Multilin™ C60

BREAKER PROTECTION SYSTEM

Breaker monitoring and control for substation and industrial automation

KEY BENEFITS

- Complete breaker control, monitoring and integration in a single platform
- Complete IEC 61850 Process Bus solution providing resource optimization and minimizing total P&C lifecycle costs
- Reduced wiring through the use of high-speed peer-to-peer communication for accepting Trip and Close commands from other relays
- Advanced automation capabilities for providing customized protection and control solutions
- Ambient temperature monitoring with alarming when outside temperature exceeds upper thresholds

- Robust network security enabling Critical Infrastructure Protection through user command logging, and dual permission access control
- Modular hardware architecture allows for flexibility in device configurations to cover most breaker applications
- Advanced fault and disturbance recording, including internal relay operating signals thus eliminating the need for external recording devices
- Simplified system integration with communications supporting serial, Ethernet and multiple protocols
- Embedded IEC61850 Protocol

APPLICATIONS

- Stand-alone breaker monitoring and control
- Multiple breaker configuration control including Breaker-and-a-Half and Ring Bus

- Automatic Bus Transfer scheme using a single device
- As part of a distributed bay controller

FEATURES

Protection and Control
- Breaker failure
- Synchronism check
- Autoreclose and Open Pole Detector
- Phase, neutral and Auxiliary Overvoltage
- Neutral and Auxiliary overvoltage
- Thermal overload, Phase, ground and neutral Overcurrent
- Sensitive directional power
- Dual breaker control

Communication
- Networking interfaces – 100Mbit Fiber Optic Ethernet, RS485, RS232, RS422, G.703, C37.94
- Multiple Protocols - IEC61850, DNP 3.0 Level 2, Modbus RTU, Modbus TCP/IP, IEC60870-5-104, Ethernet Global Data (EGD)
- Direct I/O – secure, high-speed exchange of data between URs for Direct Transfer Trip and I/O Extension applications
- Embedded Managed Ethernet Switch with 4 - 100 Mbit Fiber optic ports and 2 copper ports

IEC 61850 Process Bus Interface
- Robust communications with up to 8 HardFiber Bricks
- Seamless integration with existing C60 functions
- Redundant architecture for dependability and security

Monitoring and Metering
- Metering - current, voltage, power, energy, frequency
- Oscillography – analog and digital parameters at 64 samples/cycle
- Breaker monitoring - accumulated wear and operation time, number of operations, breaker flashover and trip coil monitoring
- Event Recorder - 1024 time tagged events with 0.5ms scan of digital inputs
- Fault Locator
- Setting Security Audit Trail for tracking changes to C60 configuration

EnerVista™ Software
- Graphical Logic Designer and Logic Monitor to simplify designing and testing procedures
- Document and software archiving toolset to ensure reference material and device utilities are up-to-date

Digital Energy

Protection and Control

The C60 Breaker Protection System is a substation hardened controller that provides a complete integrated package for the protection, control, and monitoring of circuit breakers. The C60 supports dual-breaker busbar configurations such as breaker-and-a-half or ring bus arrangements. Signals from up to 4 sets of CT's can be brought into the C60 for internal summation which is advantageous by still having the individual currents available for metering and additional protection elements that operate on individual currents.

The C60 provides fast and deterministic execution of programmable logic and extensive I/O options that are necessary for substation automation applications.

All of the necessary control logic functions are available for creating automated breaker control schemes such as the popular Main-Tie-Main scheme using a single C60 device.

Using high-speed peer-to-peer communications for inter-device messaging, the C60 can also accept breaker opening, closing and lock-out commands from other devices at a fraction of the cost of hard-wiring these signals.

