

Features

Bandcenter: Adjustable from 100 V to 135 V in 0.1 V increments.

Bandwidth: Adjustable from 1 V to 10 V in 0.1 V increments.

Line Drop Compensation: R and X compensation. Adjustable from –24 V to +24 V in 1 V increments. Z compensation available with adjustment of voltage raise from 0 V to +24 V, in increments of 1 V.

Time Delay: Definite; adjustable from 1 second to 120 seconds, in 1 second increments. Inverse; adjustable from 1 second to 120 seconds, in 1 second increments.

InterTap Time Delay: Used to introduce time delay between tap operations when control is in sequential mode; adjustable from 0 to 60 seconds in 1.0 second increments. Counter input required.

Selectable Outputs: Continuous or pulsed. Normally, an output (raise or lower) signal is maintained when the voltage remains outside the band. A pulsed output length is programmable from 0.2 to 12 seconds, in increments of 0.1 second.

Reverse Power Operation:

Transformer LTC Application: Can be set to ignore, block, regulate rev, or return to neutral operation with reverse power.

Single-Phase Regulators: If "keep track" tap position indication is applicable, unit may be set to "Return to Neutral" or "Regulate Reverse". The Regulate Reverse feature allows separate setpoints and regulation in the reverse direction without the installation of source-side VTs.

CT to VT Phasing Correction: Adjustable from 0° to +330° in 30° increments.

Real-Time Metering: The following measured and calculated values are available in real-time:

- Local Voltage
- Load kVA, or MVA
- Load Center Voltage
- Load kW, or MW
- Line Current
- Load kVAr, or MVAR
- Power Factor
- Line Frequency

Demand Metering: Time interval selected as 15, 30, or 60 minutes.

Drag Hands Operation:

The following "drag-hand" values are stored with date and time stamping and are averaged over 32 seconds:

- Minimum Local Voltage
- Maximum Local Voltage

The following "drag-hand" values are stored with date and time stamping and are calculated over the demand time interval (15, 30, or 60 minutes) as selected by the user:

- Maximum Primary Line Current
- Maximum Load kW, or MW
- Maximum Load kVAr, or MVAR
- Maximum Load kVA, or MVA (and Power Factor at time of Maximum Load kVA, or MVA)

Line Overcurrent Tapchange Inhibit: Adjustable from 200 mA to 640 mA of line current for 200 mA CT or 1.0 A to 3.2 A for 1 A CT display and 5.0 A to 16.0 A for 5 A CT display. External auxiliary CT required for 1.0 A and 5 A CT inputs.

Voltage Limits, Tap Position Limits, and Runback: Overvoltage and Undervoltage limits are independently adjustable from 95 V to 135 V in 0.1 V increments. Upper and lower tap position limits may be set by user, with tap position knowledge active. An adjustable deadband (above the overvoltage limit) of 1 V to 4 V is available, which can be used to set the runback limit.

Voltage Reduction: Three independent steps, each adjustable from 0% to 10% in 0.1% increments of the bandcenter setpoint.

External Inhibit of Auto Tapchange: Blocks automatic tapchanger operation in response to external contact closure.

Sequential or Non-Sequential Operation: Non-sequential operation resets the time delay upon momentary external contact closure at the non-sequential input.

Paralleling Methods:

Circulating Current: The circulating current method is standard, and may be implemented using separate balancing equipment such as the Beckwith Electric M-0115A Parallel Balancing Module. Consult with factory for use with existing external master-follower circuitry.

ΔVAR™: When specified, the ΔVAR1 method may be implemented by using separate balancing equipment such as the M-0115A Balancing Module. The ΔVAR2 method does not require the use of the M-0115A Balancing Module and is only applicable when paralleling two transformers.

For all methods of paralleling except ΔVAR2, overcurrent protection, such as that provided by the M-0127 Overcurrent Relay, is recommended.

VT Ratio Correction: VT correction from –15 V to +15 V in 0.1 V increments.

