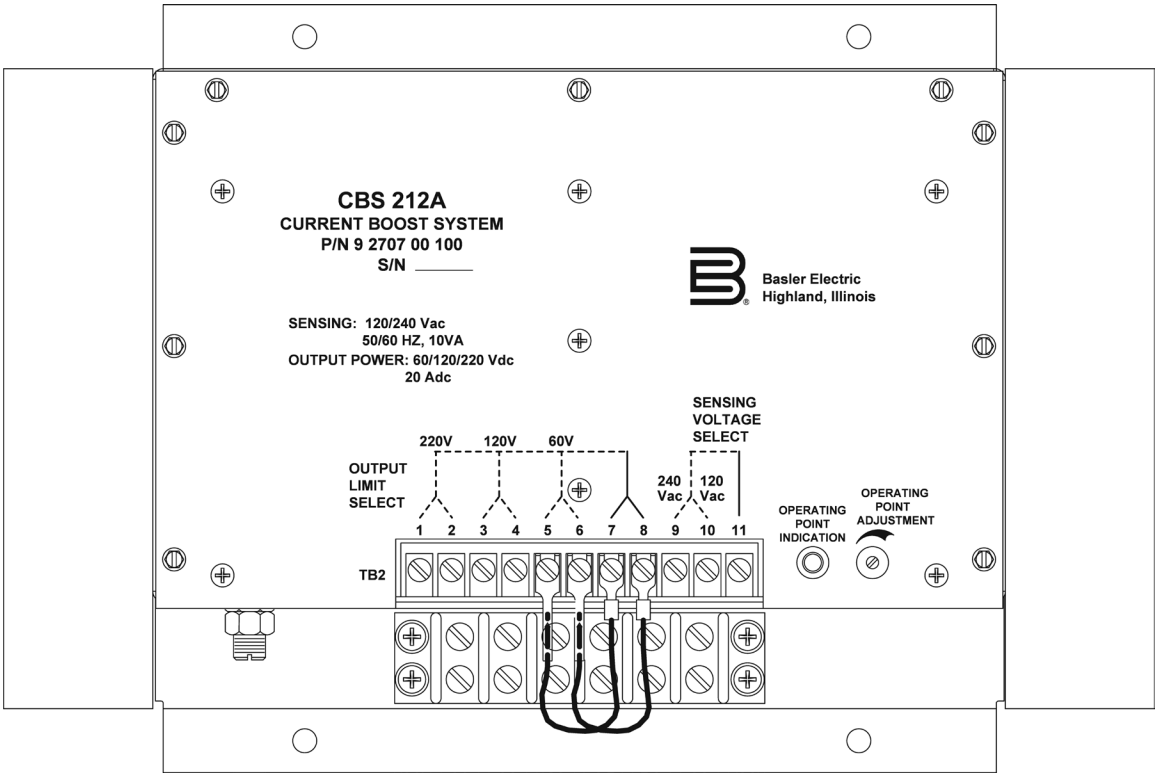
CBS 212A

Current Boost System

Instruction Manual



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Preface

This instruction manual provides information about the installation and operation of the CBS 212A. To accomplish this, the following information is provided:

- General information and functional description
- Controls and indicators
- Installation, calibration, and testing
- Specifications

Conventions Used in this Manual

Important safety and procedural information is emphasized and presented in this manual through warning, caution, and note boxes. Each type is illustrated and defined as follows.

Warning!

Warning boxes call attention to conditions or actions that may cause personal injury or death.

Caution

Caution boxes call attention to operating conditions that may lead to equipment or property damage.

Note

Note boxes emphasize important information pertaining to installation or operation.

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Warning!

READ THIS MANUAL. Read this manual before installing, operating, or maintaining this equipment. Note all warnings, cautions, and notes in this manual as well as on the product. Keep this manual with the product for reference. Only qualified personnel should install, operate, or service this system. Failure to follow warning and cautionary labels may result in personal injury or property damage. Exercise caution at all times.

Basler Electric does not assume any responsibility to compliance or noncompliance with national code, local code, or any other applicable code. This manual serves as reference material that must be well understood prior to installation, operation, or maintenance.

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This publication contains confidential information of Basler Electric Company, an Illinois corporation. It is loaned for confidential use, subject to return on request, and with the mutual understanding that it will not be used in any manner detrimental to the interests of Basler Electric Company and used strictly for the purpose intended.

It is not the intention of this manual to cover all details and variations in equipment, nor does this manual provide data for every possible contingency regarding installation or operation. The availability and design of all features and options are subject to modification without notice. Over time, improvements and revisions may be made to this publication. Before performing any of the following procedures, contact Basler Electric for the latest revision of this manual.

The English-language version of this manual serves as the only approved manual version.

Revision History

A historical summary of the changes made to this instruction manual is provided below. Revisions are listed in reverse chronological order.

Instruction Manual Revision History

Manual Revision and Date	Change
K, Jun 2025	• Updated China RoHS compliance table
J, Dec 2023	• Added China RoHS compliance
I	• This revision letter not used
H, Feb 2021	• Adjusted all relevant illustrations to provide a more accurate representation of the product • Corrected labels in the function block diagram • Added RoHS and REACH compliance statements
G2, Apr 2019	• Modified California Proposition 65 warning statement
G1, Jan 2019	• Added California Proposition 65 warning statement
G, Jun 2017	• Added coverage of current transformers BE34704001, BE34705001, BE34706001, BE34707001, BE34708001, and BE34709001
F, Apr 2015	• Added EAC certification statement
E, Nov 2001	• Corrected the metric weights listed for the current transformers • Added a controls and indicators diagram • Corrected metric dimensions and added mounting hole dimensions in mounting dimensions illustration • Revised the calibration procedures
D, C, B, and A	• No data available
—, Nov 2001	• Initial release

Contents

1 • Introduction

The CBS 212A Current Boost System assists Basler SSR-series voltage regulators during generator overload conditions and supplies the exciter field during generator short-circuits. When used with three-wire or 4-wire generators, the CBS 212A supports sustained single-phase and multiple-phase, line-to-line faults. In addition, the CBS 212A permits four-wire generators to support A-phase and B-phase line-to-neutral faults.

The CBS 212A assembly consists of a Current Boost Module and two current transformers (CTs). The Current Boost Module is designed for behind-the-panel mounting.

An Operating Point Adjustment control and Operating Point Indication LED are located on the front panel of the Current Boost Module. An Output Limit Adjustment control is located on the bottom panel of the Current Boost Module.

Special power CTs connect to two phases of the generator output and provide current to the Current Boost Module. The *Installation* chapter provides details about CT selection.

2 • Functional Description

Introduction

CBS 212Afunctions are illustrated in Figure 2-1 and described in the following paragraphs.

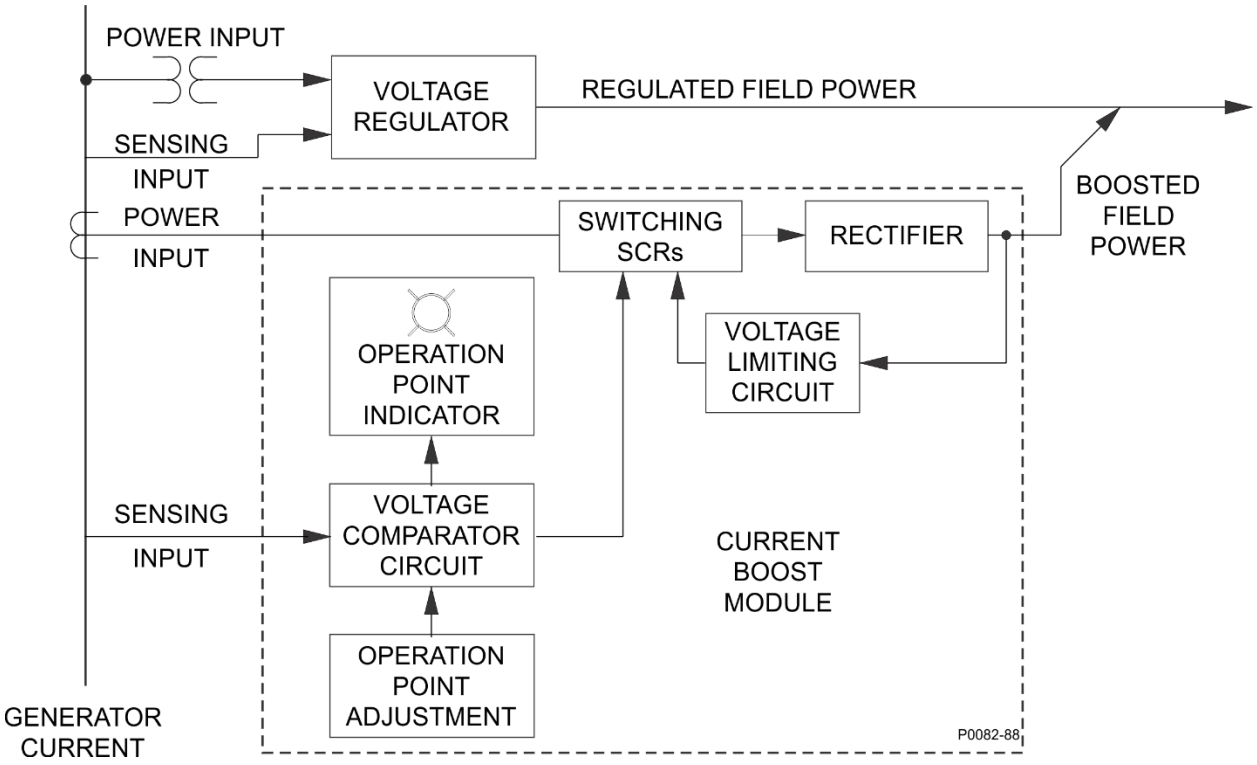


Figure 2-1. Function Block Diagram

Current Boost Module

The Current Boost Module rectifies the ac current received from the CTs and provides dc current boost to the generator exciter field.

During normal generator operation, power from the generator output provides sufficient exciter field power and the CBS 212A remains dormant. During normal operation, the CTs are effectively shorted by the internal SCRs of the CBS 212A. Normal generator operation is indicated by the Operating Point Indication LED being lit.

