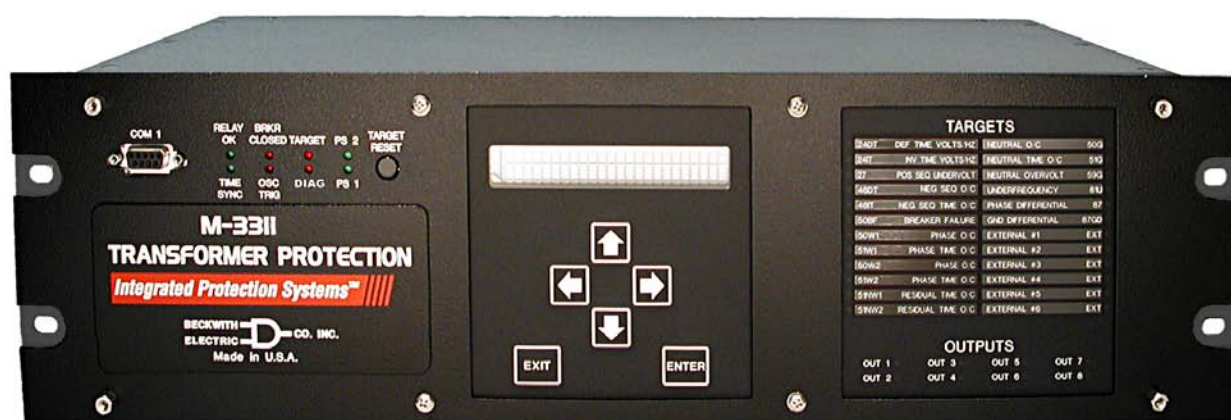


Transformer Protection M-3311

Integrated Protection System®



Unit shown with optional M-3931 HMI Module and M-3911 Target Module

- **For Transformers of All Sizes:**
 - ◆ **2 or 3 winding Transformers**
 - ◆ **Unit Wrapping of Generating Plants**
 - ◆ **Unit Protection of Other Electrical Apparatus and certain Bus Arrangements (including those with a transformer in the zone)**
- **Additional Applications: System Backup Protection, Load Shedding (voltage and frequency), Bus Protection, and individual Breaker Failure Protection for each winding input**

Standard Protective Functions

- Negative-sequence inverse time overcurrent (46)
- Winding thermal protection (49)
- Three winding instantaneous phase overcurrent (50)
- Breaker Failure (50BF)
- Instantaneous ground overcurrent (50G)
- Instantaneous residual overcurrent (50N)
- Three winding inverse time phase overcurrent (51)
- Inverse time ground overcurrent (51G)
- Inverse time residual overcurrent (51N)
- Three winding, phase differential (87T) and High Set instantaneous (87H)
- Ground differential (87GD)
- Six External input functions with individual timers

Optional Single-Phase Voltage Protection Package

- Overexcitation (24) V/Hz, two definite time and one inverse time elements
- Phase undervoltage (27) function for load shedding
- Ground Overvoltage (59G)
- Over/Underfrequency (81O/U)

Standard Features

- Four Setpoint Groups
- Eight programmable outputs and six programmable inputs
- Oscillographic recording
- 32-target storage
- Real time metering of measured and calculated parameters, including demand currents
- Two RS-232 and one RS-485 communications ports
- Standard 19" rack-mount design
- Removable printed circuit board and power supply
- 50 and 60 Hz models available
- 1 or 5 A rated CT inputs available
- M-3820B IPScom® Communications Software
- IRIG-B time synchronization
- Includes MODBUS, BECO 2200 and DNP 3.0 protocols

Optional Features

- Redundant Power Supply
- M-3911 Target Module
- M-3931 Human-Machine Interface (HMI) Module
- M-3801D IPSplot® *PLUS* Oscillograph Analysis Software

STANDARD PROTECTIVE FUNCTIONS

Device Number	Function	Setpoint Ranges	Increment	Accuracy†
Negative Sequence Overcurrent				
46	46W2/46W3			
	Definite Time Pickup	0.10 to 20.00 A (0.02 to 4.00 A)	0.01 A	± 0.1 A or $\pm 3\%$ (± 0.02 A or $\pm 3\%$)
	Time Delay	1 to 8160 Cycles	1 Cycle	-1 to +3 Cycles or $\pm 1\%$
	Inverse Time Pickup	0.50 to 5.00 A (0.10 to 1.00 A)	0.01 A	± 0.1 A or $\pm 3\%$ (± 0.02 A or $\pm 3\%$)
	Characteristic Curves	Definite Time/Inverse/Very Inverse/Extremely Inverse/IEC Curves		
	Time Dial Setting	0.5 to 11.0 0.05 to 1.10 (IEC curves)	0.1 0.01	± 3 Cycles or $\pm 5\%$
Winding Thermal Protection				
49	Time Constant	1.0 to 999.9 minutes	0.1 minutes	
	Maximum Overload Current	1.00 to 10.00 A	0.01 A	± 0.01 A
	Winding Select	W1 or W2 or W3		
Instantaneous Phase Overcurrent (Dual elements per winding)				
50	50W1/50W2/50W3			
	Pickup #1, #2	1.0 to 100.0 A (0.2 to 20.0 A)	0.1 A	± 0.1 A or $\pm 3\%$ (± 0.02 A or $\pm 3\%$)
	Time Delay #1, #2	1 to 8160 Cycles	1 Cycle	± 2 Cycles or $\pm 1\%$
Breaker Failure				
50 BF	50BFW1/50BFW2/50BFW3			
	Pickup (phase)	0.10 to 10.00 A (0.02 to 2.00 A)	0.01 A	± 0.1 A or $\pm 2\%$ (± 0.02 A or $\pm 2\%$)
	50BFNW1/50BFNW2/50BFNW3			
	Pickup (residual)	0.10 to 10.00 A (0.02 to 2.00 A)	0.01 A	± 0.1 A or $\pm 2\%$ (± 0.02 A or $\pm 2\%$)
	Time Delay	1 to 8160 Cycles	1 Cycle	-1 to +3 Cycles or $\pm 2\%$
Instantaneous Ground Overcurrent				
50G	50GW2/50GW3			
	Pickup #1, #2	1.0 to 100.0 A (0.2 to 20.0 A)	0.1 A	± 0.1 A or $\pm 3\%$ (± 0.02 A or $\pm 3\%$)
	Time Delay #1, #2	1 to 8160 Cycles	1 Cycle	± 2 Cycles or $\pm 1\%$

†Select the greater of these accuracy values.

Values in parentheses apply to 1 A CT secondary rating.

STANDARD PROTECTIVE FUNCTIONS (cont.)

