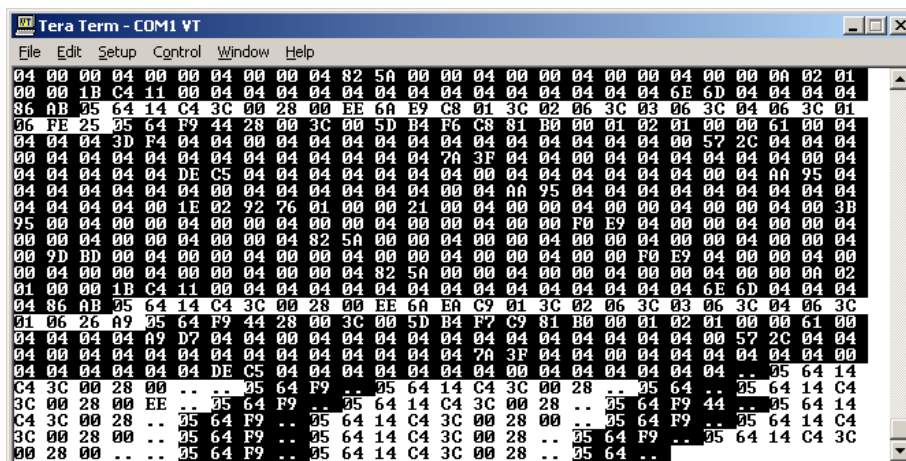
Note: If using Notepad to view the contents of the log file, all of the communications traffic is shown in non-formatted text.



Troubleshooting D20/D200 Serial Communications, continued

Buffer Overflow

The below screen capture shown good serial communications data at the top of screen and transitions to show buffer overflows at the bottom. When the buffer overflows the data is broken up and contains a series of “.” (two periods or more). This data cannot be parsed and is of no value to capture.



If a buffer overflow is observed then the CTRL-C command does not work to exit out to the system prompt until the activity on the screen stops. If the polling is continuous (i.e., communication activity does not stop) and you are unable to issue the **CTRL-C** command, there are three ways to exit out to the system prompt:

- Remove the communications cable from the COM port and wait until the activity on the screen stops. This is the recommended method, as it only stops communications on one port but it will still cause COM alarms to be generated at the master.
- Turn off the polling from the master device and wait for the activity on the screen to stop. Usually this is not possible unless a master simulator is being used, such as an ASE test set.
- Restart the D20/D200 by cycling the power. This is not normally recommended, as it takes the D20/D200 offline and stops all communications temporarily until the reboot is complete.

Troubleshooting Firmware Version Mismatches

Overview

This section describes how to troubleshoot mismatches between firmware and corresponding configurations on D20 and D200 devices.

The version of the firmware running on your D20 or D200 device must match the version that is indicated in the corresponding ConfigPro/SGConfig configuration for that device. The ConfigPro/SGConfig configuration holds many of the settings that the firmware applications need in order to run. The firmware applications expect to find these settings in specific places and these locations may not be the same in different firmware versions.

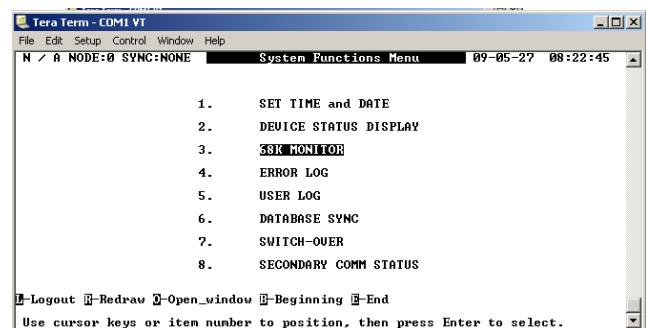
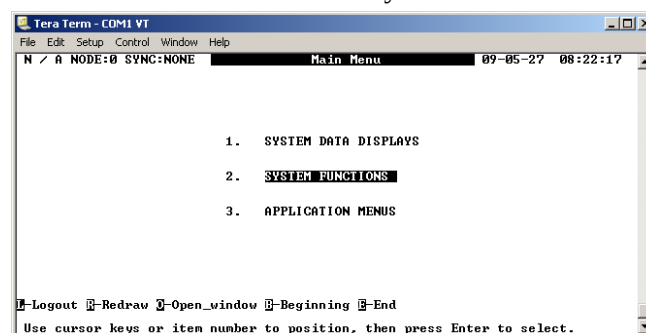
Firmware mismatches may result in unstable operation of devices. Common symptoms of a firmware mismatch include:

- RTU crashes
- Constant RTU restarts
- Repeated RTU configuration download failures
- Unexpected and/or unexplainable errors in the Wesmaint error log
- Poor RTU communications
- Point map mismatches

Verifying the name and version

Verifying the name and version of the firmware running in the RTU

1. Connect a PC to the Wesmaint port of the RTU using a Wesmaint cable. This example assumes that TeraTerm is being used as the terminal emulator. Other terminal emulators have similar functionality.
2. Log into Wesmaint using the user name and password set in your ConfigPro/SGConfig configuration. The default user name and password are **westronic** and **rd**.
3. From the Main Menu select **System Functions** then select **68K Monitor** to get access to the 68K Monitor utility.



Troubleshooting Firmware Version Mismatches, continued

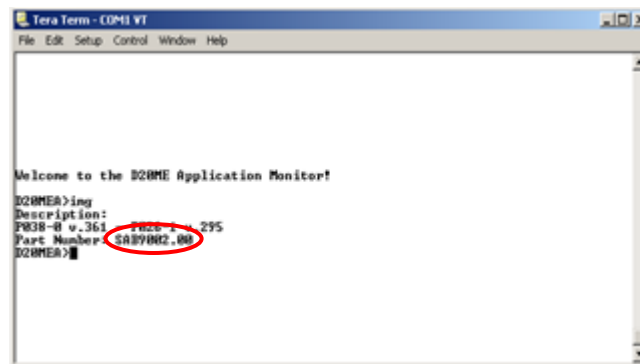
Verifying the name and version (continued)

- Once in the 68K Monitor utility, type **img** (for display firmware image) and press **Enter** to retrieve the firmware number and version running in this D20/D200.

The normal nomenclature for firmware created by GE Digital Energy is shown below, where z represents a number. The specific revision number of the firmware is shown after the period.

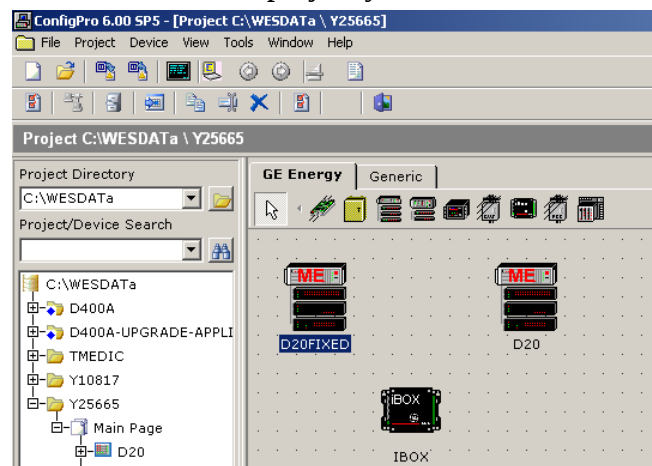
D20/D200: SABzzzz.zz

For example, firmware SAB9002.00 implies that this is D20/D200 firmware SAB9002 with revision number 00.



Compare with the firmware information in ConfigPro

- Run ConfigPro on your PC and click on the **Projects** tab in the left side of the screen.
- Find the project directory from the **Current Project Directory** field and double-click on the project you selected.

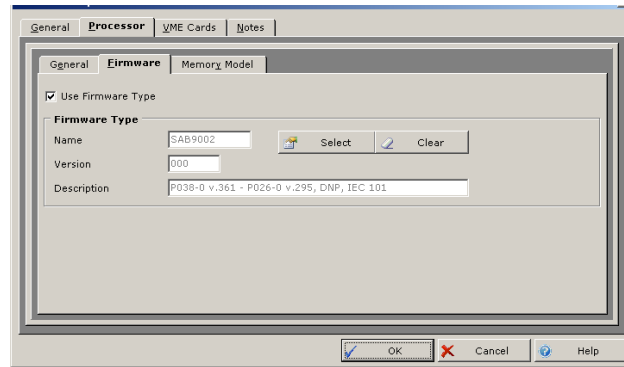


- After the project has opened, right-click on the device you are working with and choose **Properties**. The Device Properties screen appears.

Troubleshooting Firmware Version Mismatches, continued

Compare with
the firmware
information in
ConfigPro
(continued)

4. Select the **Processor** tab and then the **Firmware** tab. The screen shows the firmware version and revision used in the configuration. The **Use Firmware Type** box should be checked to specify that the specific device uses this firmware.