If the generator output voltage decreases below the operating-point setting, the CBS 212A detects the voltage drop, turns off the Operating Point Indication LED, and removes the SCR “short-circuit” from the CTs. The CBS 212A then provides full current boost to the generator exciter until the voltage returns to a level just above the operating point setting. The *Controls and Indicators* and *Installation* chapters provide information about setting the Operating Point Adjustment.

An adjustable voltage limiting circuit prevents the Current Boost Module output from exceeding the specified percentage of the nominal output voltage (60, 120, or 220 Vdc). The Output Limit Select Jumpers are used to select the nominal output voltage (60, 120, or 220 Vdc) and the Output Limit Adjustment is used to set the desired percentage of the nominal output voltage. The Output Limit Adjustment is adjustable over a range of 50 to 100 percent of the jumper-selected nominal output voltage.

3 • Controls and Indicators

CBS 212A controls and indicators consist of screwdriver-adjusted controls, jumper wires, and an indicator light. See Figure 3-1. The call-outs (A, B, C, D, and E) of Figure 3-1 are listed in Table 3-1 along with a description of each component.

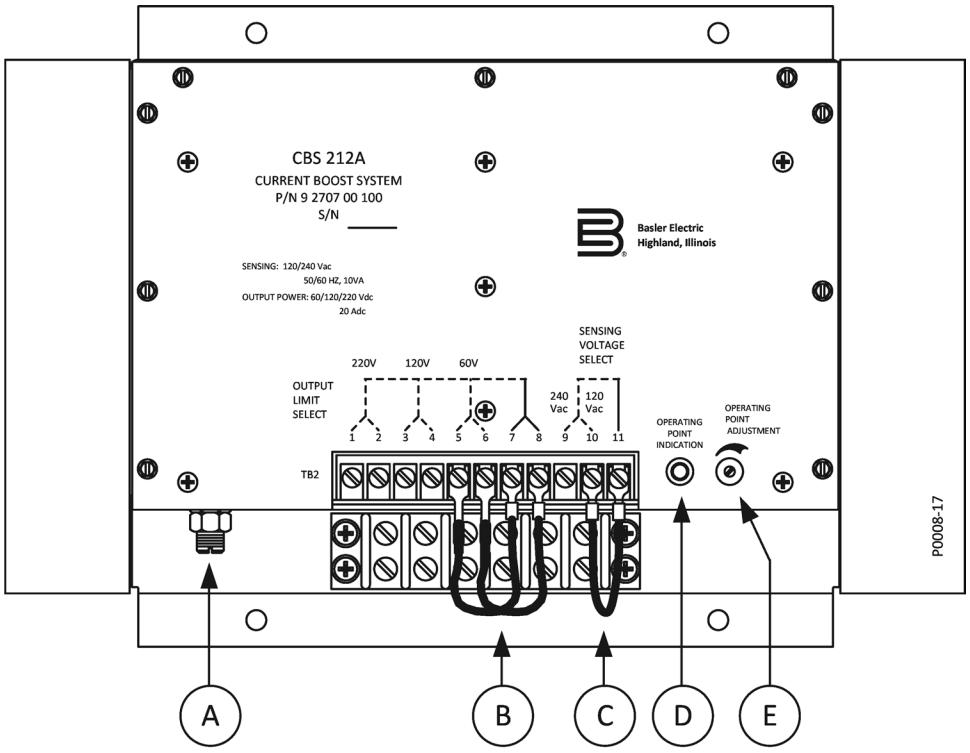


Figure 3-1. Controls and Indicators

Table 3-1. Control and Indicator Descriptions

Call-Out	Description
A	*Output Limit Adjustment.* This screwdriver-adjusted control is used to set the output voltage limit of the CBS 212A. The adjustment range is 50 to 100 percent of the selected output limit.
B	*Output Limit Select.* The output limit is selected by positioning this pair of jumper wires at the appropriate terminals. Nominal output limits of 60, 120, or 220 Vdc can be selected by repositioning the jumper wires. Jumper wire connections at TB2-1 and 2 select a 220 volt output limit, connections at TB2-3 and 4 select a 120 volt limit, and connections at TB2-5 and 6 select a 60 volt limit. The other ends of the jumper wires must always be connected to terminals TB2-7 and 8.
C	*Sensing Voltage Select.* The nominal sensing voltage is selected by positioning this jumper wire. Nominal sensing voltage levels of 120 Vac or 240 Vac can be selected. Jumper wire connections at terminals TB2-9 and 11 select 240 Vac sensing voltage. Jumper wire connections at terminals TB2-10 and 11 select 120 Vac sensing voltage.
D	*Operating Point Indication.* This LED is lit during normal generator operating conditions. It turns off when the CBS 212A is providing current boost to the exciter field. The LED turns on again when the generator output voltage increases above the Operating Point Adjustment setting.

Call-Out	Description
E	*Operating Point Adjustment.* This screwdriver-adjusted control is used to set the lower limit (pickup point) of the generator output voltage. If the generator voltage decreases below this setting, current boost is initiated until the generator voltage increases above the dropout point. For 120 Vac nominal sensing, dropout occurs when the sensed generator output voltage increases to 5 volts above the Operating Point Adjustment setting. For 240 Vac nominal sensing, dropout occurs when the sensed generator output voltage increases to 10 Vac above the Operating Point Adjustment setting. **Note** An Operating Point Adjustment setting that is too close to the nominal generator output voltage may cause oscillation of the output voltage. If oscillation occurs, rotate the Operating Point Adjustment control counterclockwise until the oscillation stops.

4 • Installation

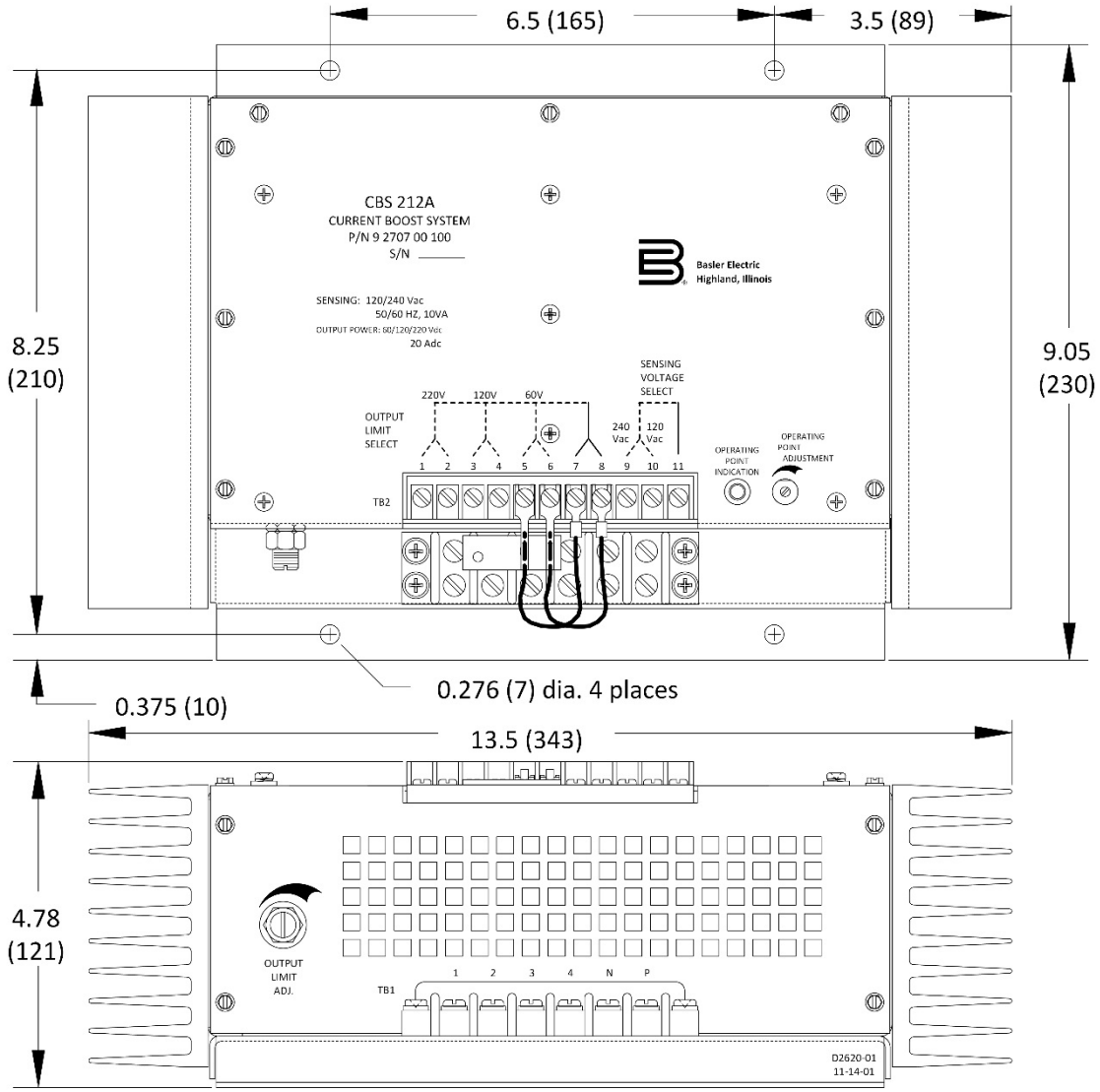
This chapter describes CBS 212A mounting, interconnections, and calibration.

Mounting

When installing a CBS 212A Current Boost System, provisions must be made for the mounting of the Current Boost Module and the Current Transformers (CTs). The CBS 212A must be mounted where the environmental conditions do not exceed the specifications given in the *Specifications* chapter.

Current Boost Module

The Current Boost Module is convection cooled and should not be mounted near heat-generating equipment or inside a totally enclosed cubicle where the temperature could exceed the operating limit. Vertical mounting is recommended to obtain optimum convection cooling. Mounting and panel drilling dimensions are provided in Figure 4-1.



NOTE: All dimensions are in inches (millimeters).

Figure 4-1. Outline and Panel Drilling Dimensions

Current Transformers (CTs)

Six CTs are available for 600 volt (or less) systems and six CTs are available for 15 kilovolt (or less) systems. The CTs should be mounted as close to the generator output terminals as practical and before any load devices such as power transformers and circuit breakers. Table 4-1 lists the available CTs and their corresponding ratios and short-circuit line-current ratings. Mounting and drilling dimensions for each of the CTs are provided in Figure 4-2 through Figure 4-13.