Device Number	Function	Setpoint Ranges	Increment	Accuracy†
Instantaneous Residual Overcurrent				
50N	50NW1/50NW2/50NW3			
	Pickup #1, #2	1.0 to 100.0 A (0.2 to 20.0 A)	0.1 A	±0.1 A or ±3% (±0.02 A or ±3%)
	Time Delay #1, #2	1 to 8160 Cycles	1 Cycle	±2 Cycles or ±1%
Inverse Time Phase Overcurrent				
51	51W1/51W2/51W3			
	Pickup	0.50 to 12.00 A (0.10 to 2.40 A)	0.01 A	±0.1 A or ±3% (±0.02 A or ±3%)
	Characteristic Curve	Definite Time/Inverse/Very Inverse/Extremely Inverse/IEC curves		
	Time Dial Setting	0.5 to 11.0 0.05 to 1.10 (IEC curves)	0.1 0.01	±3 Cycles or ±3%
Inverse Time Ground Overcurrent				
51G	51GW2/51GW3			
	Pickup	0.50 to 12.00 A (0.10 to 2.40 A)	0.01 A	±0.1 A or ±3% (±0.02 A or ±3%)
	Characteristic Curve	Definite Time/Inverse/Very Inverse/Extremely Inverse/IEC Curves		
	Time Dial Setting	0.5 to 11.0 0.05 to 1.10 (IEC curves)	0.1 0.01	±3 Cycles or ±3%
Inverse Time Residual Overcurrent				
51N	51NW1/51NW2/51NW3			
	Pickup	0.50 to 6.00 A (0.10 to 1.20 A)	0.01 A	±0.1 A or ±3% (±0.02 A or ±3%)
	Characteristic Curve	Definite Time/Inverse/Very Inverse/Extremely Inverse/IEC curves		
	Time Dial Setting	0.5 to 11.0 0.05 to 1.10 (IEC curves)	0.1 0.01	±3 Cycles or ±5%

†Select the greater of these accuracy values.

Values in parentheses apply to 1 A CT secondary rating.

STANDARD PROTECTIVE FUNCTIONS (cont.)

Device Number	Function	Setpoint Ranges	Increment	Accuracy†
Phase Differential Current				
87H				
	Pickup	5.0 to 20.0 PU	0.1 PU	±0.1 PU or ±3%
	Time Delay	1 to 8160 Cycles	1 Cycle	-1 to +3 Cycles or ±1%
87T				
87	Pickup	0.10 to 1.00 PU	0.01 PU	±0.02 PU or ±5%
	Percent Slope #1	5 to 100%	1%	±1%
	Percent Slope #2	5 to 200%	1%	±1%
	Slope Break Point	1.0 to 4.0 PU	0.1 PU	—
	Even Harmonics Restraint (2nd and 4th)	5 to 50%	1%	±1%or ±0.1 A
	5th Harmonic Restraint	5 to 50%	1%	±1% or ±0.1 A
	Pickup at 5th Harmonic Restraint	0.10 to 2.00 PU	0.01 PU	±0.1 PU or ±5%
	CT Tap W1/W2/W3	1.00 to 10.00 (0.20 to 2.00)	0.01	—

Trip response for 87T and 87H (if time delay set to 1 cycle) is less than 1.5 cycles. Each restraint element may be individually disabled, enabled, or set for cross phase averaging.

Ground Differential				
87GDW2/87GDW3				
87 GD	Pickup	0.2 to 10.00 A (0.04 to 2.00 A)	0.01 A	±0.1 A or ±5% (±0.02 A or ±5%)
	Time Delay	1 to 8160 Cycles*	1 Cycle	-1 to +3 Cycles or ±1%
	CT Ratio Correction (R_c)	0.1 to 7.99	0.01	

**The Time Delay setting should not be less than 2 cycles.*

This function operates as a directional differential. If $3I_0$ is extremely small, directional element is disabled.

External Functions				
EXT #1— #6				
EXT	Input Initiate	In #1—#6	—	—
	Output Initiate	Out #1—#8	—	—
	Time Delay	1 to 65500 Cycles	1 Cycle	-1 to +3 Cycles or ±1%

Six functions are provided for externally connected devices to trip through the M-3311 to provide additional logic and target information. Any one or more of the input contacts (INPUT1 through INPUT6) or outputs (OUTPUT1 through OUTPUT8) can be programmed to activate designated output contacts after a selected time delay. In addition, these may be incorporated into logic schemes using BECO Logic.

OPTIONAL SINGLE-PHASE VOLTAGE PROTECTION PACKAGE

Device Number	Function	Setpoint Ranges	Increment	Accuracy†
Volts/Hz Overexcitation				
Definite Time				
	Pickup #1, #2	100 to 200%	1%	± 1%
	Time Delay #1, #2	30 to 8160 Cycles	1 Cycle	+25 Cycles
24 Inverse Time				
	Pickup	100 to 150%	1%	± 1%
	Characteristic Curves	Inverse Time #1–#4	—	—
	Time Dial: Curve #1	1 to 100	1	—
	Time Dial: Curves #2–#4	0.0 to 9.0	0.1	—
	Reset Rate	1 to 999 Sec. (from threshold of trip)	1 Sec.	± .06 Seconds or ± 1%

Pickup based on nominal VT secondary voltage and nominal system frequency. Accuracy applicable from 10 to 80 Hz, 0 to 180 V, and 100 to 150% V/Hz.

This function is applicable only when phase voltage input is applied.

Phase Undervoltage				
27				
	Pickup	5 to 140 V	1 V	±0.5 V
	Inhibit Setting	5 to 140 V	1 V	±0.5 V
	Time Delay	1 to 8160 Cycles	1 Cycle	–1 to +3 Cycles or ± 1%

This function is applicable only when phase voltage input is applied.

Ground Overvoltage				
59G				
	Pickup #1, #2	5 to 180 V	1 V	±0.5 V or ±0.5%
	Time Delay #1, #2	1 to 8160 Cycles	1 Cycle	± 1 Cycle or ± 1%

This function is applicable only when voltage input from a broken delta VT is applied.

Overfrequency/Underfrequency				
81 O/U				
	Pickup #1, #2, #3, #4	55.00 to 65.00 Hz 45.00 to 55.00 Hz*	0.01 Hz	±0.1 Hz
	Time Delay #1, #2, #3, #4	2 to 65,500** Cycles	1 Cycle	–1 to +3 Cycles or ± 1%

Accuracy applies to 60 Hz models at a range of 57 to 63 Hz, and to 50 Hz models at a range of 47 to 53 Hz.

* This range applies to 50 Hz nominal frequency models.

** For 65,500 cycles, time delay setting phase voltage must be greater than 35 V ac.

This function is applicable only when phase voltage of at least 27 V ac input is applied.

†Select the greater of these accuracy values.

Values in parentheses apply to 1 A CT secondary rating.

OPTIONAL SINGLE-PHASE VOLTAGE PROTECTION PACKAGE (cont.)

Device Number	Function	Setpoint Ranges	Increment	Accuracy[†]
Nominal Settings				
	Nominal Voltage	60 to 140 V	1 V	—
	Nominal Current	0.5 to 6.00 A	0.01 A	
	VT Configuration	$V_A, V_B, V_C, V_{AB}, V_{BC}, V_{CA}, V_G$		
	Phase Rotation	ABC/ACB	—	—
	Number of Windings	2 or 3		
	Transformer/CT Connection	Standard IEEE/IEC or Custom Connections		

Functions that can be Implemented with Overcurrent/Input-Output Connections**Load Shedding**

Can help prevent overloading of remaining transformers when a station transformer is out of service.

