IFM-150
Interface Firing Module

Instruction Manual
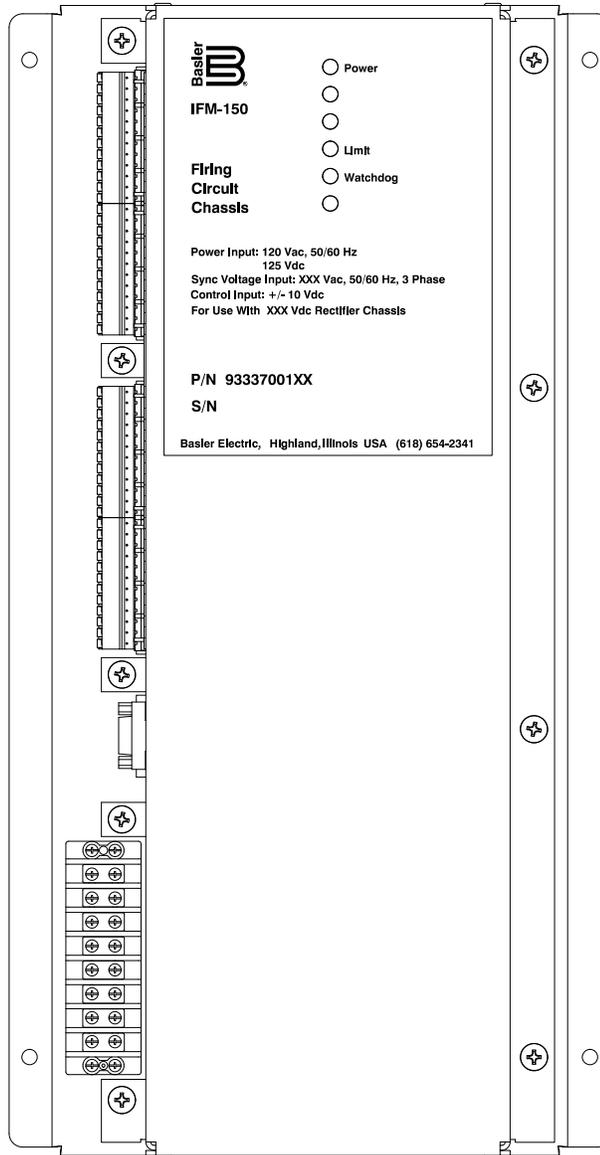
Basler
IFM-150

Firing
Circuit
Chassis

○ Power
○
○
○ Limit
○ Watchdog
○

Power Input: 120 Vac, 50/60 Hz
125 Vdc
Sync Voltage Input: XXX Vac, 50/60 Hz, 3 Phase
Control Input: +/- 10 Vdc
For Use With XXX Vdc Rectifier Chassis

P/N 93337001XX
S/N

Basler Electric, Highland, Illinois USA (618) 654-2341

Preface

This instruction manual provides information about the installation and operation of the IFM-150 Interface Firing Module. To accomplish this, the following information is provided:

- General Information
- Functional Description
- BESTCOMS™ Software
- Installation
- Maintenance

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 Interface Firing Module installation or operation.

Basler Electric

12570 State Route 143
Highland IL 62249-1074 USA
www.basler.com
info@basler.com
Tel: +1 618.654.2341
Fax: +1 618.654.2351

Warning!
READ THIS MANUAL. Read this manual before installing, operating, or maintaining the IFM-150. 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.
For terms of service relating to this product and software, see the *Commercial Terms of Products and Services* document available at www.basler.com/customer-terms-and-conditions.
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

This section provides a historical summary of the changes made to the manual, application firmware, and hardware of the IFM-150.

The revisions listed will not reflect product changes made after this manual was published. Visit www.basler.com to download the latest hardware, firmware, and BESTCOMS*Plus*® revision histories.

Instruction Manual Revision History

The revision history for this manual is provided as follows. Revisions are presented in reverse chronological order.

Manual Revision and Date	Change
U, January 2026	• Updated cover and dimension figure
T, June 2025	• Added FCC compliance
S, February 2025	• Updated China RoHS compliance
R, August 2024	• Added firmware, hardware, and software revision history
Q	• This revision letter not used
P, December 2023	• Added China RoHS compliance
O	• This revision letter not used
N, January 2021	• Updated manual style to use sectional page numbering • Added references to DECS-450 throughout manual • Installation chapter: Changed "PPT" to "PT" in Figures 17 through 20
M1, January 2019	• Added California Proposition 65 warning
M, May 2017	• Updated firing circuit board part number for three-phase versions of the IFM-150
L, January 2017	• Added RoHS compliance statement • Added caution statement about nonvolatile memory
K, March 2015	• Removed references to DECS-300 and replaced DECS-300 with DECS-400 in all connection diagrams • Added EAC declaration to the specifications • Added Windows® 8 to list of PC operating systems compatible with IFM-150 BESTCOMS
J, February 2014	• Updated firing circuit board part number
I	• This revision letter not used
H, October 2012	• Changed TVL time delay range from 0.1–10 to 0–10 • Changed maximum control angle range from 120–150 to 110–150 • Removed coverage of P/N 9333700132 from manual (Information about P/N 9333700132 is now provided in publication 9333700992) • Updated manual formatting to latest style
G, April 2011	• In Section 1, *General Information* Table 1-1, changed 480 Vdc to 480 Vac for P/N 9333700131 and 9333700132 • Updated formatting to new style (draft)
F, May 2010	• In Section 1, *General Information* under *Specifications, Metering, Control Input*, replaced the three control input metering ranges with one range • Minor text edits made throughout the manual
E, October 2009	• Added coverage of P/N 9333700132 • Added *Storage* information to Section 5, *Maintenance*
D, February 2008	• Updated maximum control angle setting description for half-controlled bridge configuration • In BESTCOMS compatibility statement, added Windows Vista and removed Windows 95, 98, Me, and NT • Added note and illustration regarding DECS-400 control signal connections
C, June 2004	• Added text and illustrations describing function of IFM-150 part numbers 9333700130 and 9333700131 • Revised Section 3, *BESTCOMS Software* to cover new/changed settings

Manual Revision and Date	Change
B, August 2003	• Added information pertaining to bridge configuration (selectable for full, half-positive, or half-negative control)
A, March 2003	• Added discussion of Transducer Voltage Sensing mode where appropriate • Modified Figure 4-3 to show generator sensing voltage obtained from transducer connected to PPT output
–, October 2002	• Initial release

Firmware Revision History

The revision history for the IFM-150 application firmware is provided as follows. Revisions are presented in reverse chronological order.

Firmware Version	Change
2.04.XX	• Corrected minor bugs • Fixed edge-case nuisance alarm • Added adjustability to maximum control angle when bridge configuration is half controlled
2.03.XX	• Added phase configuration setting to accommodate IFM-150 models used with single-phase rectifier chassis
1.02.XX	• Added bridge configuration setting to accommodate half-controlled (positive or negative) rectifier chassis
1.01.XX	• Added Transducer Voltage Sensing mode and associated settings
1.00.XX	• Initial release

Hardware Revision History

The revision history for the IFM-150 hardware is provided for each model as follows. Revisions are presented in reverse chronological order.

Table 1. Model Number 933370012X

Hardware Version	Change
R	• New circuit board design/layout
Q	• This revision letter not used
P	• New circuit board design/layout
O	• This revision letter not used
N	• Improved component location
M	• RoHS compliance expanded
L	• RoHS compliance added
K	• Adjusted position of terminal labels
J	• Revised firing circuit board layout for better electrical noise immunity • Improved relay driver circuitry
I	• This revision letter not used
H	• Released firmware version 2.04.XX
G	• New circuit board design/layout
F	• Improved resistance to transient noise
E	• Improved unit stability at startup
D	• Release of BESTCOMS version 1.03.XX
C	• Circuitry modified to accommodate transducer input for generator sensing voltage
B	• Minor modifications were made to ease assembly
A	• Initial release

Table 2. Model Numbers 9333700130 & 9333700131

| Hardware Version	Change
J	• New circuit board design/layout
I	• This revision letter not used
H	• Improved component location
G	• RoHS compliance expanded
F	• RoHS compliance added
E	• Adjusted position of terminal labels
D	• Revised firing circuit board layout for better electrical noise immunity • Improved relay driver circuitry
C	• Released firmware version 2.04.XX
B	• New circuit board design/layout
A	• Improved resistance to transient noise

Table 3. Model Numbers 9333700132, 9333700133, & 9333700134

Hardware Version	Change
D	• Improved component location
C	• RoHS compliance added
B	• Adjusted position of terminal labels
A	• Revised firing circuit board layout for better electrical noise immunity • Improved relay driver circuitry

Software Revision History

The revision history for the BESTCOMS software is provided as follows. Revisions are presented in reverse chronological order.

BESTCOMS Software Version	Change
1.07.XX	• Added Windows® 8 compatibility
1.06.XX	• Added Windows® 7 compatibility
1.05.XX	• Changed maximum control angle setting for half-controlled bridge configuration from fixed at 180° to adjustable over the range of 110° to 180° • Added Windows® Vista compatibility
1.04.XX	• Added phase configuration setting to accommodate IFM-150 models used with single-phase rectifier chassis
1.03.XX	• Added bridge configuration setting to accommodate half-controlled (positive or negative) rectifier chassis • Fixed maximum control angle setting at 180° when bridge configuration setting is at half-positive
1.02.XX	• Added Transducer Voltage Sensing mode and associated settings
1.01.XX	• Initial Release
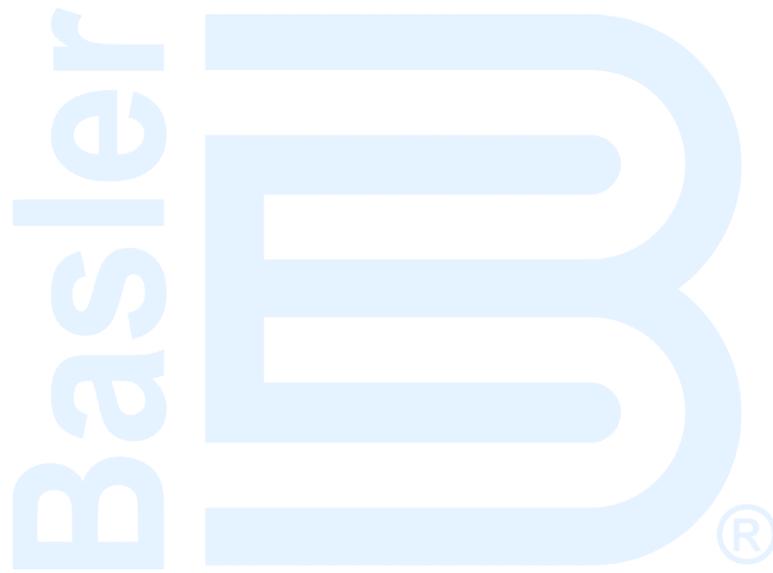
Contents

1 • General Information

Introduction

The Basler Electric IFM-150 Interface Firing Module receives a control signal from a DECS-400 or DECS-450 Digital Excitation Control System and calculates a phase-control firing angle that is synchronized with the power transformer output. The IFM-150 then generates output pulses to drive the SCRs of an excitation rectifier chassis.

The IFM-150 is available in two configurations that control either a single-phase rectifier module or a three-phase rectifier chassis.

