Engineered to order. Built to last.

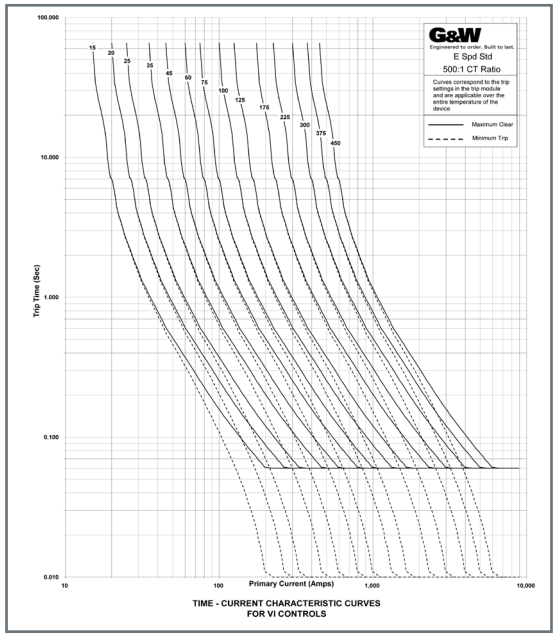
Vacuum Interrupter Controls

G&W Vacuum Interrupter Controls monitor the current and send a trip signal to open the vacuum interrupters and interrupt the fault current. G&W VI Controls are self-powered from the current transformers (CTs) located inside the switch. Controls can also be equipped to accept a trip input from another device, such as a transformer overpressure sensor.

Operation

Load and fault current are sensed by current transformers mounted internally around each bushing of the switch. The CTs also provide power to the control, thus eliminating the need for an external power source. Approximately 10 Amps per phase of current is required for self powering. If not present, the control is in sleep mode. Once the required current level is exceeded, the control will power up in 1/2 cycle, and be ready to send a trip signal if needed. In addition, a "READY" light is provided for the Type 1.0, 2.0, and 3.1 controls which flashes when the control is powered up by sufficient current on the sensing CTs, or when the control is provided with external power.

The CT secondary current is converted to a digital signal. The control constantly compares the measured current to the Time Current Characteristic (TCC) curve programmed into the memory. Based on the programmed settings, the control determines when to trip open the vacuum interrupter to interrupt the fault. All trip settings are in Minimum Trip Amperes. An approximate conversion of minimum trip to approximate fuse equivalent is provided. The control can be tested in the field using primary or secondary current injection.



◀ *Example of TCC curve*

▲ *Type 1.0 control*

G&W Control Options

Type 1.0 controls operate three, single phase vacuum interrupting mechanisms. The Type 1.0 control can be field set for either single phase or three phase trip mode. It is used on switches with either single phase reset or three phase reset handles. When in the three phase mode, all three phases trip if the selected trip level of any individual phase is reached. Trip level selections can be made under load or no-load conditions with 12 selectable minimum trip settings. Two ranges of minimum trip settings are available, 15 to 300 Amps and 30 to 600 Amps. Each unit is pre-programmed with 30 user selectable Time Current Characteristic (TCC) curves. The curve selection can be set or changed while the switch is energized.

An 8 pole dip switch allows the user to choose the TCC that best matches their individual coordination requirements. A label provides a key for the dip switch settings. The control can be factory preset to meet the user's requirements. As protection or coordination requirements change, settings can easily be changed while the switch is energized. Pressing the manual trip button when the control is powered, electronically trips all three phases of the vacuum interrupter. Each control also includes "Last Cause of Trip" LEDs. These LEDs indicate which phase experienced an overcurrent condition, or that the control was given an external or manual trip command.

Type 2.0 Control

▲ *Type 2.0 control*

Type 2.0 controls provide a user friendly interface for quick and easy programming. Trip level selections can be made under load or no-load conditions with 12 selectable minimum trip settings. Two ranges of minimum trip settings are available, 15 to 300 Amps and 30 to 600 Amps. Each unit is pre-programmed with 30 user selectable Time Current Characteristic (TCC) curves. The curve selection can be set or changed while the switch is energized.