Bus Fault Protection

Provides high speed bus protection by combining digital feeder relay logic and transformer protection logic.

Feeder Digital Relay Backup

Provides backup tripping of feeder relays by combining the self test alarm output of the feeder relays with the transformer relay.

LTC fault blocking

Provides limited blocking of LTC during fault conditions.

[†]Select the greater of these accuracy values.

Values in parentheses apply to 1 A CT secondary rating.

Configuration Options

The M-3311 Transformer Protection Relay may be purchased as a fully configured two or three winding Transformer Protection System. The M-3311 can also be purchased with the Optional Single-Phase Voltage Protection Package to expand the system to satisfy specific application needs.

Multiple Setpoint Profiles (Groups)

The relay supports four setpoint profiles. This feature allows multiple setpoint profiles to be defined for different power system configurations. Profiles can be switched either manually using the Human-Machine Interface (HMI), communication, or by control/status inputs.

Metering

Metering of voltage, three-phase and neutral currents, and frequency. Phase voltage and current metering include sequence components.

Real Time Demand (interval of 15, 30 or 60 minutes), and Maximum Demand (with date and time stamp) metering of current.

Metering accuracies are:

Voltage: ± 0.5 V or $\pm 0.5\%$, whichever is greater (range 0 to 180 V ac)

Current: 5 A rating, ± 0.1 A or $\pm 3\%$, whichever is greater (range 0 to 14 A)
1 A rating, ± 0.02 A or $\pm 3\%$, whichever is greater (range 0 to 2.8 A)

Frequency ± 0.1 Hz (from 57 to 63 Hz for 60 Hz models; from 47 to 53 Hz for 50 Hz models)

Oscillographic Recorder

The oscillographic recorder provides comprehensive data recording of all monitored waveforms, storing up to 152 cycles of data. The total record length is user-configurable for 1, 2, 3 or 4 partitions. The sampling rate is 16 times the power system nominal frequency (50 or 60 Hz). The recorder is triggered by a designated status input, trip output, or using serial communications. When untriggered, the recorder continuously stores waveform data, thereby keeping the most recent data in memory. When triggered, the recorder stores pre-trigger data, then continues to store data in memory for a user-defined, post-trigger delay period. The records may be analyzed using Beckwith Electric IPSplot® Oscillograph Analysis Software, and are also available in COMTRADE file format.

Target Storage

A total of 32 targets can be stored. This information includes the function(s) operated, the function(s) picked up, input/output contact status, time stamp, phase and ground currents.

Calculations

Current and Voltage Values: Uses discrete Fourier Transform (DFT) algorithm on sampled voltage and current signals to extract fundamental frequency phasors for M-3311 calculations.

Power Input Options

Nominal 110/120/230/240 V ac, 50/60 Hz, or nominal 110/125/220/250 V dc. Operates properly from 85 V ac to 265 V ac and from 80 V dc to 288 V dc. Withstands 300 V ac or 300 V dc for 1 second. Burden 40 VA at 120 V ac/125 V dc.

Nominal 24/48 V dc, Operates properly from 18 V dc to 56 V dc. Withstands 65 V dc for 1 second. Burden 25 VA at 24 V dc and 30 VA at 48 V dc.

Optional redundant power supply.

Sensing Inputs

One Voltage Input: Rated nominal voltage of 60 V ac to 140 V ac, 50/60 Hz. Withstands 240 V continuous voltage and 360 V for 10 seconds. Voltage input may be connected to phase voltage (L-G or L-L), or to a broken delta VT. Voltage transformer burden less than 0.2 VA at 120 V.

Eleven Current Inputs: Rated current (I_R) of 5.0 A or 1.0 A (optional), 50/60 Hz. Withstands $3 I_R$ continuous current and $100 I_R$ for 1 second. Current transformer burden is less than 0.5 VA at 5 A (5 A option), or 0.3 VA at 1 A (1 A option).

Control/Status Inputs

The control/status inputs, INPUT1 through INPUT6, can be programmed to block any of the relay functions, trigger the oscillographic recorder, select a setpoint group, or to operate one or more outputs. The control/status inputs are designed to be connected to dry contacts and are internally wetted, with a 24 V dc power supply. To provide breaker status LED indication on the front panel, the INPUT1 status input contact must be connected to the 52b breaker status contact.

One separate input is provided for monitoring and reporting either breaker trip circuit or lockout relay trip circuit integrity (*anticipated for future release*).

Output Contacts

The eight programmable output contacts (six form 'a' and two form 'c'), the power supply alarm output contact (form 'b'), and the self-test alarm output contact (form 'c') are all rated as per ANSI/IEEE C37.90-1989 for tripping. (Make 30 A for 0.2 seconds, carry 8 A, break 6 A @ 120 V ac, break 0.1 A @ 125 V dc, inductive break 0.1 A.)

Any of the relay functions can be individually programmed to activate any one or more of the eight programmable output contacts.

Breaker Monitoring

The Breaker Monitoring function calculates an estimate of the per-phase wear on the breaker contacts by measuring and integrating the current (selected as I^2t or It) passing through the breaker contacts during the interruption interval. The per-phase values are summed as an accumulated total for each phase, and then compared to a user-programmed threshold value. When the threshold is exceeded in any phase, the relay can activate a programmable output contact. The accumulated value for each phase can be displayed as an actual value.

Temperature Controller Monitoring

Any Temperature Controller equipped with a contact output may be connected to the M-3311 and controlled by the relay's BECO Logic function. Figure 1 is an example of a typical Temperature Controller Monitoring application.

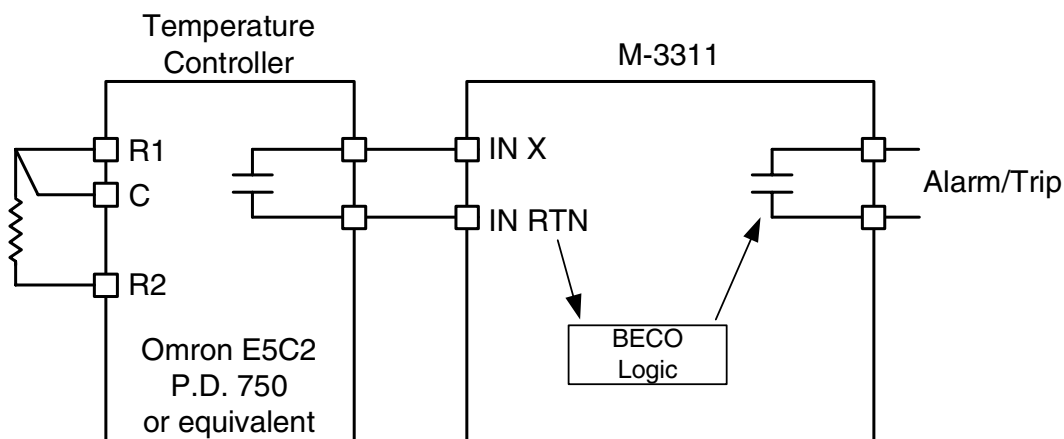


Figure 1 Typical Temperature Controller Monitoring Application

BECO Logic

This feature can be programmed utilizing the IPScom® communications software. IPScom takes the control/status inputs, outputs, and function status, and generates outputs by employing (OR, AND, NOR, and NAND) boolean logic.