Table 4-1. CT Data

CT Part Number	Turns Ratio	3-Phase Short-Circuit Line Current *	Compatible System Voltage
BE25925001 †	1:8	125 to 250 A	600 V or less
BE25926001 †	1:17	250 to 500 A	600 V or less
BE25927001 †	1:34	500 to 1,000 A	600 V or less
BE25928001	1:69	1,000 to 2,000 A	600 V or less
BE25929001	1:138	2,000 to 4,000 A	600 V or less
BE25930001	1:277	4,000 to 8,000 A	600 V or less
BE34704001 †	1:8	125 to 250 A	15 kV or less
BE34705001 †	1:17	250 to 500 A	15 kV or less
BE34706001 †	1:34	500 to 1,000 A	15 kV or less
BE34707001	1:69	1,000 to 2,000 A	15 kV or less
BE34708001	1:138	2,000 to 4,000 A	15 kV or less
BE34709001	1:277	4,000 to 8,000 A	15 kV or less

* All current values represent 300% short-circuit values.

† These CTs have pre-wound primary windings (no conductor window).

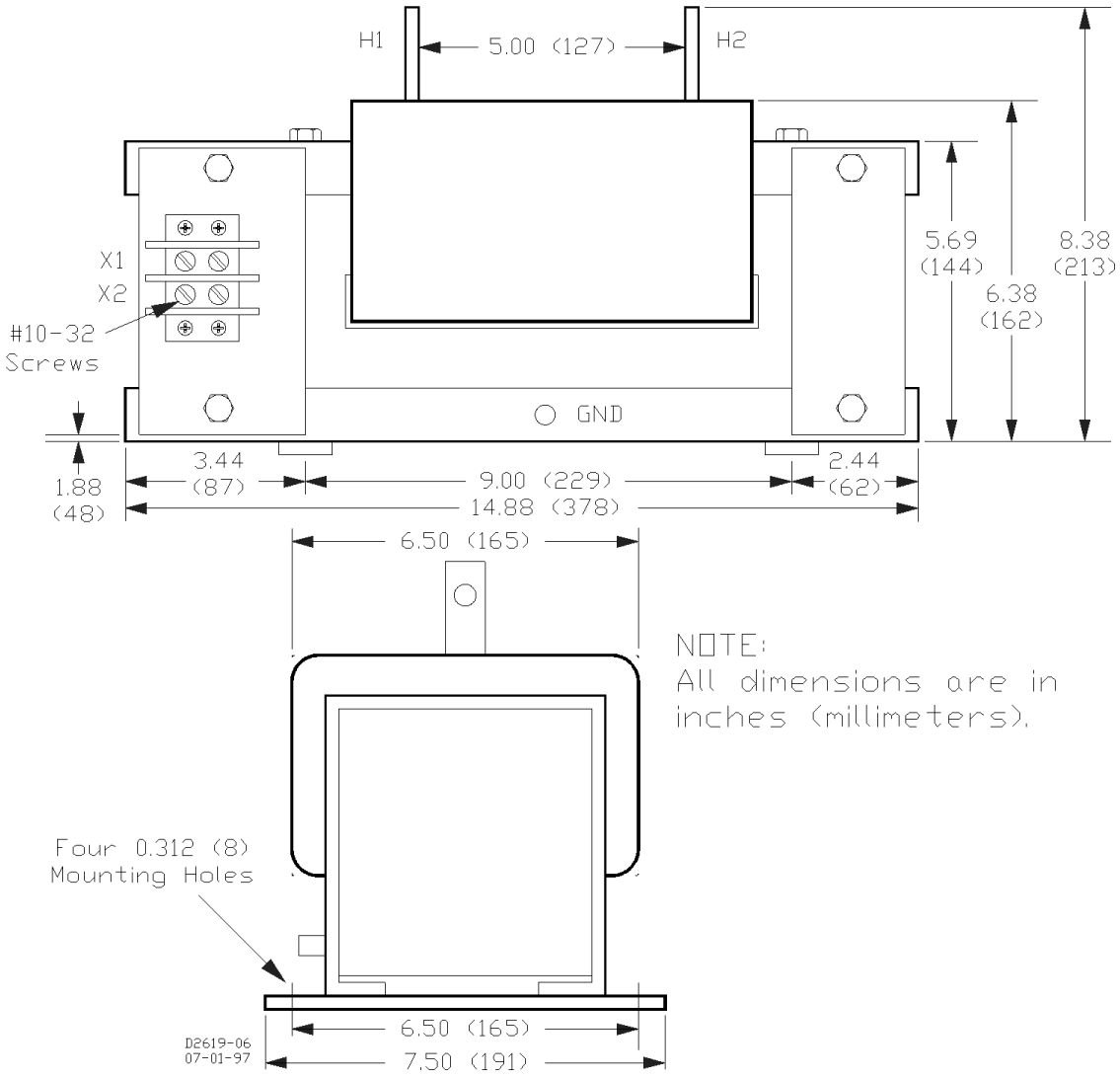


Figure 4-2. BE25925001 CT Dimensions

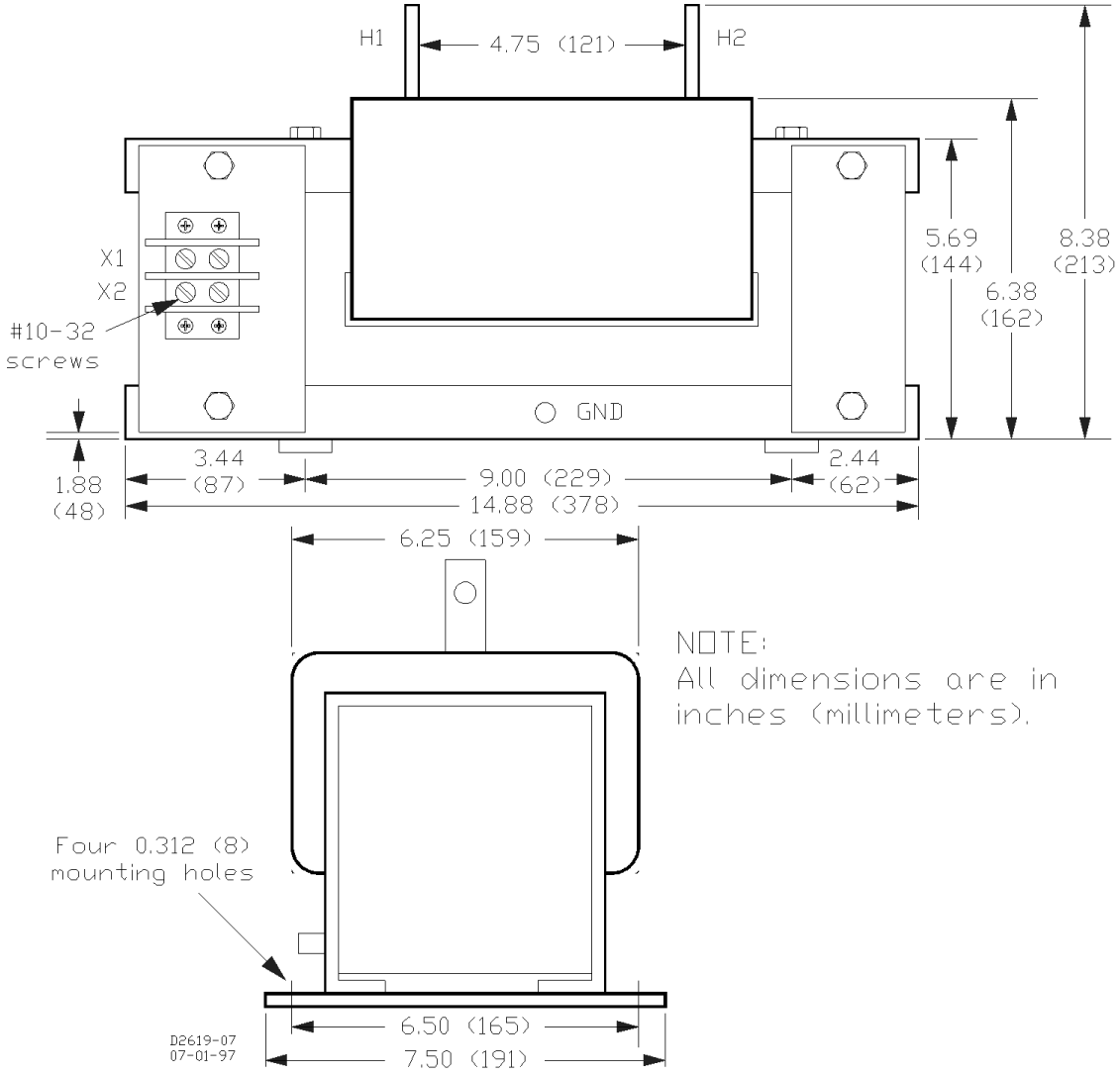


Figure 4-3. BE25926001 CT Dimensions

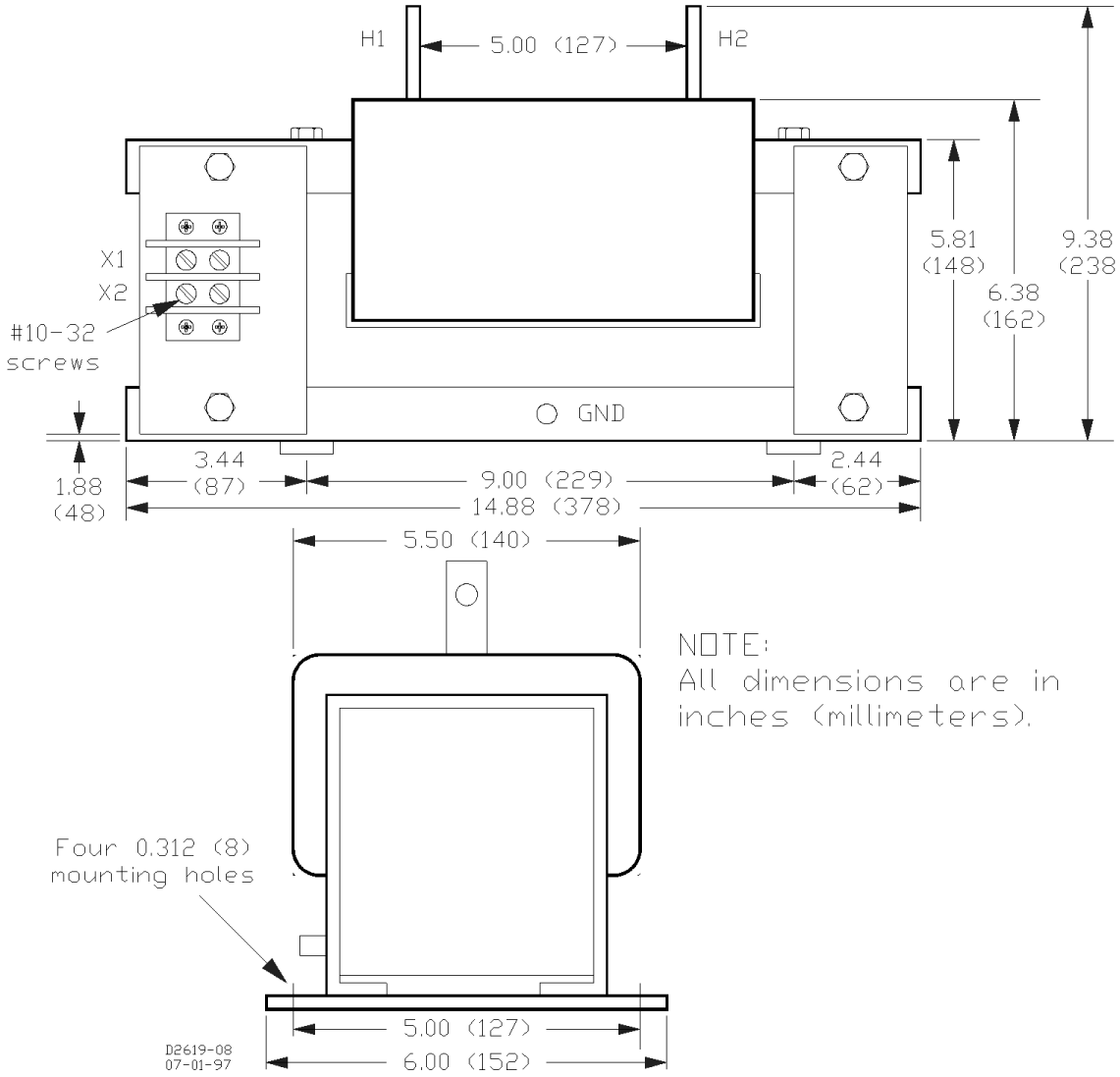


Figure 4-4. BE25927001 CT Dimensions

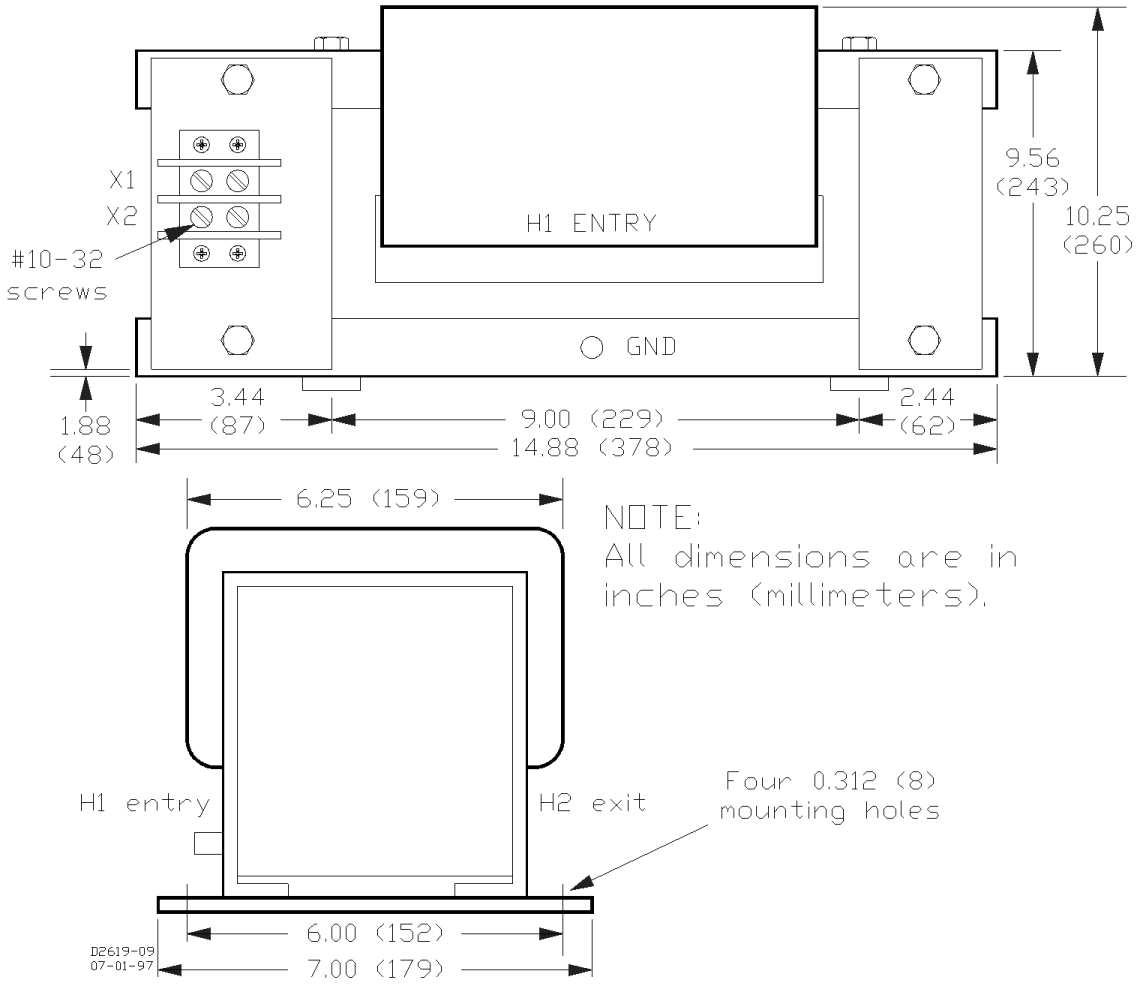


Figure 4-5. BE25928001 CT Dimensions

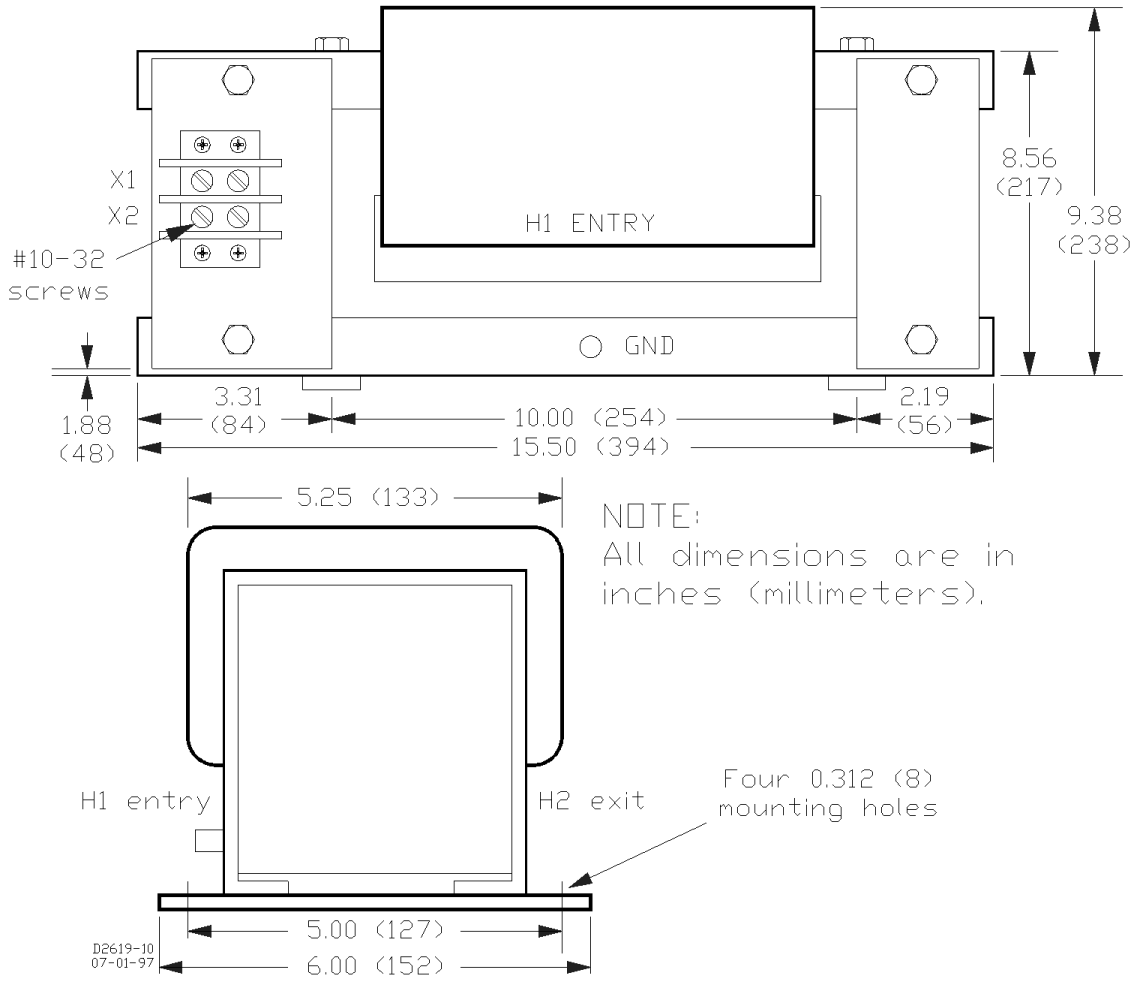


Figure 4-6. BE25929001 CT Dimensions

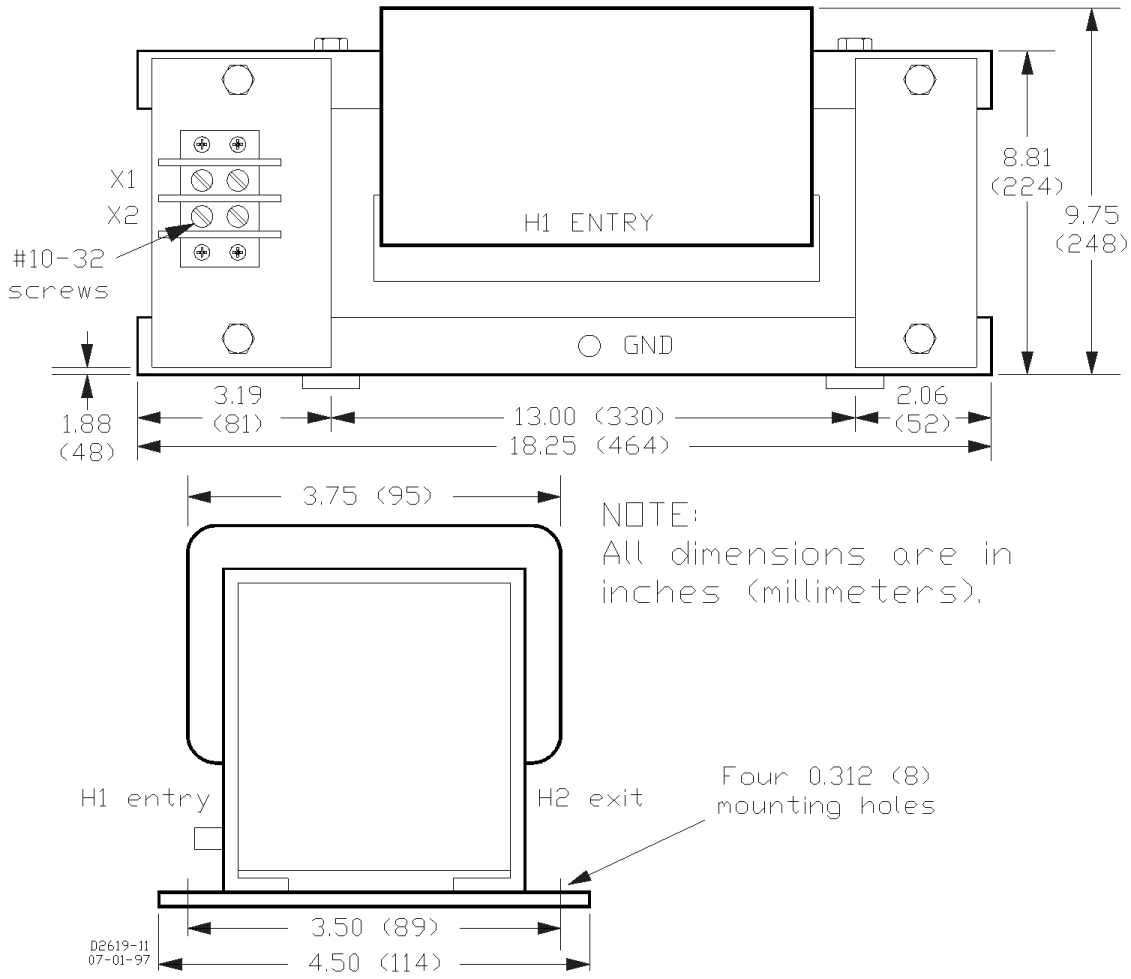


Figure 4-7. BE25930001 CT Dimensions

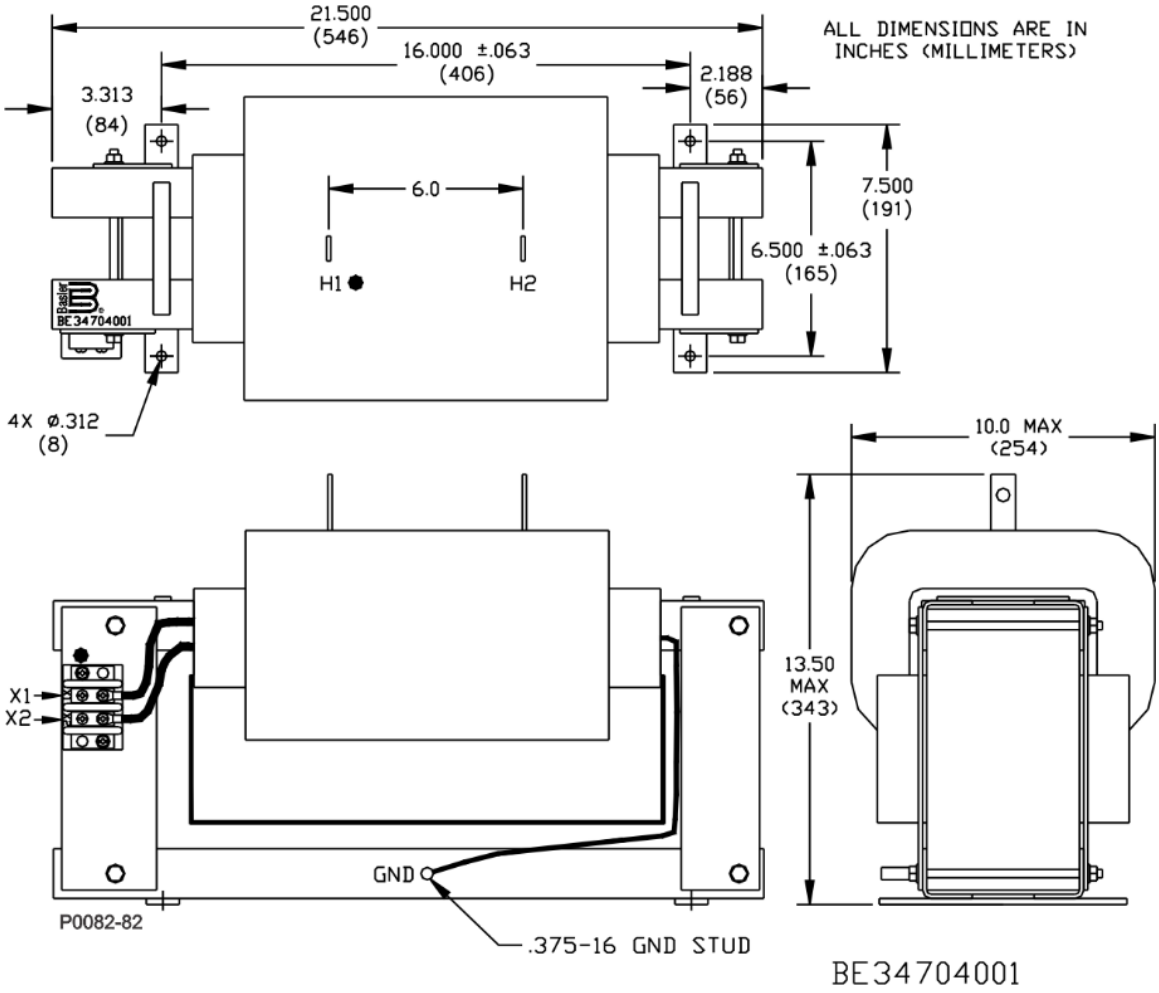


Figure 4-8. BE34704001 CT Dimensions