Self-Test Alarm Output Contacts: Alerts operator to loss of power or malfunction of control.

User-Programmable Alarm Contacts: Alerts operator to one or more of the following system conditions: Communications Block Invoked, Block Raise Voltage Limit Exceeded, Block Lower Voltage Limit Exceeded, Voltage Reduction (any step) Invoked, Reverse Power Flow Condition Detected, Line Current Limit Exceeded, Tap Block Raise in Effect, and Tap Block Lower in Effect.

Tap Position Knowledge

Transformer LTC: The optional M-2025B Current Loop Interface Module receives a signal from a position transducer and outputs to the GE-2011C through a bottom port.

Single-Phase Regulators: In most applications, tap position information can be maintained by means of an internal "keep track" logic.

Operations Counter: A software counter increments by one count per either an open/close/open contact operation (X1) or an open/close or close/open contact operation (X2), and is preset by the user. A count window mode registers any activity as a valid input within the count window time setting.

Resettable Operations Counter: A second software counter, similar to the operations counter, which may be reset by the user.

Harmonic Analysis: Provides the total harmonic distortion and the harmonic content of the load voltage and current up to the 31st harmonic (using GE-2029A with BECO 2200 protocol).

Tap Position Record: Provides a record of the number of times each tap position has been passed through (using GE-2029A with BECO 2200 protocol). The tap position record can be reset by the user.

AUTO/OFF/MANUAL Switch Status: Provides the user with the Auto/Off/Manual switch position status through the Comm ports. When the GE-2011C is configured for a switch status input, the switch status is read using the seal-in input on the control.

A or B Regulator Type: Allows the user to select the type of regulator being used to provide a more accurate source voltage calculation.

Inputs

Control Voltage Input: Nominal 120 V ac, 60 Hz (50 Hz optional); operates properly from 90 V ac to 140 V ac. If set at 60 Hz, the operating system frequency is from 55 to 65 Hz; if set at 50 Hz, the operating system frequency is from 45 to 55 Hz. The burden imposed on the input is 8 VA or less. The unit should be powered from a voltage transformer connected at the controlled voltage bus. The unit will withstand twice the voltage input for one second and four times the voltage input for one cycle.

Motor Power Input: Nominal 120 V ac to 240 V ac, at up to 6 A as required by the load, with no wiring changes required.

Line Current Input: Line drop compensation is provided by a current transformer input with a 0.2 A full scale rating. A Beckwith Electric model M-0121 (5 A to 0.2 A) or M-0169A (5 A or 8.66 A to 0.2 A) Auxiliary Current Transformer is available when required. The burden imposed on the current source is 0.03 VA or less at 200 mA. The input will withstand 400 mA for two hours and 4 A for 1 second.

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Circulating Current Input: Parallel operation of regulators or transformers is accommodated by a current transformer input with a 0.2 A full scale rating. The burden imposed on the current source is 0.03 VA or less at 200 mA. The input will withstand 400 mA for two hours and 4 A for 1 second.

Binary Inputs

Voltage Reduction 1 & 2 Inputs: These inputs provide three levels of programmable voltage reduction which can be manually invoked.

Neutral Position Detect: The Neutral Position Detect Input detects the neutral tap position, which allows for a more accurate tap position measurement when a positive tap position input is not used. This Neutral Position Detect input also allows the paralleling mode Delta Var 2 to be disabled.

Counter Input: The Counter Input detects tap position changes to provide for more precise control response. The Counter Input also allows the control to record the total number of tap changes.

Seal-in/Switch Status Input: When the Input Selection 1 configuration is set to "seal-in input", this input provides for detection of the seal-in state to operate the seal-in output. When "Input Selection 1" is set to Switch Status Input, this input provides the means to read the Auto/Manual switch position status using SCADA.