Target/Status Indicators and Controls

The **RELAY OK** LED reveals proper cycling of the microcomputer. The **BRKR CLOSED** LED illuminates when the breaker is closed (when the 52b contact is open). The **OSC TRIG** LED indicates that oscillographic data has been recorded in the unit's memory. The corresponding **TARGET** LED will illuminate when any of the relay functions trip. Pressing and releasing the **TARGET RESET** button resets the **TARGET** LEDs if the conditions causing the operation have been removed. Pressing and holding the **TARGET RESET** button will allow elements or functions in pickup to be displayed. The **PS1** and **PS2** LEDs remain illuminated as long as power is applied to the unit and the power supply is operating properly. **TIME SYNCH** LED illuminates when valid IRIG-B signal is applied and time synchronization has been established.

Communication

Communication ports include rear RS-232 and RS-485 ports, a front RS-232 port, and a rear IRIG-B port. The communications protocol implements serial, byte-oriented, asynchronous communication, providing the following functions when used with the Windows™-compatible M-3820B IPScom® Communications Software package. MODBUS, BECO 2200, and DNP 3.0 protocols are supported, providing:

- Interrogation and modification of setpoints
- Time-stamped trip target information for the 32 most recent events
- Real-time metering of all measured and calculated quantities, real-time monitoring of percentage differential characteristics, and vector displays of compensated and uncompensated phasors.
- Downloading of recorded oscillographic data

Detailed documentation on the above protocols is available on the Beckwith Electric website, at www.beckwithelectric.com

IRIG-B

The M-3311 accepts either modulated or demodulated IRIG-B time clock synchronization signals. The IRIG-B time synchronization information is used to correct the local calendar/clock and provide greater resolution for target and oscillograph time tagging.

HMI Module (optional)

Local access to the M-3311 is provided through an optional M-3931 Human-Machine Interface (HMI) Module, allowing for easy-to-use, menu-driven access to all functions via a 6-button keyboard and a 2-line by 24 character alphanumeric display. The M-3931 module includes the following features:

- User-definable access codes providing three levels of security
- Interrogation and modification of setpoints
- Time-stamped trip target information for the 32 most recent events
- Real-time metering of all measured and calculated quantities

Target Module (optional)

An optional M-3911 Target Module provides 24 target and 8 output LEDs. Appropriate target LEDs illuminate when the corresponding M-3311 function trips. The targets can be reset with the M-3311 **TARGET RESET** button if the trip conditions have been removed. The **OUTPUT** LEDs illuminate when a given programmable output is actuated.

M-3801D IPSplot® PLUS Oscillograph Analysis Software (optional)

M-3801D IPSplot *PLUS* Oscillograph Analysis Software enables the plotting and printing of M-3311 waveform data downloaded from the relay to any IBM-PC compatible computer.

Type Tests and Standards

M-3311 Transformer Protection Relay complies with the following type tests and standards:

Voltage Withstand

Dielectric Withstand

IEC 60255-5 3,500 V dc for 1 minute applied to each independent circuit to earth
 3,500 V dc for 1 minute applied between each independent circuit
 1,500 V dc for 1 minute applied to IRIG-B circuit to earth
 1,500 V dc for 1 minute applied between IRIG-B to each independent circuit
 1,500 V dc for 1 minute applied between RS-485, to each independent circuit

Impulse Voltage

IEC 60255-5 5,000 V pk, +/- polarity applied to each independent circuit to earth
 5,000 V pk, +/- polarity applied between each independent circuit
 1.2 μ s by 50 μ s, 500 Ohms impedance, three surges at 1 every 5 seconds

Insulation Resistance

IEC 60255-5 > 40 MegaOhms

Electrical Environment

Electrostatic Discharge Test

IEC 61000-4-2 Class 4 (K8 kV) – point contact discharge

Fast Transient Disturbance Tests

IEC 61000-4-4 Class IV ($\pm$ 4kV, 2.5 kHz)

Surge Withstand Capability

ANSI/IEEE 2,500 V pk–pk Oscillatory applied to each independent circuit to earth
 C37.90.1 2,500 V pk–pk applied between each independent circuit
 1989 5,000 V pk Fast Transient applied to each independent circuit to earth
 5,000 V pk Fast Transient applied between each independent circuit

Radiated Susceptibility

ANSI/IEEE 25–1000 MHz @ 35V/m
 C37.90.2

Output Contacts

ANSI/IEEE Make 30 A for 0.2 seconds, off for 15 seconds, for 2,000 operations
 C37.90.0-1989, Section 6.7.1, Tripping Output Performance Requirements

Atmospheric Environment

Temperature

IEC 60068-2-1 Cold, –20° C for 96 hours
 IEC 60068-2-2 Dry Heat, +70° C for 96 hours
 IEC 60068-2-3 Damp Heat, +40° C @ 93% RH, for 96 hours

Mechanical Environment

Vibration

IEC	Vibration response Class 1, 0.5 g
60255-21-1	Vibration endurance Class 1, 1.0 g

Compliance

UL Listed per 508 – Industrial Control Equipment

CSA Certified per C22.2 No. 14-95—Industrial Control Equipment

External Connections

M-3311 external connection points are illustrated in Figure 2, External Connections, on the following page.

Physical

Size: 19.00" wide x 5.21" high x 10.20" deep (48.3 cm x 13.2 cm x 25.9 cm)

Mounting: The unit is a standard 19", semiflush, 3-unit high, rack-mount panel design, conforming to ANSI/EIA RS-310C and DIN 41494, Part 5 specifications. Optional mounting is available.

Approximate Weight: 20.40 lbs (7.7 kg)

Approximate Shipping Weight: 28 lbs (11.3 kg)

Recommended Storage Parameters

Temperature: 5° C to 40° C

Humidity: Maximum relative humidity 80% for temperatures up to 31° C, decreasing to 31° C linearly to 50% relative humidity at 40° C.

Environment: Storage area to be free of dust, corrosive gases, flammable materials, dew, percolating water, rain and solar radiation.

See M-3311 Instruction Book, Appendix E, Layup and Storage for additional information.

Patent & Warranty

The M-3311 Transformer Protection Relay has patents pending.

The M-3311 Transformer Protection Relay is covered by a five year warranty from date of shipment.

Specification subject to change without notice.