As part of the UR Family, the C60 provides superior protection and control including:

C60 - Protection, Metering, Monitoring and Control
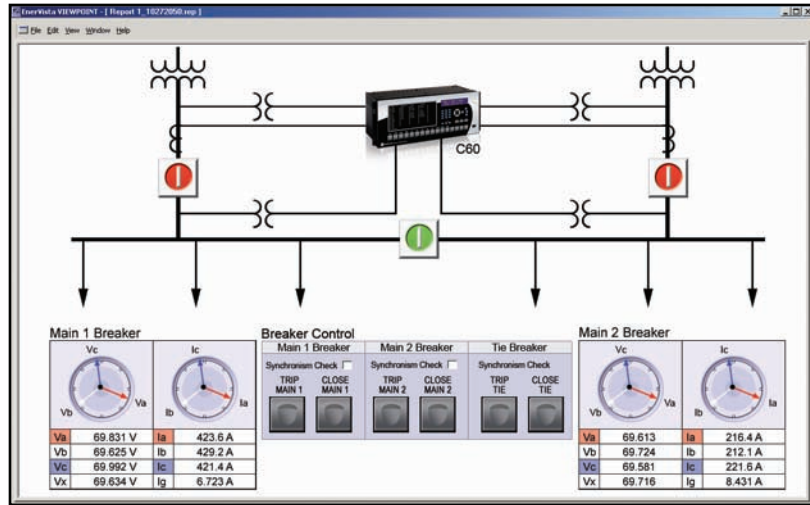
The C60 is the single point for protection, control, metering, and monitoring in one integrated device that can easily be connected directly into DCS or SCADA monitoring and control systems like Viewpoint Monitoring as shown.

Breaker Failure

The breaker failure functions included in the C60 is available to detect breaker failure conditions for both single and three-pole tripping schemes. The C60 provides two independent breaker failure functions, and all of the current source inputs, digital inputs and digital outputs need to perform breaker failure functions on dual breaker schemes such as breaker-and-a-half or ring bus arrangements. Breaker failure initiation and transfer tripping signals can be done using hardwired contacts or through communications (IEC61850 and Direct I/O).

Autorecloser

The C60 provides multi shot auto-reclosure for single pole or three pole auto-reclose on all types of faults with independently settable dead time for each shot. The protection settings can be changed

Functional Block Diagram
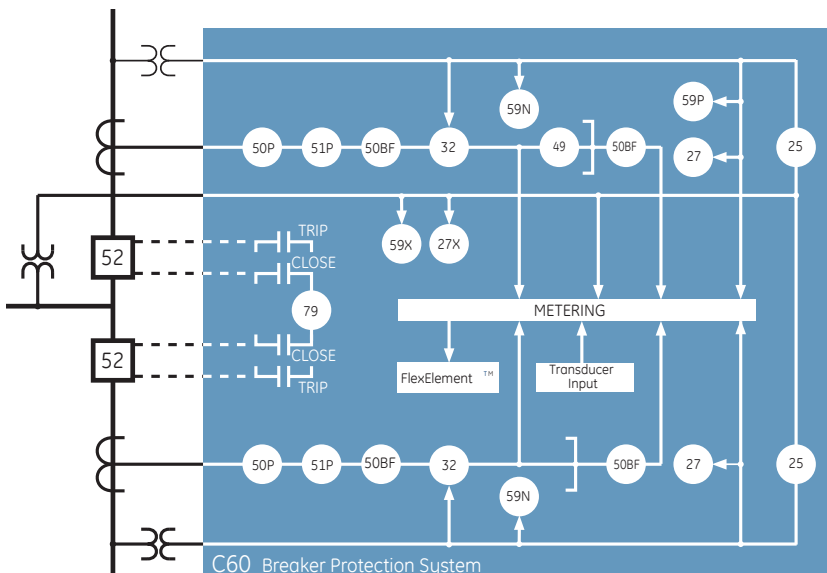
ANSI Device Numbers & Functions

Device Number	Function
25	Synchrocheck
27P	Phase Undervoltage
27X	Auxiliary Undervoltage
32	Directional Power
49	Thermal Overload
50G	Ground Instantaneous Overcurrent
50N	Neutral Instantaneous Overcurrent
50P	Phase Instantaneous Overcurrent
51G	Ground Time Overcurrent
51N	Neutral Time Overcurrent
51P	Phase Time Overcurrent
59N	Neutral Overvoltage
59P	Phase Overvoltage
59X	Auxiliary Overvoltage
79	Autoreclose
50BF	Breaker Failure

between shots (typical application being an accelerated zone 1 extension scheme). Auto-reclosure also can be dynamically blocked by user programmable logic. Four different auto-relcose modes are available enabling the users to select reclosure mode to suit specific applications.