An 8 pole dip switch allows the user to choose the TCC curve which best matches their specific coordination requirements. The control can be factory preset to meet the user's requirements. As protection or coordination requirements change, settings can easily be changed in the field. Pressing the manual trip button when the control is powered up trips all three phases of the vacuum interrupter. Each control also includes "Last Cause of Trip" LEDs. These LEDs indicate what caused the control to issue a trip command - an over current condition, Ground Fault, Instantaneous, or an external or manual trip command.

Since the control is three phase only, one minimum trip level for all three phases is set via a single selector knob. The control has a built-in, adjustable phase time delay. The control also provides a ground fault (phase imbalance) feature with adjustable trip and time delay settings as well as instantaneous trip and inrush restraint features.

Features of Type 2.0 control

Phase Time Delay – For applications requiring coordination with other protection devices, the Type 2.0 provides field selectable phase time delay capability. The phase time delay selector switch provides a phase delay range from 0 to 0.50 seconds before the programmed TCC time is initiated. This permits the user to select which protective device will trip the circuit first. The phase time delay allows sectionalizing schemes to be implemented while maintaining full line capacity throughout the circuit.

Ground Fault (Phase Imbalance) – The ground fault or phase imbalance feature continuously checks for phase imbalance or unequal currents in each of the three phases. Protection from this condition is a common requirement for large three phase motors or other sensitive loads. The ground fault trip current can be adjusted in the field by the user and is represented on the control panel as a percent (%) of the user programmed phase overcurrent minimum trip setting. The ground fault trip times using the same TCC as the phase minimum trip setting.

Instantaneous Trip – The instantaneous trip multiplier aids in customizing the protection capabilities of the Type 2.0 control. The rotary switch has nine positions. The first position, OFF, disables this feature. The other positions (x1, x3, x5, x7, x9, x11, x13, and x15) affect how the Type 2.0 calculates the trip time for overcurrent conditions. When any phase exceeds the current value defined by the minimum trip setting times the instantaneous trip multiplier, the Type 2.0 will initiate a trip command to all three phases within 1/2 cycle, 8.3 msec at 60 Hz (10 msec at 50 Hz).

Inrush Restraint – The inrush restraint function is helpful in preventing nuisance trips due to cold load pickup. The inrush restraint function is active when the Type 2.0 is initially powered up and will reactivate if the average three phase primary current drops below 7.5 Amps (15-300 Amp controls) or 15 Amps (30-600 Amp controls). The inrush restraint function consists of two selectable parameters, the Inrush Trip Multiplier (x1, x2, x3, x4, x5, x6, x7, x8, x9, x11, x13, and x15) and the Inrush Time Delay (0.00, 1.75, 3.25, 5.25, and 7.00 seconds).

The inrush trip multiplier increases the minimum trip value for the selected inrush time delay duration.

Type 3.1, 4.1, and 7.1 Controls

▲ *Type 3.1 control*

Type 3.1 and 4.1 controls provide advanced protection functions. There are two versions of these controls, each with different protection elements.

Each control includes a programming port on the enclosure for programming via a laptop computer or for retrieving event reports.

In addition, the Type 3.1 includes a Vacuum Fluorescent Display to view present load currents, last cause of trip events, and the settings present within the control, without the need for a laptop computer.

Each control is available with either the EZset or Plus programming option. Refer to the table on Page 4 for a complete list of features.

The Type 3.1 and 4.1 controls record the most recent 16 Cause of Trip Events. The Type 3.1 EZset includes a display and keypad for entering programming parameters and viewing the Cause of Trip Events. The Type 3.1 Plus, and Type 4.1 EZset and Plus utilize a laptop programming kit to enter the settings. The laptop programming kit can also be used to download and store the settings and Cause of Trip Events.

Type 7.1 controls provide the same protection features and options as the Type 3.1 and 4.1 controls. For vault and subsurface applications, utilizing Trident® solid dielectric switchgear, G&W recommends the Type 7.1 control. The Type 7.1 is mounted within the Trident's mechanism housing and has an IP68 rating for long term submersion. This eliminates the need for a separate control enclosure and associated cabling. The control is programmed using a laptop computer. A laptop programming kit is available.