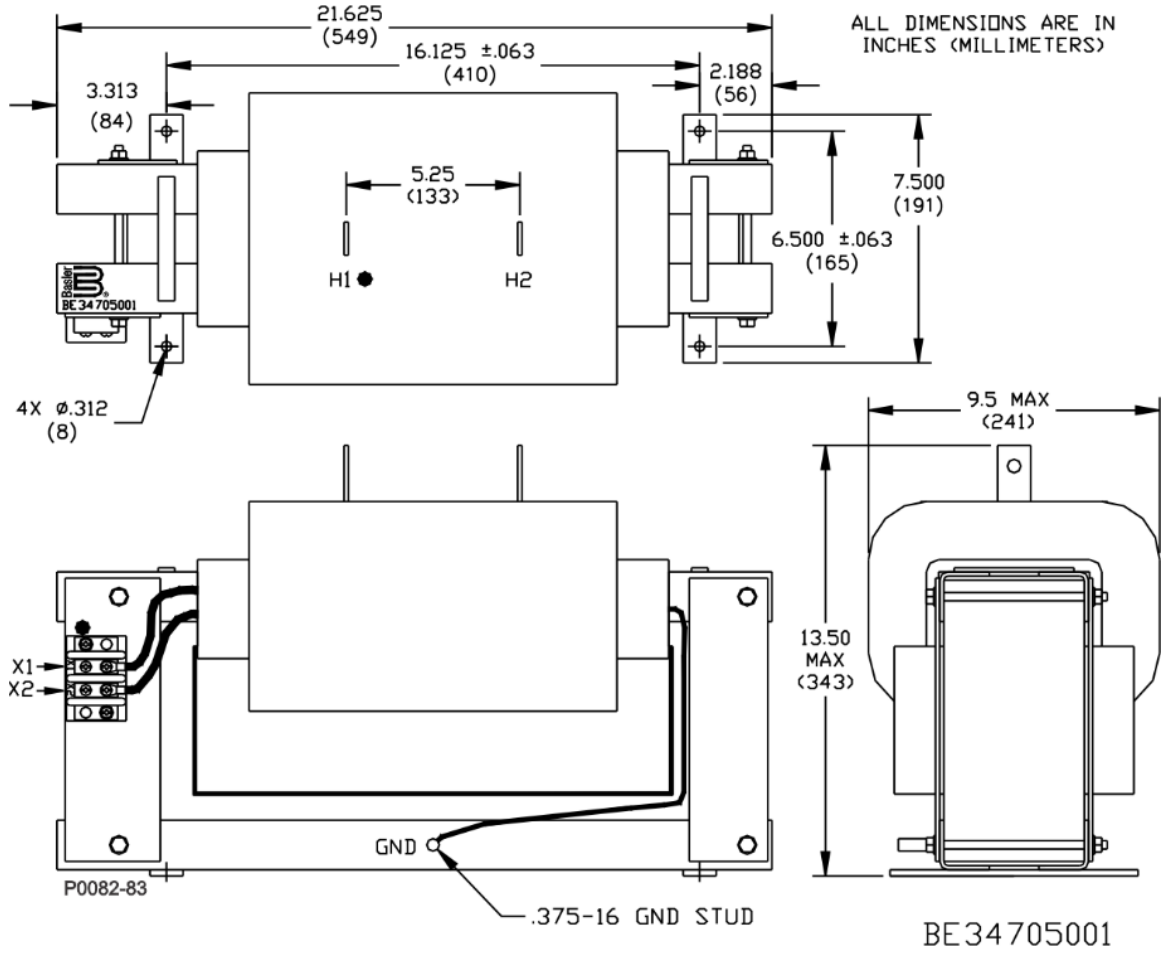


Figure 4-9. BE34705001 CT Dimensions

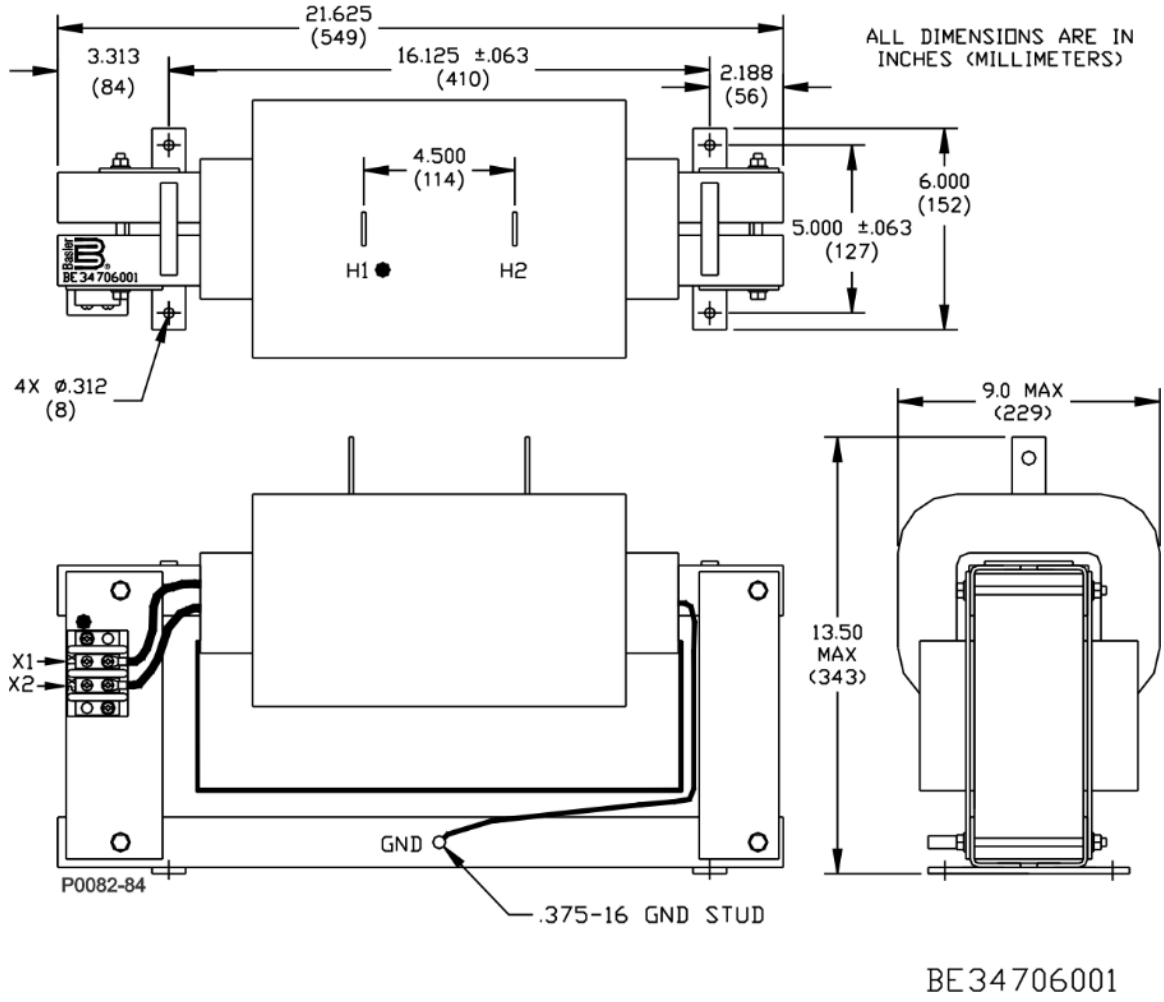


Figure 4-10. BE34706001 CT Dimensions

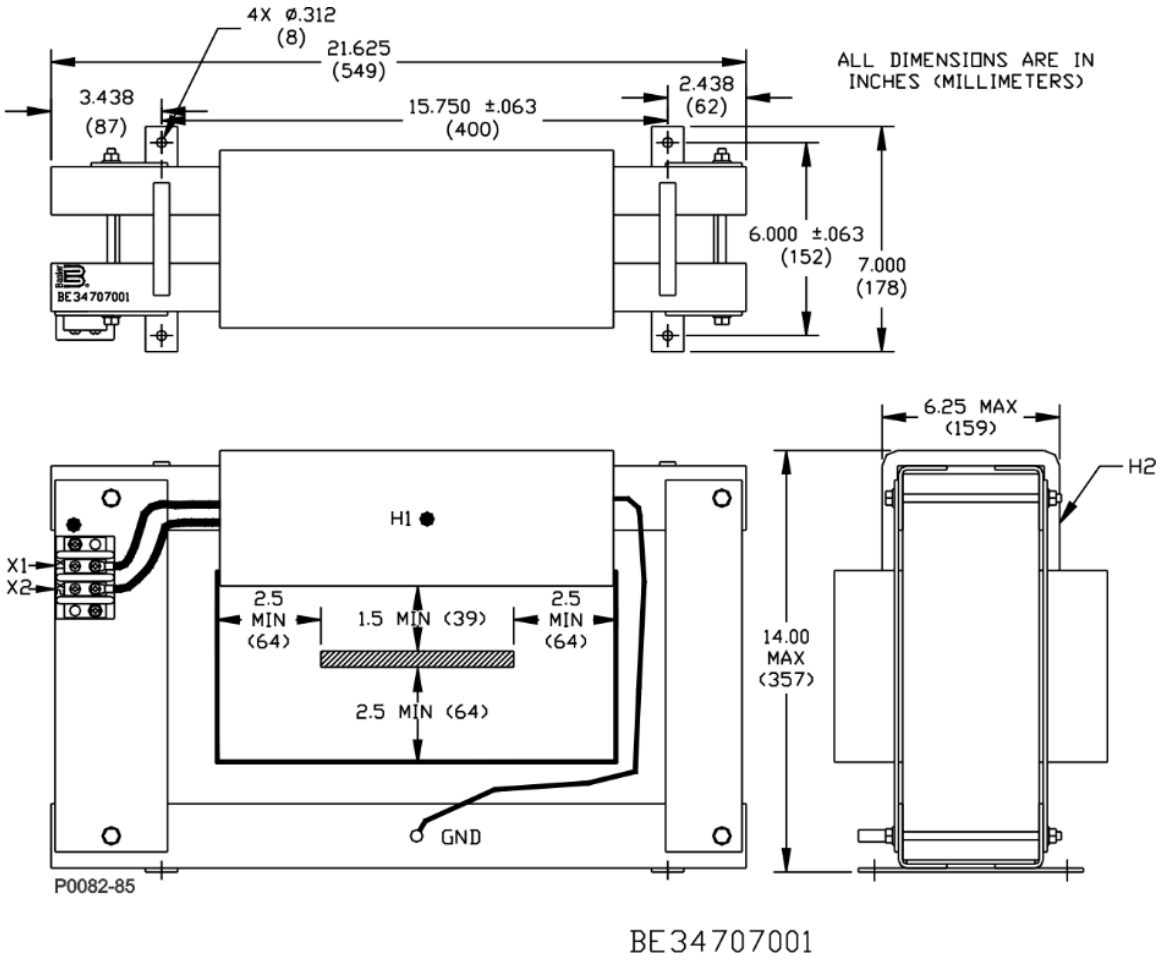


Figure 4-11. BE34707001 CT Dimensions

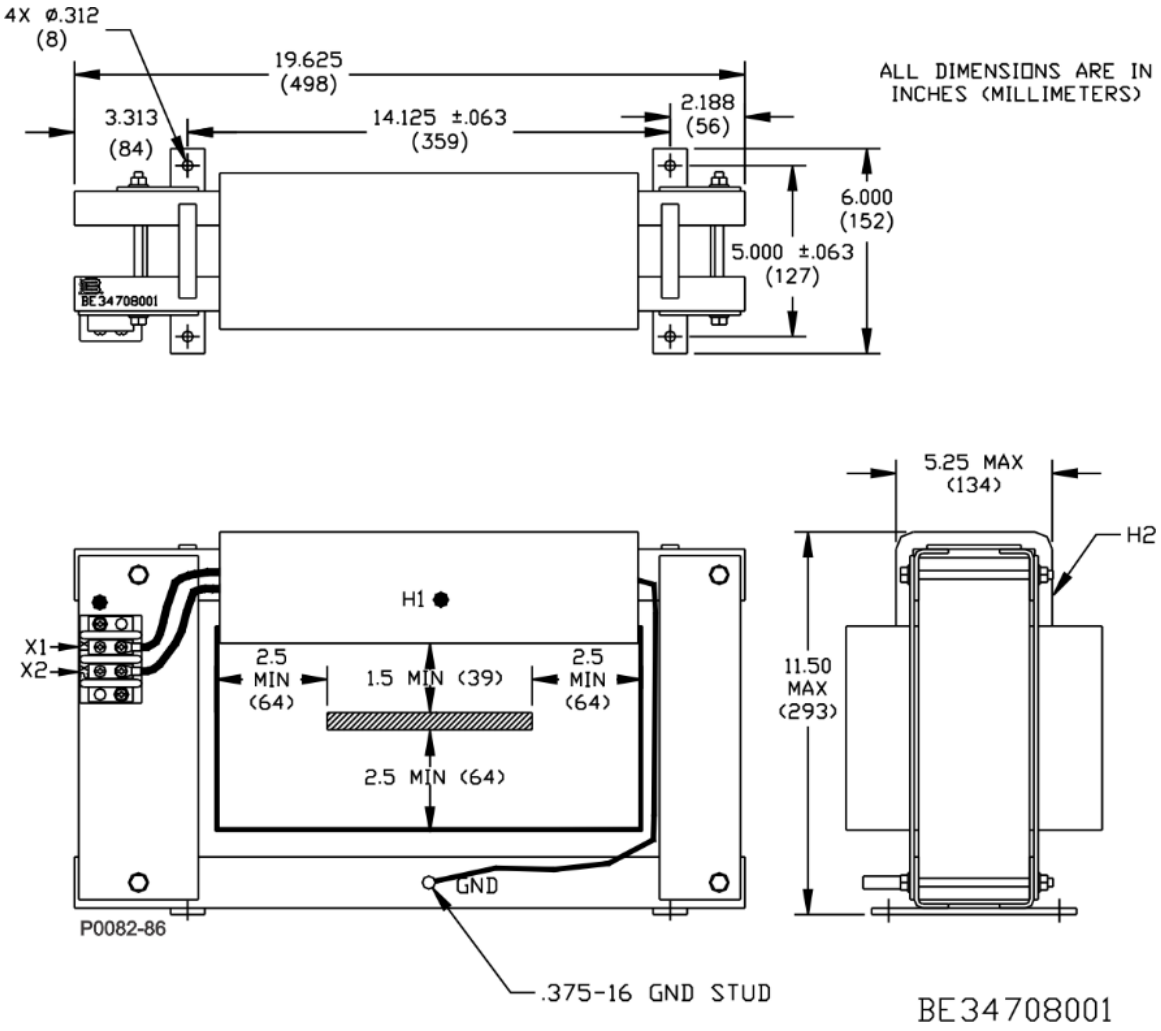


Figure 4-12. BE34708001 CT Dimensions

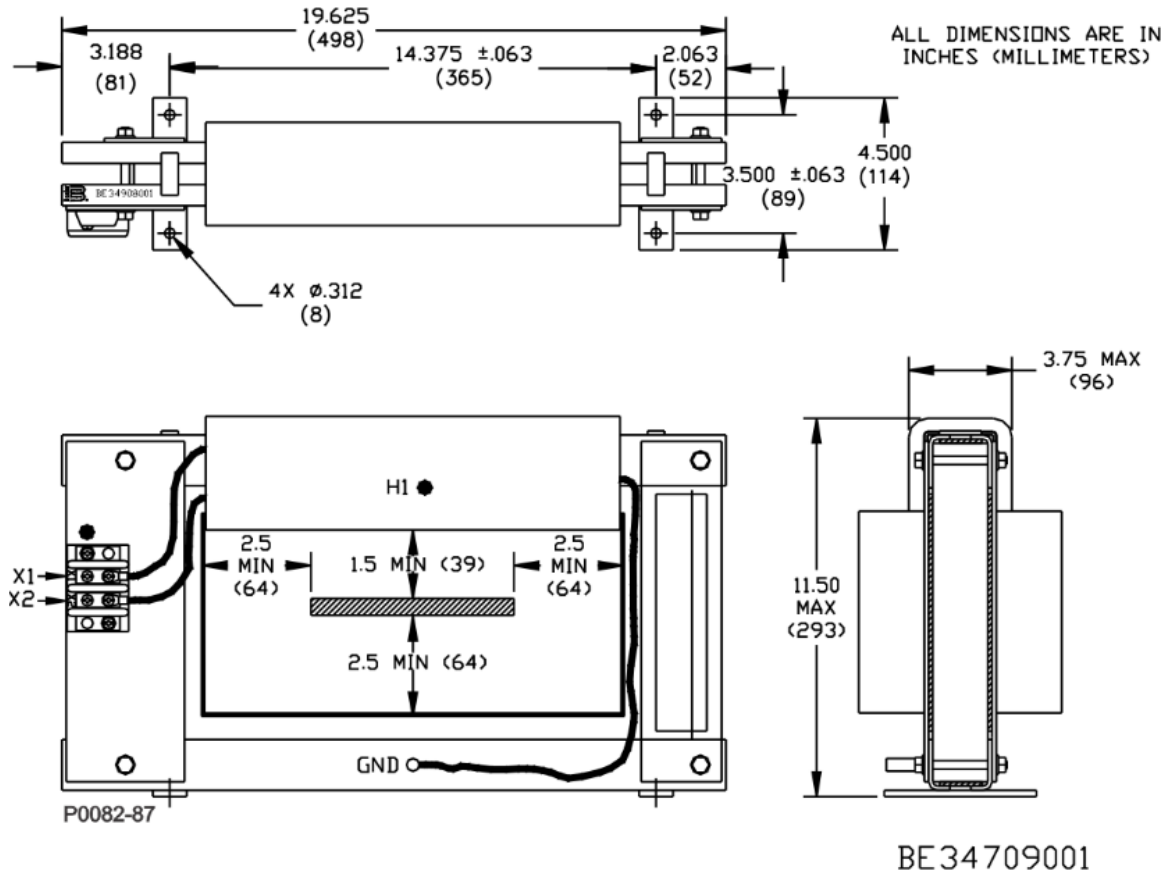


Figure 4-13. BE34709001 CT Dimensions

Interconnection

Typical CBS 212A connections are shown in Figure 4-14.

CT Connections

When the CTs are connected as shown in CBS 212A, energy is supplied to the Current Boost Module during the following fault conditions.

- Symmetrical, three-phase short-circuit (A-phase to B-phase to C-phase)
