

# Multilin D20MX



## Simple to Advanced Substation Automation Control

Distribution and transmission industries are under pressure to ensure that their grids are reliable and to prolong the usability of their assets. Data from these assets can be collected, aggregated and processed, to provide visibility of system conditions. The Multilin™ D20MX Substation Controller is a specialized computing platform designed to execute communications and energy management applications for the monitoring and control of electrical substations. The D20MX is capable of amalgamating data from multiple slave devices and D20 I/O modules connected via communication channels into a single database using various protocols. The D20MX can execute local logic, compile data, process it through one of multiple applications and report the results upstream to master stations through different server protocols.

The D20MX represents the next innovation in GE's cyber secure RTU technology for NERC-CIP environments. The D20MX is built upon the field-proven Multilin D20 technologies and continues the tradition of reliable automation and control through high quality and long term product availability.

## Key Benefits

- Reduces legacy D20/D200 RTU upgrade expenditures by over 50% through backwards compatibility with existing D20/D200 installed accessories, such as chassis, modems and D20 I/O peripheral modules
- Supports multiple partitions which eases the upgrade of D200 multi-processor configurations
- Minimizes operation and maintenance costs of existing D20-based SCADA infrastructure by leveraging existing designs, processes and infrastructure
- Introduces a new and modern network security feature suite that enables effective compliance with NERC® CIP requirements through the application of native cyber security features built into the D20MX Substation Controller

## Applications

### Data Concentrator

Automatically consolidates collected information from intelligent electrical devices (IEDs), such as relays and meters, and communicates to SCADA, EMS, DMS and Data Historian systems

### Protocol Converter

Translates different data message formats between devices to support interoperability

### Local Automation Platform

Implements popular distribution automation applications such as capacitor bank control, outage prevention programs, feeder resource optimization and control interlocking, inhibition and subgrouping

## Economical Life Extension

- Backward compatible with earlier D20/D200 RTU chassis, simplifying upgrades and reducing associated time and costs
- Modular hardware platform combines functions onto a single board, eliminates add-on expansion memory cards and cables, and decreases service time and maintenance effort
- Employs super capacitors, extending operation and availability, retaining system clock and eliminating the need to plan for and replace dead batteries

## Cyber Security and Risk Management

- Supports CyberArk functionality and RSA Authentication for remote access & industry standard cyber security features enabling NERC/CIP interoperability
- Syslog integration into enterprise system assists with audit compliance
- SSH and SFTP provide secure firmware and configuration file transfer
- Secure flash delete of customer information - No need to return D20MX to factory for re-imaging

## Flexible and Reliable

- Configurable redundant and dual LAN options with built-in dual Ethernet communication ports
- Alias IP address provides simultaneous communications with both redundant and dual LAN devices
- Multiple and simultaneous SCADA protocols for communication to multiple masters
- Supports up to 35 serial ports all with full modem control
- Supports up to 32 secondary IP addresses



## Advanced Controller

The Multilin D20MX Substation Controller collects, filters, and sorts data from a wide range of intelligent devices (RTUs, relays, meters) in the substation. The D20MX preserves original data time stamps for accurate sequence of event (SOE) logs, allowing data from large diverse geographic regions and time zones to be analyzed in extreme detail. Data can be presented simultaneously to multiple SCADA hosts. The D20MX comes with a built-in suite of protocols and security applications to facilitate integration with various substation devices and SCADA hosts.

D20MX is the sixth generation of D20 CPUs designed to provide a smooth migration path for D20 users to extend the life of aging D20 systems. It introduces a new and modern network security feature suite that enables effective compliance with NERC-CIP requirements, using open and trusted standards and protocols that allow integration with modern cyber security systems and tools.

## Advanced Substation Controller Connectivity

### Sample Enterprise Protocols:

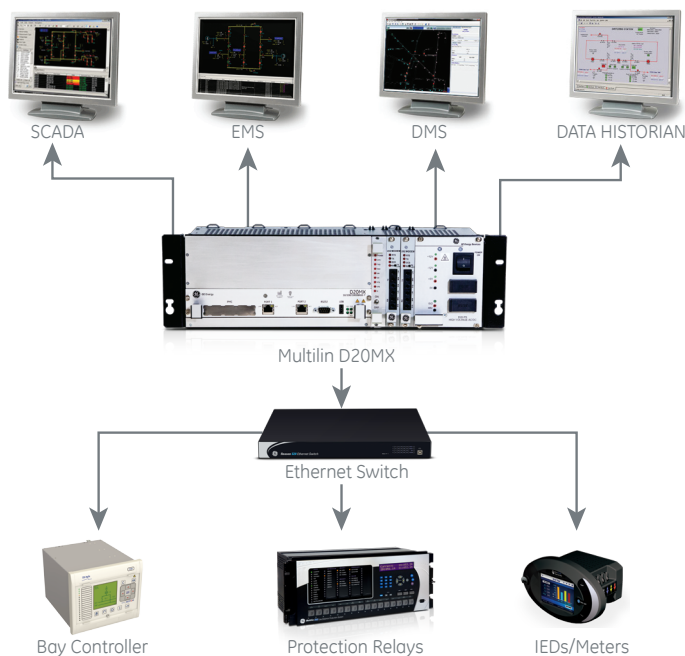
- DNP3 serial and Ethernet [TCP/UDP/IP]
- Tejas V
- HR6000/XA-21
- Modbus serial (RTU or ASCII)
- IEC 101/104
- LG-8979
- PG&E