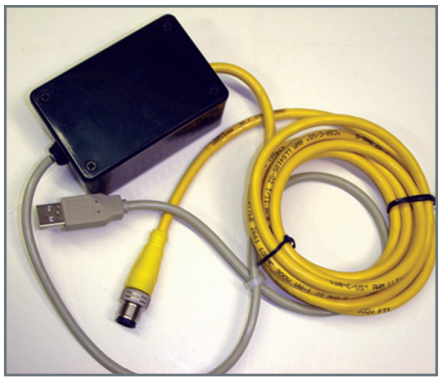
▲ *Type 7.1 control programming port*

Programming Kit

For Type 3.1, Type 4.1, or Type 7.1

Provides software and cable connection to a laptop computer for programming or retrieving vacuum interrupter control information. The cable connects the USB port of the computer to the Vacuum Interrupter Control (Type 3.1 or 4.1) or mechanism housing (Type 7.1).

Catalog Number for Type 3.1, Type 4.1, Type 7.1:
LPK7-VICSS



▲ *Programming Kit*

Type 3.1, 4.1, and 7.1 Programming Options

Feature	EZset	Plus
Trip Selection	1 or 3 Phase	1 or 3 Phase
Minimum Trip	12 Set Points (Amps) 30, 40, 50, 70, 90, 120, 150, 200, 250, 350, 450, 600 Or 15, 20, 25, 35, 45, 60, 75, 100, 125, 175, 225, 300	30 – 900 Amps, Or 15 – 450 Amps 1 Amp increments
Phase Time Delay	12 Set Points (Seconds) 0, 0.03, 0.06, 0.10, 0.15, 0.2, 0.25, 0.3, 0.35, 0.4, 0.45, 0.5	0 -10.0 Seconds, 0.01 Second increments
Instantaneous Setting	8 Multipliers 1, 3, 5, 7, 9, 11, 13, 15	For 500:1 CTs: 15-6000 For 1000:1 CTs: 30-12000 1A increments; the value must be equal or greater than the phase minimum trip.
Inrush Setting	12 Multipliers 1, 2, 3, 4, 5, 6, 7, 8, 9, 11, 13, 15	15 Multipliers 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15
Inrush Timer	5 Set Points (Seconds) 0, 1.75, 3.25, 5.25, 7.0	0.0 to 60.0 Seconds, 0.1 Second increments
Minimum Response Time	Settings (Seconds) 0, 0.05, 0.1, 0.145, 0.205, 0.26 0.335, 0.405, 0.495, 0.58	0 – 10.0 Seconds, 0.01 increments.
Ground Fault Setting 3 Phase Models Only	10 Settings Off, 10%, 15%, 20%, 25%, 30%, 35%, 40%, 45%, 50%	3 Amps – 50% of the Phase Min Trip, 1 Amp increments.
Ground Fault Curve	Separate from Phase Curve	Separate from Phase Curve
Ground Fault Instantaneous 3 Phase Models Only	n/a	Ground Min Trip – 6,000 Amps, 1 Amp increments
Ground Fault Minimum Response Time 3 Phase Models Only	n/a	0 – 10.0 Seconds, 0.01 increments.
Ground Fault Time Delay 3 Phase Models Only	n/a	0 -10.0 Seconds, 0.01 Second increments
Ground Fault Inrush Setting 3 Phase Models Only	n/a	15 Multipliers 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15
Ground Fault Inrush Timer 3 Phase Models Only	n/a	0.0 to 60.0 Seconds, 0.1 Second increments
Control ID	n/a	Device ID, Feeder Name/ Number, Other Information.
Protection Setting Method	VFD or Laptop	Laptop
Curves	30 Emulated Fuse and Electromechanical Relays	64 Emulated Fuse, Electromechanical Relays, C37.112 U1 – U5, and 5 User Created

Accessories and Options

The standard control enclosure for padmount applications is fiberglass NEMA 4X (IP56) rated. The control is also available with an option for a fiberglass NEMA 4X (IP56) enclosure with a viewing window.

▲ *Fiberglass NEMA 4X (IP56) rated control enclosure*

▲ *Fiberglass NEMA 4X (IP56) rated control enclosure with viewing window*

For applications with high humidity, the possibility of flooding, or where submersion is possible, G&W provides a Type 4.1 control in an IP68 rated enclosure which is fully sealed with epoxy compound and is rated for 20 days of submersion under 20' of water.