- A-phase to B-phase short-circuit
- A-phase to C-phase short-circuit
- B-phase to C-phase short-circuit
- A-phase to Neutral short-circuit
- B-phase to Neutral short-circuit

If the generator has a Neutral terminal, energy will be supplied to the CTs during conditions e and f. During a C-phase to Neutral short-circuit, energy will not be supplied to the CTs. In this case, if the voltage regulator is powered by phase A and phase B, the regulator may continue to supply power to the exciter field.

Current Boost Module Connections

Current Boost Module connections are shown in CBS 212A. The Sensing Voltage Select jumper and the Output Limit Select jumpers must be properly configured for your application. Information about positioning these jumpers is provided in the following paragraphs of the Calibration sub-section.

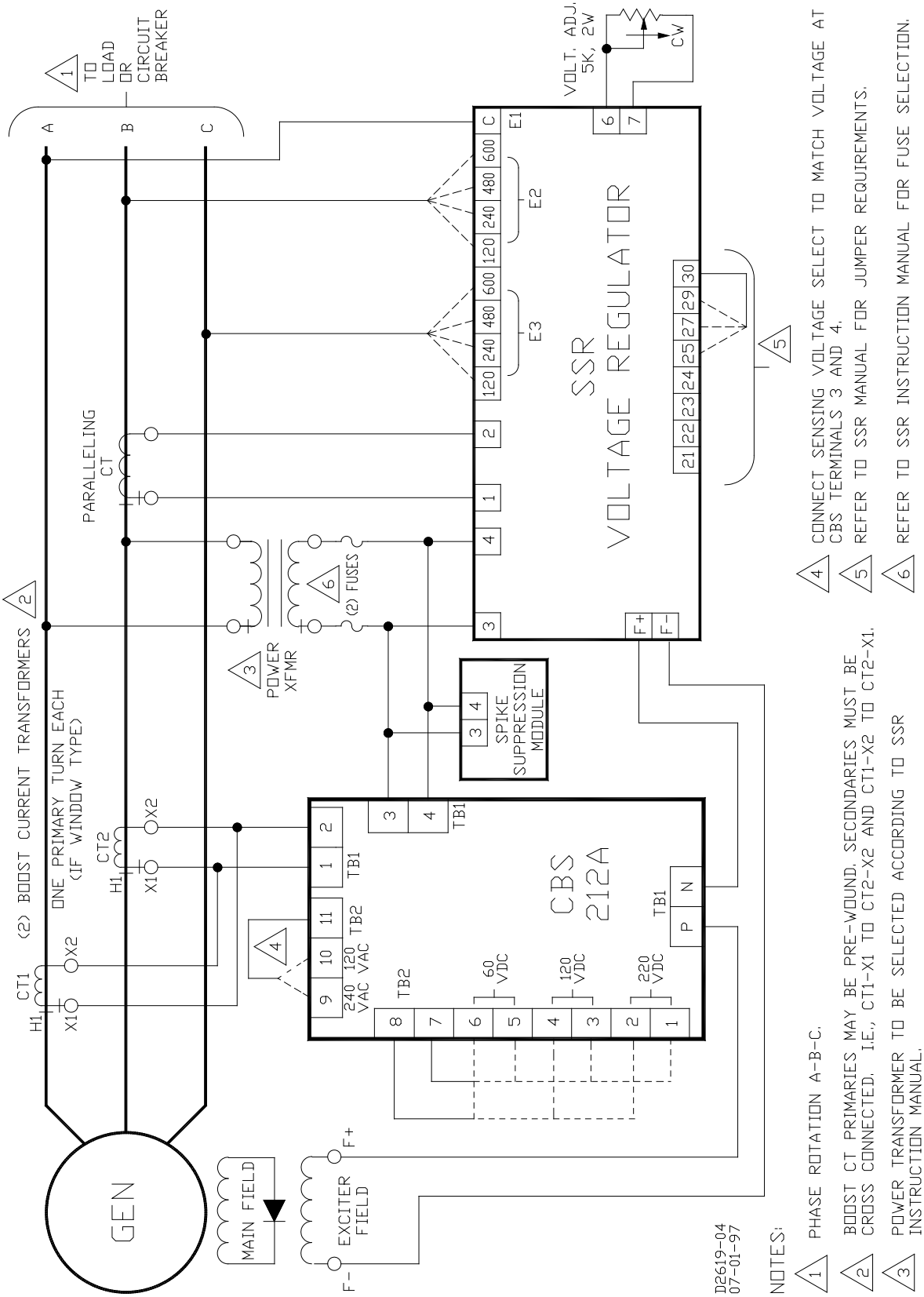


Figure 4-14. Interconnections

Calibration

CBS 212A calibration consists of positioning the Sensing Voltage Select and Output Limit Select jumpers, and adjusting the Output Limit Adjustment and Operating Point Adjustment controls. The following procedures should be performed before placing the CBS 212A into service.

Sensing Voltage Selection

Configure the CBS 212A for the level of sensing voltage that will be applied to terminals TB1-3 and 4.