Synchrocheck

The C60 monitors voltage difference, phase angle difference and slip frequency to ensure proper breaker closure as per user defined settings. C60 provides additional enhancements in synchronizing by checking dead source conditions for synchronism bypass under these conditions.

Overcurrent and Thermal Elements

Overcurrent protection is delivered through instantaneous and time overcurrent elements available for phase, neutral, ground and sensitive ground protection. Most of the standard protection curves are provided. Thermal overload elements as per IEC 255-8 standard are also available.

Sensitive Directional Power

Two separate directional power elements are provided to detect reverse and low forward power conditions for use in IEEE 1547 DG interconnection anti-islanding protection
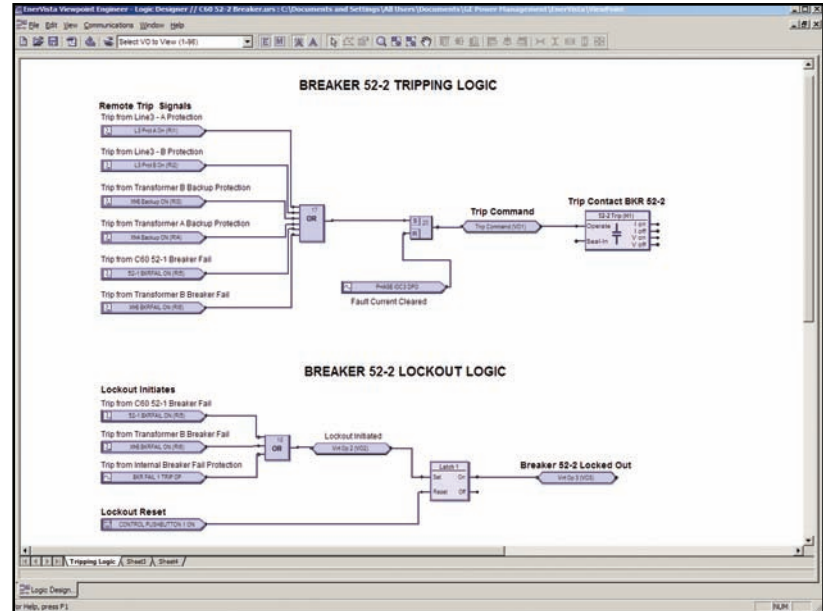
Breaker Control

The C60 allows for control of up to two breakers through commands given to it from either local or remote users. The C60 front panel can have 16 user configurable pushbuttons that can be used to select and operate the breaker functions. Each button can be customized and labeled for easy operator identification. The C60 can also accept breaker operation commands from remote users through one of the many available communication protocols including Modbus, DNP3.0, IEC61850, and IEC60870-5-104.

IEC 61850 Process Bus

The IEC 61850 Process Bus module is designed to interface with the GE Multilin HardFiber System, allowing bi-directional IEC 61850 fiber optic communications. The HardFiber System is designed to

Flexlogic Designer

Flexlogic™ allows for creating customized C60 breaker control schemes that include receiving Tripping and Closing commands from other devices and creating logic to replace the need for external lockout relays.

integrate seamlessly with the existing Universal Relay applications, including protection functions, FlexLogic, metering and communications.

The GE Multilin HardFiber System offers the following benefits:

- Communicates using open standard IEC 61850 messaging
- Drastically reduces P&C design, installation and testing labor by eliminating individual copper terminations
- Integrates with existing C60's by replacing traditional CT/VT inputs with IEC 61850 Process Bus module
- Does not introduce new Cyber Security concerns

Visit the HardFiber System product page on the GE Multilin web site for more details.