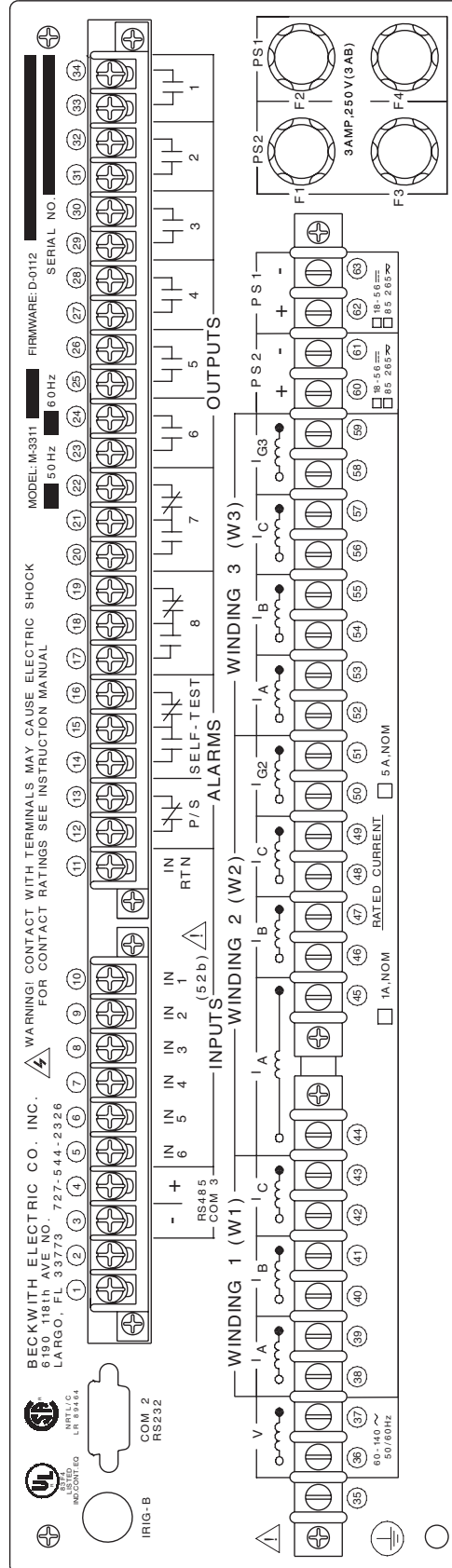


Figure 2 External Connections

NOTES:

1. Output contacts #1 through #4 contain special circuitry for high-speed operation, and close 4 ms faster than outputs 5 through 8. Outputs 1 through 6 are form "a" contacts (normally open) and outputs 7 and 8 are form "c" contacts (center tapped 'a' and 'b' contacts).
2. To comply with UL and CSA listing requirements, terminal block connections must be made with #12 AWG solid or stranded copper wire inserted in an AMP #324915 (or equivalent) connector. Wire insulation must be rated at 60° C minimum. Terminal block connections 1 through 34 must be tightened to 12 inch-pounds torque. Terminal block connections 35 through 63 must be tightened to 8 inch-pounds torque.
3. Only dry contacts must be connected to inputs (terminals 5 through 10 with 11 common) because these contact sensing inputs are internally wetted.
Application of external voltage on these inputs may result in damage to the unit.
4. All relays are shown in the de-energized state, and without power applied to the relay
5. The power supply relay (P/S) is energized when the power supply is functioning properly.
6. The self-test relay is energized when the relay has performed all self-tests successfully.

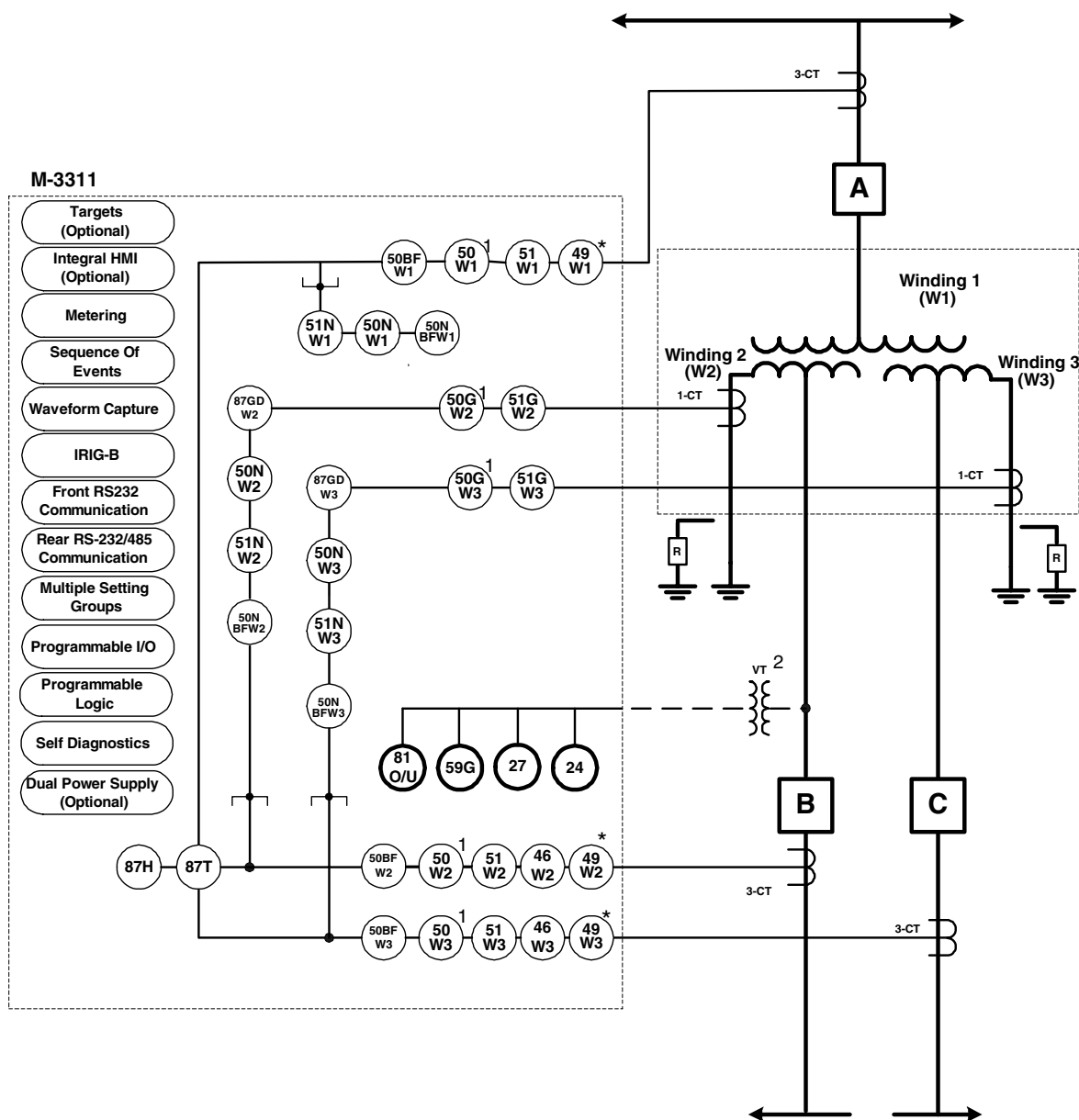
M-3311 Typical Connection Diagram



This function is available as a standard protective function.



This function is available in the Optional Single-Phase Voltage Protection Package.



* Only one winding can be enabled at a time.