### D20MX Media Connectivity:

- 7 - 35 serial ports (RS232)
- Built-in dual Ethernet ports
- (10/100/1000 Base TX or 100 Base FX) Dual D.20 communication ports

### Sample Device Protocols:

- DNP3 serial and Ethernet [TCP/UDP/IP]
- Modbus serial (RTU or ASCII)
- IEC 101/104
- SEL
- IRIG-B support



## D20MX Controller Main Connectivity Applications

GE P/N	SERVER PROTOCOLS [DPA]	V1.1	V1.2	V1.3	V1.4	V1.5	V1.6
B021-0	DNP3 DPA	•					
A068	MODBUS DPA	•					
A033-5	TEJAS V DPA	•					
A185-0	LG 8979 DPA		•				
A009	PG&E DPA		•				
A101-0	IEC 60870-5-101/104 DPA		•				
A003	HARRIS 6000/XA-21 DPA		•				
A135-0	MODBUS TCP/IP DPA			•			
A023	CDC TYPE I DPA			•			
A147-BN	SINAUT 8FM 1024 (DPDM)						•

GE P/N	CLIENT PROTOCOLS [DCA]	V1.1	V1.2	V1.3	V1.4	V1.5	V1.6
B023-0	DNP3 DCA	•					
A059	MODBUS DCA	•					
A078-0	SEL DCA		•				
B060-0	IEC 60870-5-101/104 DCA		•				
A131-0	MODBUS TCP/IP DCA			•			
A018	QUANTUM METER SCANNER DCA			•			
A194-0	COOPER 2179 DCA				•		
B080-0	IEC 60870-5-103 DCA				•		
A098-0	COURIER DCA					•	
A074	PML DCA					•	
A081-0N	PSI QUAD 4 PLUS DCA						•

GE P/N	DATA TRANSLATION APPLICATIONS [DTA]	V1.1	V1.2	V1.3	V1.4	V1.5	V1.6
A030	ACCUMMULATOR FREEZE DTA	•					
A035	ANALOG REFERENCE DTA	•					
A118	FAILOVER DTA	•					
A184-0	GENERAL ALARM DTA	•					
B009	MAILBOX DTA	•					

GE P/N	DATA TRANSLATION APPLICATIONS [DTA]	V1.1	V1.2	V1.3	V1.4	V1.5	V1.6
A123-0	NGC GENERAL DTA	•					
A113	PROGRAMMABLE SYNCHRO CHECK RELAY DTA	•					
A036	PROLOGIC EXECUTOR DTA	•					
A027	SOE LOGGER DTA	•					
A088-0	SUBSTATION MAINTENANCE DTA	•					
A027-1	COMMUNICATIONS WATCHDOG	•					
A083-0	CALCULATOR DTA	•					
A195	REDUNDANT I/O DTA		•				
B099-0	SNTP CLIENT DTA		•				
B082-0	LOGICLINX EXECUTOR DTA		•				
A041-1	PROPORTIONAL INTEGRATOR DERIVATIVE CONTROL DTA		•				
B148	TIME ZONE AND DST SETTING DTA			•			
A017	DNP V1.00 DATA LINK DTA			•			
A161-0	SECONDARY MASTER TRIP/CLOSE DTA				•		
A121-0	AUTOMATIC FREQUENCY SELECTION DTA				•		
A048	STATUS COMBINATION DTA				•		
A104-0N	ALARM GROUPING DTA				•		
A193-0	TOP OF THE HOUR ANALOG AVERAGING DTA				•		
A186-0	WESTERN POWER DISTRIBUTION (WPD) DTA				•		
B119-1N	LAN REDUNDANCY MANAGER DTA				•		
A065	CL&P DTA					•	
A064	TAP POSITION INDICATION DTA						•
A040-0N	DIGITAL TO ANALOG VALUE CONVERSION DTA						•
A119-0	PRINTMETER DTA						•
A132-0	AUTOMATIC VOLTAGE CONTROL DTA						•
A138-0	AUTOMATIC VOLTAGE CONTROL TRANSFORMER SIMULATOR DTA						•
A206-0N	TAP POSITION INDICATION - TYPE 1 DTA						•
B046-0N	COMMUNICATION STATISTICS DISPLAY DTA						•
B062-0N	DATA DISPLAY DTA						•