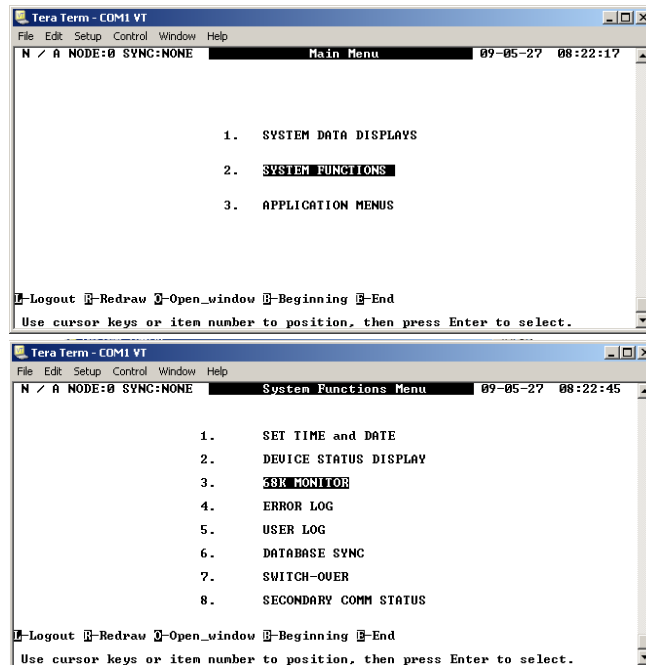
5. If the firmware number and version on this screen matches that shown by the **img** command, no further action is required. Continue to the next section if the information shown on this screen does not exactly match the information shown by the **img** command in Wesmaint.

Troubleshooting Firmware Version Mismatches, continued

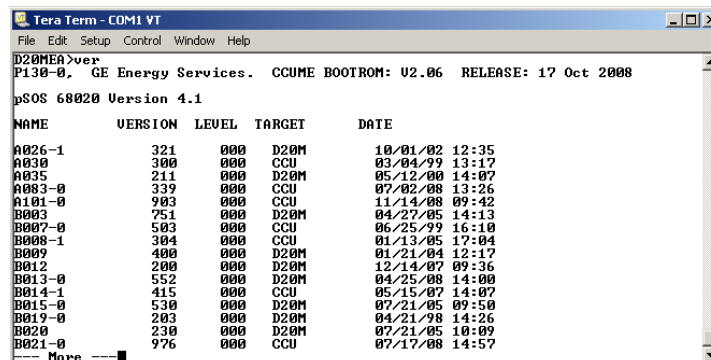
When Firmware Versions Do Not Match

If the firmware running on the D20/D200 does not match the firmware information indicated in the corresponding ConfigPro/SGConfig configuration, you should look for any mismatches between the individual applications and associated versions within the firmware running in the RTU and the firmware selected in the ConfigPro/SGConfig project.

1. Connect your PC to the Wesmaint port of the D20/D200 using the Wesmaint cable. TeraTerm is used in this example.
2. Log in to Wesmaint using the user name and password set in your ConfigPro/SGConfig configuration. The default user name and password are **westronic** and **rd**.
3. From the Main Menu select **System Functions**, select **68K Monitor** to get access to the 68K Monitor utility.



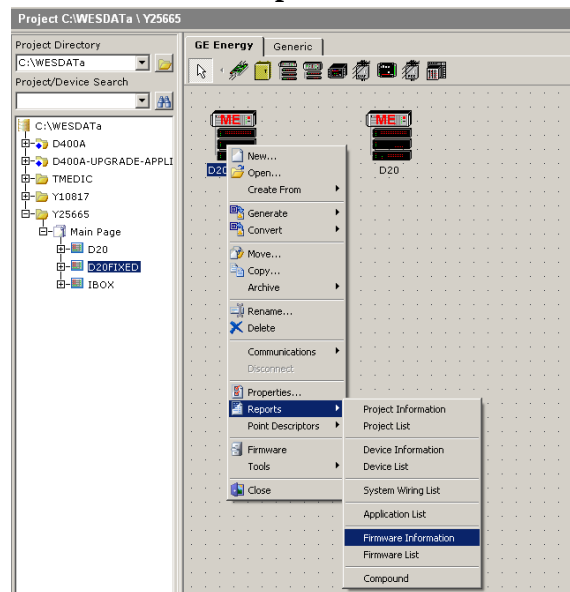
4. Once in the 68K Monitor utility type **ver** and press **Enter** to get version information regarding the base system, pSOS operating system and each application version running in the D20/D200.



Troubleshooting Firmware Version Mismatches, continued

When Firmware Versions Do Not Match (continued)

5. If you see the word --- **More** --- at the bottom of the screen there is an additional screen of information below to be displayed. Hit **Enter** to see the rest of the list of the applications.
6. After listing all the applications and their versions, use the mouse to select all the applications. TeraTerm automatically copies everything that is selected in the terminal window. Open a text editor and paste in the applications list.
7. Go back to your project in ConfigPro/SGConfig and right-click on the device and select **Reports > Firmware Information**.



8. On the Select Reports window, deselect the **Select All** option to get access to each firmware currently set in the project. Select the firmware used by the device and click **OK**.

Troubleshooting Firmware Version Mismatches, continued

**When
Firmware
Versions Do
Not Match
(continued)**

9. The Firmware Information screen appears. This screen shows the applications and their version that are selected in that firmware.

Firmware Information			
Project	Y25865		
Directory	C:\WESDATA\Y25865		
FIRMWARE			
NAME:	SAB9002		
DESCRIPTION:	P038-0 v.361 - P026-0 v.295, DNP, IEC 101		
VERSION:	000		
HISTORY			
CREATED:	1/28/2009		
LAST MODIFIED:	1/28/2009		
PROGRAMMER:	Kelvin Lo		
SELECTED APPLICATIONS			
ID.	NAME	VERSION	REVISION
A026-1	Communication Watchdog	321	1
A030	Accumulator Freeze	300	0
A035	Analog Reference	211	1
A083-0	Calculator DTA	339	0
A101-0	IEC 870-5-101 DPA	903	0
B003	D.20 Peripheral Link	751	2
B008-1	System Point Database	304	0
B009	Mailbox DTA	400	0
B012	IRIG-B	200	1
B013	DNP V3.00 Data Link	552	0
B014-1	Wesmaint II+	415	0
B015	Bridgeman	530	0
B021	DNP V3.00 DPA	976	0
B023	DNP V3.00 DCA	750	0
B034	Redundant Monitor	203	1
B062-0	Data Display DTA	123	0
B071-0	WESMAINT File Upload	200	2
B082-1	LogicLink (no Ethernet)	301	0
B085	IEC Balanced Data Link	130	0

10. The next step is to compare the individual applications and associated version from the **ver** command in 68K monitor and the **Firmware Information** report in ConfigPro/SGConfig.

If all of the applications and version information match then the configuration will work properly with the firmware running in the D20/D200 and you can proceed with downloading the configuration.

Any mismatch in an application's version information must be corrected for proper operation of the D20/D200. If required, contact GE Digital Energy Technical Support to obtain the default configuration for the specific firmware that you are using.

If the firmware was not built by GE, contact your system integrator or Value Added Reseller for assistance.

68K Monitor Commands

Introduction

This section outlines some of the 68K Monitor commands that can be used when working with D20ME. Instructions in this chapter are excerpts from the *68K Monitor User's Guide*.

Refer to the *68K Monitor User's Guide* (P136-0UG) for information about other commands not listed here.

Changing the Baud Rate

The D20ME/ME II Monitor has the ability to change the communication speed of the WESMAINT port. This is useful when downloading large files.

Example: A 1 MB code file may take upwards of 40 minutes to download at 9600 bps (the default). At 38400 bps, the transfer is only 10 – 15 minutes.

Note: Most PCs cannot exceed 115,200 bps, and some terminal programs (Windows Terminal for example) may have other restrictions. Check the program's User's Guide for help.

SET BAUD RATE command

The SET BAUD RATE command changes the data rate of the WESMAINT port to a user-supplied value.

Command Format	BAUD baud_rate
Variables	None
Parameters	baud_rate = the new data rate for the port, in bps.
Example	Type <i>BAUD 4800</i> and press ENTER. Result: The monitor switches to communicate at 4800 bps.
Special Considerations	See Notice below.

NOTICE

Speed changes made using the SET BAUD RATE command are not saved in NVRAM; the monitor will return to 9600 bps after a restart. It is recommended that this command be *only* used to speed up a serial download, and *not* to redefine the operational state.

68K Monitor Commands, continued**Supported
Speeds**

The supported data rates, in bps, are:

900	9600
1050	14400
1200	19200
1800	28200
2000	38400
2400	57600
3600	115200
4800	230400
7200	

Modify pSOS Buffers

Introduction

All applications running on D20* and D200* devices require the use of certain buffers allocated by the pSOS operating system. There are three types of buffers that we are concerned with when configuring the pSOS settings. They are:

- Process control blocks
- Exchange controls blocks
- Message buffers

If the available space in any of these buffers gets too low, the RTU can lock up or prevent applications from sending messages. In situations where you have a large number of system points or applications running, it may be necessary to increase the size of these buffers. Buffer sizes can be increased by changing the pSOS application table within ConfigPro*/SGConfig*.

When configuring these settings on a D20 or 200 system, keep in mind that pSOS settings can only be modified on D20ME, D20MEII, and D20M++ (CCU base only) processors.

Procedure

With the pSOS application already installed and available within ConfigPro/SGConfig:

1. Select the D20/D200 device.
2. Open the pSOS application.

Result: A new icon named **pSOS Configuration Table** appears in the **Data Translation Applications** tab.

3. Open the **pSOS Configuration Table** within this application.
4. When a value of 0 is entered in a column this means that the RTU is to use the default value. The default values are listed in the help text at the bottom of the screen and are also listed below for your reference:
 - # Processes = 100
 - # Exchanges = 160
 - # Messages = 2000

Note: By increasing the size of the processes, exchanges, or message buffers, you decrease the amount of available RAM. The amount of free RAM can be checked by running the command **qr /v**.

The following commands can be run from the 68K monitor prompt to give you an indication of your current system buffer levels.