Non-Sequential/SCADA Block Input: When the Input Selection 2 configuration is set to "Nonseq Input", this input provides the means to perform non-sequential operations. When Input Selection 2 is set to "SCADA Blk Input", this input provides a means to block all write operations to the control from SCADA.

Outputs

Raise Output: Capable of switching 6 A at 120 Vac to 240 V ac motor power.

Lower Output: Capable of switching 6 A at 120 Vac to 240 V ac motor power.

Seal-In Output: Connects to the B-0553 motor seal-in printed circuit board subassembly.

Deadman Alarm Output: Capable of switching 3 A at 120 V ac or 100 mA at 120 V dc.

Programmable Alarm Output: Capable of switching 3 A at 120 V ac or 100 mA at 120 V dc.

Front Panel Controls

Menu-driven access to all functions by way of four pushbuttons and a two-line alphanumeric display. There are two programmable passwords available to provide various levels of access to the control functions.

The GE-2011C offers a 2-line by 20 character LCD display for enhanced viewing in direct sunlight. It also offers a low-level LED backlight for reading in darker environments. An optional Vacuum Fluorescent Display (VFD) is available for industrial temperature range operations (–40° C to +80° C).

LED Indicators

Front panel LED indicators show the following control conditions: Out-of-Band **RAISE**, Out-of-Band **LOWER**, Reverse Power Flow **REV PWR** detected, CPU **OK.**, Line Drop Compensation **LDC IN EFFECT**, Voltage Reduction **V/RED IN EFFECT**, and Communications Auto Operation Block **COM BLK**.

Output Contacts

Alarm Contact Outputs (2): One normally open programmable contact and one normally closed self-test alarm contact; capable of switching 3 A at 120 V ac.

Voltage Measurement Accuracy

Voltage accuracy of $\pm 1\%$ in accordance with ANSI/IEEE C57.15-1999 defining control accuracy of operation.

Communications

The communication ports provide access to all features, including metering, software updates, and programming of all functions. This is accomplished using a modem or direct serial connection from any IBM PC-compatible personal computer running the GE-2029A Communications Software package or SCADA communications software. COM1 (top) is available with RS-232, RS-485, Fiber Optics, or (optional) RJ45 Ethernet. COM2 is an RS-232 front port for local communications with BECO 2200 and for software updates.

Protocols: The following standard protocols are included in COM1: BECO 2200, BECO 2179, Cooper 2179, DNP3.0, MODBUS, and UCA2.0. COM2 uses BECO 2200 for local communications.

Communications Via Direct Connection: GE-2029A supports direct communication with a GE-2011C Digital Tapchanger Control using a serial “null modem” cable with a 9-pin connector (DB9P) for the control, and the applicable connector (usually DB9S or DB25S) for the PC, or Fiber Optic communication using ST standard or two-wire RS-485.

Optional: An optional ethernet 10 Mbps port (COM 3) is available through an RJ-45 jack on the top of the control. This port supports DNP over TCP/IP, BECO 2200 over TCP/IP, and MODBUS over TCP/IP protocols.