## D20MX Classic, Advanced Automation and Multi-Partition Applications

APPLICATION ID	NAME
D20MX CLASSIC APPLICATIONS	
A009N	PG&E DPA
A033-5N	TEJAS V DPA
A036N	ProLogic Executor DTA
A113N	Programmable Synchrocheck Relay DCA
A185-0N	8979 DPA
A199-0N	HR6000/XA-21 DPA
A041-1	Proportional Integrator Derivative Control DTA
A018	Quantum Meter Scanner DCA
A023N	CDC Type I DPA
A017N	DNP V1.00 Data Link DTA
A194-0	Cooper 2179 DCA
A119-0	Printometer DTA

APPLICATION ID	NAME
D20MX ADVANCED AUTOMATION APPLICATIONS	
B082-0N	LogicLinX Executor
A138-0	Automatic Voltage Control Simulator
A132-0	Automatic Voltage Control DTA
D20MX MULTI-PARTITION SUPPORT APPLICATIONS	
B003	D.20 Peripheral Link DCA
B082-0N	LogicLinX Executor
A138-0	Automatic Voltage Control Simulator
A132-0	Automatic Voltage Control DTA
A083-0	Calculator DTA

### Upgrade of Legacy D20/D200 RTUs

The Multilin D20MX is more than an RTU. It's a commitment to the ongoing long term availability of GE's automation products. Utilities have large investments in hardwired automation systems.

Like everything else, this industrial equipment has a lifecycle that moves from infancy to normal operation, and eventually to the wear out stages. As a piece of equipment ages it fails more frequently, takes longer to repair, and eventually reaches the end of its life. Re-design and forklift replacements require utilities to re-engineer substation designs, replace field wiring, and retrain staff to manage and maintain the system, which is a costly endeavor.

The Multilin D20MX provides a cost-effective alternative to upgrades of legacy D20/D200 RTUs. This means that the investments made in GE's automation systems keep paying dividends beyond their originally projected end of life. Simply replace the failed or end of life Multilin D20 processor module with a Multilin D20MX and migrate the device configuration to extend the life of the existing D20 Controller. Add cyber security features for integration into NERC-CIP environments. As technology changes with market demands, GE continues to invest in a partnership with their customers through advanced modular design principals.

### D20MX Upgrade Process

	RTU UPGRADE SOLUTION	D20MX UPGRADE SOLUTION
	Full replacement of existing D20/D200 Unit and existing I/O modules	<b>Upgrade CPU to D20MX</b> <ul style="list-style-type: none"> <li>• Retain existing I/O modules</li> <li>• Retain I/O infrastructure</li> <li>• Migrate to modern technologies</li> </ul>
<b>INSTALLATION COST</b>		
Modify field wiring	Yes	Not required
Modify engineering drawings	Yes	Not required
Building expansion	May be required	Not required
Marshaling panels	May be required	Not required
Outages	Yes	Minimal
<b>MAINTENANCE</b>		
Modify operation processes	Yes	Not required
Retrain operations personnel	Yes	Minimal
<b>CYBER SECURITY</b>		
Built-in cyber security features	Unknown	Yes
Proprietary solutions	Unknown	Modern open industry standards

### Integration of D20 Substation Controllers into NERC-CIP Environments

The Multilin D20MX supports a comprehensive set of security functions to allow a seamless integration with existing IT department policies. Built-in cyber security features, such as Remote Authentication Dial-In User Service (RADIUS), Role Based Access Control (RBAC), and user activity logging, provide a complete security toolkit required to enable effective compliance with NERC-CIP requirements, using open and trusted standards and protocols, that allow integration with modern cyber security systems and tools.

#### RADIUS

RADIUS is a client/server networking protocol that provides centralized authentication, authorization, and accounting (AAA) management for computers to connect and use a network service. With RADIUS each user in your system has their own unique identification login, allowing you to control who gets access to what devices from where. RADIUS provides centralized AAA management for computers to connect to the D20MX.

If one of the current users of your D20MX leaves your company, you can lock down access to all the devices in your network from a central location. That user instantly loses access to every D20MX, while other users remain able to do their jobs without any adverse effects and costly password change programs.

#### AAA Network Access

Radius servers use the AAA concept to manage network access by following a few steps referred to as AAA transactions.

#### Authentication

The user sends a request to gain access to a particular resource using access credentials, typically, in the form of user name and password. The RADIUS server verifies the user's credentials and accepts or rejects access. The D20MX supports primary and secondary RADIUS servers. If for any reason the D20MX is not able to authenticate the user against the RADIUS servers, the D20MX verifies the user's credentials against a local password file.

### Authorization

In a typical centralized user authentication system, access terms are defined on a per user basis. For example, the following authorization attributes may be associated for a specific user:

- Specific D20MX IP address to be accessed by the user
- Role ID assigned to the user, where role ID defines which commands and displays the user is able to access on the D20MX
- Allowed time-of-day during which users can access the network

### Accounting

When access is granted to the user, their activity can be registered for security, system integrity monitoring and statistical purposes. For example, the following user’s activity can be recorded:

- User information
- Login time stamp
- Logout time stamp

The D20MX provides accounting information by logging the user’s activity to a remote syslog server.

### RBAC

RBAC is achieved using RADIUS or the D20MX’s internal database, ensuring only authenticated and authorized users gain access to the system.