Three-phase IFM-150 modules can be user-configured to supply SCR firing pulses to a fully controlled or half controlled (positive or negative) rectifier bridge. A fully controlled rectifier bridge requires that the IFM-150 supply six sets of firing pulses to drive the SCRs of the bridge. A half controlled rectifier bridge contains three SCRs and three diodes. Positive control is used when the SCRs are connected to the positive side (F+) of the field output. Negative control is used when the SCRs are connected to the negative side (F−) of the field output.

A single-phase IFM-150 provides full control of a single-phase rectifier module. Four sets of firing pulses are generated by the IFM-150 to drive the rectifier module SCRs.

Part Numbers

Table 1-1 lists each Interface Firing Module part number and the corresponding nominal rectifier chassis output voltage and synchronizing voltage.

Table 1-1. IFM-150 Part Number Application

Part Number	Configuration	Rectifier Chassis Output	Synchronizing Voltage
9333700120	3-phase	375 Vdc	480 Vac
9333700121	3-phase	250 Vdc	320 Vac
9333700122	3-phase	125 Vdc	160 Vac
9333700123	3-phase	63 Vdc	80 Vac
9333700124	3-phase	32 Vdc	40 Vac
9333700130	1-phase	63–125 Vdc	120/240 Vac
9333700131	1-phase	250 Vdc	480 Vac

Specifications

IFM-150 physical and electrical specifications are provided in the following paragraphs.

Control Power

AC
Nominal: 120 Vac
Range: 82 to 132 Vac
Frequency: 50, 60, or 400 Hz

DC
Nominal: 125 Vdc
Range: 90 to 150 Vdc

Bridge Control Voltage

Range: −10 to +10 Vdc

Generator Voltage Sensing—External Mode (Transducer)

Range: 0 to 13 Vdc

Output Contacts

Make and Carry: 30 A for 0.2 s per IEEE C37.90 or 7 A continuous
Break: 0.3 A at 125 Vdc or 250 Vdc (L/R = 0.4 maximum)

Metering

Generator Voltage Sensing (Internal Mode)
Range: Dependent upon nominal generator voltage selected
Accuracy: ±2% at nominal voltage and 60 Hz

Generator Voltage Sensing (External Mode)
Range: Dependent upon nominal generator voltage selected
Accuracy: ±2% at nominal voltage and frequency of transducer used

Control Input
Range: −9.99 to +9.99 Vdc
Accuracy: ±2%

Generator Frequency
Nominal: 50 or 60 Hz
Range: 10 to 180 Hz
Accuracy: ±0.1 Hz

Terminal Voltage Limiter

Voltage Range: 0 to 30,000 Vac
Delay Range: 0 to 10 s

Communication Port

Interface: Full duplex RS-232
Connection: DB-9 connector
Baud: 9600
Parity: None

Environment

Operating Temperature: −40 to 140°F (−40 to 60°C)
Storage Temperature: −40 to 185°F (−40 to 85°C)

Type Tests

Vibration and Shock: Complies with IEC 255-21-1 (1998), Class1
Humidity: Complies with Basler 99-0868, *Moisture Resistance Procedure*

EU Directives

- Hazardous substances (RoHS 2) 2011/65/EU

FCC Requirements

This product complies with FCC 47 CFR Part 15.

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:	IFM-150									
	有害物质 Hazardous Substances									
零件名称 Part Name	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	X	X	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.

Physical

Dimensions: See *Installation* chapter
Weight: 11 lb (5 kg) maximum

2 • Functional Description

Introduction

The IFM-150 Interface Firing Module receives a control signal from the DECS-400 or DECS-450 Digital Excitation Control System and then calculates a time delay based on the zero crossing of each phase of voltage from the synchronizing transformer. At the end of the time delay, the IFM-150 produces the properly synchronized sets of pulses to drive the SCRs of the excitation system rectifier chassis. As the DECS control signal increases (or decreases), the time interval between the zero crossing of each phase voltage and the start of its next output pulse will decrease (or increase). This results in an increase (or decrease) in the rectifier chassis output voltage.

A terminal voltage limiter within the IFM-150 can be enabled to monitor the generator voltage through the synchronizing transformer or external voltage transducer and compare the measurement with a user-adjustable reference level. If the generator voltage exceeds the reference level for a user-adjustable amount of time, the IFM-150 will modify the SCR firing pulses and limit the generator voltage.

Inputs

The function of each IFM-150 input is described in the following paragraphs.

Control Power (DC+, DC– and AC1, AC2)

Operating power for the Firing Circuit Chassis is applied to the Control Power inputs. If dc operating power is used, 125 Vdc should be applied to terminals DC+ and DC–. If ac operating power is used, 120 Vac should be applied to terminals AC1 and AC2. Both inputs may be used if redundant control power is desired.

Bridge Control Voltage (COM, VC+)

This signal determines the firing control angle of the rectifier bridge SCRs. The Bridge Control Voltage Input accepts a voltage range of –10 to +10 Vdc. The DECS must be programmed to supply the same range of control voltage. Refer to Basler publication 9369700990 for information about DECS-400 configuration and Basler publication 9597100990 for information about DECS-450 configuration.

Synchronization Voltage

Voltage is applied to this input and passed through the synchronizing transformer. These voltage signals are used to define the time reference for the rectifier chassis SCR control pulses. The voltages are also used for generator voltage metering in applications where the rectifier chassis operating power is supplied from the generator output (if the Internal mode of the generator voltage sensing is selected (for three-phase applications only)).

Terminal labeling for the synchronization voltage input varies according to the model of IFM-150 (single-phase or three-phase control).

The single-phase IFM-150 accepts synchronization voltage at terminals A1 and B or A2 and B. Terminals A1 and B are used for synchronization voltage in the 240 Vac or 480 Vac range. Terminals A2 and B are used for synchronization voltage in the 120 Vac range.

The three-phase IFM-150 accepts synchronization voltage at terminals A, B, and C.

Generator Voltage (B2, B3)

The dc output from the transducer, used to sense the generator voltage, is applied to this input. This signal is used for generator voltage metering if the external generator voltage sensing mode is selected.

Gate Drive Block (BL+, BL–)

When a contact closure is sensed at this input, SCR firing is blocked and the IFM-150 output is disabled.

Full Invert (INV+, INV–)

The pulse outputs are forced to their maximum delay when a contact closure is sensed at this input. This results in maximum negative voltage at the exciter output until the field current decays to nearly zero. The Full Invert contact input is used only on full-control bridges.

Start/Stop (FS+, FS–)

A contact closure at this input initiates sampling of the synchronizing voltage (to determine phase rotation) and calculation of the pulse generation time delay. Opening this contact input terminates the firing pulses.

Terminal Voltage Limiter Enable (VTLIM+, VTLIM–)

The terminal voltage limiter is enabled when contact closure is sensed at this input. When enabled, the terminal limiter will prevent the generator voltage from exceeding the limiter reference level.

Outputs

The following paragraphs describe the function of the IFM-150 outputs.

Firing Pulses

These outputs supply firing pulses to the gate trigger inputs of the Rectifier Chassis. The firing pulse terminals used depend on the model of IFM-150. *Installation* illustrates typical firing pulse output connections for single-phase and three-phase rectifier chassis applications.

Watchdog Relay (WTCHDG1, WTCHDG2)

The Watchdog Relay output closes to indicate a software execution problem within the IFM-150 or a loss of power supply. This output remains closed for several seconds after the application of control power.

Alarm Relay (ALRM1, ALRM2)

The Alarm Relay output closes when the monitored synchronizing transformer frequency decreases below the programmable level of the BESTCOMS Safe Mode Frequency setting. The output opens when the frequency increases to 1 hertz above the Safe Mode Frequency setting. This output is disabled when the Start/Stop contact input (FS+, FS–) is open.

Terminal Voltage Limiter Active Relay (LIMACTV1, LIMACTV2)

The normally-open Terminal Voltage Limiter Active Relay output closes when the terminal voltage limiter activates due to high generator voltage. When the generator voltage decreases below the limiter reference level, the terminal voltage limiter deactivates and the Terminal Voltage Limiter Active Relay output opens.

Indicators

IFM-150 indicators consist of LEDs (light emitting diodes) located on the front panel (Figure 2-1).

Power LED

This green LED lights when operating power is applied to the IFM-150 and the microprocessor is not in a reset state.

Limit LED

This red LED lights when the Terminal Voltage Limiter (TVL) of the IFM-150 is active. The Limit LED also lights for several seconds after the application of control power.

Watchdog LED

This red LED lights when a software execution problem exists within the IFM-150. The Watchdog LED also lights for several seconds after the application of control power.
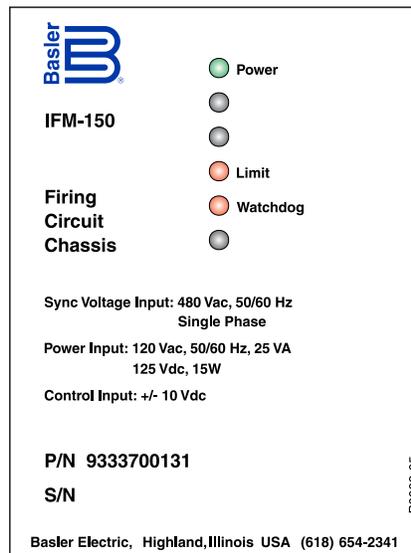

Figure 2-1. IFM-150 Indicators

Communication

A nine-pin, D-sub, RS-232 connector is located on the left side of the unit. During commissioning, this connector enables the IFM-150 to receive setting changes from a PC using BESTCOMS™ software.

Caution
This product contains one or more *nonvolatile memory* devices. Nonvolatile memory is used to store information (such as settings) that needs to be preserved when the product is power-cycled or otherwise restarted. Established nonvolatile memory technologies have a physical limit on the number of times they can be erased and written. In this product, the limit is 10,000 erase/write cycles. During product application, consideration should be given to communications, logic, and other factors that may cause frequent/repeated writes of settings or other information that is retained by the product. Applications that result in such frequent/repeated writes may reduce the useable product life and result in loss of information and/or product inoperability.

Operating Modes

IFM-150 operating modes include Normal, Safe, and Terminal Voltage Limiting.

Normal

When the generator voltage is below the Terminal Voltage Limiter (TVL) setting and the generator frequency is above the Safe mode level, the IFM-150 operates in Normal mode. In Normal mode, the IFM-150 receives a control signal, calculates a firing angle, and generates firing pulses for the excitation system SCRs.

Safe

When the generator voltage is too low or the generator frequency decreases below the BESTCOMS Safe Mode Frequency setting, the IFM-150 enters Safe mode. When operating in Safe mode, the IFM-150 does not supply SCR firing pulses. The IFM-150 exits Safe mode when the generator frequency increases to 1 hertz above the Safe Mode Frequency setting.

The Safe Mode Frequency setting is adjustable from 11 to 15 hertz, in 1 hertz increments.

Terminal Voltage Limiter

When the generator terminal voltage exceeds the BESTCOMS™ TVL setting for the duration of the BESTCOMS™ TVL time delay setting, the IFM-150 disregards the Control input from the DECS and assumes control of excitation.

The TVL setting is adjustable from 0 to 30,000 Vac and the TVL time delay setting is adjustable from 0 to 10 seconds.

