



GE VERNOVA

8 Series 845

Instruction Manual

745 to 845 Retrofit Guide

Hardware Version: C

Firmware Version: 4.30

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GE VERNOVA

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CHAPTER 1

INTRODUCTION

1.1 FOREWORD

This technical manual provides a functional and technical description of the relay, as well as a comprehensive set of instructions for using it. The level at which this manual is written assumes that you are already familiar with protection engineering and have experience in this discipline. The description of principles and theory is limited to that which is necessary to understand the product. For further details on general protection engineering theory, we refer you to the publication, Protection and Automation Application Guide, which is available online.

We have attempted to make this manual as accurate, comprehensive and user-friendly as possible. However we cannot guarantee that it is free from errors. Nor can we state that it cannot be improved. We would therefore be very pleased to hear from you if you discover any errors, or have any suggestions for improvement. Our policy is to provide the information necessary to help you safely specify, engineer, install, commission, maintain, and eventually dispose of this product. We consider that this manual provides the necessary information, but if you believe that more details are needed, please contact us.

1.1.1 TARGET AUDIENCE

This manual is aimed towards all professionals charged with installing, commissioning, maintaining, troubleshooting, or operating any of the products within the specified product range. This includes installation and commissioning personnel as well as engineers who will be responsible for operating the product.

The level at which this manual is written assumes that installation and commissioning engineers have knowledge of handling electronic equipment. Also, system and protection engineers have a thorough knowledge of protection systems and associated equipment.

1.1.2 TYPOGRAPHICAL CONVENTIONS

The following typographical conventions are used throughout this manual.

- Description of software menu items, buttons, labels or hardware keys and buttons written in bold type and colored in Vernova dark green.
For example: Select **Save** from the file menu
- The names for special keys, appear in in upper case bold type and colored in Vernova dark green.
For example: **ENTER**
- Filenames, paths, code, and text that appears on a command line interface use the courier font
For example: `Example\File.text`
- Special terminology is written with leading capitals
For example: Line Differential Relay
- If reference is made to the relay's internal settings database on the relay's LCD screen, the menu items are written in bold italics
For example: ***SECURITY*** (on the relay's LCD screen), or ***Security*** (in the EnerVista D&I Setup software)
- Menu paths are shown with > separators. This applies to both software menu paths and relay menu paths
For example: ***SETTINGS > SYSTEM SETUP > AC INPUTS*** (for relay path), or **File > Save** (for software path)
- Setting values are written with the courier font and are italicized
For example: `Enabled`
- Multilin products, use Flexlogic operands. Flexlogic operands are written in dark Vernova green uppercase courier font
For example: `PUSHBUTTON 1 ON`
- Sometimes it is beneficial to emphasize some words. Depending on the case in question, this may be done with bold, italic or upper case font attributes.
- Notes are written in italic in, and are surrounded by a border.
For example:

Note:
This is a note

1.1.3 NOMENCLATURE

Due to the technical nature of this manual, many special terms, abbreviations and acronyms are used throughout the manual. Some of these terms are well-known industry-specific terms while others may be special product-specific terms used by General Electric. The first instance of any acronym or term used in a particular chapter is explained.

We would like to highlight the following changes of nomenclature however:

- The word *relay* and *IED* (Intelligent Electronic Device) are both used to describe the protection device. The term *IED* is associated with the IEC61850 standard, whereas the term *relay* is the long-used traditional term. It may also be referred to simply as the *device* or the *product*.
- American English and spelling is used throughout this manual.
- The term 'Earth' and American term 'Ground' are equivalent. You may find either used in the manual.
- When depicting a generic instance of a number of items, this manual uses <n> where n can be any integer.

1.2 CAUTIONS, WARNINGS AND NOTES

Before attempting to install or use the device, review all safety indicators in this document to help prevent injury, equipment damage, or downtime.

1.2.1 SAFETY WORDS AND DEFINITIONS

The following symbols and formatting are used in this document indicate certain types of information:



Caution:
Refer to equipment documentation. Failure to do so could result in damage to the equipment



Warning:
Risk of electric shock



Warning:
Risk of damage to eyesight

Note:
Indicates practices not related to personal injury.

1.2.2 GENERAL CAUTIONS AND WARNINGS

The following general safety precautions and warnings apply.



Caution:
Before attempting to use the equipment, it is important that all danger and caution indicators are reviewed.
If the equipment is used in a manner not specified by the manufacturer or functions abnormally, proceed with caution. Otherwise, the protection provided by the equipment may be impaired and can result in impaired operation and injury.



Warning:
Hazardous voltages can cause shock, burns or death.



Caution:
Installation/service personnel must be familiar with general device test practices, electrical awareness and safety precautions must be followed.
Before performing visual inspections, tests, or periodic maintenance on this device or associated circuits, isolate or disconnect all hazardous live circuits and sources of electric power.



Warning:

Failure to shut equipment off prior to removing the power connections could expose you to dangerous voltages causing injury or death.

Ensure that all connections to the product are correct so as to avoid accidental risk of shock and/or fire, for example from high voltage connected to low voltage terminals.



Caution:

Follow the requirements of this manual, including adequate wiring size and type, terminal torque settings, voltage, current magnitudes applied, and adequate isolation/clearance in external wiring from high to low voltage circuits.

Use the device only for its intended purpose and application.

Ensure that all ground paths are un-compromised for safety purposes during device operation and service.

All recommended equipment that should be grounded and must have a reliable and un-compromised grounding path for safety purposes, protection against electromagnetic interference and proper device operation.

Equipment grounds should be bonded together and connected to the facility's main ground system for primary power.

Keep all ground leads as short as possible.

In addition to the safety precautions mentioned all electrical connections made must respect the applicable local jurisdiction electrical code.

It is recommended that a field external switch, circuit breaker be connected near the equipment as a means of power disconnect. The external switch or circuit breaker is selected in accordance with the power rating.

This product itself is not Personal Protective Equipment (PPE). However, it can be used in the computation of site specific Arc Flash analysis when the arc flash option is ordered. If a new appropriate Hazard Reduction Category code for the installation is determined, user should follow the cautions mentioned in the arc flash installation section.

The critical failure relay must be connected to annunciate the status of the device for ALL applications. This is particularly important for when the Arc Flash option is ordered.

Ensure that the control power applied to the device, the AC current, and voltage input match the ratings specified on the relay nameplate. Do not apply current or voltage in excess of the specified limits.

Only qualified personnel are to operate the device. Such personnel must be thoroughly familiar with all safety cautions and warnings in this manual and with applicable country, regional, utility, and plant safety regulations.



Warning:

Hazardous voltages can exist in the power supply and at the device connection to current transformers, voltage transformers, control, and test circuit terminals. Make sure all sources of such voltages are isolated prior to attempting work on the device.

Hazardous voltages can exist when opening the secondary circuits of live current transformers. Make sure that current transformer secondary circuits are shorted out before making or removing any connection to the current transformer (CT) input terminals of the device.



Caution:

For tests with secondary test equipment, ensure that no other sources of voltages or currents are connected to such equipment and that trip and close commands to the circuit breakers or other switching apparatus are isolated, unless this is required by the test procedure and is specified by appropriate utility/plant procedure.

When the device is used to control primary equipment, such as circuit breakers, isolators, and other switching apparatus, all control circuits from the device to the primary equipment must be isolated while personnel are working on or around this primary equipment to prevent any inadvertent command from this device. Use an external disconnect to isolate the mains voltage supply.



Warning:

LED transmitters are classified as IEC 60825-1 Accessible Emission Limit (AEL) Class 1M. Class 1M devices are considered safe to the unaided eye. Do not view directly with optical instruments.

Note:

To ensure the settings file inside the relay is updated, wait 30 seconds after a setpoint change before cycling power. This product is rated to Class A emissions levels and is to be used in Utility, Substation Industrial environments. Not to be used near electronic devices rated for Class B levels.

1.3 MUST-READ INFORMATION

The following general statements apply and are repeated in the relevant sections of the manual.

- Before upgrading firmware, it is very important to save the current settings to a file on your PC. After the firmware has been upgraded, it is necessary to load this file back into the device.
- The **SNTP** and **IRIG-B** settings take effect after rebooting the relay.
- Commands may be issued freely through other protocols than Modbus (i.e., DNP, IEC 104, and, IEC 61850) without user authentication or encryption of data taking place, even if the relay has the advanced security feature enabled.
- Note that the factory role password may not be changed.
- Both DNP and IEC104 protocols can work at the same time, but consider that there is only one point map. So, both protocols use the same configured points.
- The 52b contact is closed when the breaker is open and open when the breaker is closed.
- The Phase Directional element responds to the forward load current. In the case of a following reverse fault, the element needs some time – in the order of 8 ms – to change the directional signal. Some protection elements such as Instantaneous Overcurrent may respond to reverse faults before the directional signal has changed. A coordination time of at least 10 ms must therefore be added to all the instantaneous protection elements under the supervision of the Phase Directional element. If current reversal is a concern, a longer delay – in the order of 20 ms – is needed.
- The same curves used for the time overcurrent elements are used for Neutral Displacement. When using the curve to determine the operating time of the Neutral Displacement element, substitute the ratio of neutral voltage to Pickup level for the current ratio shown on the horizontal axis of the curve plot.
- The relay is not approved as, or intended to be, a revenue metering instrument. If used in a peak load control system, consider the accuracy rating and method of measurement employed, and the source VTs and CTs, in comparison with the electrical utility revenue metering system.
- In bulk oil circuit breakers, the interrupting time for currents is less than 25% of the interrupting rating and can be significantly longer than the normal interrupting time.
- For future reference, make a printout of the conversion report immediately after the conversion in case conversion reports are removed or settings modified from the 8 Series Setup Software.
- To monitor the trip coil circuit integrity, use the relay terminals “FA_1 NO” and “FA_1 COM” to connect the Trip coil, and provide a jumper between terminals “FA_1 COM” and “FA_1 OPT/V” voltage monitor).
- WiFi and USB do not currently support CyberSentry security. For this reason WiFi is disabled by default if the CyberSentry option is purchased. WiFi can be enabled, but be aware that doing so violates the security and compliance model that CyberSentry is supposed to provide.
- In Power factor monitoring, **SWITCH-IN** and **SWITCH-OUT** are mutually exclusive settings. (845, 850)

1.3.1 STORAGE

Store the unit indoors in a cool, dry place. If possible, store in the original packaging. Follow the storage temperature range outlined in the Specifications.

If applicable, use the factory-provided dust caps on all Arc Flash sensor fiber and connectors when not in use, to avoid dust contamination in the transceiver and sensor plugs.