When you configure the D20MX to use RADIUS, each D20MX user is identified by a role ID, which is an integer number provided by the RADIUS server. The D20MX makes your life easier by including a pre-configured default RBAC model.

When using RADIUS, revoking user privileges system-wide is as simple as updating the centralized user database, saving you time and money.

DESCRIPTION	ADMIN	ENGINEER	OPERATOR	OBSERVER
CAN CHANGE PASSWORD	YES	NO	NO	NO
CAN CLEAR LOGIN BUFFER	NO	NO	NO	NO
CAN CHANGE SCADA	YES	YES	NO	NO
CAN DOWNLOAD FIRMWARE	YES	YES	NO	NO
CAN PERFORM OPERATIONAL CONTROL (E.G.: BREAKER OPERATIONS)	YES	YES	YES	NO
CAN VIEW OPERATIONAL DATA	YES	YES	YES	YES

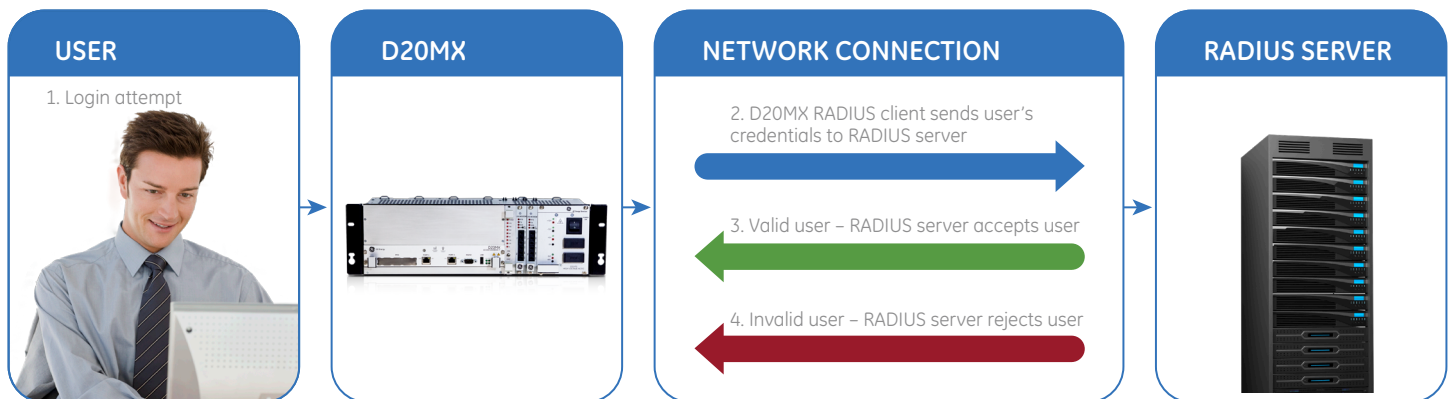
### Advanced Automation

Since releasing the first generation D20 back in 1988, GE’s automation experts have learned a lot. Through challenging projects and installations across the globe, the D20 has evolved into a leader in substation automation. The culmination of that experience is the sixth generation, the Multilin D20MX. The following are a sample of the advanced automation features available today.

### Substation Maintenance

If there is one thing operators hate, it’s false alarms. The D20MX can suppress reporting of input points while they are unavailable during maintenance. This allows users to disable groups of analog and digital input points by ignoring their actual data and quality changes within selected applications. While points are suppressed, a predefined suppression value and the point suppression quality flag are provided instead. This is useful during maintenance operations to prevent spurious OFFLINE alarms and inaccurate readings while devices are powered off or disconnected during the execution of maintenance activities.

## Centralized Authentication and Authorization



### Accumulator Freeze

Monitoring constantly incrementing and changing values, such as time of use, and energy consumption across a system, makes accurate comparisons of data a time-consuming effort. GE's accumulator freeze application simplifies this process automatically by capturing the instantaneous value of accumulator records across the system at the same point in time, giving engineers and operators a clear understanding of the state of their system.

A popular example of the use of accumulators is energy metering, where pulse streams from meter pulse generators is proportional to energy flow. This feature allows users to define groups of accumulator points whose values are frozen periodically or on demand.

### Alarm Management

The D20MX manages alarms based on real substation experience. This application allows user-defined logical grouping of individual digital inputs to generate general alarms based on the status of the signals monitored within each group. Alarm groups are user-definable, with up to 32766 groups allowed. Status inputs may belong to as many groups as required.

The great flexibility of this application ensures that each group has its own meaningful description and configurable latching or non-latching operation modes. Latching alarms require operator acknowledgement for optimized management of critical conditions in the system.

### System Redundancy

Although the D20 family of RTUs is legendary for quality, GE has prepared for those rare cases when a processor is unable to function. Through time tested and utility accepted redundancy mechanisms, the D20MX is designed for high availability requirements. In redundant processor mode, one device stands waiting, ready to take over, should the other unit stop functioning.