3 • BESTCOMS™ Software

Introduction

BESTCOMS™ software provides the communication link between the IFM-150 and the user. All IFM-150 settings are entered through BESTCOMS and all metering values are read through BESTCOMS. PID (Proportional + Integral + Derivative) software within BESTCOMS enables the user to establish proper PID parameters based on specified exciter time constants. Within BESTCOMS, IFM-150 settings can be saved in a computer file and used later to configure other units with the same settings.

Installation

BESTCOMS software operates with IBM-compatible personal computers (PCs) using Microsoft Windows® 2000, XP, Vista, 7, or 8 operating systems. The minimum recommended operating requirements are listed below.

- IBM compatible PC, 486DX2 or faster (100 MHz or higher microprocessor is recommended)
- CD-ROM drive
- One available serial port

Installing BESTCOMS

BESTCOMS software contains a setup utility that installs the program on your PC. An uninstall utility is loaded with the program that can be used to remove BESTCOMS from your PC if desired. Use the following procedure to install BESTCOMS.

1. Insert the IFM-150 CD-ROM into your PC CD-ROM drive.

2. When the IFM-150 Setup and Documentation CD menu appears, click the Install button for the BESTCOMS PC program. The BESTCOMS setup utility automatically installs the BESTCOMS software.

When BESTCOMS is installed a Basler Electric folder is added to the Windows program menu. This folder is accessed by clicking the Start button and pointing to Programs. The Basler Electric folder contains an icon for the BESTCOMS program.

Connecting the IFM-150 and PC

Connect a serial communication cable between the RS-232 connector of the IFM-150 and the appropriate communication port of the PC. Refer to *Installation* for the location of the IFM-150 RS-232 connector.

Starting BESTCOMS™

BESTCOMS is started by clicking the Windows Start button, pointing to Programs, the Basler Electric folder, and then clicking the BESTCOMS IFM-150 icon. At startup, a dialog box with the program title and version number is displayed briefly (Figure 3-1). After this dialog box is displayed, the Configuration screen is displayed (Figure 3-2).
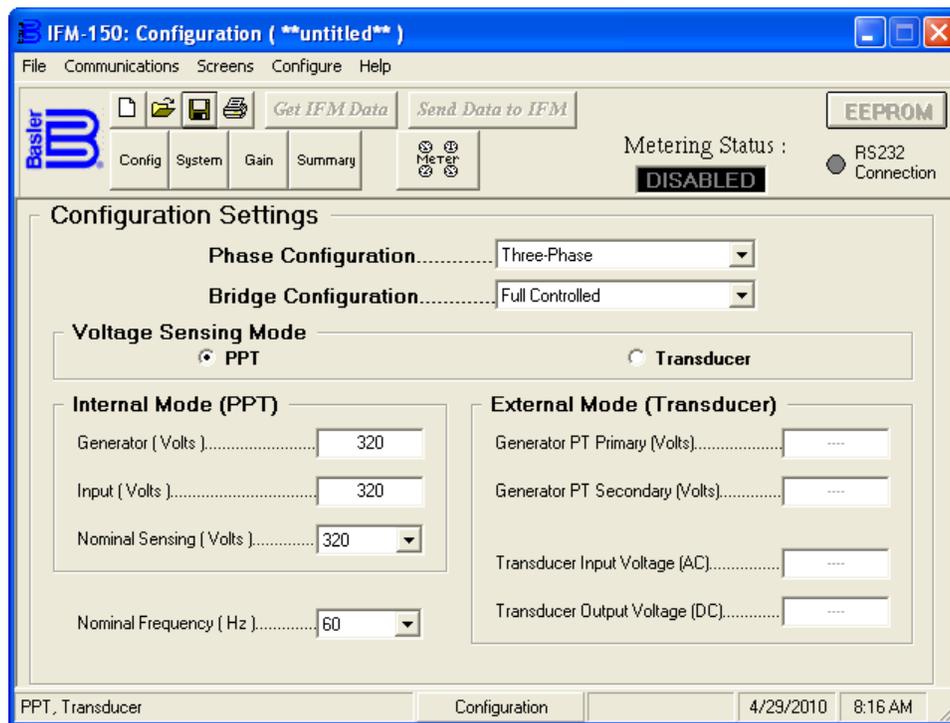
Figure 3-1. BESTCOMS™ Title and Version

Figure 3-2. BESTCOMS™ Configuration Screen

Configuring Communication

IFM-150 communication settings are fixed at a baud rate of 9600 and no parity bit. For communication to take place, your PC's communication settings must be adjusted to match the communication settings of the IFM-150.

Establishing Communication

Communication between BESTCOMS™ and the IFM-150 must be established before viewing metering values or reading or changing settings. BESTCOMS screen settings are updated only after communication is opened or the communication settings have been changed.

Open the IFM-150 communication port by using any of the following three methods.

- Click the **RS232 Connection** indicator at the right-hand side of the BESTCOMS tool bar

- Click **Communications** on the menu bar, hover the mouse pointer over **Connect to...**, and then click **RS232 Connection**

- Press the **Ctrl** and **R** keys

When any of the above methods are used, the Password entry screen of Figure 3-3 appears and prompts you to enter a password. Each IFM-150 is delivered with ifm150 as the default password. Password access expires after 15 minutes of inactivity and must be renewed in order to make setting changes. See the Password Protection paragraphs for information about changing the password.

Figure 3-3. Password Entry

After the correct password is entered, the Communication Initiation screen of Figure 3-4 is displayed. Select the appropriate PC communication port as the active communication port on your PC and click the Initialize button. BESTCOMS initiates communication by obtaining the configuration settings from the IFM-150.

When communication between BESTCOMS and the IFM-150 is established, the RS232 Connection indicator is red.
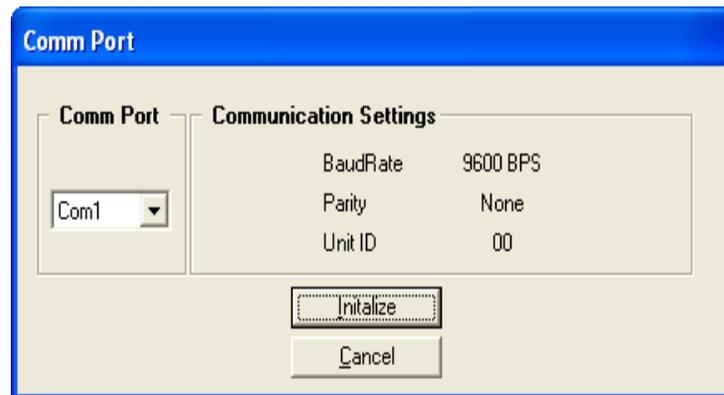

Figure 3-4. Communication Initiation Screen

| **Note** |
| --- |
| BESTCOMS™ may display the dialog box of Figure 3-5 when initializing IFM-150 communication, obtaining IFM-150 configuration settings, or performing other tasks. It is important to wait until the box closes before trying to execute communication commands. Issuing commands while the dialog box is present may disrupt communication between BESTCOMS and the IFM-150. |
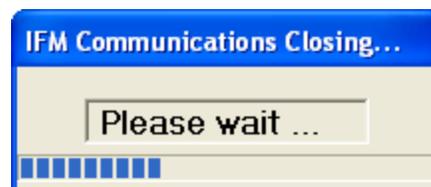
Figure 3-5. Wait Dialog Box

Changing Settings

Settings are arranged into three groups.

- Configuration
- System
- Gain

Each setting group has a corresponding button that can be selected to access that group of settings. The three setting groups also can be accessed by clicking Screens on the menu bar and then selecting the desired setting group from the list. Once a setting group is accessed, the individual settings of the group can be viewed and changed.

A setting is changed by clicking within the setting field and typing the new setting. When the cursor is placed within a setting field, the setting range for the field is displayed in the Status Bar at the bottom of the BESTCOMS screen. Once all desired setting changes have been made on a setting group screen, the settings must be sent to the IFM-150 before viewing other screens. Otherwise, the settings changes will be lost. Settings changes can be sent to the IFM-150 by using any of the following three methods.

- Press the **Enter** key.

- Click the **Send Data to IFM** button on the BESTCOMS toolbar.

- Click **Communications** on the menu toolbar and then click **Send Data to IFM-150**.

Sending and Receiving Settings

When communication is enabled, IFM-150 settings can be sent or received through BESTCOMS™.

Caution
This product contains one or more *nonvolatile memory* devices. Nonvolatile memory is used to store information (such as settings) that needs to be preserved when the product is power-cycled or otherwise restarted. Established nonvolatile memory technologies have a physical limit on the number of times they can be erased and written. In this product, the limit is 10,000 erase/write cycles. During product application, consideration should be given to communications, logic, and other factors that may cause frequent/repeated writes of settings or other information that is retained by the product. Applications that result in such frequent/repeated writes may reduce the useable product life and result in loss of information and/or product inoperability.

Sending Settings

Settings changes are sent to the IFM-150 by clicking the Send Data to IFM button. This causes the selected setting displayed on the current settings screen to become the IFM-150 setting. Settings also can be sent to the IFM-150 by clicking Communications on the menu bar and clicking Send Data to IFM. Additionally, a setting can be sent by pressing the Enter key after the new value is typed in. The Send Data to IFM button must be clicked or the Enter key must be pressed after each setting change to ensure that all settings are sent to the IFM-150. See Saving Settings to IFM-150 Memory for information about retaining IFM-150 settings after operating power is removed.

Receiving Settings

IFM-150 settings are retrieved by clicking the **Get IFM-150 Data** button. This causes the current settings of the IFM-150 to be displayed on the settings screen. Settings can also be received from the IFM-150 by clicking **Communications** on the menu bar and clicking **Get IFM Data**.

Saving Settings to IFM-150 Memory

Settings are saved in nonvolatile memory (EEPROM). In the event of a power loss, these are the settings that are active at power up. If settings are changed and sent to the IFM-150, but not sent to EEPROM, the changed settings are lost if IFM-150 operating power is lost.

When communication is enabled, setting changes are saved to EEPROM by clicking the EEPROM button.

Setting Definitions

Each of the three setting groups has a corresponding BESTCOMS screen. In the following paragraphs, settings are arranged and defined according to the organization of the BESTCOMS screens.

Configuration

Click the **Config** button to access the Configuration screen or click **Screens** on the menu bar and then click **Configuration Settings**. Configuration screen settings are shown in (Figure 3-6) and described in the following paragraphs.

Phase Configuration

Selection of the phase configuration can be made only while creating a settings file with BESTCOMS™ off-line (not communicating with the IFM-150). When BESTCOMS is communicating with the IFM-150, the phase configuration becomes a read-only value that cannot be changed. Two phase configuration settings may be selected: Three-Phase and Single-Phase.

Three-Phase. Selecting Three-Phase enables the IFM-150 to generate six sets of output pulses to drive the SCRs of a three-phase rectifier chassis.

Single-Phase. Selecting Single-Phase enables the IFM-150 to generate four sets of output pulses to drive the SCRs of a single-phase rectifier chassis.

Bridge Configuration

When Three-Phase is selected as the phase configuration, three bridge configuration settings may be selected: Full Controlled, Half Controlled - Negative, and Half Controlled - Positive. When Single-Phase is selected as the phase configuration, Full Controlled is the only bridge configuration setting available.