1.4 FOR FURTHER ASSISTANCE

For product support, contact us as follows:

GE Vernova

650 Markland Street

Markham, Ontario

Canada L6C 0M1

Worldwide telephone: +1 905 927 7070

Europe/Middle East/Africa telephone: +34 94 485 88 54

North America toll-free: 1 800 547 8629

Fax: +1 905 927 5098

Worldwide e-mail: multilin.tech@gevernova.com

Europe e-mail: multilin.tech.euro@gevernova.com

Website: <https://www.gevernova.com/grid-solutions>

1.4.1 REPAIRS

The firmware and software can be upgraded without return of the device to the factory.

For issues not solved by troubleshooting, the process to return the device to the factory for repair is as follows:

- Contact a GE Vernova Grid Solutions Technical Support Center. Contact information is found in the first chapter.
- Obtain a Return Materials Authorization (RMA) number from the Technical Support Center.
- Verify that the RMA and Commercial Invoice received have the correct information.
- Tightly pack the unit in a box with bubble wrap, foam material, or styrofoam inserts or packaging peanuts to cushion the item(s). You may also use double boxing whereby you place the box in a larger box that contains at least 5 cm of cushioning material.
- Ship the unit by courier or freight forwarder, along with the Commercial Invoice and RMA, to the factory.
- Customers are responsible for shipping costs to the factory, regardless of whether the unit is under warranty.
- Fax a copy of the shipping information to the GE Vernova Grid Solutions service department.

Use the detailed return procedure outlined at

<https://www.gevernova.com/grid-solutions/return-procedures>

The current warranty and return information are outlined at

<https://www.gevernova.com/grid-solutions/multilin/warranty>

1.5 OVERVIEW

Traditionally, retrofitting or upgrading an existing relay has been a challenging and time consuming task, often requiring re-engineering, panel modifications, and re-wiring. The 8 Series Retrofit Kit provides a quick solution to upgrade previously installed Multilin relays, reducing upgrade costs and minimizing effort.

The Retrofit Kit comes factory assembled and tested as a complete unit with the protection relay. Optional replacement hardware is available (terminal blocks and screws) for use if the existing hardware is significantly aged or damaged. A collar is provided to ensure the depth of the existing and replacement relays match, eliminating the need to push or pull cables.

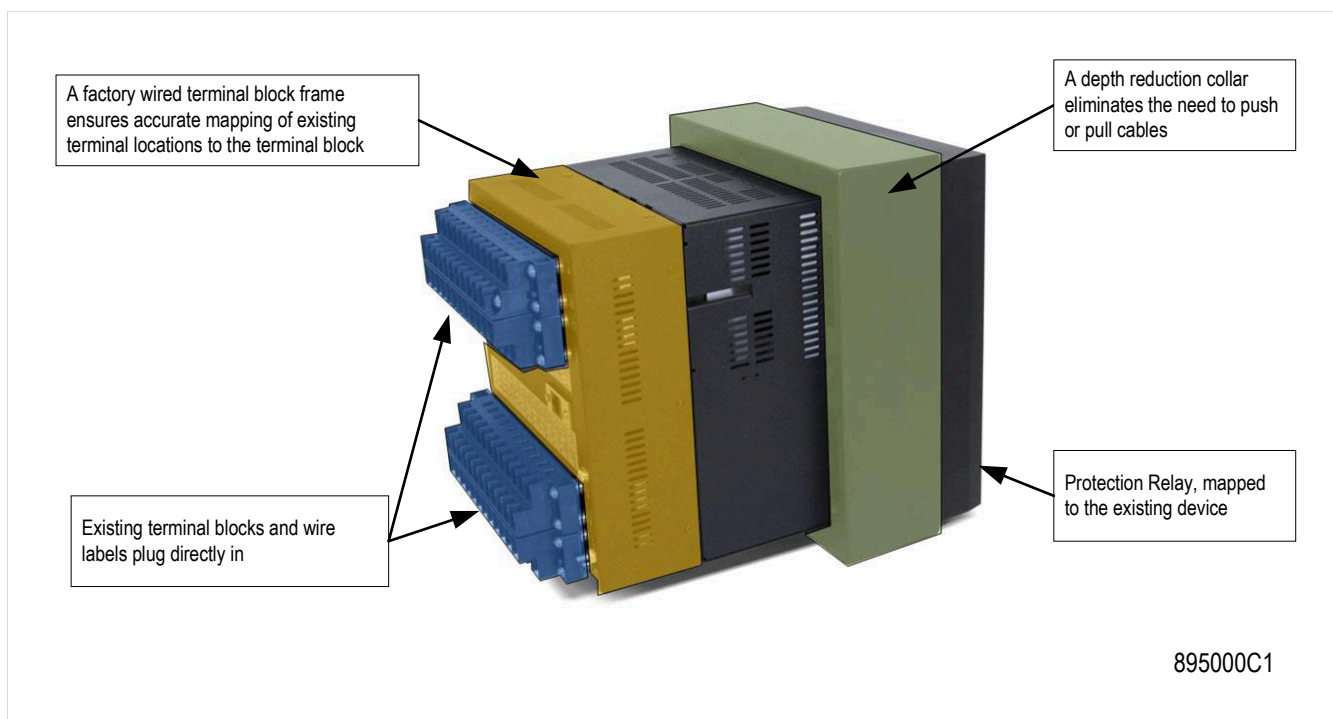


Figure 1: Retrofit Kit

The 8 Series retrofit kits can be installed in three general steps, as follows.

1. Convert the existing settings file
2. Uninstall the existing relay
3. Install the new Retrofit Kit

Wiring equivalences between the existing relay and the new 8 Series relay are shown in the Electrical Installation chapter.

The weight of the retrofit kit is 11.8 kg or 26lbs.

1.6 ORDERING

Compatible 845 order codes for existing 745 relays can be obtained online from the Multilin 845 product page on the web site.

1. Navigate to: <https://www.gevernova.com/grid-solutions/multilin/catalog/845.htm>

2. On the relay product page, click **Buy 745 to 845 Retrofit Kit**.

Check through the list of questions regarding feature availability carefully. Features not fully supported in the Multilin Retrofit Kit are clearly identified. Specifically, the following are not fully supported:

- More than 14 logic inputs
- A HI-voltage AC Power Supply with less than 88 V AC
- A LO-voltage AC Power Supply

If you require any of the features listed above, contact GE Vernova to discuss your options.

3. Enter your existing order code, and click **Order Upgrade**.

Note:

Not all features are available in 8 Series Retrofit Kits. For a complete list of available features, look online at: www.gevernova.com/grid-solutions/multilin/catalog/845.htm

CHAPTER 2

CONVERTING SETTING FILES

2.1 FIRST STEP

Before any mechanical or electrical changes are made, you must back up the settings file from the old Multilin relay. After this, you can convert the existing settings file to an 8 Series settings file. All converted settings and new settings (set to default values) must be carefully reviewed before it is uploaded to the new 8 series relay.

2.2 DOWNLOADING AND SAVING AN OLD SETPOINT FILE

In the EnerVista Setup window, setpoint files are accessed in the Settings List control bar window or the Files Window. Use the following procedure to download and save setpoint files to a local PC.

1. Start version 4.0 of the EnerVista 745 Setup software.

Note:

Only 745 setpoint files from EnerVista 745 Setup version 4.0 are supported for conversion. Older file versions must be converted to version 4.0 using the latest EnerVista 745 setup software.

2. Ensure that the site and corresponding device(s) have been properly defined and configured.
3. Select the desired device from the site list.
4. Select **File > Read Device Settings** from the online menu item, or right-click on the device and select **Read Device Settings** to obtain settings information from the device.
5. After a few seconds of data retrieval, the software requests the name and destination path of the setpoint file. The corresponding file extension is automatically assigned. Press Receive to complete the process. A new entry is added to the tree, in the File pane, showing path and file name for the setpoint file.
6. Note the location of the setpoint file.

2.3 CONVERTING A SAVED SETPOINT FILE

The EnerVista 8 Series Setup software creates new setpoint files based on an existing SR setpoint file. The new file can be uploaded to a relay at a later date. The following procedure illustrates how to convert existing setpoint files.

1. Start version 4.0 of the EnerVista 745 Setup software.

Note:

Only 745 setpoint files from EnerVista 745 Setup version 4.0 are supported for conversion. Older file versions must be converted to version 4.0 using the latest EnerVista 745 setup software.

2. In the **Offline** pane, right click and select the **New Settings File** item. A dialog similar to the following appears. This dialog allows you to configure the setpoint file for the correct firmware version and relay order code.

Note:

It is important to define the correct firmware version and order code to ensure that only available setpoints are downloaded into the relay.

Figure 2: Example of Create settings file dialog

3. Select the firmware **Version**, and **Ordercode Options** for the new setpoint file.
4. For future reference, enter some useful information in the Description box to facilitate the identification of the device and the purpose of the file.
5. To select a file name and path for the new file, click the button beside the **File Name** box.
6. Select the file name and path to store the file, or select any displayed file name to replace an existing file. All setpoint files should have the extension **.cid**.
7. Click the box beside **Initialize Settings from SR Settings File**.
8. To select an existing SR file, click the button beside the **Initialize Settings from SR Settings File** box and navigate to the file.
9. Click **OK** to complete the process. Once this step is completed, the new file, with a complete path, is added to the 8 series software environment. In addition a Conversion Report is generated, as described in the following section.

2.4 CONVERSION REPORT

Once the file conversion process is complete, the conversion results are summarized in a Conversion Report. The report is found under **Device Definition** in the **Offline** pane of the EnerVista 8 Series Setup software.

Setting	Value	Original Setting	Original Value
Protection			
Group 1			
Group 2			
Phase TOC			
Function	Disabled	Phase Time Overcurrent 1 Function	Trip & AutoReclose
Input	Phasor		
Pickup	5.010 x CT	Phase Time Overcurrent 1 Pickup(Setpoints)	5.01 x CT
Curve	IEEE Very Inverse	Phase Time Overcurrent 1 Curve	Very Inverse

Figure 3: Conversion report snippet

The Conversion Report can be printed using the File/Print command in the EnerVista taskbar or can be printed from the **GUI** print button.

- Save a copy of the Conversion Report immediately after the conversion, to use for future reference. All Conversion Reports are removed and become inaccessible if the user removes or modifies the converted file from the EnerVista 8 Series Setup Software.
- Only settings converted from the original setpoint file are shown in the Conversion Report. All other settings available in the new setpoint file are set to the default value, and must be verified by the user before putting the relay into service.