- **qx** – This command will tell you the number of free exchange control blocks (XCBs) and message buffers.
- **qp** – This command will tell you the number of free process control blocks (PCBs)

Modify pSOS Buffers, continued

Procedure (continued)

Generally, you want the number of free XCBs and PCBs to be around 30. Within your configuration, add enough on top of the default values to get the number of free control blocks within this range.

When configuring the number of message buffers there is no specific value that can be recommended. Some factors that need to be considered are:

- The amount of available RAM.
- How many applications are running.
- How many events are being generated.

In a small system the default setting is usually appropriate. In a large system dealing with a large number of points and events, you should consider setting the number of message buffers to at least 4000.

Appendix A: Product Combinations

Introduction Use Table 1 to check the combinations for the D20 M++, D20ME, D20EME, GreenSpring Ethernet, and MicroMemory cards in the three available main chassis types:

- Check that a main processor board is compatible with a chassis type
- Check that a main processor board and Ethernet and/or memory card combination is compatible with a chassis type
- Check that a main processor board and New or Old D.20 peripherals are compatible with a chassis type

Use Table 2 to check the Base compatibility and Minimum BootROM for D.20 Peripherals boards.

Compatibility: Use the following tables to check the compatibility of the components you want to combine. Notes that follow the table give restrictions that apply to these combinations.
Table 1

Note: **D20M++** showing in the Board Combination column refers to the now obsolete main processor board. It is included for customers who already have this board installed in their D20/D200 system.

Board Combinations (All in the same chassis)	Chassis Type		
	D20 Non-VME (1 Slot Horizontal)	D20ME (5 Slot Horizontal)	D200 VME (9 Slot Vertical)
D20ME	Yes (Note 1)	Yes (Note 2,6)	Yes
D20ME, EME	N/A	Yes (Note 2,3,6)	Yes
D20ME, GreenSpring	N/A	Yes (Note 2,3,6)	Yes
D20ME, MicroMemory	N/A	Yes (Note 2,4,6)	Yes (Note 4)
D20ME, GreenSpring, MicroMemory	N/A	Yes (Note 2,3,4,6)	Yes (Note 4)
D20M++	Yes	Yes (Note 6)	Yes
D20M++, EME	N/A	Yes (Note 3,5,6)	Yes (Note 5)
D20M++, GreenSpring	N/A	Yes (Note 3,6)	Yes (Note 3)
D20M++, MicroMemory	N/A	Yes (Note 6)	Yes
D20M++, GreenSpring, MicroMemory	N/A	Yes (Note 3,6)	Yes
D20ME, D20M++, EME	N/A	Yes (Note 2,3,5,6)	Yes (Note 5)
D20ME, D20M++, MicroMemory	N/A	N/A	Yes (Note 4,5)
D20ME, D20M++, GreenSpring, MicroMemory	N/A	N/A	Yes (Note 4,5)
D20ME, New D.20 Peripherals	Yes	Yes	Yes
D20ME, Old D.20 Peripherals	Yes (Table 2)	Yes (Table 2)	Yes (Table 2)

Product Combinations, continued

Notes

1. Not all non-VME backplanes pass: use 517-0224-05A, 517-0254-02 or newer. The VME D20ME, 526-2005, does NOT work with non-VME backplanes. You must use the non-VME D20ME, 526-2004.
2. Not all SIO communication panels pass: use 517-0225-09 or newer. The non-VME D20ME, 526-2004, does NOT work with VME backplanes. You must use the VME D20ME, 526-2005.
3. Ethernet cards should only be installed in the new D20 MX Chassis, or a D200 chassis. Older D20 horizontal chassis have no place for the interface cable between the D20EME and the MIC to run inside the chassis. Although you can physically bring this cable out the back of the chassis between the metalwork and the PCB, it invalidates the compliance to industrial emissions standards.
4. Do not use 16MB Micro Memory cards with the D20ME. Use 8MB card(s) as required. 16MB Micro Memory cards can be used with D20M++ cards.
5. D20 M++ cards cannot be used with D20ME or D20EME cards in systems with more than three processor boards. Occasional crashes can occur in these systems.
6. There are some limitations to the number of nodes you can have in a D20 VME Chassis:
 - Due to the mounting arrangement of the Serial I/O communications interface panel on a D20 chassis, it is not always practical to have more than one node. On the 500-0280 MX Chassis you can have one rack mounted com panel (517-0225) and one rear mounted com panel (571-0230), supplying physical com channels for two processor nodes. Additional nodes could be dedicated to Ethernet and automation applications if desired.
 - The D20 Power Supply +5V output can supply up to 5A. Each D20ME requires 1A, and the D20EME requires 110mA. The remaining power can be used to line power 5V devices on the RS-232 communication ports. This means the D20 Power Supply can power up to 4 D20ME cards and 1 D20EME.
 - The D20 Power Supply +12V output can supply a maximum of 1A. The D20EME requires 0.6A. The remaining power can be used to line power 12V devices on the RS-232 communication ports. In practice, this means that the D20 Power Supply can power either a D20EME, or a few modems. If both Ethernet and modems, or several modems, are required then an external 12V power supply is generally required.

Common Power Consumption Ratings:

- D20EME w/ MIC 0.60A @ +12V
- D20ME 0.10A @ +12V
- WESDAC 202 Modem 0.10A @ +12V
- Telenetics® Modem 0.35A @ +12V

Example: 1 D20ME, 1 D20EME w/ 10BaseT, and 1 Telenetics Modem exceeds the available +12V Capacity

Product Combinations, continued

D.20 Input/Output Peripheral Compatibility

When using the D20ME with the older vintages of the D.20 peripherals, there are some exceptions that apply:

- The newest design of the peripherals has a jumper, which allows you to select between Shunt or Series capacitors.
- You need to change the older vintage of the D20 backplane (vintage 4A or older) to a new backplane (vintage 5A or newer), and set a jumper to use shunt caps for the peripherals.
- If the EPLDs on the peripherals are older than V1.5, you need to upgrade them to PERFPAL 1.5. DO NOT upgrade them to newer versions of the PERFPAL, as they are not 100% backward compatible.
- Special arrangements need to be made with GE manufacturing to obtain PERFPAL V1.5, which are not kept in stock.

The communication statistics on the D.20 link will never be as good as they are with new peripherals, but they should not be any worse than they were in the existing system.

PCOMMONs should match the version of base software being used.

Peripheral Compatibility: Table 2

Use the following table to check the Base compatibility and Minimum BootROM for D.20 Peripherals boards.

Product	Vintage	Release Date	D.20 Communications Design Detail	Base Compatibility	Minimum BootROM
D20A WESDAC (511-0101)	Vintage 01A-16A		Shunt Cap / Perpal 1 V1.5	All	Any BootROM
	Vintage 17A-20A	97/05/13	Series Cap / Perfuni V0.0	D20 base 3.51 and newer	P002 3.05 P002-2 3.05 or P002-3 1.00
	Vintage 21A, 23A-current	98/09/18	Jumper Caps (Shunt/Series) / Perfask V0.0 See note 3	All	Any BootROM
	Vintage 22A (Note 1)	98/09/29	Series Cap / Perpal 1 V1.5	All	Any BootROM
D20K WESDAC (508-0101)	Vintage 01A-12A		Shunt Cap / Perpal 1 V1.5	All	Any BootROM
	Vintage 13A-14A, 16A	96/11/12	Series Cap / Perfuni V0.0	D20 base 3.51 and newer	P002 3.05 P002-2 3.05 or P002-3 1.00
	Vintage 15A (Note 1)	97/03/11	Series Cap / Perpal 1 V1.5	All	Any BootROM
	Vintage 17A-current	98/07/02	Jumper Caps (Shunt/Series) / Perfask V0.0 See note 3	All	Any BootROM

Product Combinations, continued**Peripheral Compatibility: Table 2 (continued)**

Product	Vintage	Release Date	D.20 Communications Design Detail	Base Compatibility	Minimum BootROM
WESDAC D20S (507-0101)	Vintage 01A-10A		Shunt Cap / Perpal 1 V1.5	All	Any BootROM
	Vintage 11A, 13A-17A	96/09/11	Series Cap / Perfuni V0.0	D20 base 3.51 and newer	P002 3.05 P002-2 3.05 or P002-3 1.00
	Vintage 12A (Note 1)	96/08/08	Series Cap / Perpal 1 V1.5	All	Any BootROM
	Vintage 18A-current	98/06/11	Jumper Caps (Shunt/Series) / Perfask V0.0 See note 3	All	Any BootROM
WESDAC D20C (504-0002)	Vintage 01A-19A		Shunt Cap / Perpal 3 V1.2 <i>Cannot use 2nd D.20 com port (for redundant link)</i>	All	Any BootROM
	Vintage 20A-23A	96/11/19	Series Cap / Perfuni V0.0 <i>Cannot use 2nd D.20 com port (for redundant link)</i>	D20 base 3.51 and newer	P002 3.05 P002-2 3.05 or P002-3 1.00
	Vintage 24A-current	98/06/25	Jumper Caps (Shunt/Series) / Perfask V0.0 See note 3	All	Any BootROM
	Vintage 01A-19A		Shunt Cap / Perpal 3 V1.2 <i>Cannot use 2nd D.20 com port (for redundant link)</i>	All	Any BootROM
WESTERM M+ (517-0224)	Vintage 01A-04A		Shunt cap	All D20 Base All D20M++ Base	Any BootROM
	Vintage 05A-07A	96/01/03	Series cap	D20 base 3.51 and newer	P002 3.05 P002-2 3.05 or P002-3 1.00
	Vintage 08A (Note 1)	97/05/07	Shunt cap	All D20 Base All D20M++ Base	Any BootROM
	Vintage 09A-current	98/08/07	Jumper caps (Shunt/Series) See note 2	All	Any BootROM
	Vintage 01A-04A		Shunt cap	All D20 Base All D20M++ Base	Any BootROM
WESTERM M+ (517-0225)	Vintage 01A-04A		Shunt cap	All D20 Base All D20M++ Base	Any BootROM
	Vintage 05A-06A	96/01/03	Series cap	D20 base 3.51 and newer	P002 3.05 P002-2 3.05 or P002-3 1.00
	Vintage 07A-current	98/08/07	Jumper caps (Shunt/Series) See note 2	All	Any BootROM
	Vintage 01A-04A		Shunt cap	All D20 Base All D20M++ Base	Any BootROM