Full Controlled. When the phase configuration is three-phase, selecting full control causes the IFM-150 to generate six sets of output pulses to drive the positive and negative SCRs of a three-phase, fully controlled rectifier chassis. Typical connections for a fully controlled, three-phase rectifier chassis are shown in *Installation*. When the phase configuration is single-phase, full control causes the IFM-150 to generate four sets of output pulses to drive the positive and negative SCRs of a fully-controlled, single-phase rectifier chassis. Typical connections for a fully-controlled, single-phase rectifier chassis are shown in *Installation*.

Half Controlled—Negative. Selecting negative, half control causes the IFM-150 to generate three sets of output pulses to drive the three negative SCRs of a three-phase, negative, half controlled rectifier chassis. Typical connections for a negative, half controlled rectifier chassis are shown in *Installation*.

Half Controlled—Positive. Selecting positive, half control causes the IFM-150 to generate three sets of output pulses to drive the three positive SCRs of a three-phase, positive, half controlled rectifier chassis. Typical connections for a positive, half controlled rectifier chassis are shown in *Installation*.
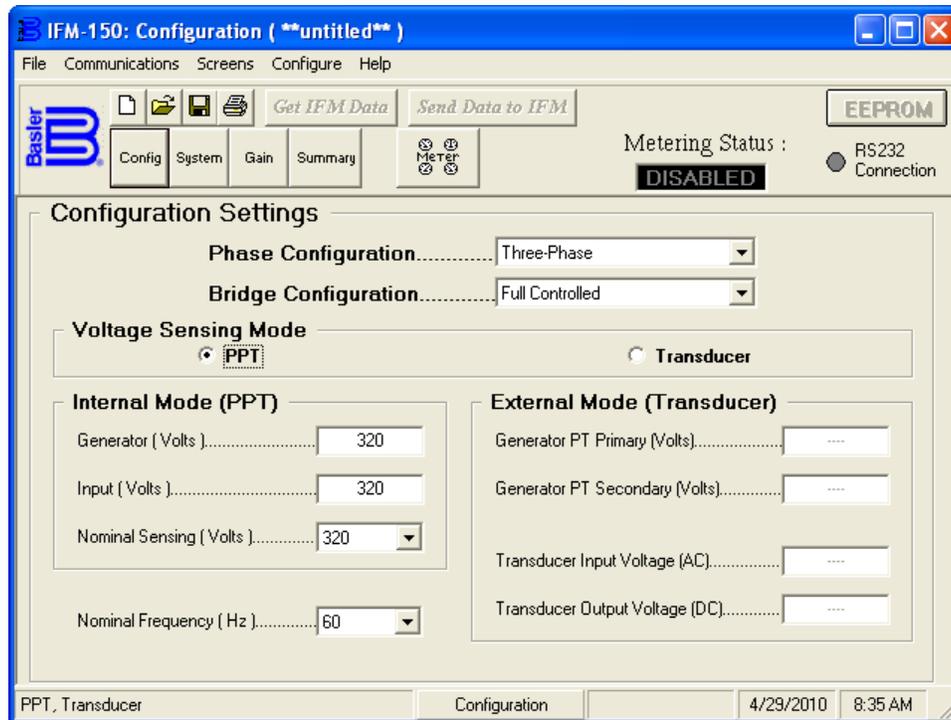
Figure 3-6. Configuration Screen

Voltage Sensing Mode

Two generator voltage sensing modes are available: PPT and Transducer.

PPT mode can be selected only for three-phase applications. When PPT mode is selected, the output from the PPT (power potential transformer) is used as the voltage sensing source.

Transducer mode can be selected for single-phase or three-phase applications. When Transducer mode is selected, the dc output from a user-supplied transducer is used as the voltage sensing source. The transducer input is connected to the secondary side of the sensing potential transformers.

Internal Mode (PPT)

This group of settings are active only when "PPT" is selected as the Voltage Sensing mode.

Generator (Volts). This setting field is used to enter the nominal value of the voltage on the primary winding of the excitation system power potential transformer (PPT). A value of 0 to 30,000 may be entered. The default value is 320.

Input (Volts). This setting field defines the nominal level of the synchronization voltage applied to the IFM-150 when nominal generator voltage is applied at the primary winding of the PPT. A value of 0 to 600 may be entered. The default value is 320.

Nominal Sensing (Volts). This setting field is used to select the synchronization voltage level applied to the Synchronization input of the IFM-150. One of five values may be selected: 40, 80, 160, 320, or 480. The default value is 320. The synchronization voltage is listed on the front panel of the IFM-150.

Nominal Frequency (Hz)

This setting field is used to select the nominal frequency of the rectifier bridge power source. A value of 50 or 60 may be selected in both modes of voltage sensing. The default value is 60.

External Mode (Transducer)

This group of settings is active only when Transducer is selected as the Voltage Sensing mode.

Generator PT Primary (Volts). This setting field is used to enter the nominal value of the generator sensing potential transformer primary voltage, which is connected to the generator output. A value of 0 to 30,000 may be entered. The default value is 150.

Generator PT Secondary (Volts). This setting field is used to enter the nominal value of the PPT secondary voltage, which is connected to the input of the user-supplied voltage transducer. A value of 0 to 600 may be entered. The default value is 150.

Transducer Input Voltage (AC). This setting field is used to enter the nominal value of the transducer input voltage. A value of 0 to 300 may be entered. The default value is 150.

Transducer Output Voltage (DC). This setting field is used to enter the nominal value of the transducer output voltage. A value of 0 to 10 may be entered. The default value is 10.

System

Click the **System** button to access the System screen or click <u>S</u>**creens** on the menu bar and then click **System Settings**. System settings are shown in Figure 3-7 and are described in the following paragraphs.

Control Angle—Minimum (degrees)

By defining the minimum value of the calculated control angle, this field is used to adjust the maximum positive output voltage of the excitation system rectifier bridge.

When the phase configuration is single-phase (Configuration Settings screen), a value of 20 to 40 may be entered. The default value is 30 degrees.

When the phase configuration is three-phase and the bridge configuration is fully controlled, half controlled positive, or half controlled negative, a value of 10 to 20 may be entered. The default value is 10 degrees.

Control Angle—Maximum (degrees)

By defining the maximum value of the calculated control angle, this field is used to adjust the maximum negative output voltage of the excitation system rectifier bridge.

When the bridge configuration is fully controlled (Configuration Settings screen), a value of 110 to 150 degrees may be entered. The default value is 140 degrees.

When the bridge configuration is half controlled (positive or negative), a value of 110 to 180 degrees may be entered. The default value is 165 degrees.
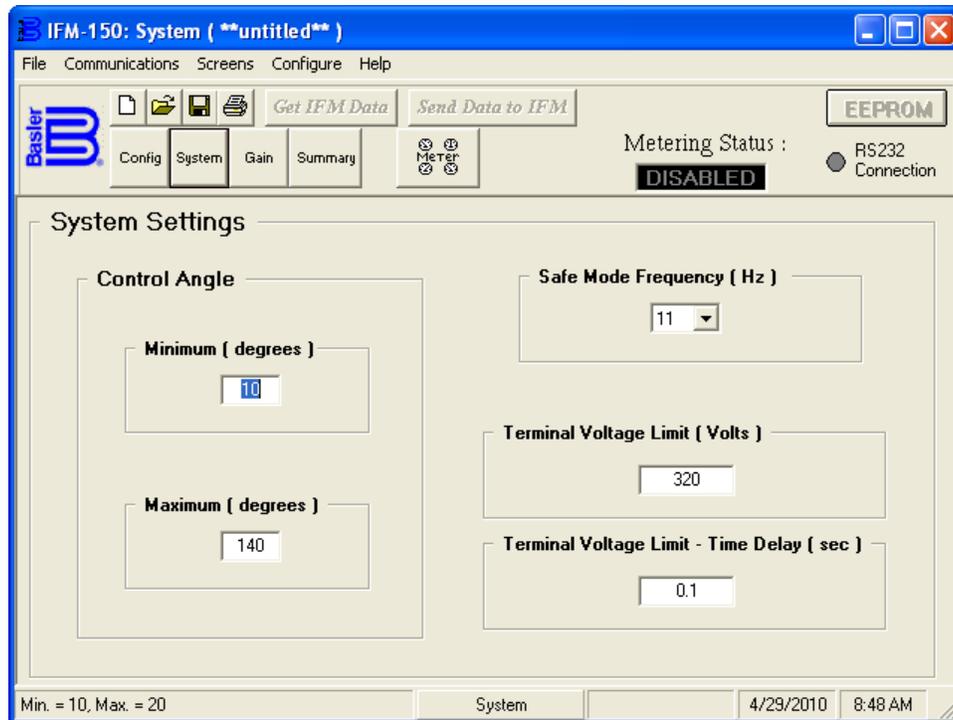
Figure 3-7. System Screen

Safe Mode Frequency (Hz)

This setting field selects the frequency level below which the IFM-150 stops applying firing pulses and enters Safe mode. A value of 11, 12, 13, 14, or 15 may be selected. The default value is 11.

Terminal Voltage Limit (Volts)

When the generator terminal voltage exceeds the value of this field, the IFM-150 disregards the Control input and assumes control of regulation. A value of 0 to 30,000 may be entered. The default value is 320.

Terminal Voltage—Time Delay (sec)

This setting field determines the time delay between when excess terminal voltage is detected and when the IFM-150 takes corrective action. A value of 0 to 10 may be entered. The default value is 0.1.

Gain

The Gain Settings screen setting fields define the gains in the PID terminal voltage control loop.

Click the Gain button to access the Gain Settings screen or click Screens on the menu bar and then click Gain Settings. The Gain Settings screen is shown in Figure 3-8. The range and default values for the five gain parameters are provided in the following paragraphs.

Overall Gain (KG)

A KG value of 0 to 1,000 may be entered. The default value is 30.

Proportional Gain (KP)

A KP value of 0 to 1,000 may be entered. The default value is 10.

Integral Gain (KI)

A KI value of 0 to 1,000 may be entered. The default value is 2.

Derivative Gain (KD)

A KD value of 0 to 1,000 may be entered. The default value is 10.

Differential Time Constant (TD)

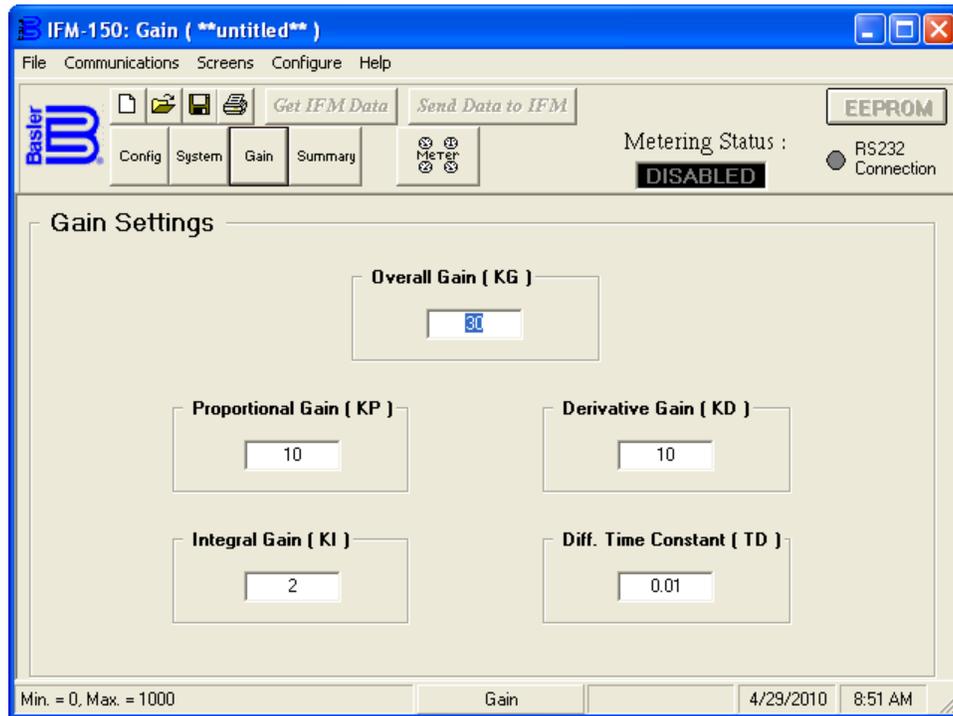A TD value of 0 to 1.00 second may be entered. The default value is 0.01.