Dual D20MX units can be deployed, creating a redundant system where accumulators are automatically synchronized between the two systems and configurations are synchronized on demand. Serial communication links are automatically switched between the units based on system health.

The D20MX has redundant Ethernet, enabling automatic switchover between two sets of Ethernet switches, ensuring there is no single point of failure in the system.

### Control Lockout

The control lockout feature ensures that only a single master station can access a group of controls at one time, and can lock out groups of controls to allow for safer local maintenance. Users can create custom control groups. Any digital output can be included in any control group.

### Analog Inputs Monitoring

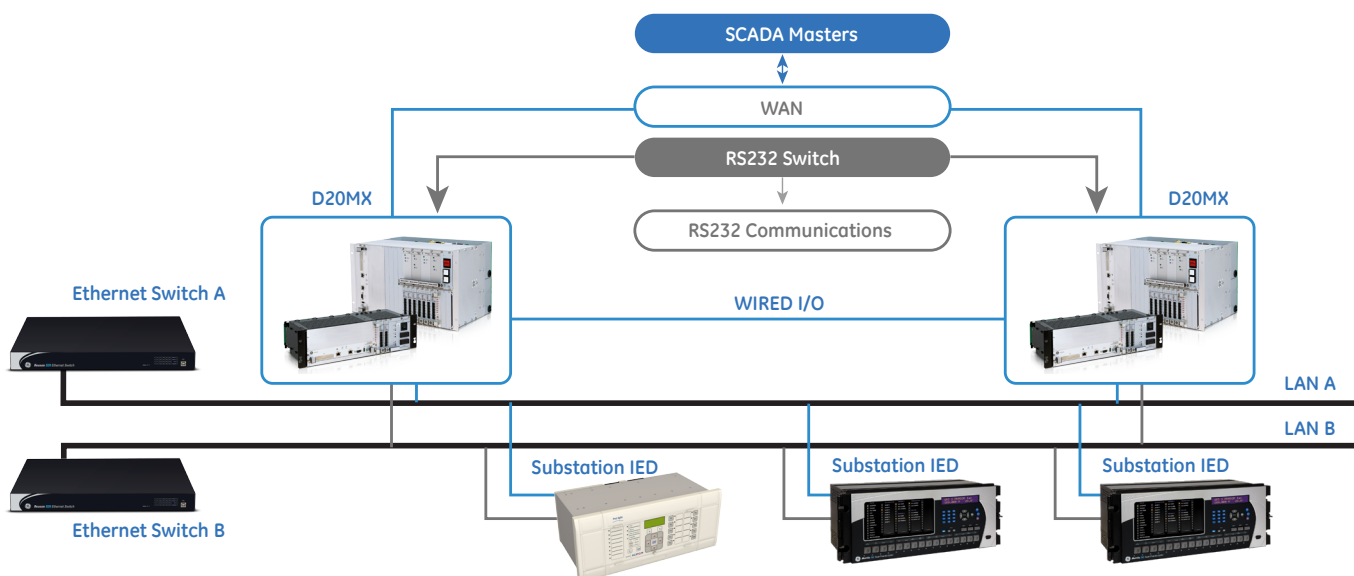
GE's analog reference provides enhanced and simplified monitoring of analog input monitoring equipment. Operators define a reference value used to compare against monitored signals. The application reports failures in analog input hardware, allowing effective maintenance of the monitoring devices, reduced downtime and increased reliability of the system.

### SGConfig Setup Software

The Multilin SGConfig software integrates support for the complete portfolio of GE's Substation Controllers, including the D20MX series. The SGConfig software introduces an updated graphical user interface while maintaining configuration processes and workflows available in the ConfigPro setup software.

Convenient access to product documentation and screencasts is provided directly from the SGConfig software. (Screencasts are short instruction videos on popular setup processes.)