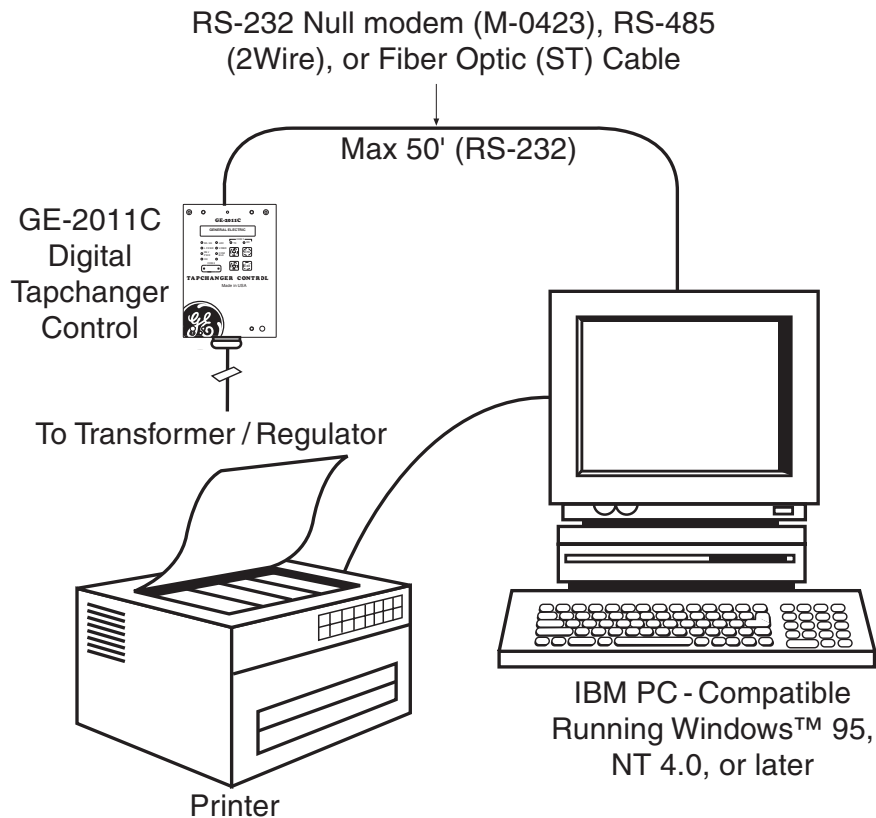


Figure 1 Direct Connection

Communications Via Modem: GE-2029A supports remote (modem) communications with a GE-2011C Digital Tapchanger Control. A Hayes-compatible modem and proper cabling is required.

GE-2011C Digital Tapchanger Control

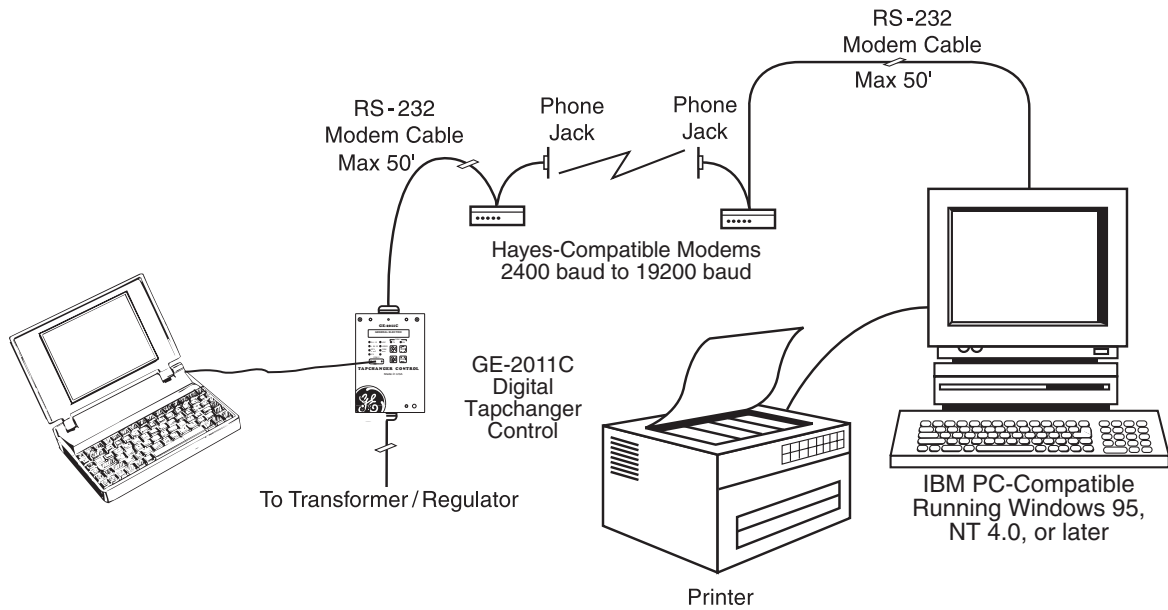


Figure 2 Modem Connection

Communications Using Networking: The addressing capability of TapTalk allows networking of multiple digital tapchanger controls. Each tapchanger control can be assigned an address ranging from 1 to 200. Selected commands may be broadcast to all controls on the network. Figures 3, 4, and 5 illustrate typical network configurations.