Figure 3-8. Gain Screen

Summary of Parameters

The Summary screen (Figure 3-9) lists all IFM-150 settings, the IFM-150 firmware version level, and the BESTCOMS™ version level. Communication with an IFM-150 must be established for a summary of settings to be displayed. The settings shown on the Summary screen depend upon the Voltage Sensing mode selected (either PPT or Transducer).

To access the Summary screen, click the **Summary** button to or click **Screens** on the menu bar and click **Summary of Parameters**.
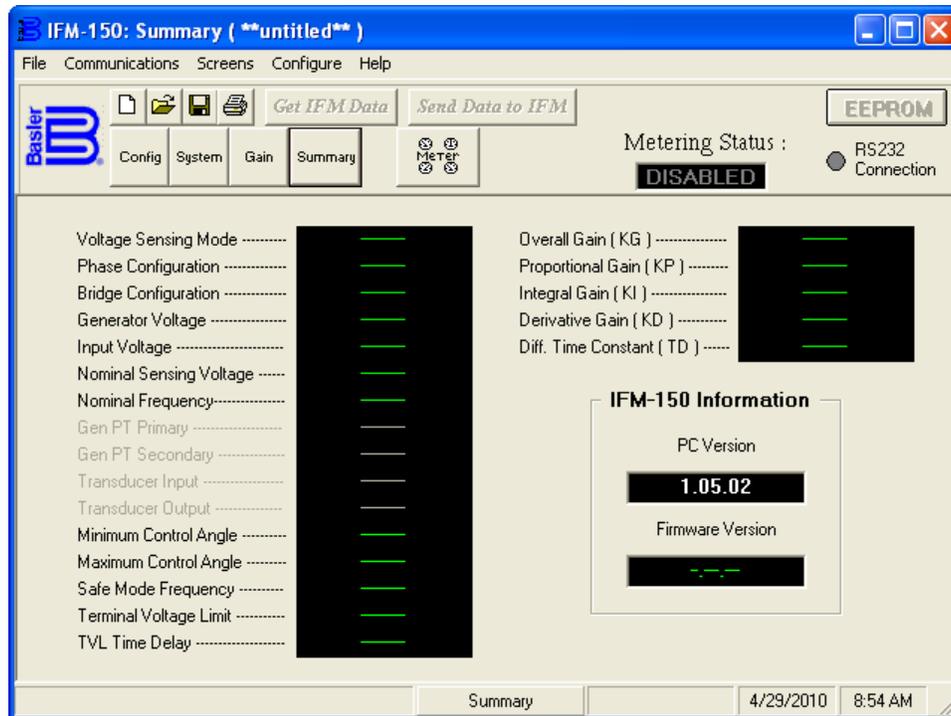
Figure 3-9. Summary Screen

Metering

The Metering screen displays the status of key generator parameters and IFM-150 inputs, outputs, settings, switch inputs, and operating modes. IFM-150 function blocks and settings are illustrated in a logic diagram to ease understanding of IFM-150 function.

Current Metering screen values are displayed only when communication with the IFM-150 has been established. A metering status of Enabled or Disabled is indicated by a metering status field on the tool bar.

To access the Metering screen, click the **Metering** button or click <u>Screens</u> on the menu bar and click **Metering**. The Metering screen is illustrated in Figure 3-10. Metering screen fields and indicators are described in the following paragraphs.

Terminal Voltage Limit (Volts)

This setting field selects the level of generator voltage that will activate the Terminal Voltage Limiter time delay. A value of 0 to 30,000 may be entered. The default value is 320.

Time Delay (sec)

The value of this setting field determines the length of time between when the generator terminal voltage exceeds the limit setting and when the Terminal Voltage Limiter becomes active. A value of 0 to 10 seconds may be entered. The default value is 0.1.

Avg. Gen. Voltage (Volts)

The metered value of the average generator voltage is displayed in this field.

TVL Output

This field displays a scaled value of the Terminal Voltage Limiter output.

PID

Clicking this block accesses the IFM-150 PID settings screen. The PID settings screen provides adjustment of overall gain (KG), proportional gain (KP), derivative gain (KD), integral gain (KI), and the differential time constant (TD).
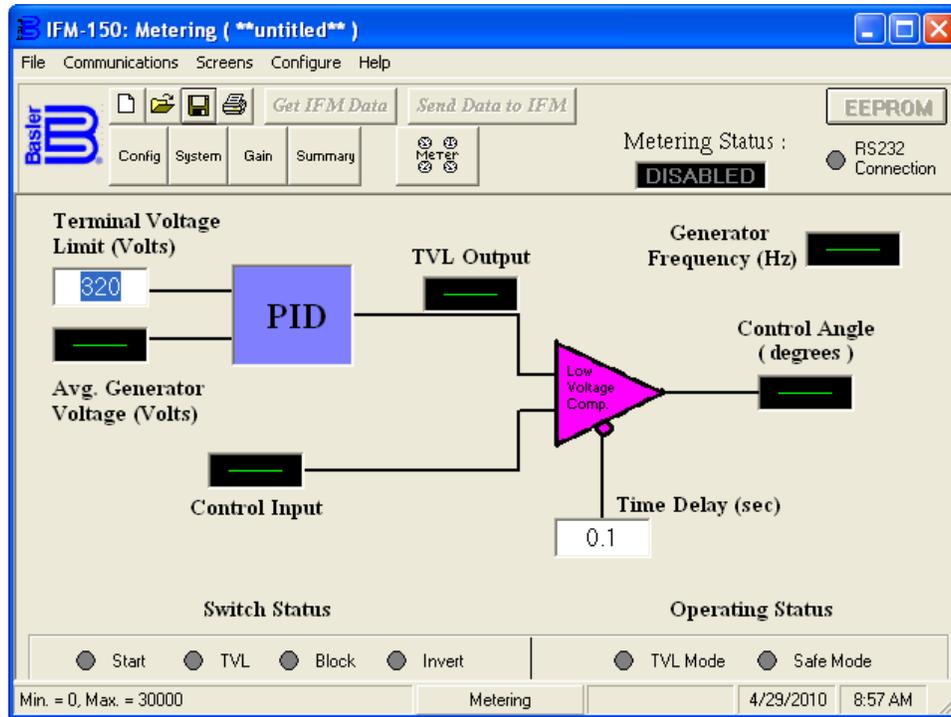

Figure 3-10. Metering Screen

Control Input

This field displays the value of control voltage supplied by the DECS to the IFM-150 Auto Control input.

Control Angle (degrees)

The control angle value for the firing pulses generated by the IFM-150 is displayed in this field. The control angle calculated by the IFM-150 is based on the level of control input voltage received from the DECS.

Generator Frequency (Hz)

This field displays the frequency value of the generator output.

Switch Status

Indicators on the Metering screen provide the status of four IFM-150 switching inputs: Start, TVL, Block, and Invert.

Start

This indicator turns red when the IFM-150 is generating SCR firing pulses.

TVL

This indicator turns red when the Terminal Voltage Limiter is active.

Block

This indicator turns red when the IFM-150 Block input is active and SCR firing pulses are inhibited.

Invert

This indicator turns red when the IFM-150 receives a Full Invert contact input and the SCR firing pulses are forced to their maximum delay.

Operating Status

Indicators on the Metering screen provide the status for two IFM-150 operating modes: TVL and Safe.

TVL Mode

This indicator turns red when the IFM-150 is operating in Terminal Voltage Limit mode.

Safe Mode

This indicator turns red when the IFM-150 is operating in Safe mode. The IFM-150 enters Safe mode when the generator voltage or frequency decreases below a preset value. When operating in Safe mode, the IFM-150 does not deliver SCR firing pulses.

Settings Files

BESTCOMS™ software enables you to print a list of IFM-150 settings, save IFM-150 settings to a file, and open a settings file and upload those settings to an IFM-150. A settings file may also be opened and edited within any text editing software.

Printing Settings Files

A printout of IFM-150 settings can be useful for recordkeeping or comparison purposes. IFM-150 settings are printed by clicking the **Printer** icon, clicking **File** on the Menu bar and then clicking **Print**, or by pressing the **Ctrl** and **P** keys. When the print command is given, a dialog box appears and gives you the opportunity to save your settings. Then, the Print Preview screen appears. The Print Preview screen allows selection of the printer and printer settings. A settings report can be tailored to print specific setting groups. If a saved file is printed, the file location and name, and user-comments are included in the header area. The **Print** button is clicked to print a settings report.

Saving Settings Files

Saving IFM-150 settings to a file for uploading to other IFM-150 units saves setup time when configuring multiple units with the same configuration. A settings file can also be created in BESTCOMS without being connected to an IFM-150. The settings of the desired screens can be changed and these settings can then be saved to a file. Once a settings file is created, it can be edited using any text editing software, and then saved for uploading.

A settings file is created by using any of the following methods.

- Click the **Save File** icon on the toolbar

- Click **File** on the menu toolbar and then click **Save**

- Press the **Ctrl** and **S** keys

When any of the above methods are used, a Properties dialog box appears and allows entry of file comments. The Properties dialog box also displays the BESTCOMS version that the file is being saved with. Clicking **OK** or **Cancel** displays a Save As dialog box. The Save As dialog box allows you to select a path and name for the settings file. Clicking **Save** saves the file. Once saved, the file name is displayed on the BESTCOMS title bar.

Uploading Settings Files

An IFM-150 settings file downloaded from an IFM-150 or created within BESTCOMS can be uploaded to other IFM-150 units. Only a settings file with an .ifm extension can be uploaded to an IFM-150 unit. Before uploading a file, communication must be initiated with the IFM-150 that is to receive the settings. Refer to the paragraphs labeled *Starting BESTCOMS, Establishing Communication* for information about initiating communication with the IFM-150.

The upload process is initiated by using any of the following methods.

- Click the **Open** icon on the toolbar

- Click **File** on the menu bar and then click Open

- Press the **Ctrl** and **O** keys

When any of the above methods are used, a dialog box appears and asks if you want to save the current settings. Clicking **Yes** or **No** displays an Open dialog box that allows you to navigate to and select the desired settings file for uploading. When the desired file is selected, the **Open** button is clicked to upload the file.

Password Protection

Password protection guards against unauthorized changing or viewing of IFM-150 settings. A single, case-sensitive password protects all IFM-150 settings. The IFM-150 is delivered with a default password of ifm150. Once the password is changed, it should be stored in a secure location. If the user-defined password is lost or forgotten, BESTCOMS-IFM-150 must be reloaded to restore the default password.