Additional enclosures and control designs are available for dry vault applications.

◀ *Type 4.1 control in IP68 rated enclosure*

Other Accessories

9V Battery Power Packs are available to illuminate the Cause Of Trip LEDs and power the Type 1.0, 2.0, or 3.1 controls to utilize the Manual Trip pushbutton.
Catalog Number: *VICPP-TYPE12 or VICPP-TYPE34*

▲ *VICPP-TYPE12*

▲ *VICPP-TYPE34*

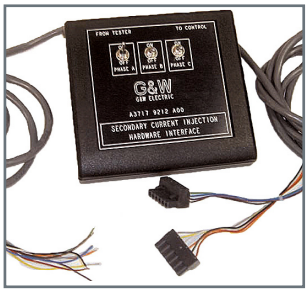
Test Sets

Current Injection Test Set - The Primary Current Test Set includes a Phenix Tester, primary current cables, Vacuum Interrupter Control connector, hardwired secondary current interface cables, and test documentation.
Catalog Number: *PCTS-300*

The Relay Adapter Test Set - includes an interface between commercially available secondary current test sets (such as Doble or Omicron) and the Vacuum Interrupter Control CT input and trip output connections as well as proposed test documentation.

Catalog Number for Type 1.0, 2.0, 3.1, or 4.1 Controls in NEMA 4 or NEMA 6P enclosures: *SCHI-NEMA.*
Catalog Number for IP68 Type 4.1 Controls: *SCHI-IP68.*