The settings file conversion process is provisioned to reduce the effort of manually converting settings. This conversion process does not guarantee settings accuracy. Each successfully converted setting must be reviewed before putting the relay in service.

Settings in the Conversion Report window are linked to the appropriate settings screens. Use the Conversion report window to navigate to the corresponding settings window to review converted settings.

2.5 LOADING SETPOINTS FROM A FILE

Once the converted settings file has been thoroughly reviewed, and the new Relay installed, the settings file can be uploaded.

Note:

An error message occurs when attempting to upload a setpoint file with a revision number that does not match the relay firmware. If the firmware has been upgraded since saving the setpoint file, see the Instruction Manual for instructions on changing the revision number of a setpoint file.

The following procedure illustrates how to load setpoints from a file.

1. Start the latest version of the EnerVista 8 Series Setup software.
2. Select the previously saved setpoints file from the **File** pane of the software main window.
3. Select the **Offline > Edit Settings File Properties** menu item and verify that the corresponding file is fully compatible with the hardware and firmware version of the target relay. If the versions are not identical, see *Upgrading Setpoint Files* to a New Revision for details on changing the setpoints file version.
4. Right-click on the selected file and select the **Write Settings File to Device** item.
5. Select the target relay from the list of devices shown and click **Send**.

If there are no incompatibilities between the target device and the settings file, the data is transferred to the relay. An indication of the percentage completed is shown in the bottom of the main window.

CHAPTER 3

REMOVING EXISTING RELAY

3.1 UNINSTALL EXISTING SR RELAY

Always be sure to follow your company's safety policies and procedures during the retrofit process.



Caution:
Always be sure to follow your company's safety policies and procedures during the retrofit process..



Caution:
Wear appropriate personal protective equipment for hand and eye protection.

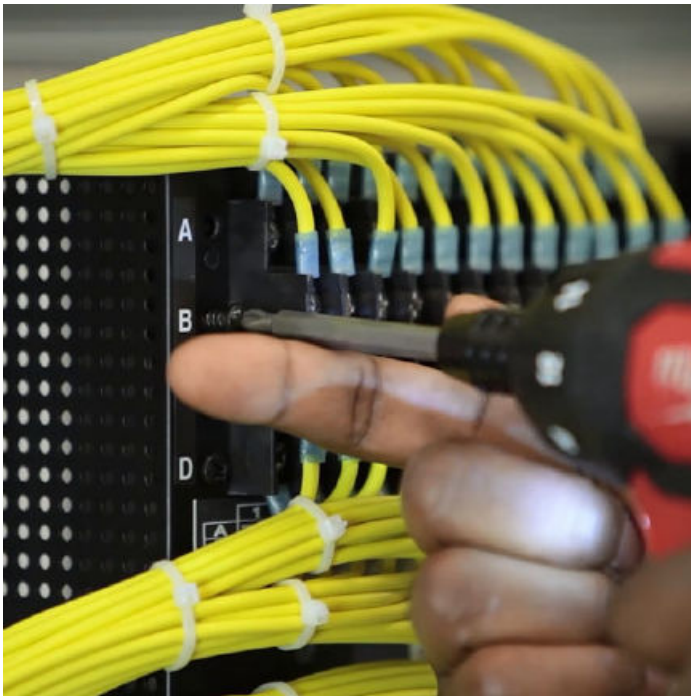


Warning:
Turn off control power before drawing out or re-inserting the relay.

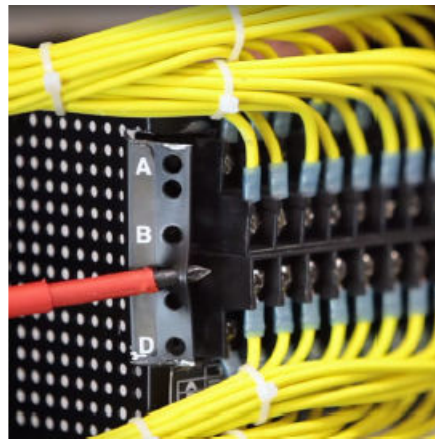
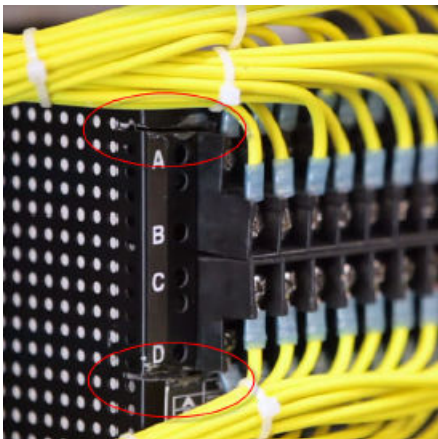
1. Disconnect the Ethernet cable from the back of the relay
2. Remove the relay from its case.



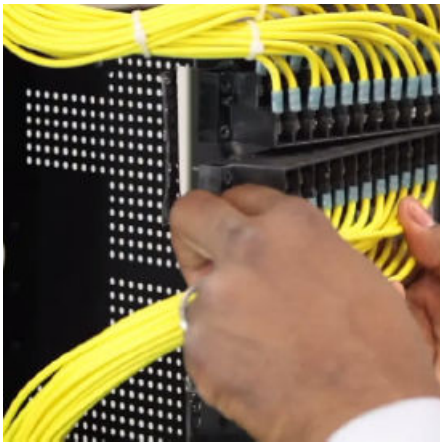
3. From the back of the relay case, remove the terminal block screws. Do not remove any wires.



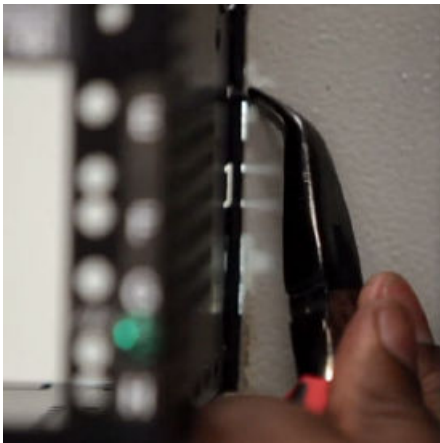
4. Pry open the metal sides of the case around the terminal blocks. Use pliers to further pry open the case. This will loosen the terminal blocks from the case.
5. A horizontal cutting tool may be used to cut slots on both sides of the terminal blocks in the positions indicated, if required. Be careful not to damage any wires during this process.



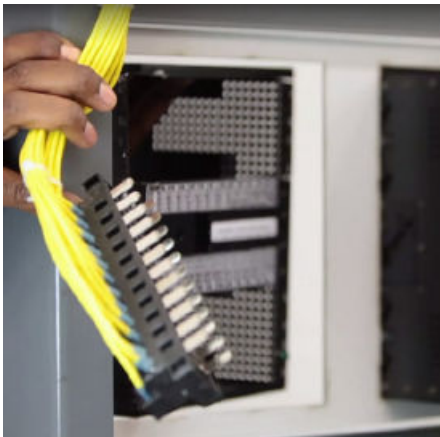
6. Remove terminal blocks by pushing inwards, twisting sideways, and then pulling outwards.



7. Undo the tabs on the case around the cutout from the back.



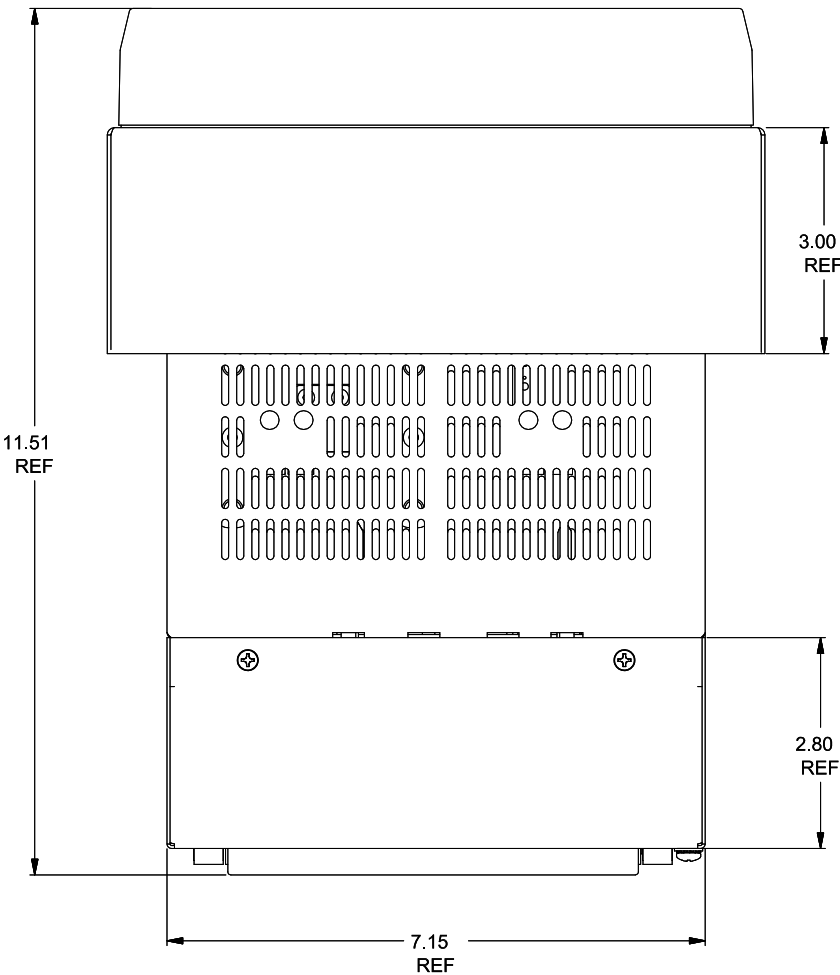
8. Remove the empty case.