Product Combinations, continued

Notes

1. Temporary Vintage (limited distribution)
 2. Selection for Shunt or Series capacitor is made using a jumper setting.
 3. Selection is made using a combination jumper setting: (i) for a Shunt or Series capacitor and (ii) for an EPLD.
-

Appendix B: D20 Spare Cross-Reference

Introduction

This appendix attempts to cross reference the old part numbers with the new smart catalogue numbers. For the most part, the smart catalogue numbers represented here only indicate the prefix or base-line for the complete smart order code. For the complete smart order code, you need to specify the selections for the various sub-components.

Visit the online store for the appropriate spare parts and the rules governing sub-component selections:

- [D20 ME Substation Controller](#) spare parts
- [D20K Control Output Module](#) spare parts
- [D20S Status Input Module](#) spare parts
- [D20A Analog Input Module](#) spare parts
- [D20C Combination I/O Module](#) spare parts
- [D20KI Interposer Relay Panel](#) spare parts

This appendix provides spare cross-reference tables for the following modules:

- D20 Spare Parts Modules
 - D20A: D20 Analog Input Module
 - D20C: D20 Combination Module
 - D20K: D20 Control Output Module
 - D20S: D20 Status Input Module
-

B.1 D20 Spare Parts Modules, Spare Cross-Reference

Spare part numbers are listed for:

- Processors
- Ethernet
- Modems
- Terminations
- Power Supply
- Media Interfaces
- Chassis
- D20 Programmed Chip Set – BOOTROM
- D20 Programmed Chip Set – PCOMMON
- D20 Programmed Chip Set – PCOMMON2

In the below tables > Smart Part Number Prefix column:

X-X represents Firmware and Bootrom Choice respectively

U-U represents "Not Needed"

Processors

Description	Legacy Part Number	Smart Catalog Number Prefix
D20ME non-VME Processor, 7 x RS232 ports	526-2004	D20ME-P-A-X-X
D20ME non-VME Processor, 7 x RS232 ports, conformal coated	526-2004-CC	D20ME-P-E-X-X
D20ME non-VME Processor, 7 x RS232 / RS 485 ports	526-2006	D20ME-P-B-X-X
D20ME VME non-VME Processor, 7 x RS232 / RS 485 ports, conformal coated	526-2006-CC	D20ME-P-F-X-X
D20ME Processor, 7 x RS232 ports	526-2005	D20ME-P-C-X-X
D20ME VME Processor, 7 x RS232 ports, conformal coatd	526-2005-CC	D20ME-P-D-X-X
D20ME VME Processor, 7 x RS232 / RS 485 ports	526-2007	D20ME-P-G-X-X
D20ME VME Processor, 7 x RS232 / RS 485 ports, conformal coated	526-2007-CC	D20ME-P-H-X-X
D20ME VME Processor, 7 x RS232 / RS 485 ports Epoxy Conformal Coated	526-2007-ECC	D20ME-P-I-X-X

Ethernet

Description	Legacy Part Number	Smart Catalog Number Prefix
D20 EME ETHERNET MEMORY, 0MB KIT	526-2101	D20ME-E-H-U-U
D20 EME ETHERNET MEMORY, 0MB KIT, Conformal Coated	526-2101-CC	D20ME-E-P-U-U
D20 EME Ethernet Memory Expansion, 8MB	526-2100	D20ME-E-C-U-U
D20 EME Ethernet Memory Expansion, 8MB, conformal coated	526-2100-CC	D20ME-E-F-U-U
D20 EME Ethernet Memory Expansion, 8MB, conformal coated	526-2100-ECC	D20ME-E-G-U-U
D20 EME2 Ethernet Memory Expansion, 8MB [use with 526-2116]	526-2117	D20ME-E-N-U-U

D20 EME Ethernet Memory Expansion, 8MB, NO ETHERNET	526-2102	D20ME-E-L-U-U
D20 EME Ethernet/Ethernet Memory Expansion, 16MB	526-2100 & 526-2115	D20ME-E-E-U-U
D20 EME Ethernet Memory Expansion, 16MB, no ethernet	526-2102 & 526-2115	D20ME-E-M-U-U
D20 EME2 Ethernet Memory Expansion, 16MB [use with 526-2116]	517-2117 & 517-2115	D20ME-E-O-U-U

Modems

Description	Legacy Part Number	Smart Catalog Number Prefix
Wesdac D20 202/V.23 Modem, bin mount	520-0120	D20ME-M-A-U-U
Wesdac D20 202/V.23 Modem, bin mount, conformal coated	520-0120-CC	D20ME-M-B-U-U
Modem, Telenetics 14.4K 2 wire Dialup, Bin mount	580-0771	D20ME-M-C-U-U
Modem, Telenetics 14.4K 4 wire Leased line, bin mount	580-0772	D20ME-M-D-U-U
Wesdac 202/V.23 Modem, 19 inch rack mount	520-0090	D20ME-M-E-U-U
Wesdac 202/V.23 Modem, 19 inch rack mount, conformal coated	520-0090-CC	D20ME-M-F-U-U

Termination

Description	Legacy Part Number	Smart Catalog Number Prefix
Westerm D20 termination Panel, Panel Mount, 15 inch ribbon I/F cable	517-0225	D20ME-T-A-U-U
Westerm D20 termination Panel, Panel Mount, 15 inch ribbon I/F cable, conformal coated	517-0225-CC	D20ME-T-D-U-U
Westerm D20 termination Panel, Chassis Mount	517-0230	D20ME-T-B-U-U
Westerm D20 termination Panel, Panel Mount, 24 inch ribbon I/F cable	517-0300	D20ME-T-C-U-U

Power Supply

Description	Legacy Part Number	Smart Catalog Number Prefix
D20 Power Supply, 20-60VDC Input, 24V ISO Output	580-2004	D20ME-S-A-U-U
D20 Power Supply, 20-60VDC Input, 48V ISO Output	580-2005	D20ME-S-B-U-U
D20 Power Supply, 100-300VDC/85-264VAC Input, 24V ISO Output	580-2006	D20ME-S-C-U-U
D20 Power Supply, 100-300VDC/85-264VAC Input, 48V ISO Output	580-2007	D20ME-S-D-U-U

Media Interfaces

Description	Legacy Part Number	Smart Catalog Number Prefix
D20 EME 10BASE-FL Media Interfase Card	526-2112 & 977-0298	D20ME-X-K-U-U
D20 EME 10BASE-FL Media Interfase Card, conformal coated	526-2112-CC & 977-0298	D20ME-X-A-U-U
D20 EME 10BASE-FL Media Interfase Card, Epoxy conformal coated	526-2112-ECC & 977-0298	D20ME-X-B-U-U
D20 EME 10BASE-TX Media Interfase Card	526-2116 & 977-0298	D20ME-X-L-U-U

Chassis

Description	Legacy Part Number	Smart Catalog Number Prefix
D20 Chassis assembly nonVME 3U, single slot	500-0305	D20ME-C-A-U-U
D20 Chassis assembly VME 3U	500-0280 & COVER PLATES	D20ME-C-B-U-U
D20 Chassis assembly nonVME 3U, single slot, Conformal Coated	500-0305-CC	D20ME-C-C-U-U
D20 Chassis assembly VME 3U, Conformal Coated	500-0280-CC & COVER PLATES	D20ME-C-D-U-U

D20 Programmed Chip Set - BOOTROM

Description	Legacy Part Number	Smart Catalog Number Prefix
P149-0 VER.129, D20ME D20 Base BOOTROM	P149-0 VER.129	D20CP-3A
P130-0 VER.204, D20ME CCU BOOTROM	P130-0 VER.204	D20CP-3B
P130-0 VER.134, D20ME CCU BOOTROM	P130-0 VER.134	D20CP-3C
P130-0 VER.133, D20ME CCU BOOTROM	P130-0 VER.133	D20CP-3D
P130-0 VER.132, D20ME CCU BOOTROM	P130-0 VER.132	D20CP-3E
P130-0 VER.130, D20ME CCU BOOTROM	P130-0 VER.130	D20CP-3F
P130-0 VER.131, D20ME CCU BOOTROM	P130-0 VER.131	D20CP-3G
P130-0 VER.129, D20ME CCU BOOTROM	P130-0 VER.129	D20CP-3H
P130-0 VER.128, D20ME CCU BOOTROM	P130-0 VER.128	D20CP-3I
P130-0 VER.127, D20ME CCU BOOTROM	P130-0 VER.127	D20CP-3J
P130-0 VER.126, D20ME CCU BOOTROM	P130-0 VER.126	D20CP-3K
P130-0 VER.123, D20ME CCU BOOTROM	P130-0 VER.123	D20CP-3L
P130-0 VER.205, D20ME CCU BOOTROM	P130-0 VER.205	D20CP-3M
P130-0 VER.206, D20ME CCU BOOTROM	P130-0 VER.206	D20CP-3O
P130-0 VER.210, D20ME CCU BOOTROM	P130-0 VER.210	D20CP-3P
P130-0 VER.212, D20ME CCU BOOTROM	P130-0 VER.212	D20CP-3Q