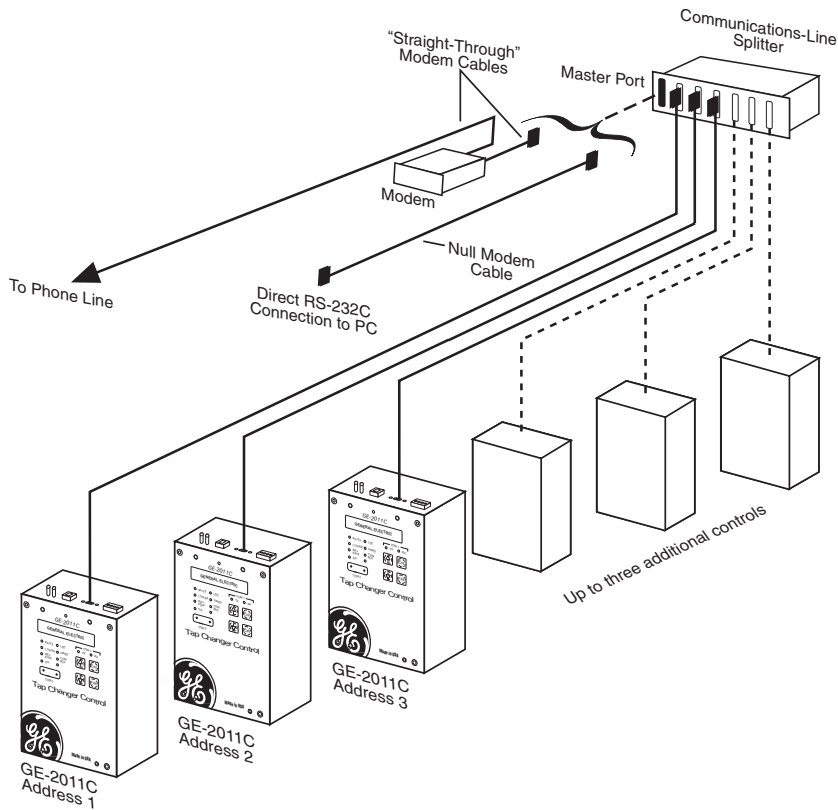


Figure 3 Network Connection

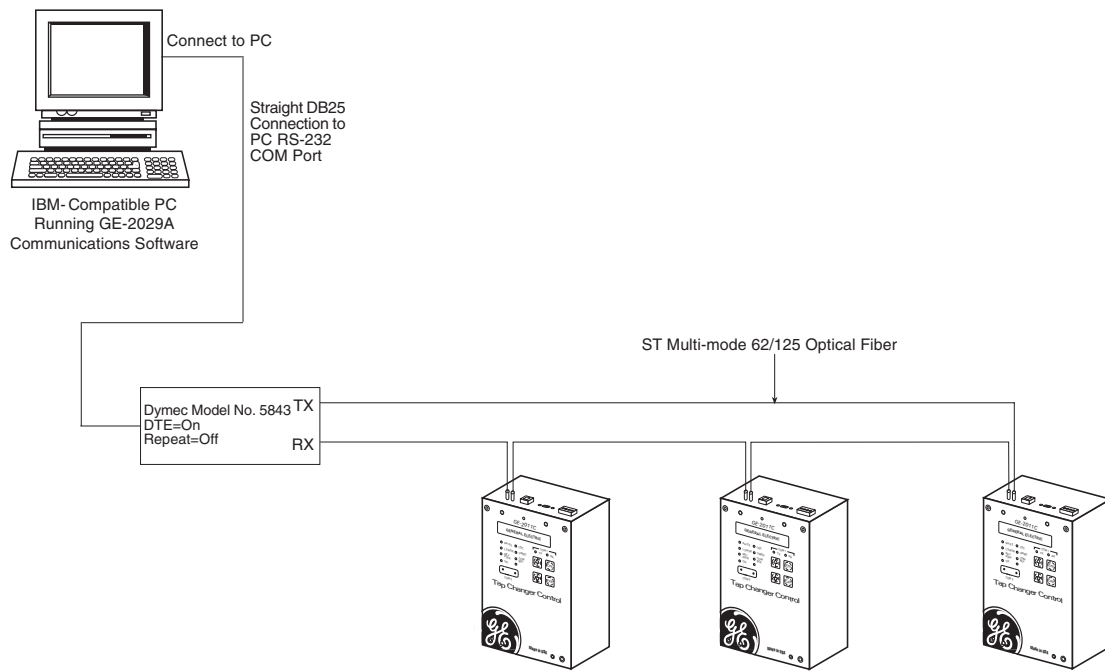


Figure 4 Fiber Optic Connection Loop