NOTES:

1. All 50 and 50G functions may be applied instantaneous or definite time, and are multiple (2) elements, each with individual pickup and time delay setpoints.
2. Only one voltage input is available for the M-3311. This can be a phase voltage input or voltage generated from a broken delta VT connection. 81O/U, 27, and 24 Functions are only available if the voltage input is connected to the phase voltage. If the voltage input is connected to phase voltage, Function 59G will be unavailable. Function 59G is only available if the voltage input is connected to a broken delta VT. If voltage input is connected to broken delta VT, Functions 81O/U, 27, and 24 will be unavailable.

Figure 3 Typical One-Line Connection Diagram

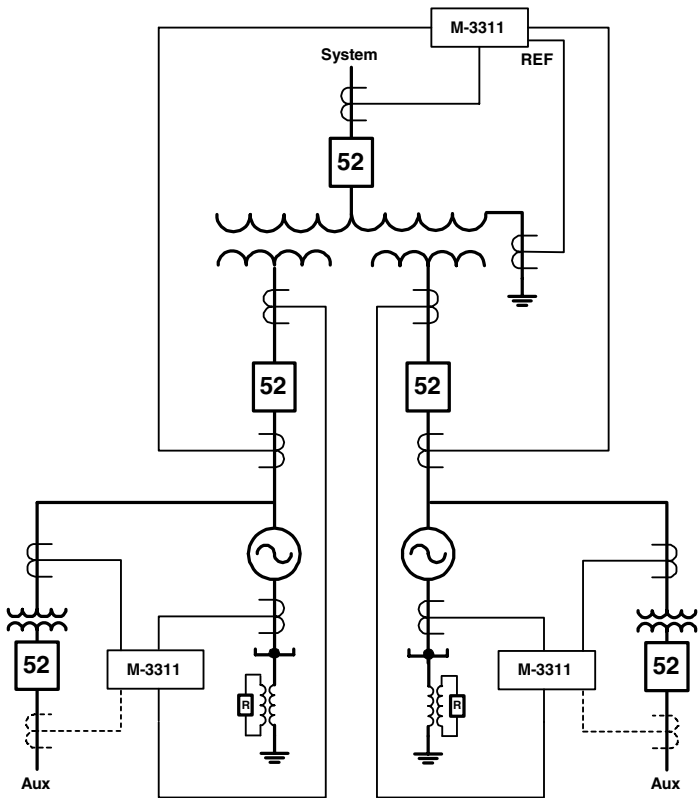


Figure 4 Dual Generator Power Plant Wrap

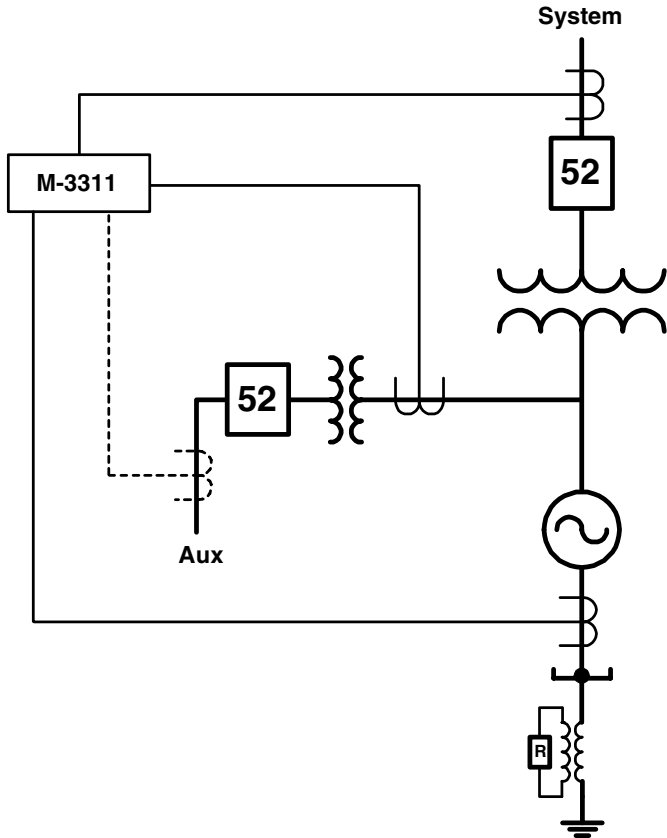


Figure 5 Generator Plant Unit Wrap

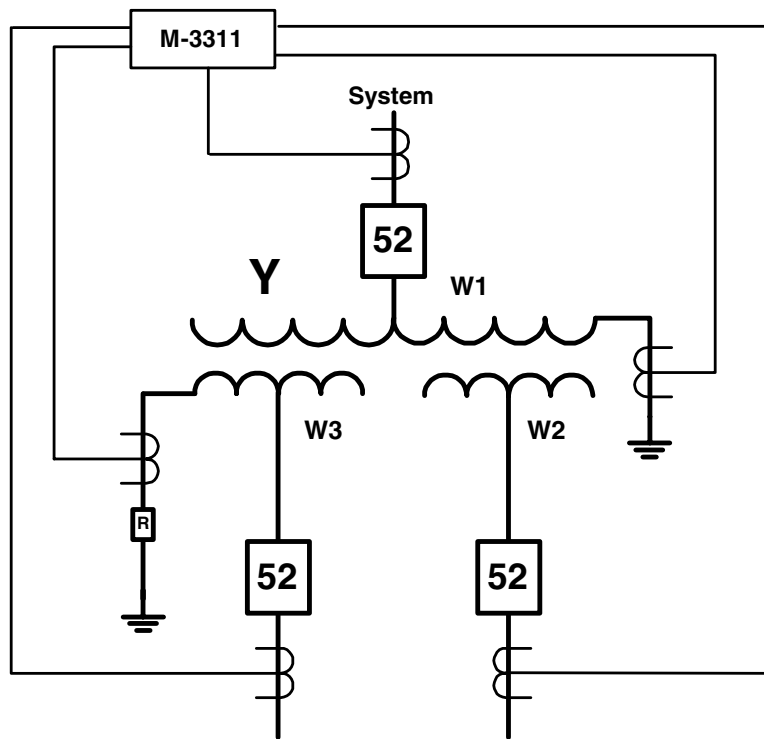


Figure 6 Three Winding Transformer with Shunt Reactor REF

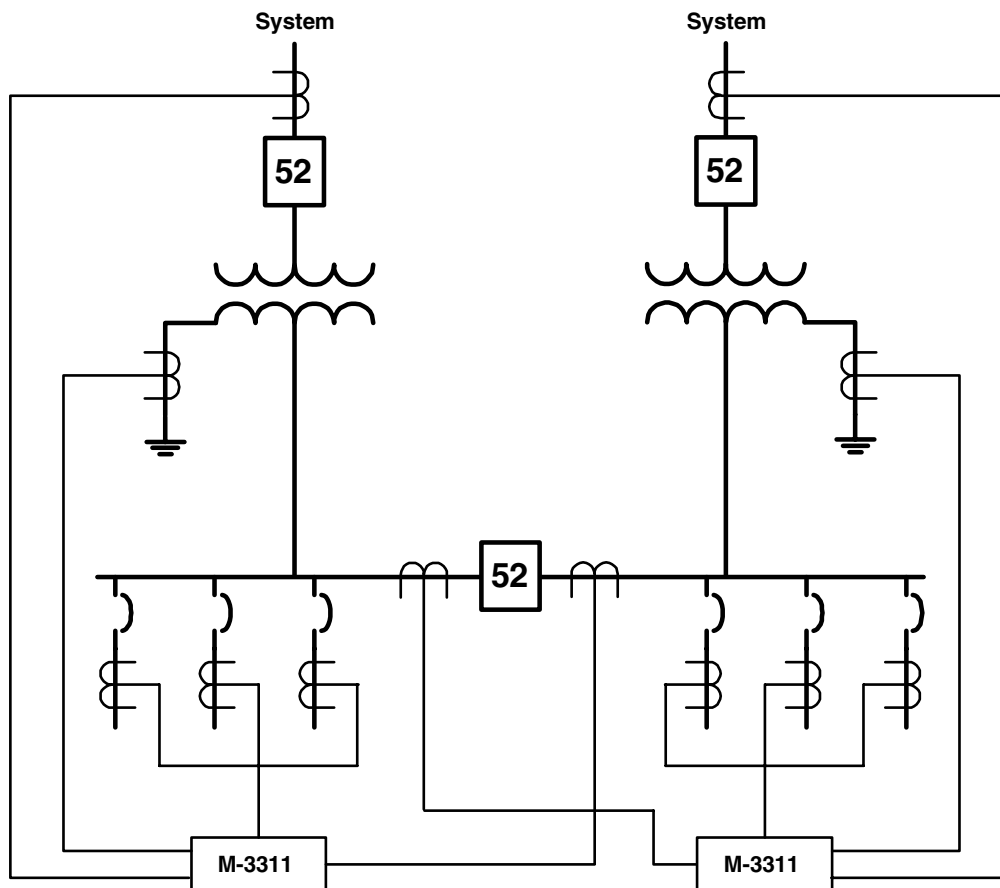