Advanced Automation

The C60 incorporates advanced automation features including powerful FlexLogic™ programmable logic, communication, and SCADA capabilities that far surpass what is found in the average breaker relay or controller. The C60 integrates seamlessly

with other UR relays for complete breaker management including reclosing, load shedding, and synchronism applications.

FlexLogic™

FlexLogic™ is the powerful UR-platform programming logic engine that provides the ability of creating customized protection and control schemes thereby minimizing the need, and the associated costs, of auxiliary components and wiring. Using FlexLogic™, the C60 can be programmed to provide the required logic for performing complete breaker control in schemes that may include simple single breaker management, equipment backup protection as well as sophisticated automatic transfer schemes.

Scalable Hardware

The C60 is available with a multitude of I/O configurations to suit the most demanding application needs. The expandable modular design allows for easy configuration and future upgrades.

- Multiple CT/VT configurations allow for implementation of many different schemes, including single and dual breaker applications

- Flexible, modular I/O covering a broad range of input signals and tripping schemes
- RTDs and DCmA inputs are available to monitor equipment parameters such as temperature & pressure

Monitoring and Metering

The C60 includes high accuracy metering and recording for all AC signals. Voltage, current, and power metering are built into the relay as a standard feature. Current and voltage parameters are available as total RMS magnitude, and as fundamental frequency magnitude and angle.

Fault and Disturbance Recording

The advanced disturbance and event recording features within the C60 can significantly reduce the time needed for postmortem analysis of power system events and creation of regulatory reports. Recording functions include:

- Sequence of Event (SOE)
  - 1024 time stamped events
- Oscillography,
  - 64 digital & up to 40 Analog channels

- Data Logger, disturbance recording – 16 channels up to 1 sample / cycle / channel
- Fault Reports
  - Powerful summary report of pre-fault and fault values

The very high sampling rate and large amounts of storage space available for data recording in the C60 can eliminate the need for installing costly standalone recording equipment.

Advanced Device Health Diagnostics

The C60 performs comprehensive device health diagnostic tests during startup and continuously at runtime to test its own major functions and critical hardware. These diagnostic tests monitor for conditions that could impact security and availability of protection, and present device status via SCADA communications and front panel display. Providing continuous monitoring and early detection of possible issues helps improve system uptime.

- Comprehensive device health diagnostic performed during startup

- Monitors the CT/VT input circuitry to validate the integrity of all signals

Communications

The C60 provides advanced communications technologies for remote data and engineering access, making it easy and flexible to use and integrate into new and existing infrastructures. Direct support for fiber optic Ethernet provides high-bandwidth communications allowing for low-latency controls and high-speed file transfers of relay fault and event record information. The available redundant Ethernet option and the embedded managed Ethernet switch provide the means of creating fault tolerant communication architectures in an easy, cost-effective manner without the need for intermediary communication hardware. The C60 supports the most popular industry standard protocols enabling easy, direct integration into DCS and SCADA systems.

- IEC61850
- DNP 3.0
- Ethernet Global Data (EGD)
- IEC60870-5-104
- Modbus RTU, Modbus TCP/IP