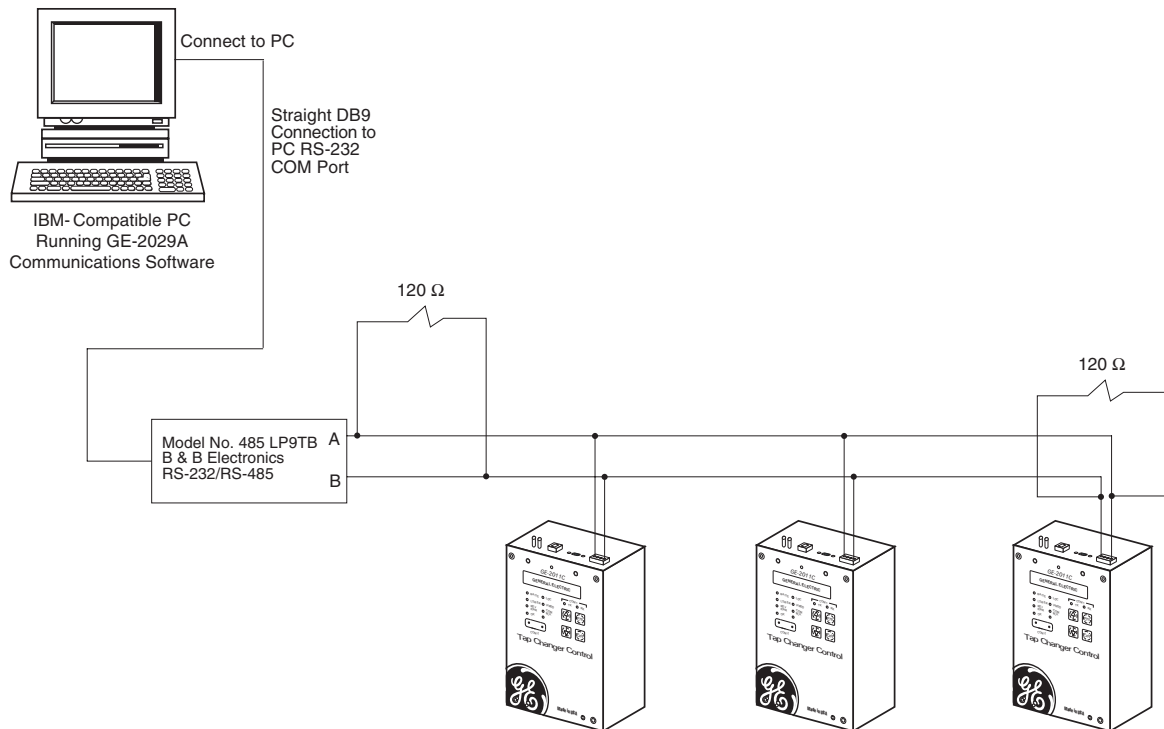


Figure 5 RS-485 Network Connection

Application: Using a PC, the operator has real-time, remote access to all functions of the GE-2011C Digital