D20 Programmed Chip Set - PCOMMON

Description	Legacy Part Number	Smart Catalog Number Prefix
PCOMMON V212	SBA0001/00	D20CP-11
PCOMMON V213	SBA0003/00	D20CP-12
PCOMMON V220	SBA0004/00	D20CP-13
PCOMMON V221	SBA0007/00	D20CP-14
PCOMMON V300	SBA0005/00	D20CP-15
PCOMMON V301	SBA0006/00	D20CP-16
PCOMMON V305	SBA0009/00	D20CP-17
PCOMMON V306	P010-0 VER. 306	D20CP-18

D20 Programmed Chip Set – PCOMMON2

Description	Legacy Part Number	Smart Catalog Number Prefix
PCOMMON2 V221	P022 VER.221	D20CP-29
PCOMMON2 V305	P022 VER.305	D20CP-20

B.2 D20 Analog Input Modules, Spare Cross-Reference

Legacy and new part numbers are listed for:

- D20A WESTERM Modules
- D20A WESDAC Modules
- DNP3A WESDAC Modules
- D20A Adapter Modules

D20A WESTERM Modules

Legacy Part Number and Description	Smart Catalog Number Prefix and Description
WESTERM Modules – Legacy Part Number	WESTERM Modules - New Part Number Prefix
(517-0163) - WESTERM D20A Type 1 Version 1	(D20A-TL-P-U)- D20A 32 inputs, LV Power input (20-60VDC or D.20), compression termination
(517-0163-CC) - WESTERM D20A TYPE 1 VERSION 1 Conformal Coated	(D20A-TL-P-C)- D20A 32 inputs, LV Power input (20-60VDC or D.20), compression termination, conformal coated
(517-0240) - WESTERM D20 AZ	(D20A-TH-P-U)- D20AZ 32 inputs, HV Power input (40-150VDC), compression termination
(517-0240-CC) - WESTERM D20 AZ Conformal Coated	(D20A-TH-P-C)- D20AZ 32 inputs, HV Power input (40-150VDC), compression termination, conformal coated
(517-0240-ECC) - WESTERM D20 AZ – Epoxy Conformal Coated	(D20A-TH-P-E)- D20AZ 32 inputs, HV Power input (40-150VDC), compression termination, epoxy conformal coated
(517-0328) - WESTERM D20AB	(D20A-TL-B-U)- D20AB 32 inputs, LV Power input (20-60VDC or D.20), barrier termination
(517-0328-CC) - WESTERM D20AB Conformal Coated	(D20A-TL-B-C)- D20AB 32 inputs, LV Power input (20-60VDC or D.20), barrier termination, conformal coated
(517-0178) - WESTERM D20 AD	(D20A-TL-D-U)- D20AD 32 inputs, LV Power input (20-60VDC or D.20), DB25 termination
(517-0178-CC) - WESTERM D20 AD Conformal Coated	(D20A-TL-D-C)- D20AD 32 inputs, LV Power input (20-60VDC or D.20), DB25 termination, conformal coated
(517-0251) - WESTERM D20 OAD	(D20A-TM-D-U)- D20OAD 32 inputs, LV Power Input (40-150VDC), DB25 termination, redundant D.20 link and PS input
(517-0216) - WESTERM D20AX W/TB PLUGS	(D20A-TL-X-U)- D20AX 32 inputs, LV Power input (20-60VDC or D.20), compression disconnect termination
(517-0216-CC) - WESTERM D20AX W/TB PLUGS Conformal Coated	(D20A-TL-X-C)- D20AX 32 inputs, LV Power input (20-60VDC or D.20), compression disconnect termination, conformal coated
(517-0364) - WESTERM D20AZ BREAK AWAY W/TBS	(D20A-TH-X-U)- D20AZ 32 inputs, HV Power input (40-150VDC), compression disconnect termination

D20A WESDAC Modules

Legacy Part Number and Description	Smart Catalog Number Prefix and Description
WESDAC Modules – Legacy Part Number	WESDAC Modules - New Part Number Prefix
(511-0101) - WESDAC D20A Type 1 Version 1	(D20A-DL-U-U)- WESDAC D20A LV
(511-0101-CC) - WESDAC D20A Type 1 Version 1 Conformal Coated	(D20A-DL-U-C)- WESDAC D20A LV Conformal Coated
(511-0103) - WESDAC D20A HV2	(D20A-DH-U-U)- WESDAC D20A HV
(511-0103-CC) - WESDAC D20A HV2 Conformal Coated	(D20A-DH-U-C)- WESDAC D20A HV Conformal Coated
(511-0103-ECC) - WESTERM D20SX W/TB Plugs	(D20A-DH-U-E)- WESDAC D20A HV Epoxy Conformal Coated

DNP3A WESDAC Modules

Legacy Part Number and Description	Smart Catalog Number Prefix and Description
DNP I/O Module Spares - Legacy Part Number	DNP I/O Module Spares – New Part Number Prefix
(511-0301) - DNP I/O Module - DC ANALOG INPUT	(D20A-3L-U-U)-WESDAC D20A LV, DNP3 Communications
(511-0301-CC) - DNP I/O Module - DC ANALOG INPUT Conformal Coated	(D20A-3L-U-C)-WESDAC D20A LV, DNP3 Communications, Conformal Coated
(511-0303) - DNP I/O Module - DC ANALOG INPUT HV	(D20A-3H-U-U)- WESDAC D20A HV, DNP3 Communications

D20A Adapter Modules

Legacy Part Number and Description	Smart Catalog Number Prefix and Description
D20 Analog Adaptors – Legacy Part Number	Adapter Pack – New Part Number
(530-0004) - Analog Adaptor, I/P Voltage	(D20A-U-U-U-U-U-1-U-U) - Voltage Input adaptor - +/- 1, +/- 5, +/- 10 VDC (Set of 32: 530-0004)
(530-0005) – Analog Adaptor, I/P 1mA/1V	(D20A-U-U-U-U-U-2-U-U) - 1 mA / 1V current input adaptor (Set of 32: 530-0005)
(530-0045) - Analog Adaptor, I/P 2MA/1V	(D20A-U-U-U-U-U-3-U-U) - 10 mA / 5V current input adaptor (Set of 32: 530-0045)
(530-0050) - 1MA/5V I/P Analog Adaptor	(D20A-U-U-U-U-U-4-U-U) - 1 mA / 5V current input adaptor (Set of 32: 530-0050)
(530-0025) - 1.2MA/1V I/P Analog Adaptor	(D20A-U-U-U-U-U-5-U-U) - 1.2 mA / 1V current input adaptor (Set of 32: 530-0025)
(530-0051) - Analog Adaptor, I/P (2MA/5V)	(D20A-U-U-U-U-U-6-U-U) - 2 mA / 5V current input adaptor (Set of 32: 530-0051)
(530-0052) - Analog Adaptor, I/P 20MA/5V	(D20A-U-U-U-U-U-7-U-U) - 20 mA / 5V current input adaptor (Set of 32: 530-0052)
(530-0090) - Analog Adaptor, I/P 1MA/5V	(D20A-U-U-U-U-U-9-U-U) - 1 mA / 5V current input adaptor, high precision (Set of 32: 530-0090)
(530-0095) - Analog Adaptor, I/P 1.5MA/5V	(D20A-U-U-U-U-U-A-U-U) - 1.5 mA / 5V current input adaptor (Set of 32: 530-0095)
(530-0108) - Analog Adaptor, 2MA/5V I/P .01%	(D20A-U-U-U-U-U-B-U-U) - 2 mA / 5V current input adaptor, high precision 0.01% (Set of 32: 530-0108)
(530-0003) - Analog Adaptor, I/P 20MA/1V	(D20A-U-U-U-U-U-C-U-U) - 20mA/1V current input adaptor (Set of 32: 530-0003)
(530-0030) - 1.5MA/1V I/P Analog Adaptor	(D20A-U-U-U-U-U-D-U-U) - 1.5 mA / 1V current input adaptor (Set of 32: 530-0030)
(530-0073) - 5MA/1V I/P Analog Adaptor	(D20A-U-U-U-U-U-G-U-U) - 5mA/1V current input adaptor (Set of 32: 530-0073)
(530-0085) - 2.5MA/5V I/P Analog Adaptor	(D20A-U-U-U-U-U-J-U-U) - 2.5mA/5V current input adaptor (Set of 32: 530-0085)
(530-0091) - 1.1MA/5V I/P Analog Adaptor	(D20A-U-U-U-U-U-N-U-U) - 1.1mA/5V current input adaptor (Set of 32: 530-0091)
(530-0094) – Analog Adaptor, I/P 1.25MA/5V	(D20A-U-U-U-U-U-P-U-U) - 1.25mA/5V current input adaptor (Set of 32: 530-0094)
(530-0131) - Analog Adaptor 12.8MA/5V	(D20A-U-U-U-U-U-Q-U-U) - 12.8mA/5V current input adaptor (Set of 32: 530-0131)
(530-0086) - 50MA/5V I/P Analog Adaptor	(D20A-U-U-U-U-U-H-U-U) - 50mA/5V current input adaptor (Set of 32: 530-0086)