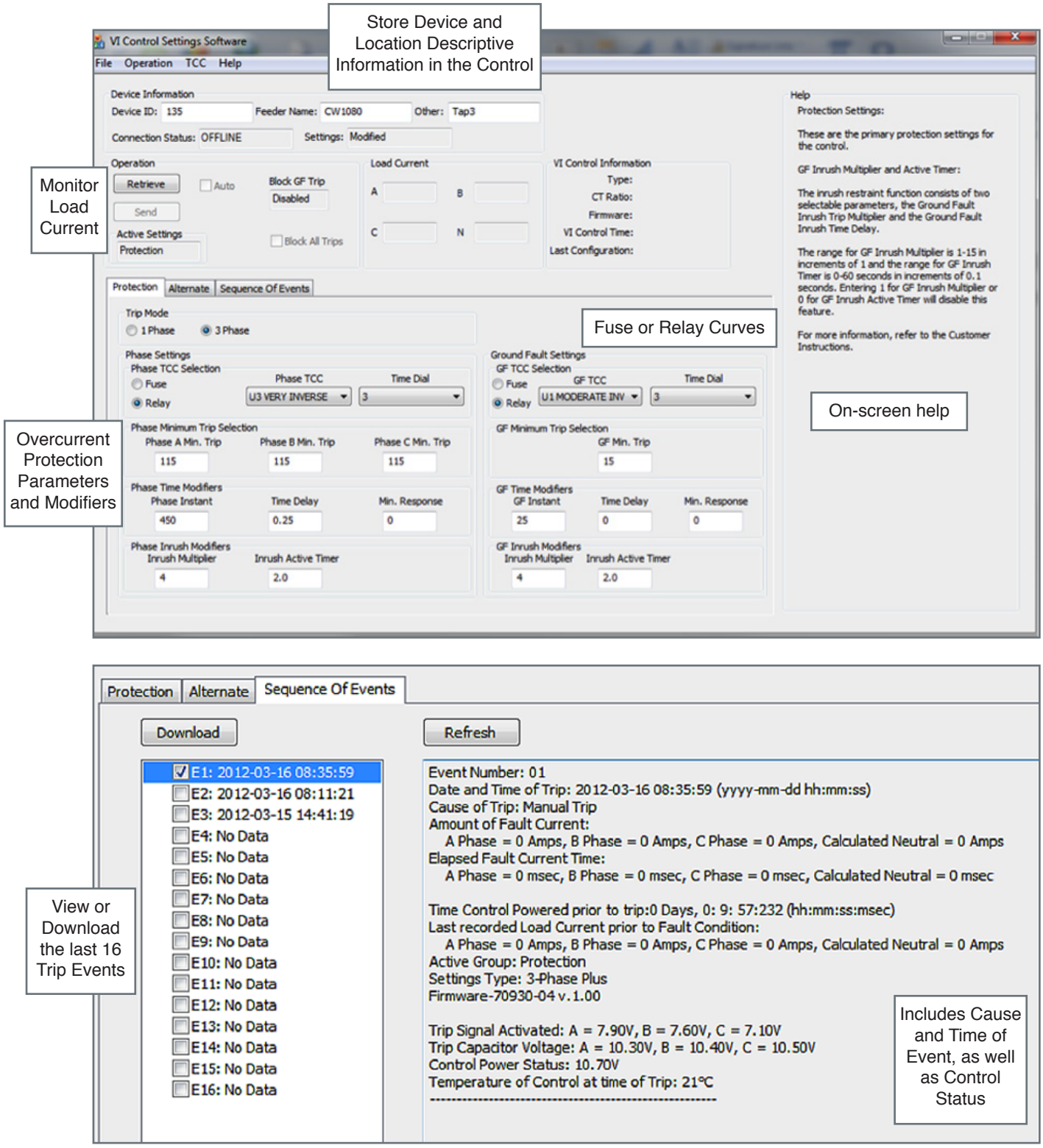
▲ *Current injection test set*



▲ *Relay adapter test set*

Vacuum Interrupter Control Setting Software

The Type 3.1, 4.1, and 7.1 Vacuum Interrupter Controls utilize the Vacuum Interrupter Control Setting Software (VICSS) to install the Overcurrent Protection Parameters, read the load current, and view and download the last 16 trip event information.



The VICSS is available free of charge with the Programming Kit or as a download from the G&W Website.

Specification

Power Requirements	Powered by current from the current transformers
External Power Requirements (optional)	12-24 VDC (Standard), 48VDC, 120VAC, 220VAC
Type 1.0 or 2.0 Minimum Trip Setting Options (500:1 CT)	15A, 20A, 25A, 35A, 45A, 60A, 75A, 100A, 125A, 175A, 225A, 300A
Type 1.0 or 2.0 Minimum Trip Setting Options (1000:1 CT)	30A, 40A, 50A, 70A, 90A, 120A, 150A, 200A, 250A, 350A, 450A, 600A
Type 3.1, 4.1, or 7.1 Minimum Trip Setting Options	See table page 4
Enclosure	NEMA 4X, NEMA 4X with viewing window, or IP68 Type 4.1.
Frequency	60 Hz (Standard) 50 Hz (Optional)
Environment	Operating Temperature: -40°C to +65°C Storage Temperature: -50°C to +85°C Humidity: 10% to 95%

Type Tests:

Electrostatic Discharge test	IEC 60255-22-2 Level 4 contact discharge
Radiated Electromagnetic Field Disturbance test	IEC 60255-22-3 Level 3
Radiated Electromagnetic Interference	IEEE C37.90.2-1995 - 35V/m
Surge Withstand	IEEE C37.60
Vibration	IEC 60255-21-1 First Edition – 1988 (EN 60255-21-1 First Edition – 1995) Electrical relays, Part 21: Vibration, shock, bump, and seismic tests on measuring relays and protection equipment; Section One – Vibration tests (sinusoidal); Severity: Class 1 Endurance; Class 2 Response. IEC 60255-21-2 First Edition – 1988 (EN 60255-21-2 First Edition – 1995) Electrical relays, Part 21: Vibration, shock, bump, and seismic tests on measuring relays and protection equipment; Section Two – Shock and Bump tests. Severity Level: Class 1 Shock withstand, Bump; Class 2 Shock Response

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- Submersible vault and padmount
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- Single phase and three phase
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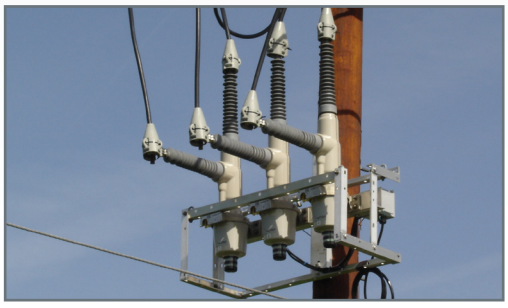

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Catalog VI-13
July, 2013