CHAPTER 4

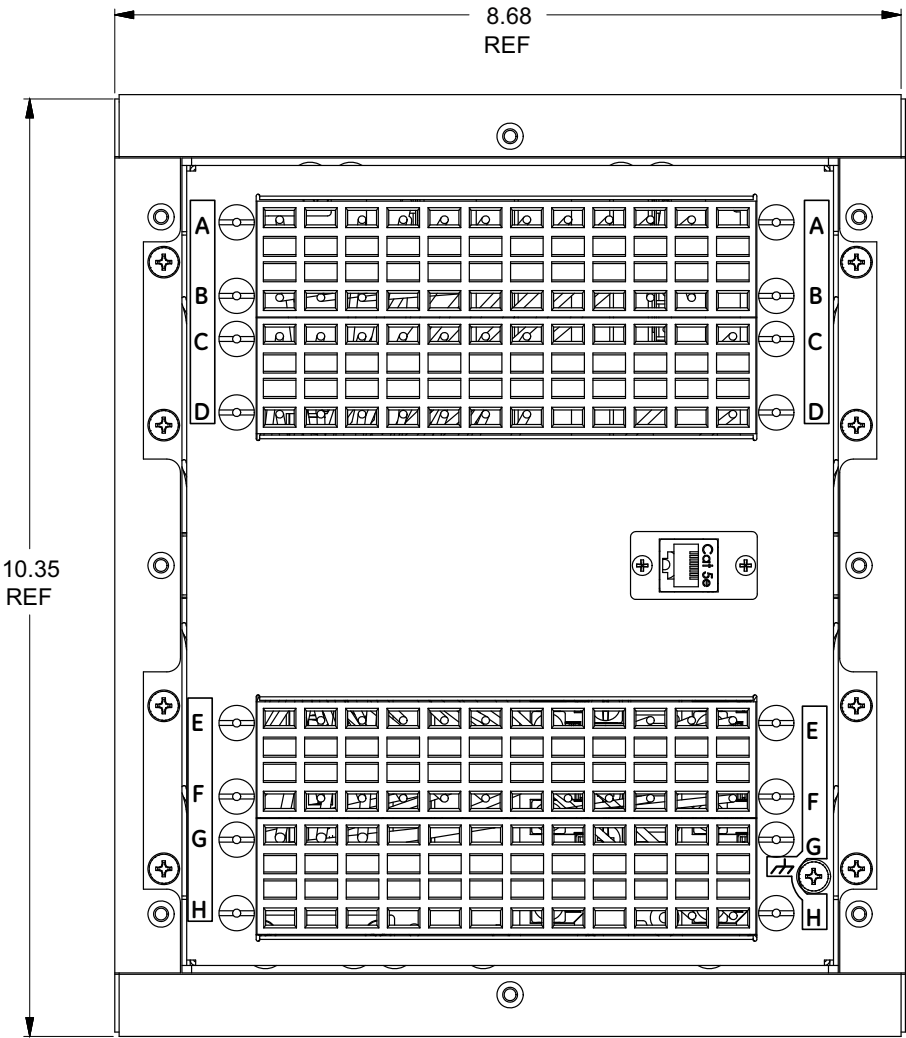
INSTALLING THE NEW 8 SERIES RELAY

4.1 DIMENSIONS



895009C1

Figure 4: Overall dimensions - top view



895010C1

Figure 5: Overall dimensions - back view

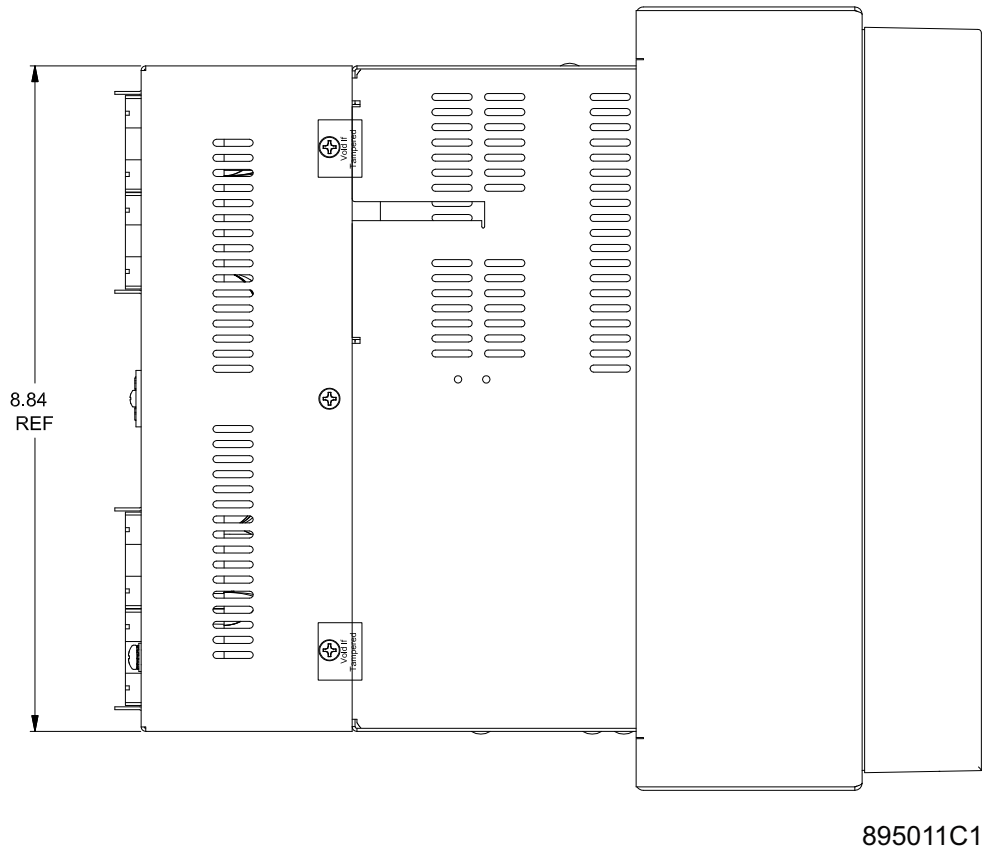
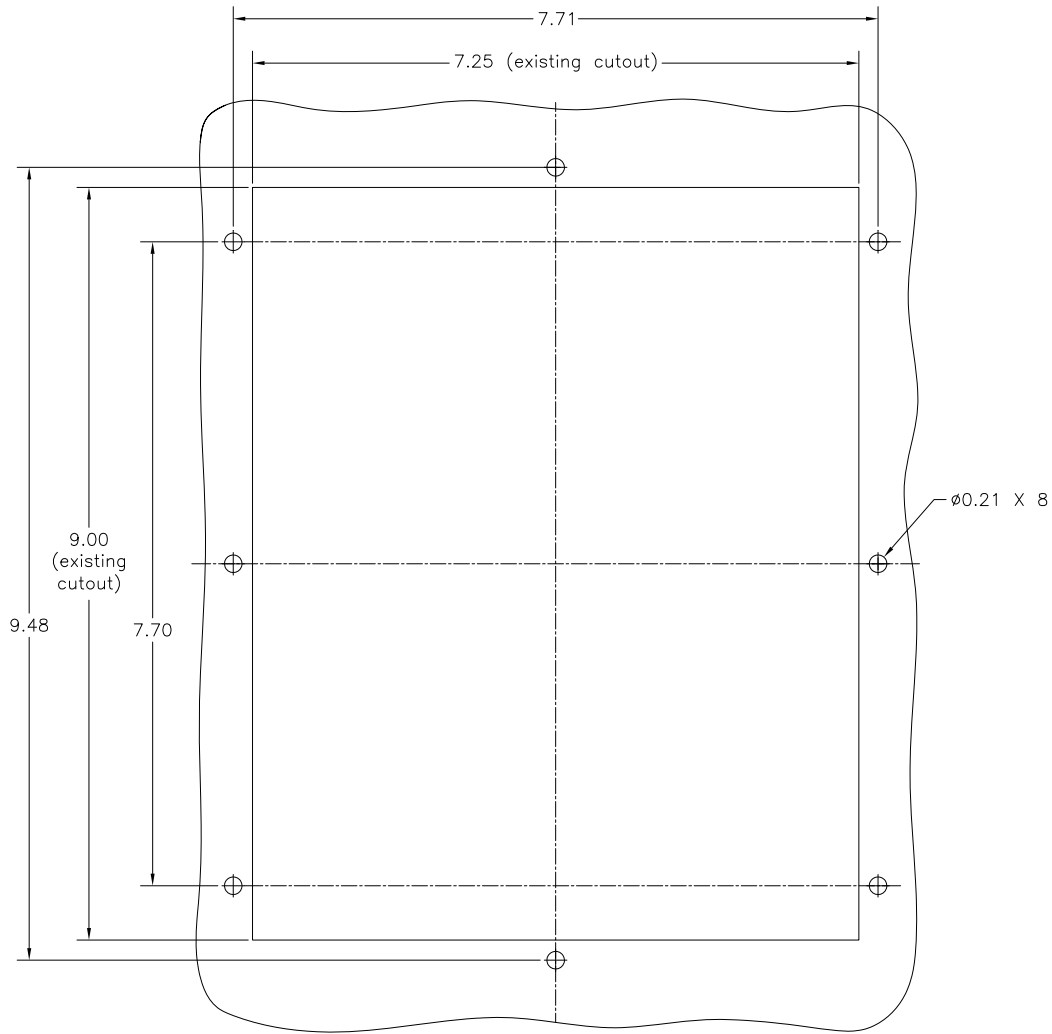