Changing the Password

A new password can be programmed by performing the following steps.

1. Click **Communications** on the menu bar and then click **Change Password**. The Change Password dialog box of Figure 3-11 appears.

2. Type the new password in the Enter New Password field. Re-enter the new password in the Confirm New Password field.

3. Click **OK** to activate the new password.

Figure 3-11. Change Password Dialog Box

Note
A password change can be made only after communication between BESTCOMS™ and the IFM-150 is established.

Terminating Communication

IFM-150 communication is terminated by using any of the following methods.

- Click **Communications** on the menu bar and then click **Close**

- Click the **RS232 Connection** indicator

- Press the **Ctrl** and **C** keys

When any of the above methods are used, a dialog box appears and confirms your request to close communication. Clicking **Yes** closes communication and clicking **No** aborts the closing of communication.

Embedded Firmware

Embedded firmware is the operating program that controls the actions of the IFM-150. The IFM-150 stores firmware in nonvolatile flash memory that can be reprogrammed through the RS-232 communication port. It is not necessary to replace EPROM chips when replacing the firmware with a newer version.

Updating the Firmware

Future enhancements to IFM-150 functionality may make a firmware update desirable. IFM-150 embedded firmware can be updated by performing the following steps.

Caution
If power is lost or communication is interrupted during file transfer, the IFM-150 will not recover and will cease to be operational. Firmware uploading may replace some user-adjusted settings with factory-default settings.

1. Connect a communication cable between the RS-232 connector of the IFM-150 and the appropriate communication port of your PC.

2. Click **Configure** on the menu bar and then click **Upload Embedded Firmware**. A dialog box is displayed that asks if you wish to continue with firmware uploading.

3. Click **Yes** to proceed with firmware uploading. The IFM Embedded Program Loader application starts (Figure 3-12).

4. Click the **Get Device Information** button. The IFM Embedded Program Loader retrieves and displays the IFM-150 model number, style number, serial number, and application program version number in the left-hand column.

5. Click the **Start Transfer Data** button to proceed with firmware uploading. A dialog box appears and recommends that your IFM-150 settings be saved in a file that can be uploaded to the IFM-150 after the embedded firmware is updated.

    Clicking **No** allows you to exit the upload process so that an IFM-150 settings file can be created. Refer to the Settings Files sub-section for information about creating a settings file.

    Clicking **Yes** continues with the upload process and displays an Open dialog box. The Open dialog box is used to locate and select the appropriate file for uploading to the IFM-150. Only files with a .S19 extension are displayed in the Open dialog box.
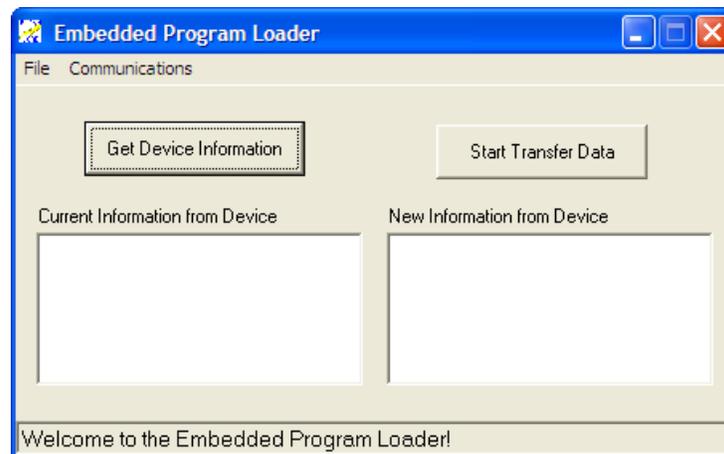
Figure 3-12. IFM-150 Embedded Program Loader

6. Select the appropriate file for uploading and click the **Open** button to start the file transfer. A dialog box indicating the progress of the file transfer is displayed.

   Once the transfer is complete, the device information is displayed in the right-hand column of the IFM-150 Embedded Program Loader. The displayed program version number indicates the version and date of the firmware just loaded.

7. Close the IFM-150 Embedded Program Loader. BESTCOMS™ loads the default settings, loads the saved settings, and checks the settings.

4 • Installation

Mounting

The IFM-150 can be mounted anywhere the ambient temperature does not exceed the limits stated in *General Information, Specifications*. Overall chassis dimensions are shown in Figure 4-1.
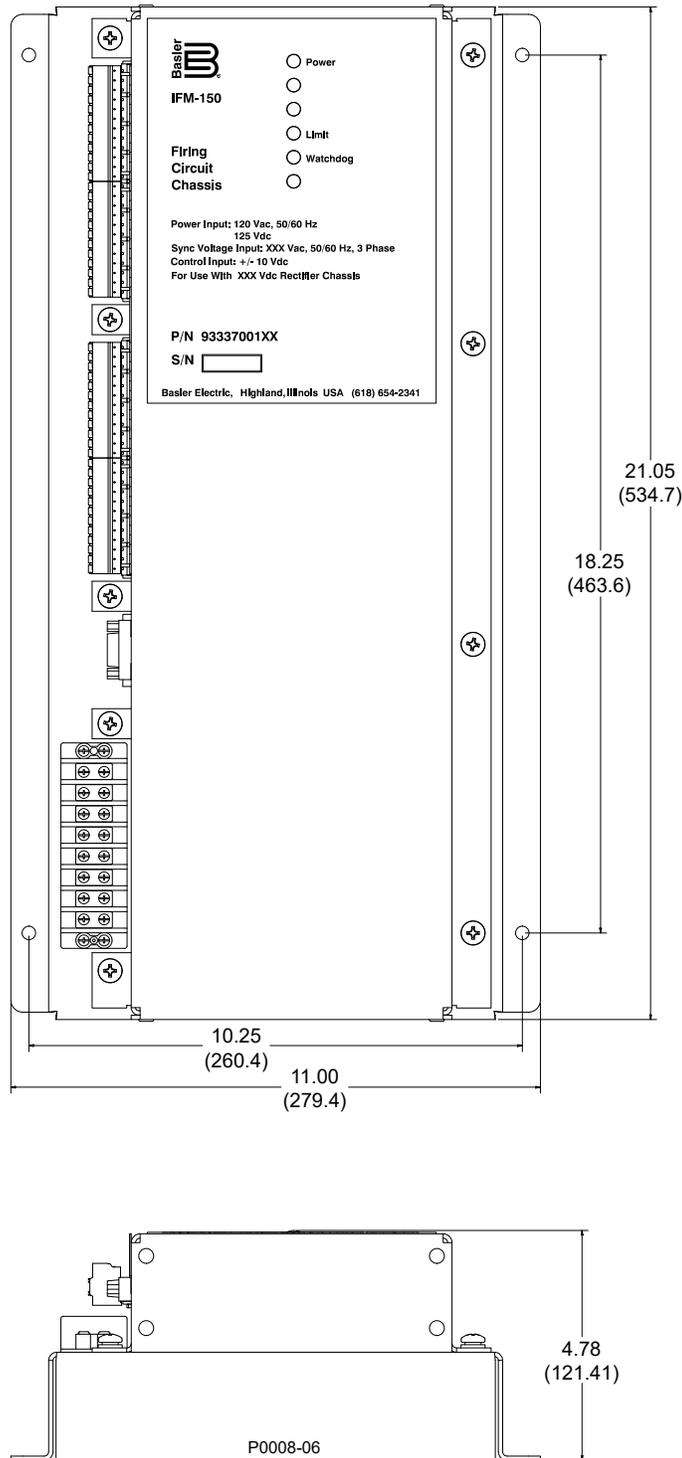
Figure 4-1. IFM-150 Outline Dimensions

Connections

The wires connecting the IFM-150 to the rectifier chassis carry critical gating signals that are subject to noise that will increase as the wire length increases. Therefore, it is recommended that the two chassis be located within the same enclosure. Connections between the IFM-150 and rectifier chassis should be made with shielded, non-bundled, twisted-pair cables using a minimum of 20-gauge wire and with a maximum length of 10 feet (3 meters). All other connections require 14 AWG wire as a minimum.

NOTE

Figure 4-2 illustrates the control signal connections between the DECS-400 and IFM-150. For DECS-450 applications, the connections shown in Figure 4-4 through Figure 4-7 differ only in the two control signal connections between the IFM-150 and DECS-450.