## Typical Architecture for Redundant D20 Substation Control System

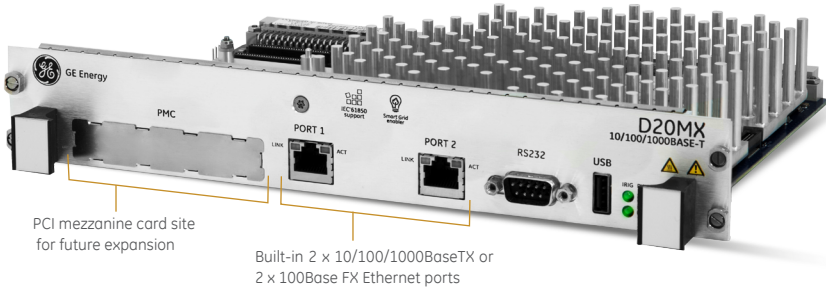




## Hardware Overview

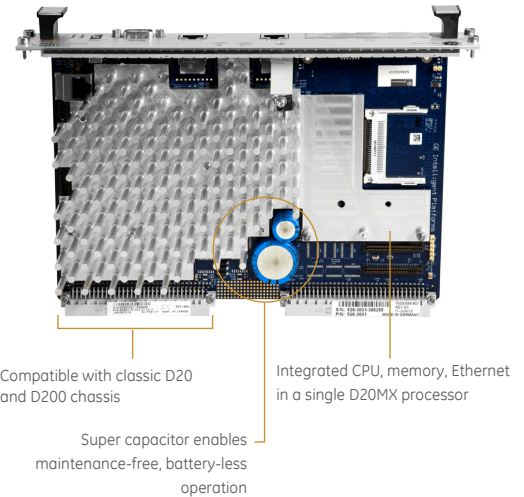
### Fully Equipped Out-of-the Box

Previous generations of D20/D200 RTUs required add-on system components and software to support Ethernet communications and optional memory expansion. The new D20MX is equipped by default with integrated memory, 10/100/1000BASE-TX or 100BASE-FX IEEE 802.3 compliant communications and a core load firmware with a comprehensive set of key substation automation applications.



### Backwards Compatibility

The Multilin D20MX is an embedded single board computer powered by a 667 Mhz PowerQUICC II Pro processor pin-for-pin compatible unit with existing D20 processors and accessories, such as chassis, D20 remote I/O peripherals, modems.



## Technical Specifications

SYSTEM	
<b>PROCESSOR:</b>	667 MHz embedded PowerQUICC II Pro
<b>MEMORY</b>	<ul style="list-style-type: none"> <li>1024 MB of 266 MHz DDR2 RAM with ECC</li> <li>16 MB NVRAM for persistent event storage</li> </ul>
<b>STORAGE</b>	<ul style="list-style-type: none"> <li>8 MB boot flash</li> <li>256 MB firmware flash</li> </ul>
<b>OPERATING SYSTEM:</b>	VxWorks
<b>LED INDICATORS</b>	<ul style="list-style-type: none"> <li>System status: Power, Ready</li> <li>Ethernet port status: Link and Activity status per port</li> <li>Power supply: Power</li> <li>IRIG: Flashes when active</li> </ul>
COMMUNICATIONS	
<b>NETWORK CONNECTIONS</b>	<ul style="list-style-type: none"> <li>Dual redundant Ethernet interface</li> <li>Twisted Pair</li> <li>10/100/1000BaseTX (Isolated RJ-45 connector)</li> <li>100BaseFX (Fiber Optic: 1300 nm, 50/125 µm, 62.5/125 µm multi-mode duplex fiber cable, ST connectors)</li> </ul>
<b>SERIAL COMMUNICATIONS</b>	<ul style="list-style-type: none"> <li>D.20 Link, 2 channels</li> <li>Data rate: 250 kbps</li> <li>Surge protected to ±2000 V peak</li> <li>D20MX main board supports 7x serial channels and 2x D.20 link channels.</li> <li>With serial expansion processor card, system supports 2 additional D.20 link channels and up to 28 additional serial channels</li> <li>RS-232, 7 to 35 CHANNELS                             <ul style="list-style-type: none"> <li>5-signal (TXD, RXD, RTS#, CTS#, DCD#) DTE ports</li> <li>Data rate: independently-selectable; refer to the application configuration guides.</li> </ul> </li> </ul>
<b>MAINTENANCE PORT</b>	<ul style="list-style-type: none"> <li>RS-232, 1 channel/ 2 ports</li> <li>2-signal (TXD, RXD)</li> <li>Data rate: 19200 (default)</li> </ul>

RATED POWER SUPPLIES	
<b>AC-DC:</b>	100 to 240 V AC (±10%) 143 W output maximum
Minimum/Maximum AC voltage:	90V AC / 265 V AC 100 to 300 V DC (±10%) 143 W output maximum
Minimum/Maximum DC voltage:	88 V DC / 330 V DC
<b>DC-DC:</b>	20 to 55 V DC (±10%) 135 W maximum Minimum/Maximum DC voltage: 18 V DC / 60 V DC
PEAK INRUSH CURRENT AT 25 °C ON COLD START	
<b>AC-DC :</b>	50 A, max at 230 V AC
<b>DC-DC:</b>	50 A, max at 230 V AC
<b>RATED FREQUENCY:</b>	50/60 Hz nominal (47 to 63 Hz) (AC/DC)

PHYSICAL	
<b>OVERALL HEIGHT:</b>	40.34 mm (1.588 in.)
<b>WIDTH:</b>	261.87 mm (10.31 in.)
<b>DEPTH:</b>	160 mm (6.3 in.)
<b>D20MX WEIGHT:</b>	0.7 kg (1.65 lb.)
<b>FIBER CARD WEIGHT:</b>	0.2 kg (0.35 lb.)

BATTERY SHIPPING RESTRICTIONS	
The D20MX does not contain a battery and is therefore not affected by US DOT or ICAO shipping restrictions.	
<b>MATERIAL/FINISH:</b>	Galvannealed steel with black power coat

KIT PACKAGE	
<b>LENGTH:</b>	49.5 cm (19.5 in.)
<b>WIDTH:</b>	34.3 cm (13.5 in.)
<b>HEIGHT:</b>	15.2 cm (6 in.)
<b>WEIGHT:</b>	2.54 kg (5.6 lb.)