Figure 6: Overall dimensions - side view



895012C1

Figure 7: Cutout dimensions

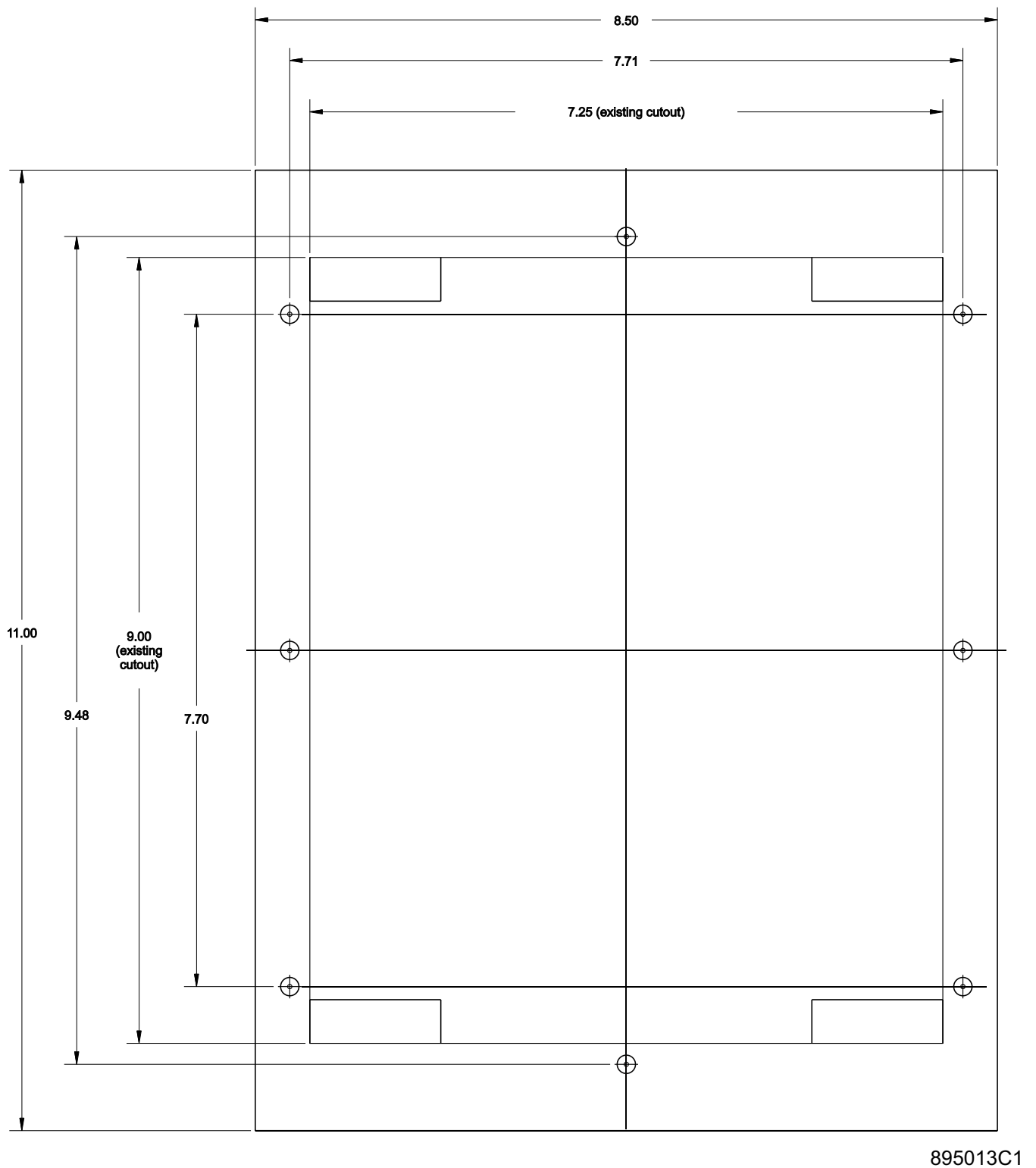


Figure 8: Drill guide template

4.2 MOUNTING THE RETROFIT KIT

With the retrofit kit, the draw-out and insertion mechanism remains the same. The depth of the new terminal blocks is a close match to the depth of the SR terminal blocks due to the depth reduction collar included in the Retrofit Kit. There is no need to push or pull wires.

The 8 Series Retrofit kit model shown may vary slightly from shown, but the installation steps remain the same.

1. Use the template to mark holes for mounting the retrofit kit. Do not use the template in the manual as this may not be to scale.
2. Drill or punch eight 0.21" diameter holes around the cutout border as shown in the drill guide template.



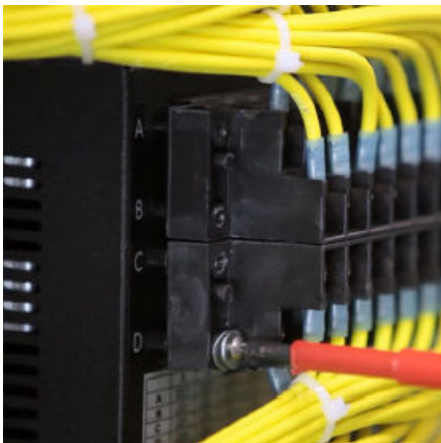
3. Insert the retrofit kit in the cutout and secure it with the screws provided.



4. Insert the wired existing terminal blocks back on to the female terminal blocks at the back of the retrofit kit case.



5. Secure the terminal blocks by screwing into place



6. Insert the new 8S relay inside the newly mounted Retrofit Kit case



CHAPTER 5

ELECTRICAL INSTALLATION

5.1 8S TERMINAL LAYOUT

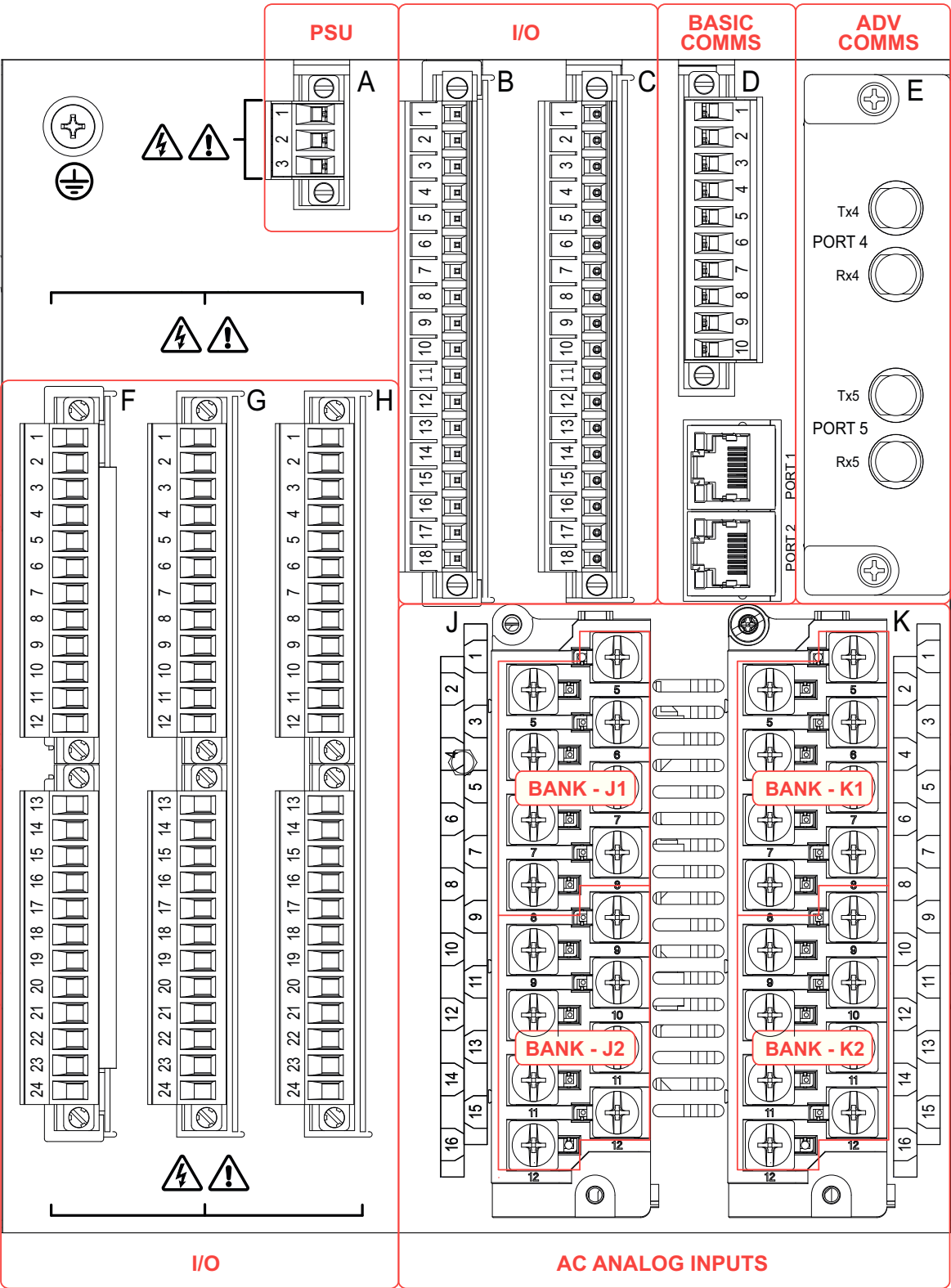
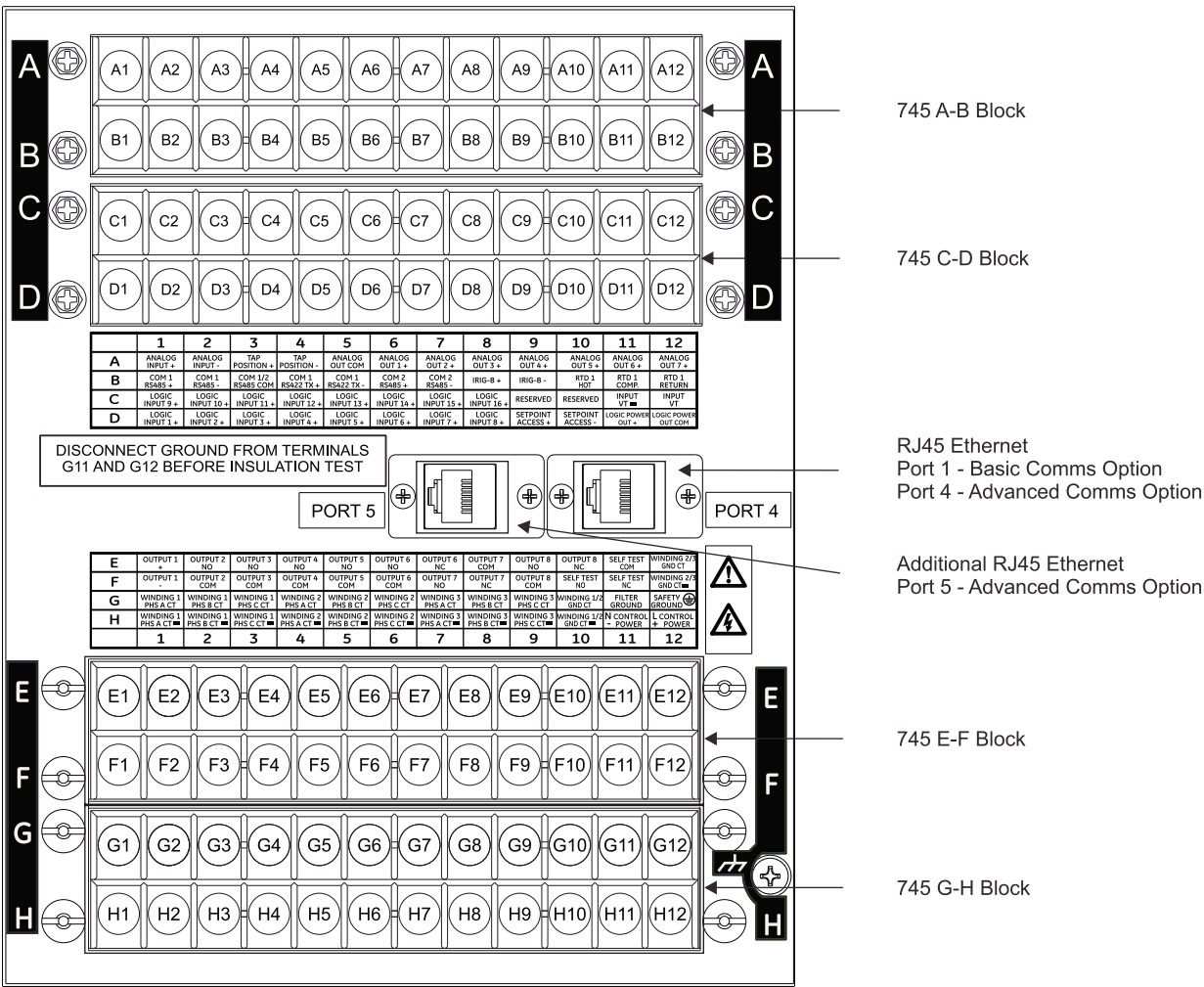