IFM-150	VC+	COM

P0054-04

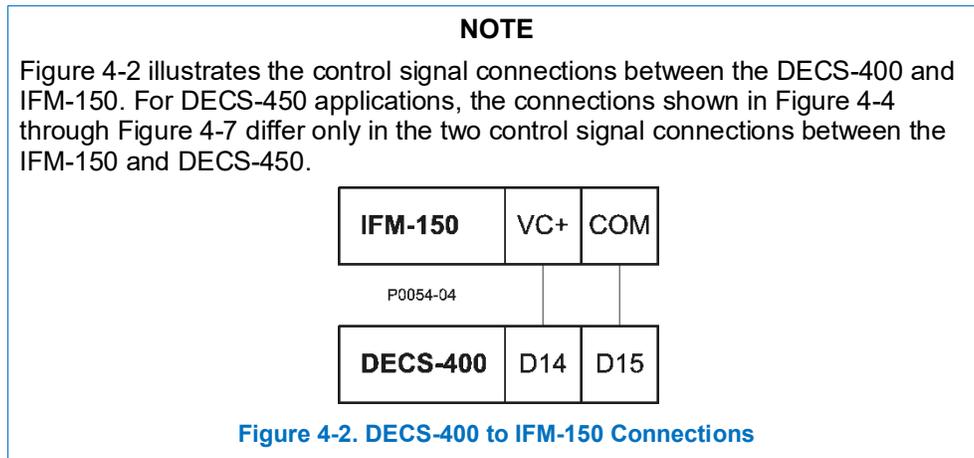| **DECS-400**	D14	D15

Figure 4-2. DECS-400 to IFM-150 Connections

Figure 4-3 illustrates the IFM-150 connection terminals for single-phase versions (part number 9333700130 or 9333700131) and three-phase versions (part numbers 9333700120, 9333700121, 9333700122, 9333700123, and 9333700124). Typical interconnection of an IFM-150, single-phase rectifier module, and DECS-450 is shown in Figure 4-4. Typical interconnection of an IFM-150, three-phase rectifier chassis, and DECS-450 is shown in Figure 4-5 through Figure 4-7. Figure 4-5 shows the IFM-150 connected to a fully controlled, three-phase rectifier chassis, Figure 4-6 shows the IFM-150 connected to a half controlled (positive), three-phase rectifier chassis, and Figure 4-7 shows the IFM-150 connected to a half controlled (negative), three-phase rectifier chassis.
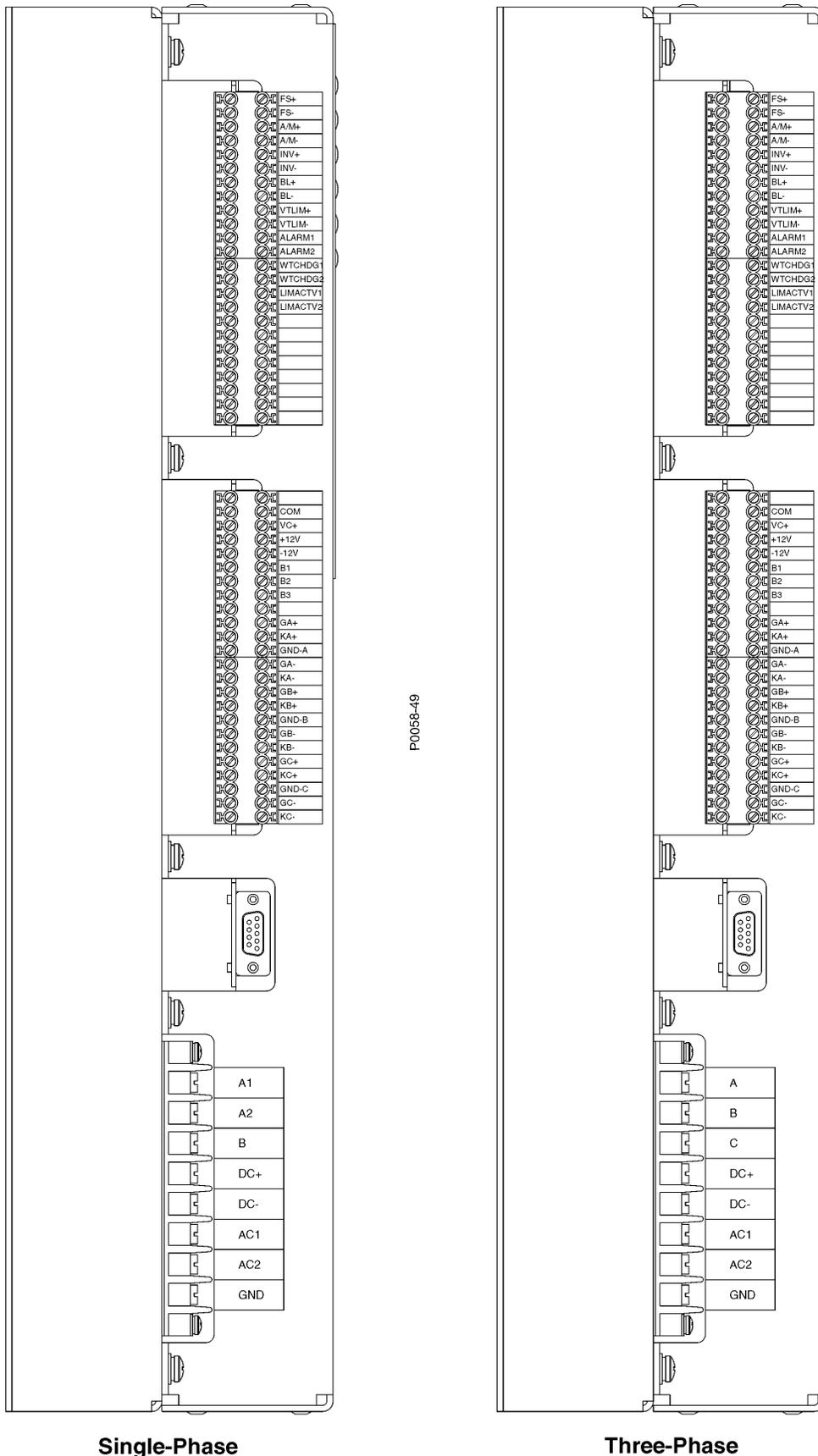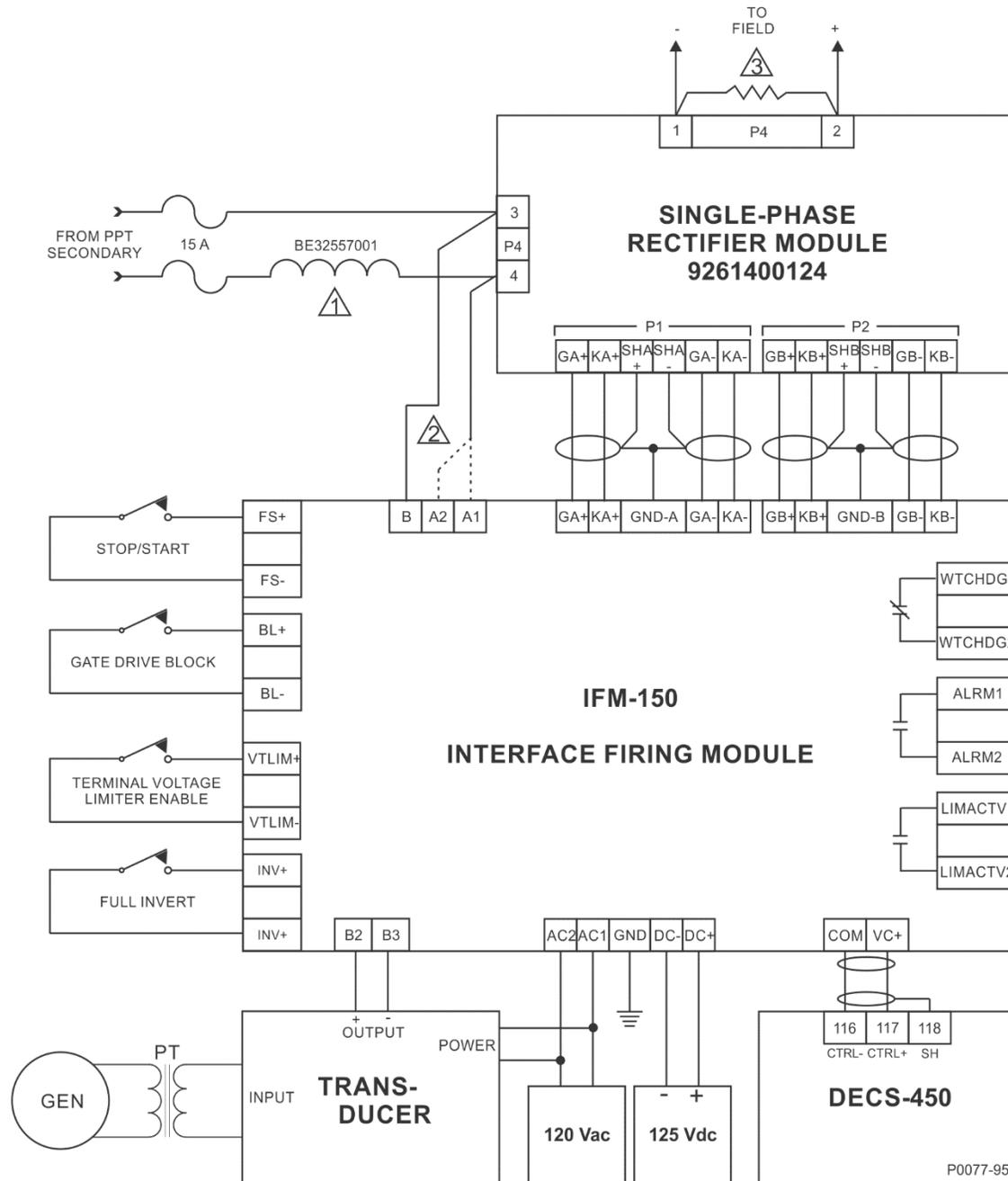
Single-Phase