ENVIRONMENTAL	
<b>OPERATING TEMPERATURE:</b>	0°C to +70°C
<b>Note:</b>	Do not operate the D20MX above 60°C for extended periods of time as this will shorten the life of the super capacitor and reduce the backup time of the real time clock.
<b>HUMIDITY RATING:</b>	5% to 95% relative humidity, non-condensing
ENVIRONMENTAL RATING	
<b>INGRESS PROTECTION:</b>	IP30 (IEC 60529)
<b>INSTALLATION/OVERVOLTAGE CATEGORY:</b>	CAT II (2)
<b>POLLUTION DEGREE:</b>	2
<b>USE:</b>	Indoor use only
<b>OPERATING ALTITUDE:</b>	Maximum altitude 3000 m (9480 feet) above sea level
<b>MTBF (MIL-HDBK-217):</b>	D20MX Processor Board <ul style="list-style-type: none"> <li>Non-VME with 10/100/1000BASE-TX copper: 449,616 hours at 40°C</li> <li>Non-VME with 100BASE-FX fiber optic: 265,657 hours at 40°C</li> </ul>

SOFTWARE	
<b>CONFIGURATION:</b>	Performed using SGConfig 7 and higher

## Standards &amp; Protection

EMISSION		
EN55011 (CISPR 11)	ISM RF equipment – Electromagnetic disturbance characteristics	Radiated Emissions 30 MHz to 1 GHz Conducted Emissions 150 kHz – 30 MHz
IMMUNITY		
IEC 61000-4-2	Electrostatic discharge (ESD) immunity test	
IEC 61000-4-3	Radiated, radio-frequency electromagnetic field immunity test	
IEC 61000-4-4	Electrical fast transient/burst immunity test	
IEC 61000-4-5	Surge immunity test	
IEC 61000-4-6	Immunity to conducted disturbances, induced by radio-frequency fields	
IEC 60255-22-6		
IEC 60255-22-1	1 MHz burst immunity test	
IEC 61000-4-8	Power frequency magnetic field immunity test	
IEC 61000-4-9	Pulse magnetic field immunity test	
IEC 60255-22-1	Damped Oscillatory and Ring wave	
IEC 61000-4-11	Voltage dips, short interruptions and voltage variations immunity tests	
IEC 61000-4-16	Test for immunity to conducted, common mode disturbances in the frequency range 0 Hz to 150 kHz	
IEC 61000-4-17	Ripple on DC input power port immunity test	
IEC 61000-4-29+	Voltage dips, short interruptions and voltage variations on DC input power port immunity test. This standard only applies when using high voltage DC as the source (100 V DC to 300 V DC).	
SAFETY		
EC 61010-1	Safety requirements for electrical equipment for measurement, control and laboratory use - General requirements	
IEC 60255-5	Insulation coordination for measuring relays and protection equipment – Requirements and tests	Dielectric and Resistance measurements not applicable due to design (TVS in circuit)
ENVIRONMENTAL		
IEC 60068-2-1	Cold	2 hours non powered, soak at -40 °C, then warm to -20 °C and leave powered for 16 hours
IEC 60068-2-22	Dry Heat	16 hours powered at +70 °C
IEC 60068-2-6	Vibration (sinusoidal)	A logarithmic sweep from 10 Hz to 150 Hz to 10 Hz at 1 oct/ min for 1 sweep cycle in the 3 orthogonal axes. Acceleration level 1 g
IEC 60068-2-27	Shock - Operating Response Test Shock - Non-Operating With - Stand Test	Pulse shape: Half sine Pulse duration: 11 ms <ul style="list-style-type: none"> <li>Operating Response Test: Acceleration level: 5 g's</li> <li>Non-Operating Withstand Test: Acceleration level: 15 g's</li> <li>3 pulses per polarity per axis for a total of 18 pulses</li> </ul>
IEC 60068-2-29	Bump – Non operating test	Pulse shape: Half sine Pulse duration: 11 ms Acceleration level: 10 g's 1000 pulses per polarity per axis for a total of 6000 pulses
IEC 60068-2-30	Damp heat, cyclic (12 h + 12 h cycle)	Dropping on each face Dropping on each corner
IEC 60068-2-31	Drop and topple	Toppling (or pushover) For a total of 12 drops
IEC 60068-2-78	Humidity Testing	96 hours steady state humidity at 40 °C and 93% RH