Figure 9: Rear Terminal Layout of the 8 Series Platform

5.2 REAR TERMINAL LAYOUT OF THE 745-845 RETROFIT KIT



895019C1

Figure 10: Rear Terminal Layout of the 745-845 Retrofit Kit

5.3 TERMINALBLOCKMAPPING

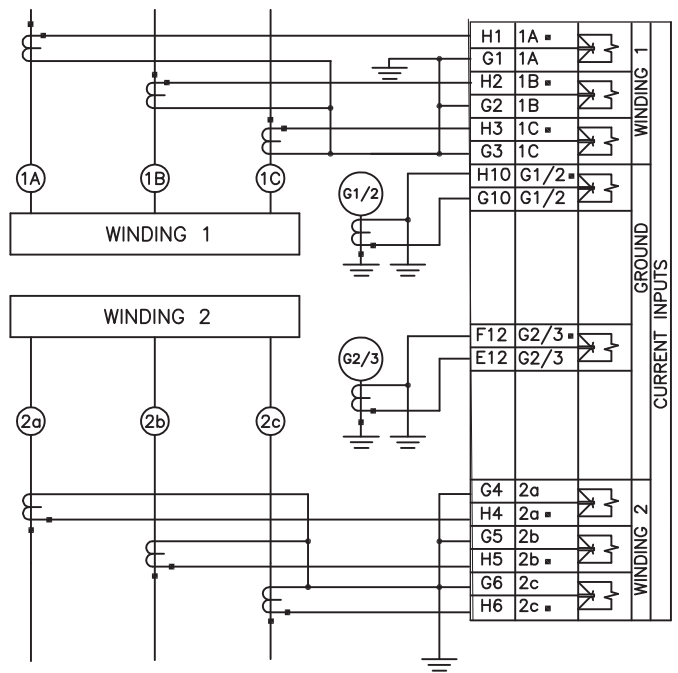
745 Terminal Block Assignments

	1	2	3	4	5	6	7	8	9	10	11	12
A	ANALOG INPUT +	ANALOG INPUT -	TAP POSITION +	TAP POSITION -	ANALOG OUT COM	ANALOG OUT 1 +	ANALOG OUT 2 +	ANALOG OUT 3 +	ANALOG OUT 4 +	ANALOG OUT 5 +	ANALOG OUT 6 +	ANALOG OUT 7 +
B	COM 1 RS485 +	COM 1 RS485 -	COM 1/2 RS485 COM	COM 1 RS422 TX +	COM 1 RS422 TX -	COM 2 RS485 +	COM 2 RS485 -	IRIG-B +	IRIG-B -	RTD 1 HOT	RTD 1 COMP.	RTD 1 RETURN
C	LOGIC INPUT 9 +	LOGIC INPUT 10 +	LOGIC INPUT 11 +	LOGIC INPUT 12 +	LOGIC INPUT 13 +	LOGIC INPUT 14 +	LOGIC INPUT 15 +	LOGIC INPUT 16 +	RESERVED	RESERVED	INPUT VT n	INPUT VT
D	LOGIC INPUT 1 +	LOGIC INPUT 2 +	LOGIC INPUT 3 +	LOGIC INPUT 4 +	LOGIC INPUT 5 +	LOGIC INPUT 6 +	LOGIC INPUT 7 +	LOGIC INPUT 8 +	SETPOINT ACCESS +	SETPOINT ACCESS -	LOGIC POWER OUT +	LOGIC POWER OUT COM
E	OUTPUT 1 +	OUTPUT 2 NO	OUTPUT 3 NO	OUTPUT 4 NO	OUTPUT 5 NO	OUTPUT 6 NO	OUTPUT 6 NC	OUTPUT 7 COM	OUTPUT 8 NO	OUTPUT 8 NC	SELF TEST COM	WINDING 2/3 GND CT
F	OUTPUT 1 -	OUTPUT 2 COM	OUTPUT 3 COM	OUTPUT 4 COM	OUTPUT 5 COM	OUTPUT 6 COM	OUTPUT 7 NO	OUTPUT 7 NC	OUTPUT 8 COM	SELF TEST NO	SELF TEST NC	WINDING 2/3 GND CT n
G	WINDING 1 PHS A CT	WINDING 1 PHS B CT	WINDING 1 PHS C CT	WINDING 2 PHS A CT	WINDING 2 PHS B CT	WINDING 2 PHS C CT	WINDING 3 PHS A CT	WINDING 3 PHS B CT	WINDING 3 PHS C CT	WINDING 1/2 GND CT	FILTER GROUND	SAFETY GROUND 
H	WINDING 1 PHS A CT n	WINDING 1 PHS B CT n	WINDING 1 PHS C CT n	WINDING 2 PHS A CT n	WINDING 2 PHS B CT n	WINDING 2 PHS C CT n	WINDING 3 PHS A CT n	WINDING 3 PHS B CT n	WINDING 3 PHS C CT n	WINDING 1/2 GND CT n	N CONTROL - POWER	L CONTROL + POWER

745 to 845 Terminal Block Mapping

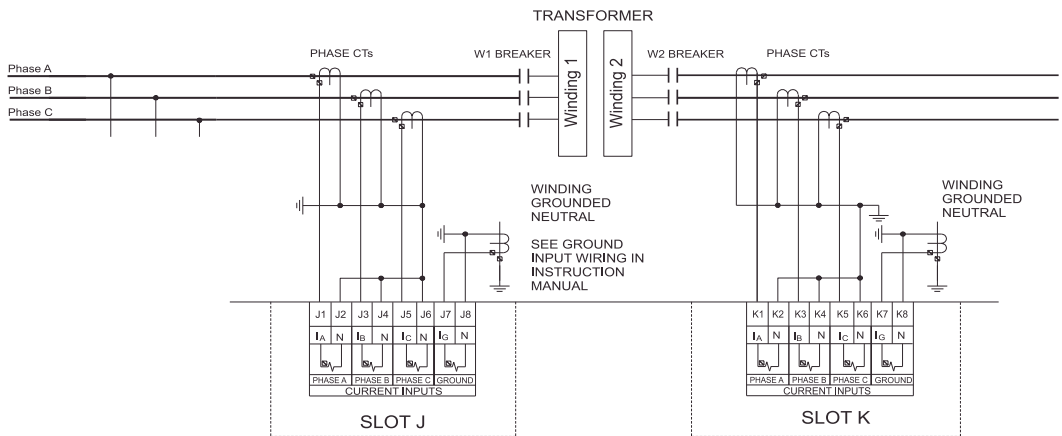
	1	2	3	4	5	6	7	8	9	10	11	12
A	G10	G14	G16	G17	G8	G1	G2	G3	G4	G5	G6	G7
B	D3	D4	D5	N/A	N/A	N/A	N/A	D1	D2	G19	G20	G21
C	H14	H15	H16	H17	H18	H19	N/A	N/A	N/A	N/A	J9	J10
D	F13	F14	F15	F16	F17	F18	F19	H13	N/A	N/A	F21, H21	F20, H20
E	H12	F1	F4	H1	H4	F9	F7	F11	H9	H7	F23	K7
F	H11	F2	F5	H2	H5	F8	F12	F10	H8	F24	F22	K8
G	J2	J4	J6	K2	K4	K6	K10	K12	K14	J7	A3	A3
H	J1	J3	J5	K1	K3	K5	K9	K11	K13	J8	A2	A1