Power System Troubleshooting

The C60 contains tools that allow for early detection of impending breaker problems and allow for maintenance to be performed before serious damage occurs.
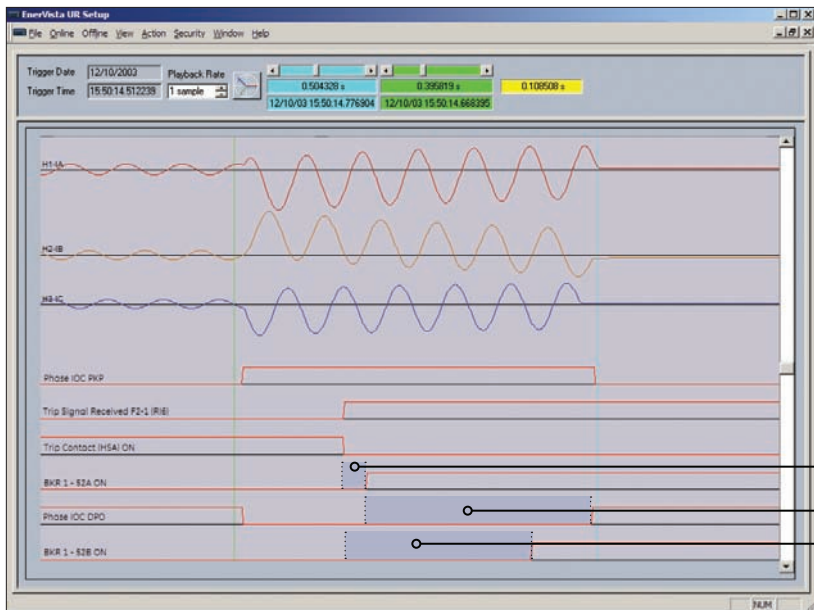
Triggering a waveform on each breaker operation can identify changes in the length of time each part or mechanism in the breaker takes to perform its function.

Breaker Latch Release Time:
Indicates how long it took for the breaker latch to release from the time the Trip Coil was energized by the relay

Arc Extinguish Time
Indicates the length of time that was required for the breaker to extinguish the arc and finally clear the fault

Breaker Mechanism Travel Time:
Indicates time interval required for the breaker mechanism to travel to its rest position

Interoperability with Embedded IEC61850

Use the C60 with integrated IEC61850 to lower costs associated with breaker protection, control and automation. GE Multilin's leadership in IEC61850 comes from 1000's of installed devices and follows on seven years of development experience with UCA 2.0.

- Replace expensive copper wiring between devices with direct transfer of data using GOOSE messaging
- Configure systems based on IEC61850 and also monitor and troubleshoot them in real-time with EnerVista™ Viewpoint Engineer
- Integrate GE Multilin IEDs and generic IEC61850-compliant devices seamlessly in EnerVista™ Viewpoint Monitoring

Direct I/O Messaging

Direct I/O allows for sharing of high-speed digital information between multiple UR relays via direct back-to-back connections or multiplexed through a standard DS0 multiplexer channel bank. Regardless of the connection method, Direct I/O provides continuous real-time channel monitoring that supplies diagnostics information on channel health.

Direct I/O provides superior relay-to-relay communications that can be used in advanced interlocking, generation rejection and other special protection schemes.

- Communication with up to 16 UR relays in single or redundant rings rather than strictly limited to simplistic point-to-point configurations between two devices
- Connect to standard DS0 channel banks through standard RS422, G.703 or IEEE C37.94 interfaces or via direct fiber optic connections
- No external or handheld tester required to provide channel diagnostic information

Multi-Language

The C60 supports English, French, Russian, and Chinese languages on the front panel, EnerVista™ setup software, and product manual. Easily switch between English and an additional language on the local displays without uploading new firmware.

EnerVista™ Software

The EnerVista™ Suite is an industry-leading set of software programs that simplifies every aspect of using the C60 relay. The EnerVista™ suite provides all the tools to monitor the status of your the protected asset, maintain the relay, and integrate information measured by the C60 into DCS or SCADA monitoring systems. Convenient COMTRADE and Sequence of Events viewers are an integral part of the UR Setup software included with every UR relay, to carry out postmortem event analysis to ensure proper protection system operation.

EnerVista™ Launchpad

EnerVista™ Launchpad is a powerful software package that provides users with all of the setup and support tools needed for configuring and maintaining GE Multilin products. The setup software within Launchpad allows configuring devices in real-time by communicating using serial, Ethernet, or modem connections, or offline by creating setting files to be sent to devices at a later time.