B.3 D20 Combination Modules, Spare Cross-Reference

Legacy and new part numbers are listed for:

- D20C WESTERM Modules
- D20C WESDAC Modules
- DNP3C WESDAC Modules
- D20C Digital Input Adapter Modules
- D20C First Slot of Analog Adapter Modules
- D20C Second Slot of Analog Adapter Modules
- D20C Output Adapters
- D20C WESDAC Daughter Cards

D20C WESTERM Modules

Legacy Part Number and Description	Smart Catalog Number Prefix and Description
D20 Combination WESTERM Modules – Legacy Part Number	D20 Combination WESTERM Modules - New Part Number Prefix
(517-0169) - WESTERM D20C TYPE 1 VERSION 1	(D20CS-T-1) - D20C LV (20-60VDC or D.20 Power), Compression Termination & DB25 for Interposer relays
(517-0180) - WESTERM D20 CD	(D20CS-T-2) - D20CD LV (20-60VDC or D.20 Power), DB25 Termination
(517-0326) - WESTERM D20 CB	(D20CS-T-3) - D20CB LV (20-60VDC or D.20 Power), Barrier Termination & DB25 for Interposer relays
(517-0217) - WESTERM D20 CX W/TB PLUGS	(D20CS-T-4) - D20CX LV (20-60VDC or D.20 Power), Compression Disconnect Termination & DB25 for Interposer relays
(517-0333) - WESTERM D20 CDI, 48V	(D20CS-T-6) - D20CDI LV (20-60VDC or D.20 Power), 48V Isolated Common & DB25 for Interposer relays
(517-0263) - WESTERM D20 CDI, 130V	(D20CS-T-7) - D20CDI LV (20-60VDC or D.20 Power), 130V Isolated Common & DB25 for Interposer relays (
(517-0239) - WESTERM D20 C4Z, 48V DI	(D20CS-T-8) - D20C4Z HV 48V DI Compression Termination Analog Input Only
(517-0325) - WESTERM D20 C4Z2, 48V DI	(D20CS-T-5) - D20C4Z HV 48V DI Compression Disconnect Termination
(517-0253) - WESTERM D20 C4Z 110V DI	(D20CS-T-9) - D20C4Z HV 110V DI Compression Termination Analog Input Only
(517-0362) - WESTERM D20 C4Z2 24V DI	(D20CS-T-A) - D20C4Z2 HV 24V DI Compression Termination Analog Input & Output Allowed
(517-0363) - WESTERM D20 C4Z2 WITH PLUGS, 48V DI	(D20CS-T-C) - D20C4Z2 HV 48V DI Compression Disconnect Termination
(517-0267) - WESTERM D20 C4Z2 (220V)	(D20CS-T-D) - D20C4Z2 HV 220V DI Compression Disconnect Termination

D20C WESDAC Modules

Legacy Part Number and Description	Smart Catalog Number Prefix and Description
WESDAC Modules – Legacy Part Number	WESDAC Modules - New Part Number Prefix
(504-0002) - WESDAC D20C+	(D20CS-D-1) - WESDAC D20C LV
(504-0003) - WESDAC D20C HV	(D20CS-D-2) - WESDAC D20C HV

DNP3C WESDAC Modules

Legacy Part Number and Description	Smart Catalog Number Prefix and Description
DNP 3 Module Spares - Legacy Part Number	DNP 3 Module Spares – New Part Number Prefix
(504-0302) - DNP I/O LV MODULE - COMBINATION	(D20CS-3-1)- WESDAC D20C LV, DNP3 Communications
(504-0303) - DNP I/O HV MODULE - COMBINATION	(D20CS-3-2)- WESDAC D20C HV, DNP3 Communications

D20C Digital Input Adapter Modules

Legacy Part Number and Description	Smart Catalog Number Prefix and Description
D20 Combination Digital Input Adapter – Legacy Part Number	D20 Combination Digital Input Adapter – New Part Number
(245-0031) - D20 C 12V Digital Input Adapter	(D20CS-U-U-U-1-U-U-U-U-U-U) - 12V Digital Input Adapter [245-0031]
(245-0030 (4x), 245-0029 (2x)) - D20 C 24V Digital Input Adapter	(D20CS-U-U-U-2-U-U-U-U-U-U) - 24V Digital Input Adapter [245-0030 (4x), 245-0029 (2x)]
(245-0004) - D20 C 48V Digital Input Adapter	(D20CS-U-U-U-3-U-U-U-U-U-U) - 48V Digital Input Adapter [245-0004]
(530-0133) - D20 C 130V Digital Input Adapter for LV	(D20CS-U-U-U-4-U-U-U-U-U-U) - 130V Digital Input Adapter for LV [530-0133]
(245-0012) - D20 C 220V Digital Input Adapter for HV	(D20CS-U-U-U-5-U-U-U-U-U-U) - 130V Digital Input Adapter for HV [245-0012]

D20C First Slot of Analog Adapter Modules

Legacy Part Number and Description	Smart Catalog Number Prefix and Description
D20 Combination First Slot of Analog Adapters – Legacy Part Number	D20 Combination First Slot of Analog Adapters – New Part Number
(530-0004) - D20C Voltage Input Adapter	(D20CS-U-U-U-1-U-U-U-U-U-U) - Voltage Input Adapter [530-0004]
(530-0087) - 0.1mA to 5V Current Input Adapter	(D20CS-U-U-U-2-U-U-U-U-U-U) - 0.1mA to 5V Current Input Adapter [530-0087]
(530-0088) - 0.3mA to 5V Current Input Adapter	(D20CS-U-U-U-3-U-U-U-U-U-U) - 0.3mA to 5V Current Input Adapter [530-0088]
530-0089) - 0.5mA to 5V Current Input Adapter	(D20CS-U-U-U-4-U-U-U-U-U-U) - 0.5mA to 5V Current Input Adapter [530-0089]
(530-0050) - 1 mA to 5V Current Input Adapter	(D20CS-U-U-U-5-U-U-U-U-U-U) - 1 mA to 5V Current Input Adapter [530-0050]
(530-0090) - 1 mA to 5V Current Input Adapter [High Precision]	(D20CS-U-U-U-6-U-U-U-U-U-U) - 1 mA to 5V Current Input Adapter [High Precision] [530-0090]
(530-0091) - 1.1 mA to 5V Current Input Adapter	(D20CS-U-U-U-7-U-U-U-U-U-U) - 1.1 mA to 5V Current Input Adapter [530-0091]
(530-0094) - 1.25 mA to 5V Current Input Adapter	(D20CS-U-U-U-8-U-U-U-U-U-U) - 1.25 mA to 5V Current Input Adapter [530-0094]
(530-0095) - 1.5 mA to 5V Current Input Adapter	(D20CS-U-U-U-9-U-U-U-U-U-U) - 1.5 mA to 5V Current Input Adapter [530-0095]
(530-0051) - 2 mA to 5V Current Input Adapter	(D20CS-U-U-U-A-U-U-U-U-U-U) - 2 mA to 5V Current Input Adapter [530-0051]
(530-0108) - 2 mA to 5V Current Input Adapter [High Precision]	(D20CS-U-U-U-B-U-U-U-U-U-U) - 2 mA to 5V Current Input Adapter [High Precision] [530-0108]
(530-0086) - 2.5 mA to 5V Current Input Adapter	(D20CS-U-U-U-C-U-U-U-U-U-U) - 2.5 mA to 5V Current Input Adapter [530-0085]
(530-0045) - 2mA to 1V Current Input Adapter	(D20CS-U-U-U-D-U-U-U-U-U-U) - 2mA to 1V Current Input Adapter [530-0045]
(530-0131) - 12.8 mA to 5V Current Input Adapter	(D20CS-U-U-U-E-U-U-U-U-U-U) - 12.8 mA to 5V Current Input Adapter [530-0131]

(530-0052) - 20 mA to 5V Current Input Adapter	(D20CS-U-U-U-U-F-U-U-U-U-U) - 20 mA to 5V Current Input Adapter [530-0052]
(530-0086) - 50 mA to 5V Current Input Adapter	(D20CS-U-U-U-U-G-U-U-U-U-U) - 50 mA to 5V Current Input Adapter [530-0086]