5.4 745 TO 845 CT CONNECTIONS



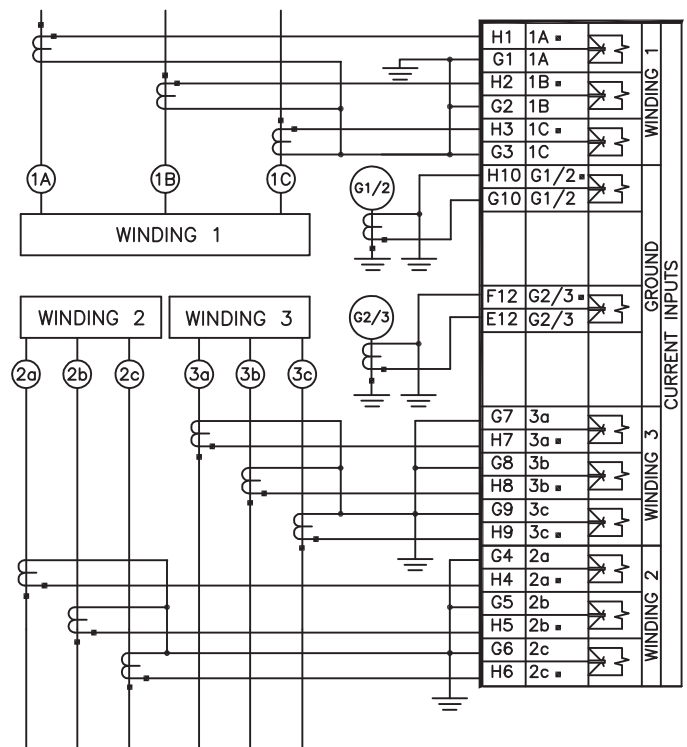
895020C1

Figure 11: 745 CT Wiring - Two-Winding Transformer



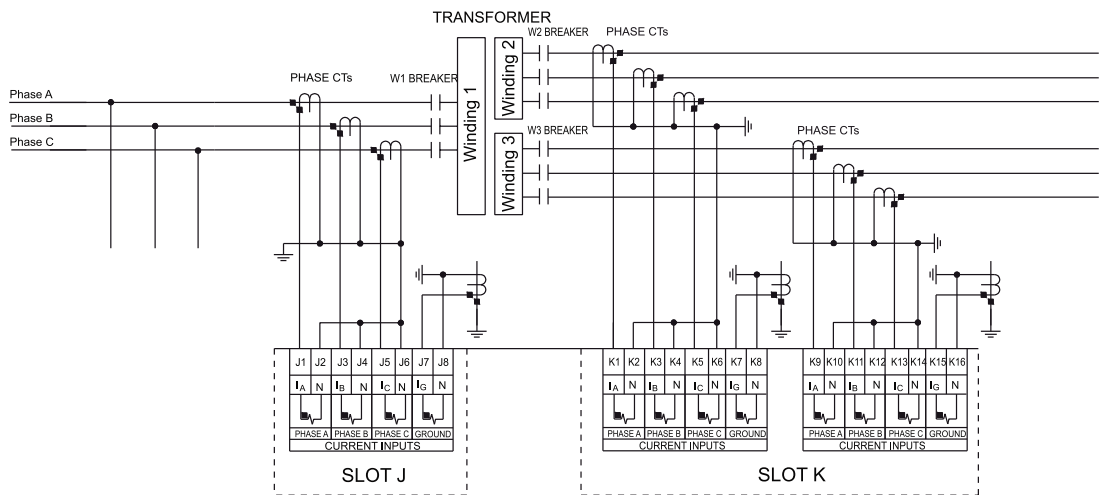
895021C1

Figure 12: 845 CT Wiring - Two-Winding Transformer



895022C1

Figure 13: 745 CT Wiring - Three-Winding Transformer



89523C1

Figure 14: 845 CT Wiring - Three-Winding Transformer

CT connections table

CT connections	System Connection	745	845
Phase Current Inputs	Winding 1 - Phase A n	H1	J1
	Winding 1 - Phase A RETURN	G1	J2
	Winding 1 - Phase B n	H2	J3
	Winding 1 - Phase B RETURN	G2	J4
	Winding 1 - Phase C n	H3	J5
	Winding 1 - Phase C RETURN	G3	J6
	Winding 2 - Phase A n	H4	K1
	Winding 2 - Phase A RETURN	G4	K2
	Winding 2 - Phase B n	H5	K3
	Winding 2 - Phase B RETURN	G5	K4
	Winding 2 - Phase C n	H6	K5
	Winding 2 - Phase C RETURN	G6	K6
	Winding 3 - Phase A n	H7	K9
	Winding 3 - Phase A RETURN	G7	K10
	Winding 3 - Phase B n	H8	K11
	Winding 3 - Phase B RETURN	G8	K12
	Winding 3 - Phase C n	H9	K13
	Winding 3 - Phase C RETURN	G9	K14
Ground Current Inputs	For two-winding transformer: Winding 1 - Ground n For three-winding transformer: Winding # as assigned by 745 Ground CT Input setpoint for G1/2 - Ground n	G10	J7
	For two-winding transformer: Winding 1 - Ground RETURN For three-winding transformer: Winding # as assigned by 745 Ground CT Input setpoint for G1/2 - Ground RETURN	H10	J8
	For two-winding transformer: Winding 2 - Ground n For three-winding transformer: Winding # as assigned by 745 Ground CT Input setpoint for G2/3 - Ground n	E12	K7
	For two-winding transformer: Winding 2 - Ground RETURN For three-winding transformer: Winding # as assigned by 745 Ground CT Input setpoint for G2/3 - Ground RETURN	F12	K8

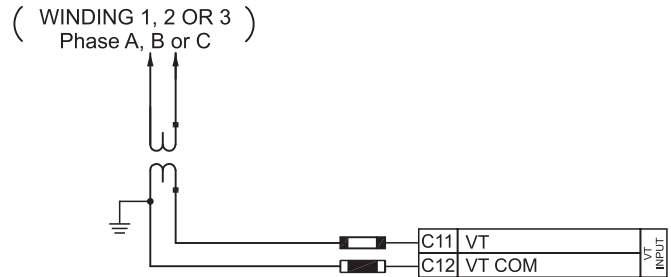
Note:

Ground Protection elements should be configured to the signal input bank based on the setpoints.

5.5 745 TO 845 VT CONNECTIONS

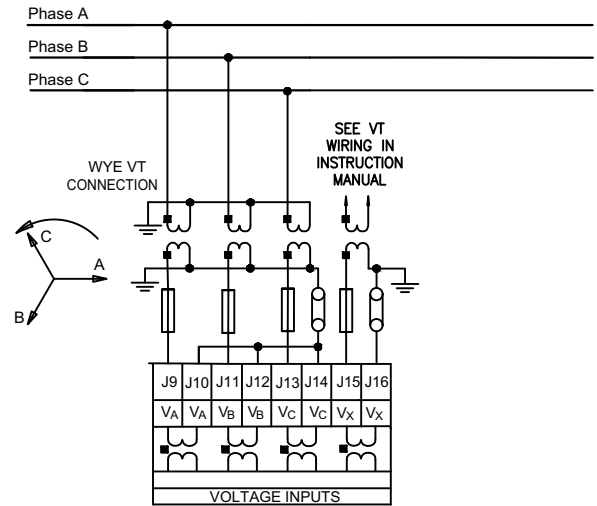
Set **845 SYSTEM > VOLTAGE SENSING > PHASE VT CONNECTION** to *Single*.

Set **845 SYSTEM > VOLTAGE SENSING > PSEUDO VOLTAGE REFERENCE** to match the **745 VOLTAGE INPUT PARAMETER** setpoint (regardless of winding).



895024C1

Figure 15: 745 VT Connections



895025C1

Figure 16: 845 VT Connections

VT connection table

Type	System Connection	745	845
Voltages	VT Input any winding, any phase	C11	J9
Voltages	VT Return any winding, any phase	C12	J10

5.6 CONTROL POWER AND GROUNDING

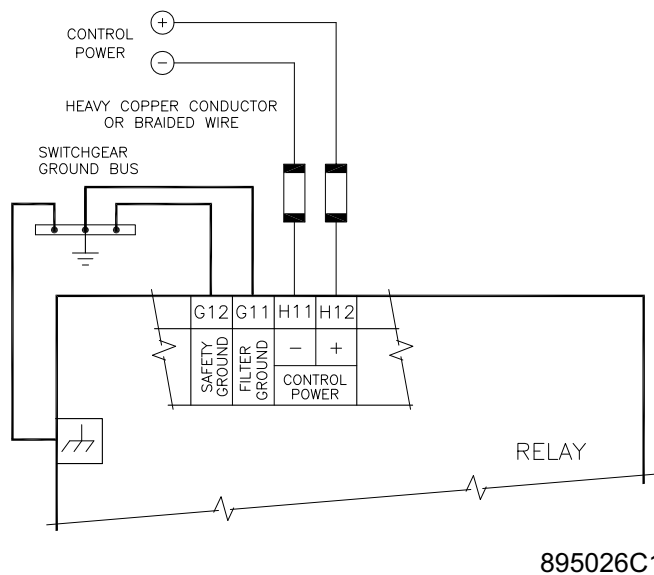


Figure 17: 745 Control power and grounding

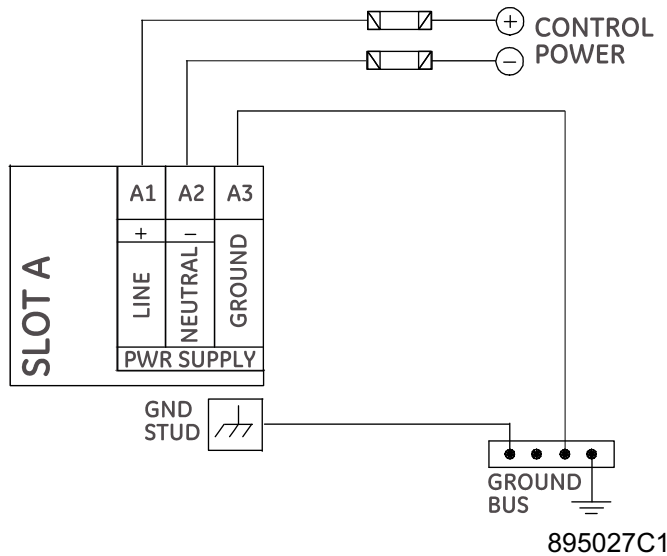


Figure 18: 745 Control power and grounding

Control Power and Grounding

Type	Function	750/760	850
Power Supply	Plus	H12	A1
Power Supply	Negative	H11	A2
Power Supply	Ground	G11/G12	A3

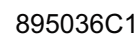


Figure 19: 745-845 Contact Output Mapping

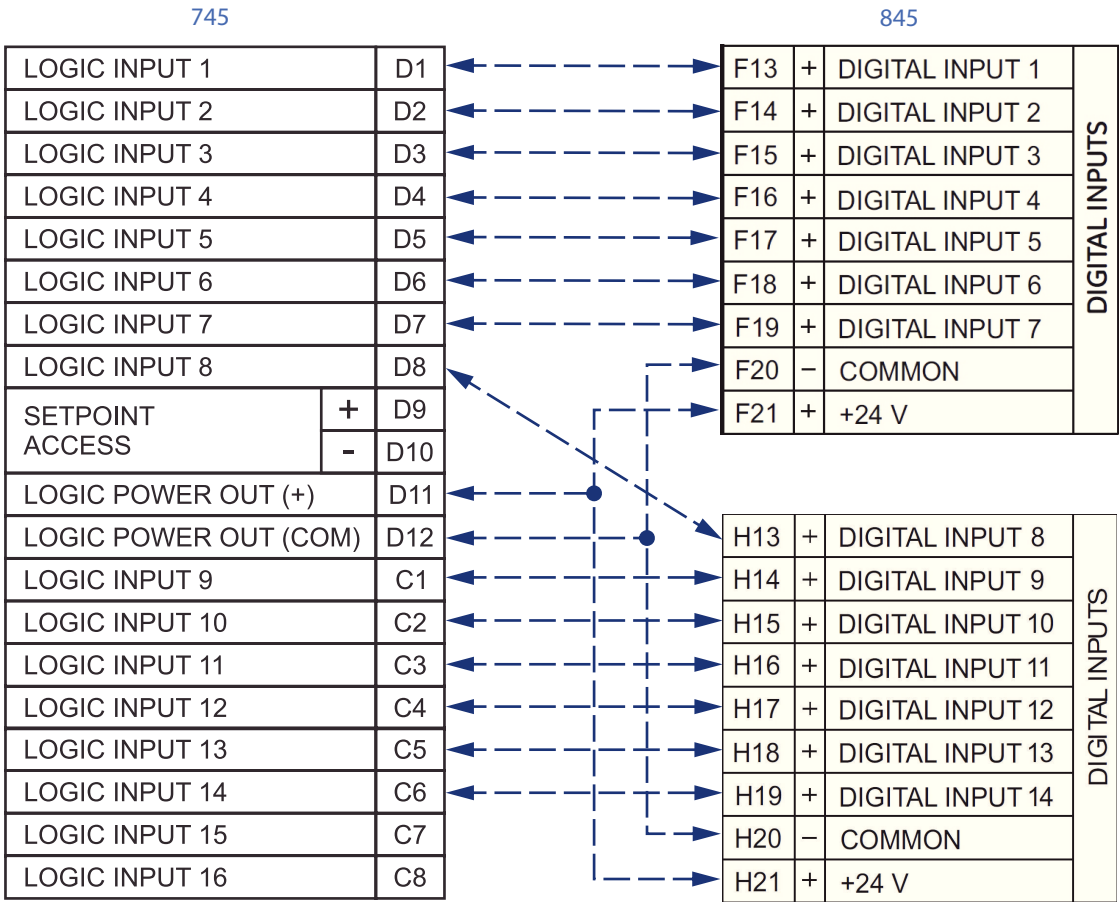
Trip and close coil supervision is not available