Simplifying Fault and Disturbance Analysis

The events recorded in multiple GE devices can be collected and merged into a single station wide Sequence of Events Record to simplify the tracking of substation operations

Included in Launchpad is a document archiving and management system that ensures critical documentation is up-to-date and available when needed. Documents made available include:

- Manuals
- Application Notes
- Guideform Specifications
- Brochures
- Wiring Diagrams
- FAQ's
- Service Bulletins

Viewpoint Monitoring

Viewpoint Monitoring is a simple-to-use and full-featured monitoring and data recording software package for small systems. Viewpoint Monitoring provides a complete HMI package with the following functionality:

- Plug-&-Play Device Monitoring

- System Single-Line Monitoring & Control
- Annunciator Alarm Screens
- Trending Reports
- Automatic Event Retrieval
- Automatic Waveform Retrieval

Viewpoint Engineer

Viewpoint Engineer is a set of powerful tools that will allow the configuration and testing of UR relays at a system level in an easy-to-use graphical drag-and-drop environment. Viewpoint Engineer provides the following configuration and commissioning utilities:

- Graphical Logic Designer
- Graphical System Designer
- Graphical Logic Monitor
- Graphical System Monitor

Viewpoint Maintenance

Viewpoint Maintenance provides tools that will create reports on the operating status of the relay, simplify the steps to download fault and event data, and reduce the work required for cyber-security compliance audits. Tools available in Viewpoint Maintenance include:

- Settings Security Audit Report
- Device Health Report
- Single Click Fault Data Retrieval

EnerVista™ Integrator

EnerVista™ Integrator is a toolkit that allows seamless integration of GE Multilin devices into new or existing automation systems. Included in EnerVista Integrator is:

- OPC/DDE Server
- GE Multilin Drivers
- Automatic Event Retrieval
- Automatic Waveform Retrieval

Specialized Protection & Control

User Interface

The C60 front panel provides extensive local HMI capabilities. The local display is used for monitoring, status messaging, fault diagnosis, and device configuration. User configurable messages that combine text with live data, can be displayed when user-defined conditions are met.

LED Indicators

Multi-Language Display
- English
- Russian
- French
- Chinese

User Programmable Pushbuttons

Typical Wiring

TYPICAL CONFIGURATION
THE AC SIGNAL PATH IS CONFIGURABLE

A
B
C

52

52

CONNECTION AS REQUIRED

CONNECTION AS REQUIRED

VOLTAGE INPUTS | CURRENT INPUTS
8F / 8G

VOLTAGE INPUTS | CURRENT INPUTS
8F / 8G

H5a +	CONTACT INPUT H5a
H5c +	CONTACT INPUT H5c
H6a +	CONTACT INPUT H6a
H6c +	CONTACT INPUT H6c
H5b −	COMMON H5b
H7a +	CONTACT INPUT H7a
H7c +	CONTACT INPUT H7c
H8a +	CONTACT INPUT H8a
H8c +	CONTACT INPUT H8c
H7b −	COMMON H7b
H8b	SURGE

DIGITAL INPUTS/OUPUTS   6G

P5a +	CONTACT INPUT P5a
P5c +	CONTACT INPUT P5c
P6a +	CONTACT INPUT P6a
P6c +	CONTACT INPUT P6c
P5b −	COMMON P5b
P7a +	CONTACT INPUT P7a
P7c +	CONTACT INPUT P7c
P8a +	CONTACT INPUT P8a
P8c +	CONTACT INPUT P8c
P7b −	COMMON P7b
P8b	SURGE

DIGITAL INPUTS/OUTPUTS   6G

H1 H1a H1b H1c
H2 H2a H2b H2c
H3 H3a H3b H3c
H4 H4a H4b H4c

VOLTAGE AND CURRENT SUPERVISION   TC₁

1 P1a P1b P1c
2 P2a P2b P2c
3 P3a P3b P3c
4 P4a P4b P4c

TC₂   VOLTAGE SUPERVISION

B1b	CRITICAL FAILURE
B1a	
B2b	
B3a −	48 VDC OUTPUT
B3b +	
B5b HI +	CONTROL POWER
B6b LO +	
B6a −	
B8a	SURGE FILTER
B8b	

POWER SUPPLY

DC
AC or DC

(DC ONLY)