FS+
FS-
A/M+
A/M-
INV+
INV-
BL+
BL-
VTLIM+
VTLIM-
ALARM1
ALARM2
WTCHDG1
WTCHDG2
LIMACTV1
LIMACTV2

COM
VC+
+12V
-12V
B1
B2
B3
GA+
KA+
GND-A
GA-
KA-
GB+
KB+
GND-B
GB-
KB-
GC+
KC+
GND-C
GC-
KC-

A1
A2
B
DC+
DC-
AC1
AC2
GND

Three-Phase

FS+
FS-
A/M+
A/M-
INV+
INV-
BL+
BL-
VTLIM+
VTLIM-
ALARM1
ALARM2
WTCHDG1
WTCHDG2
LIMACTV1
LIMACTV2

COM
VC+
+12V
-12V
B1
B2
B3
GA+
KA+
GND-A
GA-
KA-
GB+
KB+
GND-B
GB-
KB-
GC+
KC+
GND-C
GC-
KC-

A
B
C
DC+
DC-
AC1
AC2
GND

P0058-49

Figure 4-3. IFM-150 Terminals

Figure 4-4. Typical Connections, Single-Phase, Full Control

1. Inductor required if PPT source impedance is less than 100 uH.

2. Connect to terminal A1 for 240 range, connect to A2 for 120 V range.

3. Pre-load resistor supplied by user. Use 100 ohm, 500 watt resistor for 120 V input or 200 ohm, 1,000 watt resistor for 240 V input.
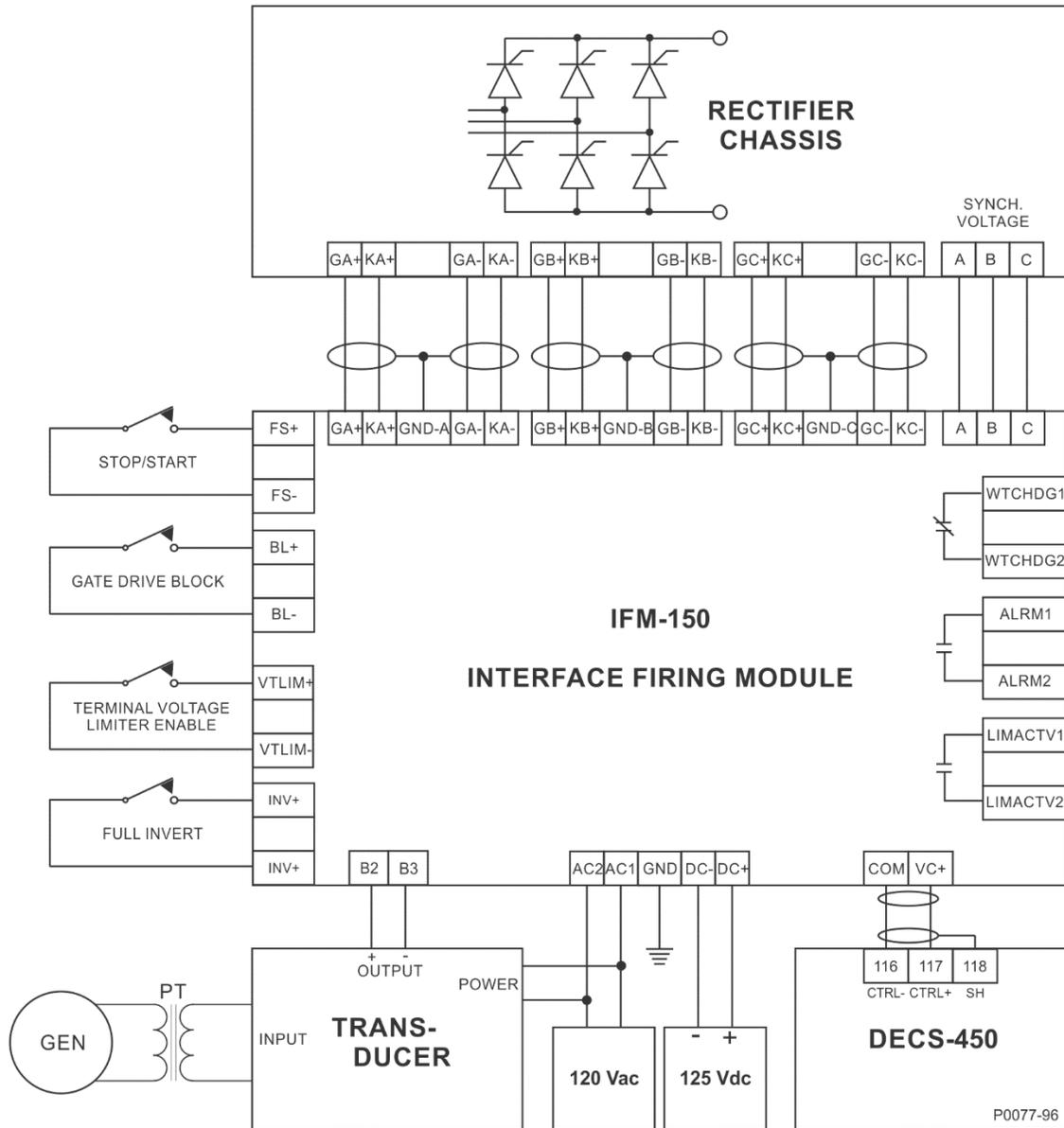
Figure 4-5. Typical Connections, Three-Phase, Full Control
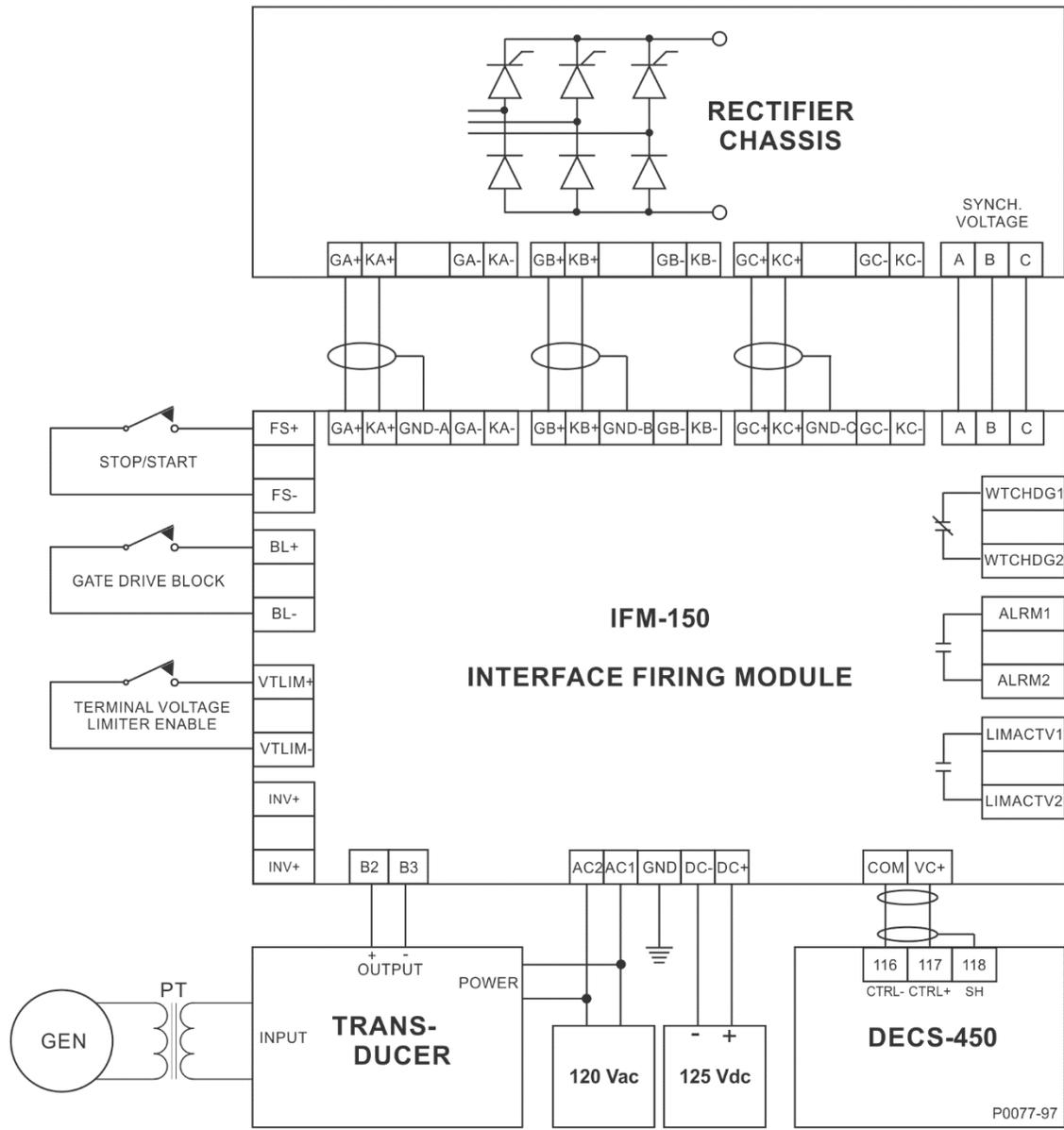
Figure 4-6. Typical Connections, Three-Phase, Half Control: Positive
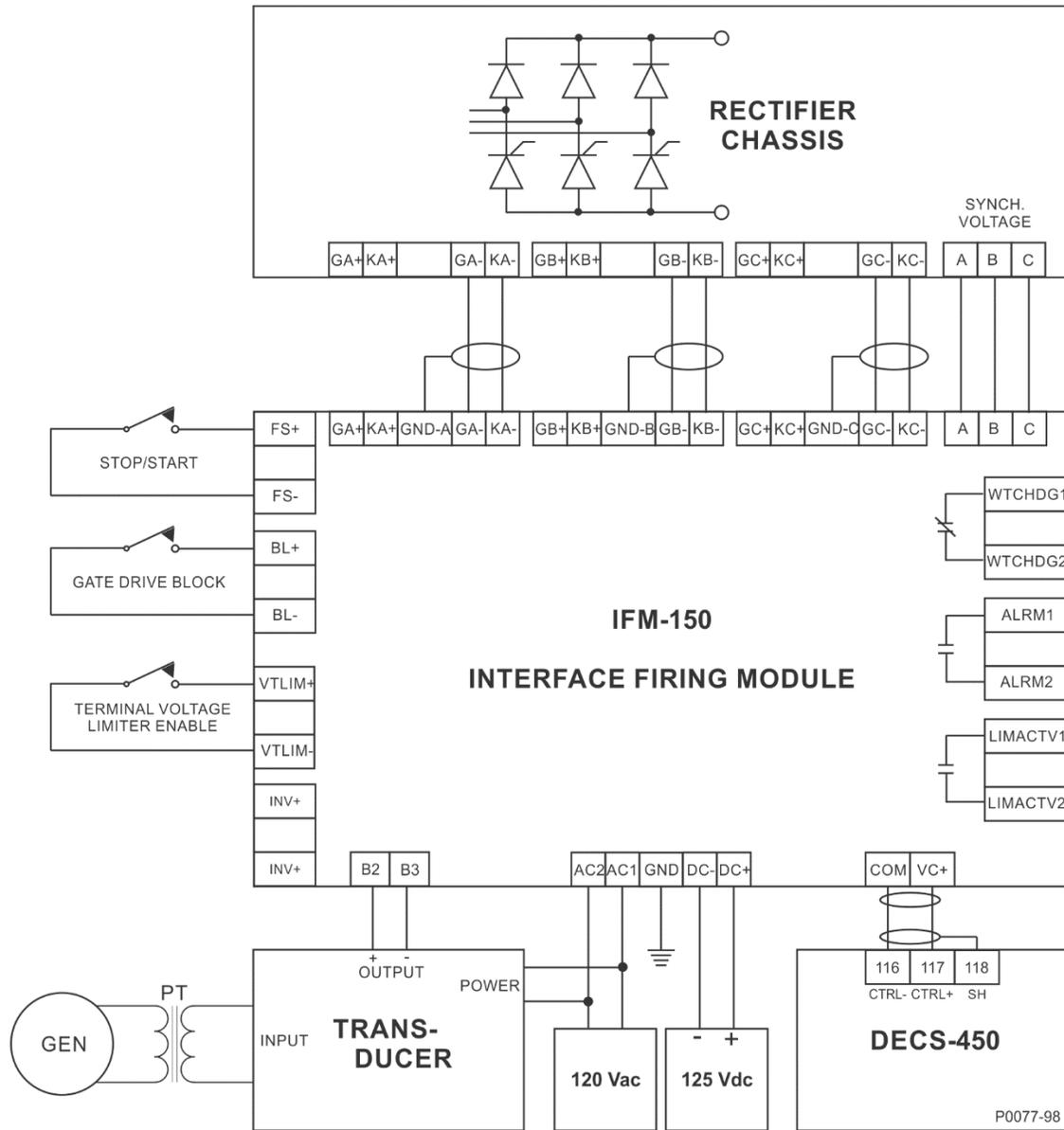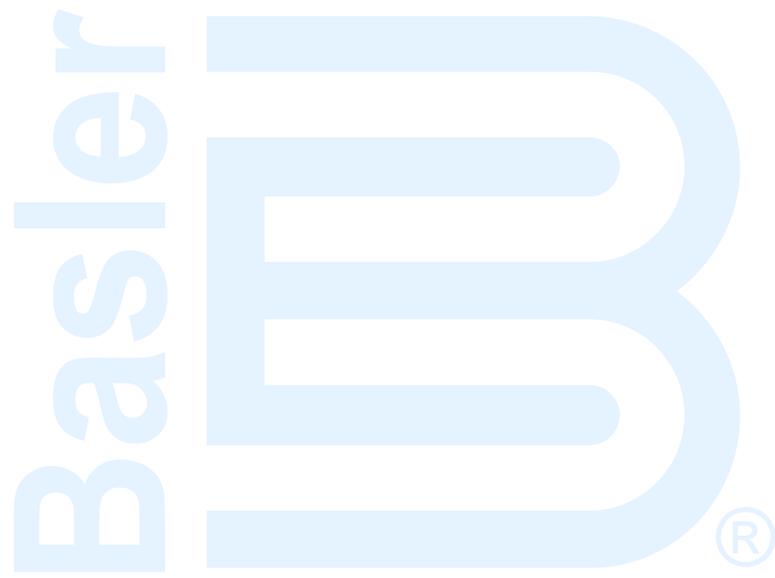
Figure 4-7. Typical Connections, Three-Phase, Half Control: Negative

5 • Maintenance

General

The IFM-150 Interface Firing Module requires no preventive maintenance. If the chassis fails to function as expected, contact Basler Electric Technical Sales and Support at (1) (618) 654 2341 for assistance.

Storage

This device contains long-life, aluminum, electrolytic capacitors. For devices that are not in service (spares in storage), the life of these capacitors can be maximized by energizing the device for 30 minutes once per year.

Replacement Parts

The IFM-150 has only one subassembly that is suitable for replacement by the user: the firing circuit board. Firing circuit board part numbers are listed in Table 5-1. Replacement or repair of firing circuit board components or other assemblies should be performed only by Basler Electric personnel.

Table 5-1. Firing Circuit Board Cross-Reference

IFM-150 Part Number	Firing Circuit Board Part Number
9333700120	9333701115
9333700121	
9333700122	
9333700123	
9333700124	
9333700130	9333701107
9333700131	

BBB Basler Electric®

www.basler.com