Figure 7 Main Tie Radial Substation

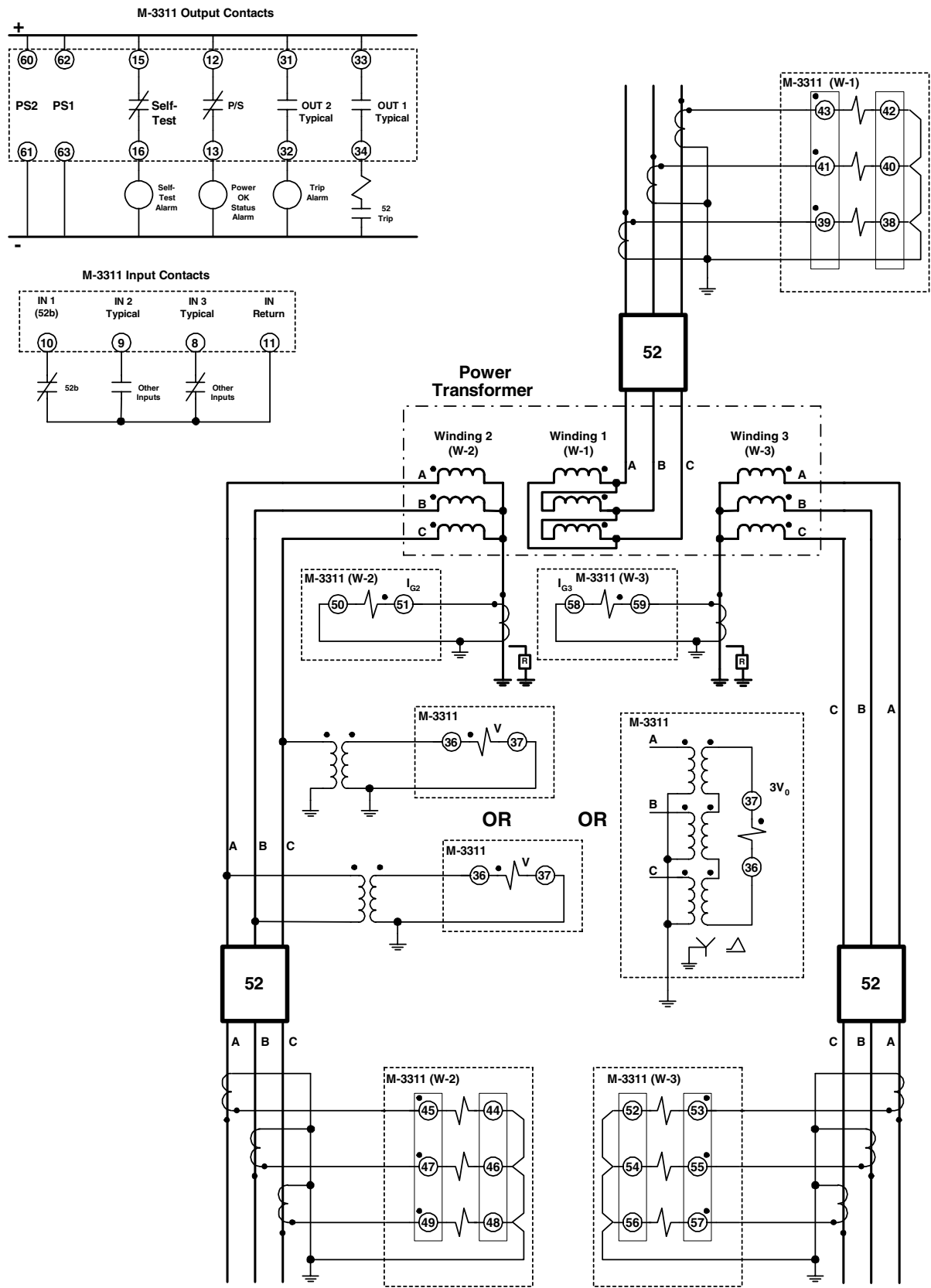


Figure 8 Typical Three-Line Connection Diagram

M-3311 Transformer Protection Relay

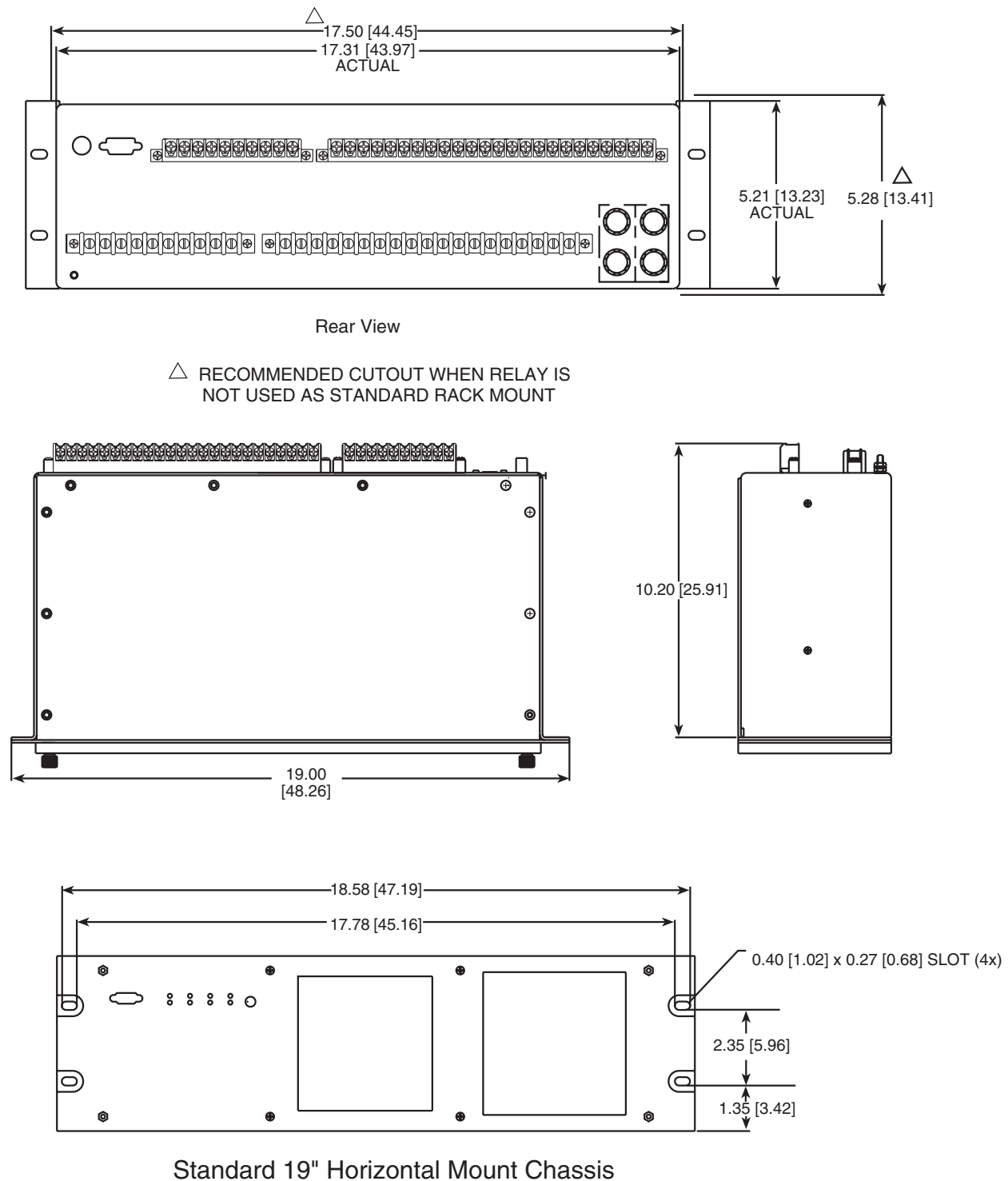
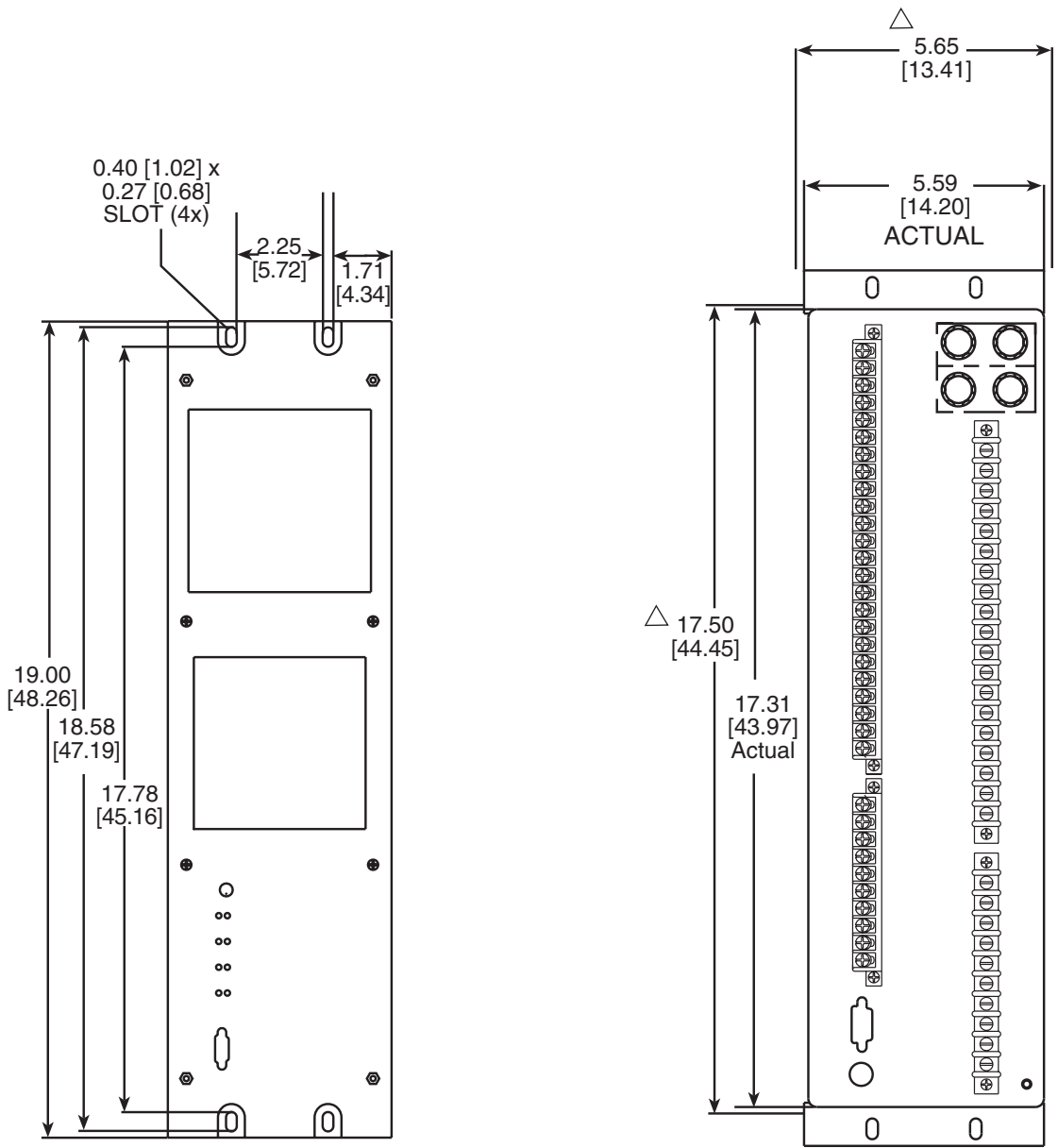


Figure 9 Horizontal Mounting Dimensions



■ **NOTE:** Dimensions in brackets are in centimeters.

△ RECOMMENDED CUTOUT WHEN RELAY IS NOT USED AS STANDARD RACK MOUNT

Optional Vertical Mount Chassis

Figure 10 Vertical Mounting Dimensions



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