GE Consumer & Industrial
Multilin

C60
BREAKER MANAGEMENT RELAY

CONTACTS SHOWN WITH NO CONTROL POWER

* Fibre Optic

Ground at Remote Device

Shielded twisted pairs

10BaseFL	NORMAL	COM 1
10BaseFL	ALTERNATE	
10BaseT		
D1a +	RS485 COM 2	
D2a −		
D3a com		
D4b +	IRIG-B Input	
D4a −		
BNC	IRIG-B Input	
BNC	IRIG-B Output	

9H

CPU

Co-axial
Co-axial

No. 10AWG Minimum

GROUND BUS

MODULES MUST BE GROUNDED IF TERMINAL IS PROVIDED

UR   COMPUTER

TXD 1   1 8
RXD 2   2 3   RXD
     3   3 2   TXD
     4   4 20
SGND 5   5 7   SGND
     6   6 6
     7   7 4
     8   8 5
     9   9 22

9 PIN CONNECTOR   25 PIN CONNECTOR

RS-232
DB-9
(front)

PERSONAL COMPUTER

MODULE ARRANGEMENT

X	W	V	U	T	S	R	P	N	M	L	K	J	H	G	F	D	B
							6		8			6		8		9	1
							Inputs/outputs		CT/VT			Inputs/outputs		CT/VT		CPU	Power Supply

(Rear View)

This diagram is based on the following order code:
C60-H00-HCL-F8F-H6G-M8F-P6G
This diagram provides an example of how the device is wired, not specifically how to wire the device. Please refer to the Instruction Manual for additional details on wiring based on various configurations.

Ordering

	C60 - * ** - H * * - F**- H**- M**-P** - U**-W**	For Full Sized Horizontal Mount
	C60 - * ** - V F * - F**- H**- M** #**	For Reduced Size Vertical Mount