## Ordering Codes

### Multilin D20MX Substation Controller

D20MX	_*	*	*	*	*	*	*	*	*	*	*	U	*	Description
D20 MX CPU Options	A													(A) - D20MX dual 10/100/1000BASE-TX Ethernet Ports (front access)
	C													(C) - D20MX dual 100BASE-FX ST Ethernet Ports (front access)
	G													(G) - D20MX dual 100BASE-FX Ethernet Ports (rear access)
D20MX Power Supply	w													(A) - D20 Power Supply, 20-60VDC Input, 24V ISO Output
	B													(B) - D20 Power Supply, 20-60VDC Input, 48V ISO Output
	C													(C) - D20 Power Supply, 100-300VDC/85-264VAC Input, 24V ISO Output
	D													(D) - D20 Power Supply, 100-300VDC/85-264VAC Input, 48V ISO Output
D20MX Modem slots 1, 2 & 3		U	U	U										(U) - Empty slot with cover plate
		A	A	A										(A) - Wesdac D20 202 bin modem
		C	C	C										(C) - Telenetics 14400 baud modem 2-wire dial up
		D	D	D										(D) - Telenetics 14400 baud modem 4-wire leased line
		E												(E) - D20MX dual 100BASE-FX ST Media Interface Card
		F												(F) - D20MX dual 100 BASE-FX LC Media Interface Card
D20MX Serial Termination Panel Options					A									(A) - 19" Rack Mount Serial IO Western Panel
					B									(B) - D20 Chassis Rear Mounted Serial IO Western Panel
					C									(C) - D20 Chassis Rear Mounted Serial IO Western Panel w/Extended Bracket
D20MX firmware options						0	H							(0H) -D20MX firmware v1.40 (9600 baud)
						0	J							(0J) -D20MX firmware v1.40 (19200 baud)
						0	K							(0K) -D20MX firmware v1.50 (9600 baud)
						0	L							(0L) -D20MX firmware v1.50 (19200 baud)
						0	M							(0M) -D20MX firmware v1.60 (9600 baud)
						0	N							(0N) -D20MX firmware v1.60 (19200 baud)
						0	U							(0U) -D20MX firmware Latest Release (19200 baud)
						0	V							(0V) -D20MX firmware Latest Release (9600 baud)
D20MX D2X CLASSIC Applications License										U				(U) - Not required
										A				(A) - D2X CLASSIC APPLICATIONS
D20MX ADVANCED AUTOMATION Applications License											U			(U) - Not required
										B				(B) - ADVANCED AUTOMATION APPLICATIONS
Multi-Partition Support License											U			(U) - Not required
											C			(C) - Multi-Partition Support
FUTURE Feature												U		(U) - Not required
Serial Expansion													U	(U) - Not required
													A	(A) - 7 additional ports (14 ports total. 1x 19" Rack Mount Serial IO Western Panel included)
													B	(B) - 14 additional ports (21 ports total. 2x 19" Rack Mount Serial IO Western Panel included)
													C	(C) - 21 additional ports (28 ports total. 3x 19" Rack Mount Serial IO Western Panel included)

Note: The 19" Rack Mounted Serial IO Western Panel included with the Serial Expansion options must be installed directly below the D20 chassis



## Ordering Codes

## Upgrade Kits Order Codes

D20MXK	_*	*	*	*	*	*	*	*	U	*	Description
D20 MX CPU Options	A										(A) - Upgrade Kit for D20 Horizontal chassis - Multi Slot
	B										(D) - Upgrade Kit for D20 Horizontal chassis - Single Slot
	C										(C) - D20MX CPU only
	E										(E) - Serial Expansion only for D20 Horizontal chassis
D20MX CPU Options	A										(A) - D20MX dual 10/100/1000BASE-TX Ethernet Ports (front access)
	C										(C) - D20MX dual 100BASE-FX ST Ethernet Ports (front access)
	G										(G) - D20MX dual 100BASE-FX Ethernet Ports (rear access)
	U										(U) - Not required
D20MX Media Interface Card Options		U									(U) - Not required
		E									(E) - D20MX dual 100BASE-FX ST Media Interface Card
		F									(F) - D20MX dual 100 BASE-FX LC Media Interface Card
D20MX Firmware Options			0	H							(0H) - D20MX firmware v1.40 (9600 baud)
			0	J							(0J) - D20MX firmware v1.40 (19200 baud)
			0	K							(0K) -D20MX firmware v1.50 (9600 baud)
			0	L							(0L) -D20MX firmware v1.50 (19200 baud)
			0	M							(0M) -D20MX firmware v1.60 (9600 baud)
			0	N							(0N) -D20MX firmware v1.60 (19200 baud)
			0	U							(0U) -D20MX firmware Latest Release (19200 baud)
			0	V							(0V) -D20MX firmware Latest Release (9600 baud)
			U	U							(UU) -Not required
D20MX D2X CLASSIC Applications License					U						(U) - Not required
					A						(A) - D2X CLASSIC APPLICATIONS
D20MX ADVANCED AUTOMATION Applications License						U					(U) - Not required
						B					(B) - ADVANCED AUTOMATION APPLICATIONS
Multi Partition							U				(U) - Not required
							C				(C) - Multi-Partition Support
FUTURE Feature								U			(U) - Not required
Serial Expansion									U		(U) - Not required
									A		(A) - 7 additional ports (14 ports total)
									B		(B) - 14 additional ports (21 ports total)
									C		(C) - 21 additional ports (28 ports total)

Note: Serial IO Western panel not included with SE in kits. This is a D20MX upgrade kit, RTU already has SIO panel.



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