GE-2011C Digital Tapchanger Control

Tapchanger Control. The control can act as the monitoring point for all voltage, current, and related power quantities, thereby simplifying operation while avoiding transducers and multiple Remote Terminal Unit (RTU) analog inputs. The protocols implement half-duplex, two-way communications. This allows all functions, which would otherwise require the presence of an operator at the control, to be performed remotely. Communication capabilities include:

- Interrogation and modification of setpoints
- Broadcast of commands, such as tap change inhibit and voltage reduction (up to three steps) to networked controls
- Recognition of alarm conditions, such as voltage extremes and excessive load
- Selective control of raise and lower tap change operations
- Re-configuration of the control, such as a change to the demand integration time period or a selection of different alarm parameters

Unit Identifier: A 2-row by 15-character alphanumeric sequence, set by the user, can be used for unit identification.

Environmental

Temperature: stated accuracies of the control are maintained from -40°C to $+80^{\circ}\text{C}$ with either the LCD or Vacuum Fluorescent displays.

■ **NOTE:** The LCD display's functional temperature range is -20°C to 70°C . The optional Vacuum Fluorescent display will function over the full temperature range.

IEC 60068-2-1 Cold, -40°C for 96 hours

IEC 60068-2-2 Dry Heat, $+80^{\circ}\text{C}$ for 96 hours

IEC 60068-2-3 Damp Heat, $+40^{\circ}\text{C}$ @ 95% RH for 96 hours

Fungus Resistance: a conformal coating is used on the printed circuit board to inhibit fungus growth.

Transient Protection

High Voltage

All input and output terminals will withstand 1500 V ac rms to chassis or instrument ground for one minute with a leakage current not to exceed 25 mA, for all terminals to ground. Input and output circuits are electrically isolated from each other, from other circuits and from ground.

■ **NOTE:** RS-232 and RS-485 communications ports are excluded.

Surge Withstand Capability

IEEE C37.90.1-2002 2,500 Vpk-pk Oscillatory
 4,000 Vpk Fast Transient Burst

IEEE C37.90.1-1989 2,500 Vpk-pk Oscillatory
 5,000 Vpk Fast Transient

■ **NOTE:** Disturbance is applied to digital data circuits (RS-232, RS-485, RJ45 Ethernet) port through capacitive coupling clamp.

Radiated Electromagnetic Withstand Capability

All units are protected against electromagnetic radiated interference from portable communications transceivers.

Electrostatic Discharge Test

EN 60255-22-2-1997 (EN61000-4-2)

Class 4 (8 Kv) – Point Contact Discharge
 (15 Kv) – Air Discharge

Fast Transient Disturbance Test

EN 60255-22-4-2002 (EN61000-4-4)

Class A (4 Kv, 2.5 kHz)

■ **NOTE:** Disturbance is applied to digital data circuits (RS-232, RS-485, RJ45 Ethernet) ports through capacitive coupling clamp.

Industrial Certifications

UL Listed (508 – Industrial Control Equipment)

Physical

Size: 5 13/16" wide x 8 1/2" high x 3" deep (10.81 cm x 21.6 cm x 7.62 cm)

GEounting: Unit mounts directly to adapter or conversion front panels sized to replace popular industry tapchanger controls.

Approximate Weight: 3 lbs, 11 oz (1.67 kg)

Approximate Shipping Weight: 6 lbs, 11 oz (3.03 kg)

Patent & Warranty

The GE-2011C Tapchanger Control is covered by U.S. Patents 5,315,527 and 5,581,173.

The GE-2011C Tapchanger Control is covered by a five year warranty from date of shipment.

Specification subject to change without notice.