Category	Code					Description
Base Unit	C60					Base Unit
CPU	I					RS485 + RS485 (IEC61850 option not available)
	E					RS485 + Multi-mode ST 10BaseF
	G					RS485 + Multi-mode ST Redundant 10BaseF
	H					RS485 + Multi-mode ST 100BaseFX
	J					RS485 + Multi-mode ST Redundant 100BaseFX
	K					RS485 + 10/100BaseT
	N					
	S					RS485 + 6 port, 100 Mbps, Managed Ethernet Switch
Software Options	00					No Software Options
	01					Ethernet Global Data
	03					IEC61850
	04					Ethernet Global Data
Mount	H					Horizontal (19" rack) - Standard
	A					Horizontal (19" rack) - Harsh Chemical Environment Option
	V					Vertical (3/4 size) - Standard
	B					Vertical (3/4 size) - Harsh Chemical Environment Option
User Interface	K					Enhanced English Front Panel
	L					Enhanced English Front Panel with User-Programmable Pushbuttons
	M					Enhanced French Front Panel
	N					Enhanced French Front Panel with User-Programmable Pushbuttons
	Q					Enhanced Russian Front Panel
	T					Enhanced Russian Front Panel with User-Programmable Pushbuttons
	U					Enhanced Chinese Front Panel
	V					Enhanced Chinese Front Panel with User-Programmable Pushbuttons
	F					Vertical Front Panel with English display
Power Supply	H					125 / 250 V AC/DC
	H				RH	125/250 V AC/DC with redundant 125/250 V AC/DC power supply
	L					24 - 48 V (DC only)
CT/VT DSP	8L		8L			Standard 4CT/4VT w/ enhanced diagnostics
	8M		8M			Sensitive Ground 4CT/4VT w/ enhanced diagnostics
	8N		8N			Standard 8CT w/ enhanced diagnostics
	8R		8R			Sensitive Ground 8CT w/ enhanced diagnostics
IEC 61850 Process Bus		81				8 Port IEC 61850 Process Bus Module
Digital I/O		XX	XX	XX	XX	XX	No module
		4A	4A	4A	4A	4A	4 Solid State (No Monitoring) MOSFET Outputs
		4C	4C	4C	4C	4C	4 Solid State (Current w/opt Voltage) MOSFET Outputs
		4L	4L	4L	4L	4L	14 Form-A (No Monitoring) Latchable Outputs
		67	67	67	67	67	8 Form-A (No Monitoring) Outputs
		6C	6C	6C	6C	6C	8 Form-C Outputs
		6D	6D	6D	6D	6D	16 Digital Inputs
		6E	6E	6E	6E	6E	4 Form-C Outputs, 8 Digital Inputs
		6F	6F	6F	6F	6F	8 Fast Form-C Outputs
		6K	6K	6K	6K	6K	4 Form-C & 4 Fast Form-C Outputs
		6L	6L	6L	6L	6L	2 Form-A (Current w/ opt Voltage) & 2 Form-C Outputs, 8 Digital Inputs
		6M	6M	6M	6M	6M	2 Form-A (Current w/ opt Voltage) & 4 Form-C Outputs, 4 Digital Inputs
		6N	6N	6N	6N	6N	4 Form-A (Current w/ opt Voltage) Outputs, 8 Digital Inputs
		6P	6P	6P	6P	6P	6 Form-A (Current w/ opt Voltage) Outputs, 4 Digital Inputs
		6R	6R	6R	6R	6R	2 Form-A (No Monitoring) & 2 Form-C Outputs, 8 Digital Inputs
		6S	6S	6S	6S	6S	2 Form-A (No Monitoring) & 4 Form-C Outputs, 4 Digital Inputs
		6T	6T	6T	6T	6T	4 Form-A (No Monitoring) Outputs, 8 Digital Inputs
		6U	6U	6U	6U	6U	6 Form-A (No Monitoring) Outputs, 4 Digital Inputs
		6V	6V	6V	6V	6V	2 Form-A (Cur w/ opt Volt) 1 Form-C Output, 2 Latching Outputs, 8 Digital Inputs
Transducer I/O		5A	5A	5A	5A	5A	4 dcmA Inputs, 4 dcmA Outputs
		5C	5C	5C	5C	5C	8 RTD Inputs
		5D	5D	5D	5D	5D	4 RTD Inputs, 4 dcmA Outputs
		5E	5E	5E	5E	5E	4 dcmA Inputs, 4 RTD Inputs
		5F	5F	5F	5F	5F	8 dcmA Inputs
Inter-Relay Communications						7A	820 nm, multi-mode, LED, 1 Channel
						7B	1300 nm, multi-mode, LED, 1 Channel
						7C	1300 nm, single-mode, ELED, 1 Channel
						7H	820 nm, multi-mode, LED, 2 Channels
						7I	1300 nm, multi-mode, LED, 2 Channels
						7J	1300 nm, single-mode, ELED, 2 Channels
						7S	G.703, 2 Channels
						7W	RS422, 2 Channels
						77	IEEE C37.94, 820 nm, multimode, LED, 2 Channel
						2B	IEEE C37.94, 1300nm, singlemode, ELED, 2 channel
						2S	6 port, 100 Mbps, Managed Ethernet Switch, HI (125/250V AC/DC)
						2T	6 port, 100 Mbps, Managed Ethernet Switch, LO (24-48 Vdc)

Accessories for the C60

- UR Applications I Learning CD — TRCD-URA1-C-S-1
- Multilink Ethernet Switch — ML2400-F-HI-HI-A2-A2-A6-G1
- Viewpoint Engineer — VPE-1
- Viewpoint Maintenance — VPM-1
- Viewpoint Monitoring IEC61850 — VP-1-61850

Visit www.GEMultilin.com/C60 to:

- View Guideform specifications
- Download the instruction manual
- Review applications notes and support documents
- Buy a C60 online
- View the UR Family brochure

Ordering Note: To view the latest options available for the C60, or to order the UR Classic Front Panel, please visit our online store for more details.