D20C Second Slot of Analog Adapter Modules

Legacy Part Number and Description	Smart Catalog Number Prefix and Description
D20 Combination Second Slot of Analog Adapters – Legacy Part Number	D20 Combination Second Slot of Analog Adapters – New Part Number
(530-0004) - D20C Voltage Input Adapter	(D20CS-U-U-U-U-1-U-U-U-U-U) - Voltage Input Adapter [530-0004]
(530-0087) - 0.1mA to 5V Current Input Adapter	(D20CS-U-U-U-U-2-U-U-U-U-U) - 0.1mA to 5V Current Input Adapter [530-0087]
(530-0088) - 0.3mA to 5V Current Input Adapter	(D20CS-U-U-U-U-3-U-U-U-U-U) - 0.3mA to 5V Current Input Adapter [530-0088]
(530-0089) - 0.5mA to 5V Current Input Adapter	(D20CS-U-U-U-U-4-U-U-U-U-U) - 0.5mA to 5V Current Input Adapter [530-0089]
(530-0050) - 1 mA to 5V Current Input Adapter	(D20CS-U-U-U-U-5-U-U-U-U-U) - 1 mA to 5V Current Input Adapter [530-0050]
(530-0090) - 1 mA to 5V Current Input Adapter [High Precision]	(D20CS-U-U-U-U-6-U-U-U-U-U) - 1 mA to 5V Current Input Adapter [High Precision] [530-0090]
(530-0091) - 1.1 mA to 5V Current Input Adapter	(D20CS-U-U-U-U-7-U-U-U-U-U) - 1.1 mA to 5V Current Input Adapter [530-0091]
(530-0094) - 1.25 mA to 5V Current Input Adapter	(D20CS-U-U-U-U-8-U-U-U-U-U) - 1.25 mA to 5V Current Input Adapter [530-0094]
(530-0095) - 1.5 mA to 5V Current Input Adapter	(D20CS-U-U-U-U-9-U-U-U-U-U) - 1.5 mA to 5V Current Input Adapter [530-0095]
(530-0051) - 2 mA to 5V Current Input Adapter	(D20CS-U-U-U-U-A-U-U-U-U-U) - 2 mA to 5V Current Input Adapter [530-0051]
(530-0108) - 2 mA to 5V Current Input Adapter [High Precision]	(D20CS-U-U-U-U-B-U-U-U-U-U) - 2 mA to 5V Current Input Adapter [High Precision] [530-0108]
(530-0086) - 2.5 mA to 5V Current Input Adapter	(D20CS-U-U-U-U-C-U-U-U-U-U) - 2.5 mA to 5V Current Input Adapter [530-0086]
(530-0045) - 2mA to 1V Current Input Adapter	(D20CS-U-U-U-U-D-U-U-U-U-U) - 2mA to 1V Current Input Adapter [530-0045]
(530-0131) - 12.8 mA to 5V Current Input Adapter	(D20CS-U-U-U-U-E-U-U-U-U-U) - 12.8 mA to 5V Current Input Adapter [530-0131]
(530-0052) - 20 mA to 5V Current Input Adapter	(D20CS-U-U-U-U-F-U-U-U-U-U) - 20 mA to 5V Current Input Adapter [530-0052]
(530-0086) - 50 mA to 5V Current Input Adapter	(D20CS-U-U-U-U-G-U-U-U-U-U) - 50 mA to 5V Current Input Adapter [530-0086]

D20C Output Adapters

Legacy Part Number and Description	Smart Catalog Number Prefix and Description
D20 Combination Output Adapters - Legacy Part Number	D20 Combination Output Adapters - New Part Number
(530-0083) - Voltage Output Adapter	(D20CS-U-U-U-U-H-U-U-U-U-U) - Voltage Output Adapter [530-0083]
(530-0079) - 1mA Current Output Adapter	(D20CS-U-U-U-U-I-U-U-U-U-U) - 1mA Current Output Adapter [530-0079]

(530-0080) - 5mA Current Output Adapter	(D20CS-U-U-U-U-U-J-U-U-U-U) - 5mA Current Output Adapter [530-0080]
(530-0081) - 10mA Current Output Adapter	(D20CS-U-U-U-U-U-K-U-U-U-U) - 10mA Current Output Adapter [530-0081]
(530-0082) - 20mA Current Output Adapter	(D20CS-U-U-U-U-U-L-U-U-U-U) - 20mA Current Output Adapter [530-0082]

D20C WESDAC Daughter Cards

Legacy Part Number and Description	Smart Catalog Number Prefix and Description
D20 Combination WESDAC Daughter Cards - Legacy Part Number	D20 Combination WESDAC Daughter Cards - New Part Number
(540-0162) - WESDAC D20C D.20 Wesmaint Interface (LV)	(D20CS-U-U-U-U-U-U-U-U-U-A) - WESDAC D20C LV Wesmaint Interface Module [540-0162]
(540-0209) - WESDAC D20C D.20 Wesmaint Interface (HV)	(D20CS-U-U-U-U-U-U-U-U-U-B) - WESDAC D20C HV Wesmaint Interface Module [540-0209]
(540-0166) - WESDAC D20C Analog I/O	(D20CS-U-U-U-U-U-U-U-U-U-C) - WESDAC D20C LV 8 Analog Input / 8 Analog Output Expansion Module [540-0166]
(540-0159) - WESDAC D20C Analog I/P (LV)	(D20CS-U-U-U-U-U-U-U-U-U-D) - WESDAC D20C LV 16 Analog Input Expansion Module [540-0159]
(540-0205) - WESDAC D20C Analog I/P (HV)	(D20CS-U-U-U-U-U-U-U-U-U-E) - WESDAC D20C HV 16 Analog Input Expansion Module [540-0205]
(540-0227) - WESDAC D20 CHV Analog I/O DB	(D20CS-U-U-U-U-U-U-U-U-U-F) - WESDAC D20C HV 8 Analog Input / 8 Analog Output Expansion Module [540-0227]

B.4 D20 Control Modules, Spare Cross-Reference

Legacy and new part numbers are listed for:

- D20K WESTERM Modules
- D20K WESDAC Modules
- DNP3K WESDAC Modules

D20K WESTERM Modules

Legacy Part Number and Description	Smart Catalog Number Prefix and Description
WESTERM Modules – Legacy Part Number	WESTERM Modules - New Part Number Prefix
(517-0164) - WESTERM D20K Type 1 Version 1	(D20K-TL-P-UU) - D20K LV (20-60VDC or D.20 Power), Compression Termination
(517-0164-CC) - WESTERM D20K Type 1 Version 1 (Conformal Coated)	(D20K-TL-P-CU) - D20K LV (20-60VDC or D.20 Power), Compression Termination, Conformal Coated
(517-0143) - WESTERM D20 KR	(D20K-TL-D-UU) - D20KR LV (20-60VDC or D.20 Power), DB25 Termination
(517-0143-CC) - WESTERM D20 KR (Conformal Coated)	(D20K-TL-D-CU) - D20KR LV (20-60VDC or D.20 Power), DB25 Termination, Conformal Coated
(517-0218) - WESTERM D20KX W/TB Plugs	(D20K-TL-X-UU) - D20KX LV (20-60VDC or D.20 Power), Compression Disconnect Termination
(517-0218-CC) - WESTERM D20KX W/TB Plugs (Conformal Coated)	(D20K-TL-X-CU) - D20KX LV (20-60VDC or D.20 Power), Compression Disconnect Termination, Conformal Coated
(517-0242) - WESTERM D20 K4Z	(D20K-TH-P-UU) - D20K4Z HV (40-150VDC or D.20 Power), Compression Termination
(517-0242-CC) - WESTERM D20 K4Z (Conformal Coated)	(D20K-TH-P-CU) - D20K4Z HV (40-150VDC or D.20 Power), Compression termination, Conformal Coated
(517-0242 - ECC) - WESTERM D20 K4Z - Epoxy Conformal Coat	(D20K-TH-P-EU) - D20K4Z HV (40-150VDC or D.20 Power), Compression Termination, Epoxy Conformal Coated
(517-0220) - WESTERM D20KR Type 2	(D20K-TL-D-UW) - D20KR TYPE 2 LV (20-60VDC or D.20 Power), DB25 Termination with Wire-Wrap adapter option
(517-0250) - WESTERM D20 OKR	(D20K-TL-D-UR) - D20 OKR LV (20-60VDC or D.20 input), Compression Termination, redundant D.20 and PS Input

D20K WESDAC Modules

Legacy Part Number and Description	Smart Catalog Number Prefix and Description
WESDAC Modules – Legacy Part Number	WESDAC Modules - New Part Number Prefix
(508-0101) - WESDAC D20K Type 1 Version 1	(D20K-DL-U-UU) - WESDAC D20K LV
(508-0101-CC) - WESDAC D20K Type 1 Version 1 (Conformal Coated)	(D20K-DL-U-CU) - WESDAC D20K LV, Conformal Coated
(508-0102) - WESDAC D20K HV	(D20K-DH-U-UU) - WESDAC D20K HV
(508-0102-CC) - WESDAC D20K HV (Conformal Coated)	(D20K-DH-U-CU) - WESDAC D20K HV, Conformal Coated
(508-0102-ECC) - WESDAC D20 KHV - Epoxy Conformal Coat	(D20K-DH-U-EU) - WESDAC D20K HV, Epoxy Conformal Coated

DNP3K WESDAC Modules

Legacy Part Number and Description	Smart Catalog Number Prefix and Description
DNP 3 Control Modules - Legacy Part Number	DNP 3 Control Modules – New Part Number Prefix
(508-0301) - DNP I/O Module - Control	(D20K-3L-U-UU)- WESDAC D20K LV, DNP3 Communications
(508-0301-CC) - DNP I/O Module - Control (Conformal Coated)	(D20K-3L-U-CU)- WESDAC D20K LV, DNP3 Communications, Conformal Coated
(508-0302) - DNP I/O Module - Control HV	(D20K-3H-U-UU)- WESDAC D20K HV, DNP3 Communications
(508-0302-CC) - DNP I/O Module - Control HV (Conformal Coated)	(D20K-3H-U-CU)- WESDAC D20K HV, DNP3 Communications, Conformal Coated

B.5 D20 Status Modules, Spare Cross-Reference

Legacy and new part numbers are listed for:

- D20S WESTERM Modules
- D20S WESDAC Modules
- DNP3S WESDAC Modules
- D20S RNET Adapter Pack