- For sensing voltage of 90 to 139 Vac, use the 120 Vac jumper position. Connect the Sensing Voltage Selection jumper across terminals TB2-10 and 11.
- For sensing voltage of 180 to 277 Vac, use the 240 Vac jumper position. Connect the Sensing Voltage Selection jumper across terminals TB2-9 and 11.

Output Limit Selection

Configure the CBS 212A for the level of field forcing voltage required to support a short-circuited generator output.

1. Determine the level of field current required to sustain generator output during a short-circuit condition. This value of current can be found in the generator manufacturer's short-circuit saturation data (plot of exciter field current versus line current with the generator output short-circuited).
2. Obtain the hot exciter field resistance from the manufacturer's data for your generator.
3. Calculate the Current Boost System field forcing voltage by multiplying the field current value obtained in Step 1 by the resistance obtained in Step 2.
4. Position the Output Limit Select jumpers for the voltage range that most closely matches the field forcing voltage calculated in Step 3. Jumper positions are summarized in the following paragraphs.
    - 60 Vdc Output Limit: jumper terminals TB2-7 to 5 and jumper terminals TB2-8 to 6.
    - 120 Vdc Output Limit: jumper terminals TB2-7 to 3 and jumper terminals TB2-8 to 4.
    - 220 Vdc Output Limit: jumper terminals TB2-7 to 1 and jumper terminals TB2-8 to 2.

Output Limit Adjustment

Set the output voltage limit of the CBS 212A. The Output Limit Adjustment control has an adjustment range of 50 to 100 percent of the voltage selected by the Output Limit Selection jumpers.

A coarse adjustment of the CBS 212A output voltage limit can be made by approximation. The following example illustrates the technique.

- If the desired voltage limit is 90 Vdc and the Output Limit Selection jumpers are in the 120 Vdc position, set the Output Limit Adjustment control to the midpoint (halfway between 50 percent and 100 percent).

If a more precise setting of the output limit is desired, the adjustment must be performed during short-circuit testing of the generator. Refer to the generator manufacturer's recommended procedures for short-circuit testing and perform the following steps.

1. Rotate the Output Limit Adjustment control fully counterclockwise.
2. Connect a dc voltmeter to terminals TB1-P (+) and N (–).
3. Apply a three-phase short-circuit to the generator output in accordance with the generator manufacturer's procedures.
4. While observing the voltmeter, slowly rotate the Output Limit Adjustment control clockwise until the desired output voltage at terminals TB1-P and N is obtained.

Operating Point Adjustment

Set the Operating Point Adjustment control at the level of generator voltage where the CBS 212A provides current boost to the exciter field. Performing this procedure with the generator unloaded is the preferred method for adjusting the operating voltage level. If the generator load cannot be removed, perform the steps listed under Loaded Generator.

Unloaded Generator

1. Rotate the Operating Point Adjustment control fully clockwise.
2. Remove all loads from the generator output.
3. Start the generator and bring it up to rated speed.
4. Lower the generator output voltage to the level where current boost is desired.
5. Slowly adjust the Operating Point Adjustment control counterclockwise until the Operating Point Indication LED turns off (current boost is initiated).
6. Slowly increase the generator output voltage until the Operating Point Indication LED lights (current boost is terminated).
7. Verify that the current-boost pickup and dropout levels are such that generator output voltage oscillations will not occur.

Loaded Generator

1. De-energize the generator field and connect a jumper wire (10 AWG) across terminals TB1-1 and 2.
2. Perform Steps 3 through 7 of the *Unloaded Generator* sub-section.
3. Remove the jumper wire from terminals TB1-1 and 2 when calibration is complete.

5 • Testing

The procedures of this chapter can be used to verify proper installation of the CBS 212A and confirm the calibration settings made in the calibration procedures of the *Installation* chapter. These procedures are to be performed only after the CBS 212A has been installed and calibrated in accordance with the instructions contained in the *Installation* chapter.

Installation Verification

Performing the following steps verifies proper CT selection and connection of the CBS 212A and CTs.

1. Ensure that the generator is not rotating.
2. Verify that the CBS 212A is connected in accordance with the interconnection diagram in the *Installation* chapter.
3. Insert a 20 Aac ammeter in the conductor leading to terminal TB2-1 of the CBS 212A.
4. Start the generator and bring it up to rated speed.
5. Apply a nominal load to the generator. The CBS 212A Operating Point Indication LED should be lit (no current boost applied).
6. Note the ac current measured by the ammeter. The measured value should be approximately equal to the calculated current value. The calculated current value is obtained using Equation 5-1.

$$I_C = I_L \times 1.73 \times \frac{1}{S}$$

Equation 5-1. Calculated Current Value

Where: IC is the calculated value
IL is the generator line current
S is the number of secondary turns for the selected CT. This value is obtained from the CT Data table in the *Installation* chapter.

If the measured current and calculated current are dissimilar, recheck the generator data used for CT selection and the CT connections.

Calibration Verification

Verify proper CBS 212A calibration by performing the following steps. Performing this procedure with the generator unloaded is the preferred method for verifying CBS 212A calibration. If the generator load cannot be removed, perform the steps listed under *Loaded Generator*.

Unloaded Generator

1. Start the generator and bring it up to rated speed. The Operating Point Indication LED should light (no current boost is applied).
2. Slowly reduce the generator output voltage until the Operating Point Indication LED turns off (current boost is applied). The observed pickup level should match the Operating Point Adjustment setting made during calibration (see *Calibration* in the *Installation* chapter).
3. Slowly increase the generator output voltage until the Operating Point Indication LED turns on (current boost is withdrawn).
4. Verify that the current-boost pickup and dropout levels are such that generator output voltage oscillations will not occur.

Loaded Generator

1. De-energize the generator field and connect a suitably-sized jumper wire across terminals TB1-1 and 2.
2. Perform Steps 1 through 4 of the *Unloaded Generator* sub-section.
3. Remove the jumper wire from terminals TB1-1 and 2 when calibration verification is complete.

Power Verification

To verify that the CBS 212A will provide the specified boost current during short-circuit operation, refer to the generator manufacturer's recommended procedures for generator testing under short-circuit conditions. If desired, final adjustment of the Output Limit Adjustment control may be made during short-circuit testing.

6 • Specifications

CBS 212A Current Boost Systems have the following features and capabilities.

Operational Specifications

Output Power

Voltage .....60/120/220 Vdc (controlled by position of Output Limit Select jumpers)
Current .....20 Adc

Sensing Voltage

Nominal Level .....120/240 Vac (jumper selectable)
Frequency .....50/60 Hz
Voltamperes .....10 VA

Output Limiting

Output Selection.....60, 120, or 220 Vdc (jumper selectable)
Adjustment Range.....50 to 100% of selected output

Operation Point Adjustment Range

120 V Nominal.....70 to 131 Vac
240 V Nominal.....140 to 262 Vac

Dropout Ratio

120 V Nominal.....5 V above pickup point
240 V Nominal.....10 V above pickup point

Power Dissipation

At Continuous Rating .....< 50 W

General Specifications

Type Tests

Shock .....15 G in each of three mutually perpendicular planes
Vibration .....5 to 26 Hz at 1.2 G
26 to 52 Hz at 0.036” (0.914 mm), double amplitude
52 to 260 Hz at 5 G

Agency Compliance

Hazardous Substances .....RoHS 2-2015
Chemical Substances .....REACH (EC 1907/2006)
Eurasian Conformity.....EAC TP TC 004/2011, TP TC 020/2011

Temperature Ratings

Operating.....–40°F to 140°F (–40°C to 60°C)
Storage.....–85°F to 185°F (–65°C to 85°C)

China RoHS

The following table serves as the declaration of hazardous substances for China in accordance with PRC standard SJ/T 11364-2014. The EFUP (Environment Friendly Use Period) for this product is 40 years.

PRODUCT:	CBS 212A									
零件名称 Part Name	有害物质 Hazardous Substances									
	铅 Lead (Pb)	汞 Mercury (Hg)	镉 Cadmium (Cd)	六价铬 Hexavalent Chromium (Cr^{6+})	多溴联苯 Polybrominated Biphenyls (PBB)	多溴二苯醚 Polybrominated Diphenyl Ethers (PBDE)	邻苯二甲酸二丁酯 Dibutyl Phthalate (DBP)	邻苯二甲酸丁苄酯 Benzyl butyl phthalate (BBP)	邻苯二甲酸二酯 Bis(2-ethylhexyl) phthalate (BEHP)	邻苯二甲酸二异丁酯 Diisobutyl phthalate (DIBP)
金属零件 Metal parts	O	O	O	O	O	O	O	O	O	O
聚合物 Polymers	O	O	O	O	O	O	O	O	O	O
电子产品 Electronics	X	O	O	O	O	O	O	O	O	O
电缆和互连配件 Cables & interconnect accessories	O	O	O	O	O	O	O	O	O	O
绝缘材料 Insulation material	O	O	O	O	O	O	O	O	O	O

本表格依据 SJ/T11364 **的**规定编制。

O: **表示**该有害物质在该部件所有均质材料中的含量均在 GB/T 26572 规定的限量要求以下。

X: **表示**该有害物质至少在该部件的某一均质材料中的含量超出 GB/T 26572 规定的限量要求。

This form was prepared according to the provisions of standard SJ/T11364.

O: Indicates that the hazardous substance content in all homogenous materials of this part is below the limit specified in standard GB/T 26252.

X: Indicates that the hazardous substance content in at least one of the homogenous materials of this part exceeds the limit specified in standard GB/T 26572.

Weights

Current Boost Module .....15 lb. (6.8 kg)
CT BE25925-001 .....84 lb. (38.1 kg)
CT BE25926-001 .....78 lb. (35.4 kg)
CT BE25927-001 .....66 lb. (29.9 kg)
CT BE25928-001 .....122 lb. (55.3 kg)
CT BE25929-001 .....73 lb. (33.1 kg)
CT BE25930-001 .....50 lb. (22.7 kg)
CT BE34704001.....140 lb. (64 kg)
CT BE34705001.....135 lb. (62 kg)
CT BE34706001.....110 lb. (50 kg)
CT BE34707001.....200 lb. (91 kg)
CT BE34708001.....100 lb. (46 kg)
CT BE34709001.....60 lb. (28 kg)

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