Contact outputs

745 Function	845 Function	745	845
Output 1: solid state trip (+)	Auxiliary 12 NO	E1	H12
Output 1: solid state trip (-)	Auxiliary 12 Common	F1	H11
Output 2: trip relay (NO)	Auxiliary 1 NO	E2	H22

745 Function	845 Function	745	845
Output 2: trip relay (common)	Auxiliary 1 Common	F2	F9
Output 3: trip relay (NO)	Auxiliary 2 NO	E3	F8
Output 3: trip relay (common)	Auxiliary 2 Common	F3	F7
Output 4: trip relay (NO)	Auxiliary 9 NO	E4	F12
Output 4: trip relay (common)	Auxiliary 9 Common	F4	F11
Output 5: trip relay (NO)	Auxiliary 10 NO	E5	F10
Output 5: trip relay (common)	Auxiliary 10 Common	F5	H9
Output 6: auxiliary relay (NO)	Auxiliary 3 NO	E6	H8
Output 6: auxiliary relay (common)	Auxiliary 3 Common	F6	H7
Output 6: auxiliary relay (NC)	Auxiliary 3 NC	E7	H12
Output 7: auxiliary relay (NO)	Auxiliary 4 NO	F8	H11
Output 7: auxiliary relay (common)	Auxiliary 4 Common	E8	H10
Output 7: auxiliary relay (NC)	Auxiliary 4 NC	F8	F24
Output 8: auxiliary relay (NO)	Auxiliary 11 NO	E9	F23
Output 8: auxiliary relay (common)	Auxiliary 11 Common	F9	F22
Output 8: auxiliary relay (NC)	Auxiliary 11 NC	E10	H7
Output 9: service relay (NO)	Critical Failure 8 NO	F10	F24
Output 9: service relay (common)	Critical Failure 8 Common	E11	F23
Output 9: service relay (NC)	Critical Failure 8 NC	F11	F22

5.8 CONTACT INPUTS



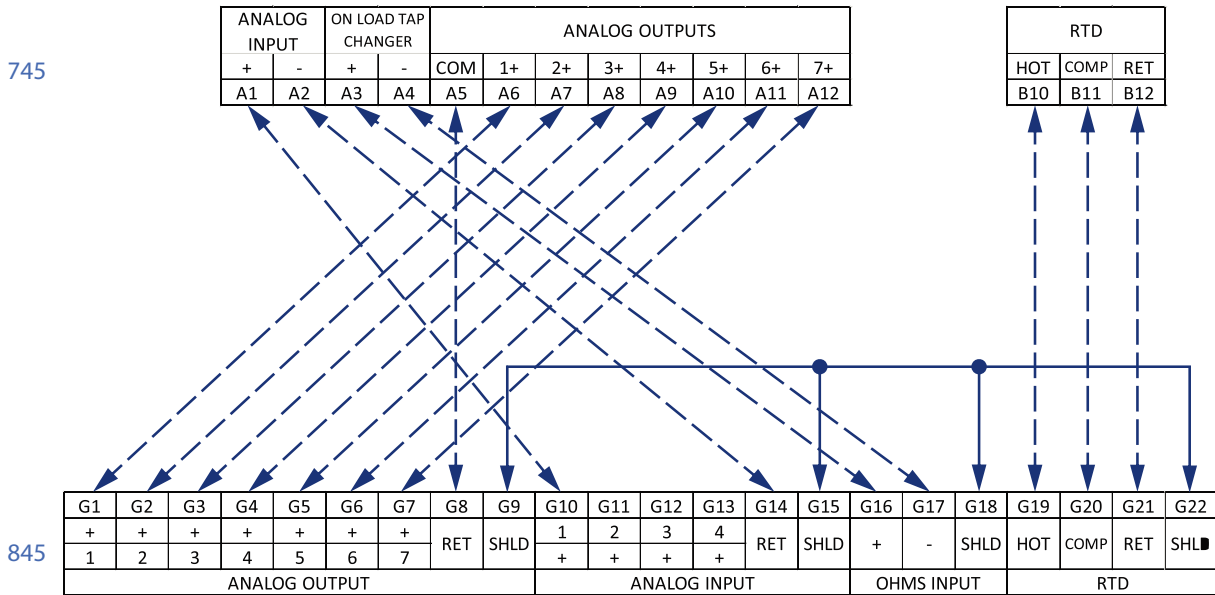
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Contact Inputs

System Connection	745	845
Logic Input 1	D1	F13
Logic Input 2	D2	F14
Logic Input 3	D3	F15
Logic Input 4	D4	F16
Logic Input 5	D5	F17
Logic Input 6	D6	F18
Logic Input 7	D7	F19
Logic Input 8	D8	H13
Logic Input 9	C1	H14
Logic Input 10	C2	H15
Logic Input 11	C3	H16
Logic Input 12	C4	H17
Logic Input 13	C5	H18
Logic Input 14	C6	H19

System Connection	745	845
Logic Input 15	C7	Not supported
Logic Input 16	C8	Not supported

5.9 LOW VOLTAGE ANALOG I/O, TAP POSITION INPUT, RTD INPUT MAPPING



895028C1

Figure 20: Low Voltage Analog I/O, Tap Position Input, RTD Input Mapping

Low Voltage Inputs and Outputs

Type	System Connection	745	845
Analog Input	Analog Input 1+	A1	G10
Analog Input	Analog Input Common -	A2	G14
Analog Output	Analog Output 1+	A6	G1
Analog Output	Analog Output 2+	A7	G2
Analog Output	Analog Output 3+	A8	G3
Analog Output	Analog Output 4+	A9	G4
Analog Output	Analog Output 5+	A10	G5
Analog Output	Analog Output 6+	A11	G6
Analog Output	Analog Output 7+	A12	G7
Analog Output	Analog Output Common -	A5	G8
Tap Position Input	Tap Position +	A3	G16
Tap Position Input	Tap Position -	A4	G17
RTD Input	RTD Hot	B10	G19
RTD Input	RTD Compensation	B11	G20
RTD Input	RTD Return	B12	G21

5.10 COMMUNICATION MAPPINGS

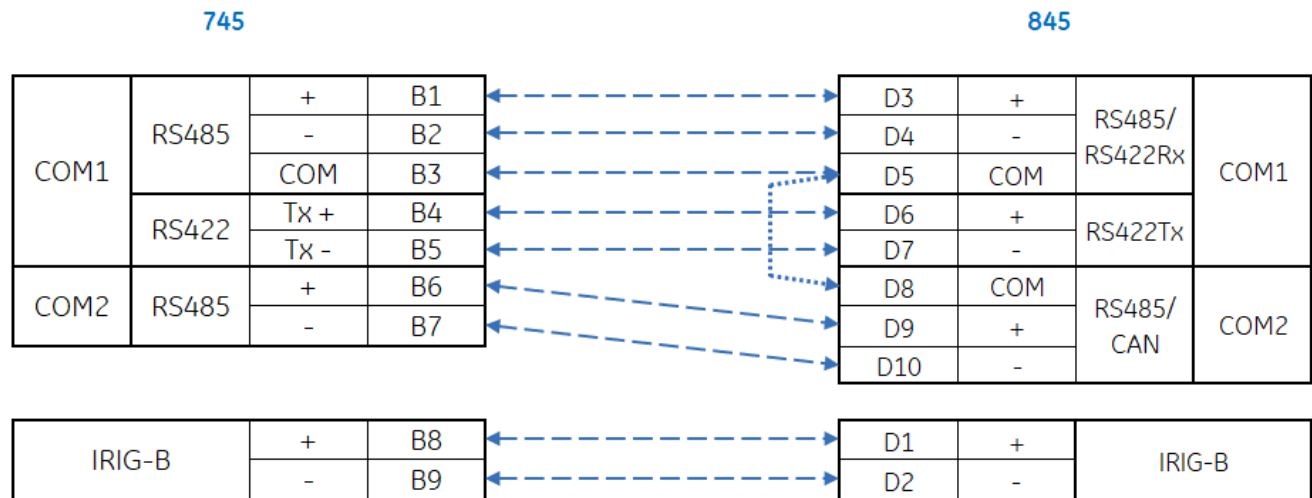


Figure 21: 745-845 Communications

Communications

System Connection	745	845
Computer RS485 (+) / RS422 (Rx+)	B1	D3
Computer RS485 (-) / RS422 (Rx-)	B2	D4
Computer RS485/RS422 (common)	B3	D5
RS422 (Tx+)	B4	D6
RS422 (Tx-)	B5	D7
External RS485 (+)	B6	D9
External RS485 (-)	B7	D10
IRIG-B +	B8	D1
IRIG-B -	B9	D2

Note:
The 845 supports the Computer RS485 mode, not the 4-wire RS422 mode.

Note:
We recommend converting the External RS485 channel to Ethernet using Multinet.

CHAPTER 6

APPENDIX A

6.1 WARRANTY

For products shipped as of 1 October 2013, GE Vernova warrants most of its GE manufactured products for 10 years. For warranty details including any limitations and disclaimers, see the GE Vernova Terms and Conditions on the GE Vernova website.

For products shipped before 1 October 2013, the standard 24-month warranty applies.

6.2 REVISION HISTORY

MANUAL PART NUMBER	RELEASE DATE
1601-0726-A1	January 2023
845-1601-0726-C430-1	June 2025

For information on the updates included in this release of the Instruction Manual, please refer to the latest release notes online.