D20S WESTERM Modules

Legacy Part Number and Description	Smart Catalog Number Prefix and Description
WESTERM Modules – Legacy Part Number	WESTERM Modules - New Part Number Prefix
(517-0165) - WESTERM D20S TYPE 1 VERSION 1	(D20S-TL-P-U-S)- D20S LV (20-60VDC or D.20 Power) Compression Termination
(517-0165-CC) - WESTERM D20S TYPE 1 VERSION 1 - Conformal Coated	(D20S-TL-P-C-S)- D20S LV (20-60VDC or D.20 Power) Compression Termination, Conformal Coated
(517-0165-ECC) - WESTERM D20S TYPE 1 VERSION 1 - Epoxy Conformal Coated	(D20S-TL-P-E-S)- D20S LV (20-60VDC or D.20 Power) Compression Termination, Epoxy Conformal Coated
(517-0179) - WESTERM D20 SD	(D20S-TL-D-U-S)- D20SD LV (20-60VDC or D.20 Power) DB25 Termination
(517-0179-CC) - WESTERM D20 SD - Conformal Coated	(D20S-TL-D-C-S)- D20SD LV (20-60VDC or D.20 Power) DB25 Termination, Conformal Coated
(517-0179-ECC) - WESTERM D20 SD - Epoxy Conformal Coated	(D20S-TL-D-E-S)- D20SD LV (20-60VDC or D.20 Power) DB25 Termination, Epoxy Conformal Coated (517-0179-ECC)
(517-0219) - WESTERM D20SX W/TB PLUGS	(D20S-TL-X-U-S)- D20SX LV (20-60VDC or D.20 Power) Compression/Disconnect Termination
(517-0219-CC) - WESTERM D20SX W/TB PLUGS - Conformal Coated	(D20S-TL-X-C-S)- D20SX LV (20-60VDC or D.20 Power) Compression/Disconnect Termination Conformal Coated
(517-0219-ECC) - WESTERM D20SX W/TB PLUGS - Epoxy Conformal Coated	(D20S-TL-X-E-S)- D20SX LV (20-60VDC or D.20 Power) Compression/Disconnect Termination Epoxy Conformal Coated (517-0219-ECC)
(517-0327) - WESTERM D20SB	(D20S-TL-B-U-S)- D20SB LV (20-60VDC or D.20 Power) Barrier Termination
(517-0327-CC) - WESTERM D20SB - Conformal Coated	(D20S-TL-B-C-S)- D20SB LV (20-60VDC or D.20 Power) Barrier Termination, Conformal Coated
(517-0327-ECC) - WESTERM D20SB - Epoxy Conformal Coated	(D20S-TL-B-E-S)- D20SB LV (20-60VDC or D.20 Power) Barrier Termination, Epoxy Conformal Coated
(517-0330) - WESTERM D20 SDI, 24V	(D20S-TL-D-U-I-024)- D20SDI-24 LV (20-60VDC or D.20 Power) DB25 Termination
(517-0331) - WESTERM D20 SDI, 48V	(D20S-TL-D-U-I-048)- D20SDI-48 LV (20-60VDC or D.20 Power) DB25 Termination
(517-0262) - WESTERM D20 SDI, 125V	(D20S-TL-D-U-I-125)- D20SDI-125 LV (20-60VDC or D.20 Power) DB25 Termination
(517-0252) - WESTERM D20 OSD	(D20S-TM-D-U-G-048)- D20 OSD LV (20-60VDC or D.20 Power), DB25 Termination, Redundant D.20 and PS Input
(517-0241) - WESTERM D20 SZ 48V	(D20S-TH-P-U-G-048)- D20SZ HV (40-150 VDC Power) Compression Termination
(517-0241-CC) - WESTERM D20 SZ 48V - Conformal Coated	(D20S-TH-P-C-G-048)- D20SZ HV (40-150 VDC Power) Compression Termination, Conformal Coated
(517-0249) - WESTERM D20 SZ 110V	(D20S-TH-P-U-G-110)- D20SZ HV (40-150 VDC Power) Compression Termination

(517-0249-ECC) - WESTERM D20 SZ 110V - Epoxy Conformal Coated	(D20S-TH-P-E-G-110)- D20SZ HV (40-150 VDC Power) Compression Termination, Epoxy Conformal Coated
(517-0266) - WESTERM D20 SZ2 (110/220V)	(D20S-TH-P-U-S)- D20SZ HV (40-150 VDC Power) Compression Termination
(517-0366) - WESTERM D20 SZ WITH PLUGS(48V)	(D20S-TH-X-U-G-048)- D20SZ HV (40-150 VDC Power) Compression/Disconnect Termination
(517-0377) - WESTERM D20 SZ WITH PLUGS (24V)	(D20S-TH-X-U-G-024)- D20SZ HV (40-150 VDC Power) Compression Termination

D20S WESDAC Modules

Legacy Part Number and Description	Smart Catalog Number Prefix and Description
WESDAC Modules – Legacy Part Number	WESDAC Modules - New Part Number Prefix
(507-0101) - WESDAC D20S Type 1 Version 1	(D20S-DL-U-U-U)- WESDAC D20S LV
(507-0101-CC) - WESDAC D20S Type 1 Version 1- Conformal Coated	(D20S-DL-U-U-C)- WESDAC D20S LV Conformal Coated
(507-0103) - WESDAC D20S HV2	(D20S-DH-U-U-U)- WESDAC D20S HV
(507-0103-CC) - WESDAC D20S HV2 - Conformal Coated	(D20S-DH-U-U-C)- WESDAC D20S HV Conformal Coated
(507-0103-ECC) - WESDAC D20S HV2 - Epoxy Conformal Coated	(D20S-DH-U-U-E)- WESDAC D20S HV Epoxy Conformal Coated

DNP3S WESDAC Modules

Legacy Part Number and Description	Smart Catalog Number Prefix and Description
DNP I/O Module Spares - Legacy Part Number	DNP I/O Module Spares – New Part Number Prefix
(507-0301) - DNP I/O MODULE - DIGITAL INPUT	(D20S-3L-U-U-U)- WESDAC D20S LV, DNP3 Communications
(507-0301-CC) - DNP I/O MODULE - DIGITAL INPUT - Conformal Coated	(D20S-3L-U-U-C)- WESDAC D20S LV, DNP3 Communications, Conformal Coated
(507-0303) - DNP I/O MODULE - DIGITAL INPUT HV	(D20S-3H-U-U-U)- WESDAC D20S HV, DNP3 Communications
(507-0303-CC) - DNP I/O MODULE - DIGITAL INPUT HV - Conformal Coated	(D20S-3H-U-U-C)- WESDAC D20S HV, DNP3 Communications, Conformal Coated

D20S RNET Adapter Packs

Legacy Part Number and Description	Smart Catalog Number Prefix and Description
D20 RNET Adapter Packs – Legacy Part Number	RNET Options – New Part Number
(245-0009) - 12V Digital Input Adapter	(D20S-U-U-U-U-U-012-U-U-U) - 12 V Digital Input Adapter - Set of 25
(245-0030) - 24V Digital Input Adapter	(D20S-U-U-U-U-U-024-U-U-U) - 24 V Digital Input Adapter - Set of 17
(245-0029) - 24V Digital Input Adapter	(D20S-U-U-U-U-U-024-U-U-U) - 24 V Digital Input Adapter - Set of 8
(245-0004) - 48V Digital Input Adapter	(D20S-U-U-U-U-U-048-U-U-U) - 48 V Digital Input Adapter - Set of 25
(245-0012) - 110V Digital Input Adapter	(D20S-U-U-U-U-U-110-U-U-U) - 110 V Digital Input Adapter - Set of 24
(530-0133) - 125V Digital Input Adapter	(D20S-U-U-U-U-U-125-U-U-U) - 125 V Digital Input Adapter - Set of 25
(530-0133) - 220V Digital Input Adapter	(D20S-U-U-U-U-U-220-U-U-U) - 220 V Digital Input Adapter - Set of 24

MODIFICATION RECORD

Version	Revision	Date	Change Description
2.00	2	Jul 27, 2007	Modified the notes on Page 45 and 46 to state that the DCD and CTS must be disabled for RS 485 to function correctly (CC 20070623-0003)
	3	Jan 9, 2008	Added product safety and regulatory compliance info.
		Jan 22, 2008	Added notices regarding RS-232 Switch Panel.
	4	Jun 12, 2008	Added safety note to p. 4.
	5	Aug 18, 2008	Removed reference to documents that are unavailable.
	6	Sep 16, 2008	Added RS485 pinout and wiring schematics to p. 61,62.
	7	Mar 2, 2009	Added transient suppression note to p. 62.
	8	Jul 21, 2011	Updated Technical Support contact information
	9	Mar 3, 2014	Added Replacement Fuse part numbers to table (see p118)
	10	Aug 7, 2014	Updated section: - D20EME Main Board and Available Options (part numbers 526-2116, 526-2117, and 526-2118). Added sections: - Remove configuration data content. - Specifications and Supported Standards - Downloading firmware (extracted from TN0001) - Troubleshooting D20/D200 serial communications (extracted from TN0016) - Troubleshooting firmware version mismatches (extracted from TN0018) - D.20 Link Power Options (extracted from TN0019) - Removing Hardcoded D20 Passwords (extracted from TN0020) - D20ME II RS-485 port transient suppression (extracted from TN0022) - D20A & D20C - Calibrating Analog I/O (extracted from TN0031) - Modify pSOS Buffers - Re-initializing D20 Peripherals 580-0299 D200 Power Supply Switch (115/230 VAC input voltage selection on +5V VERO power supply) (extracted from TN0028) 526-2110 Discontinuance (extracted from PRBT-0294) - Appendix B: D20 Spare Cross-Reference tables
	11	Jul 29, 2015	Updated Product Support and Safety > Hazardous Voltages section
	12	Nov 6, 2015	Added EAC compliance content and added RoHS compliance.

