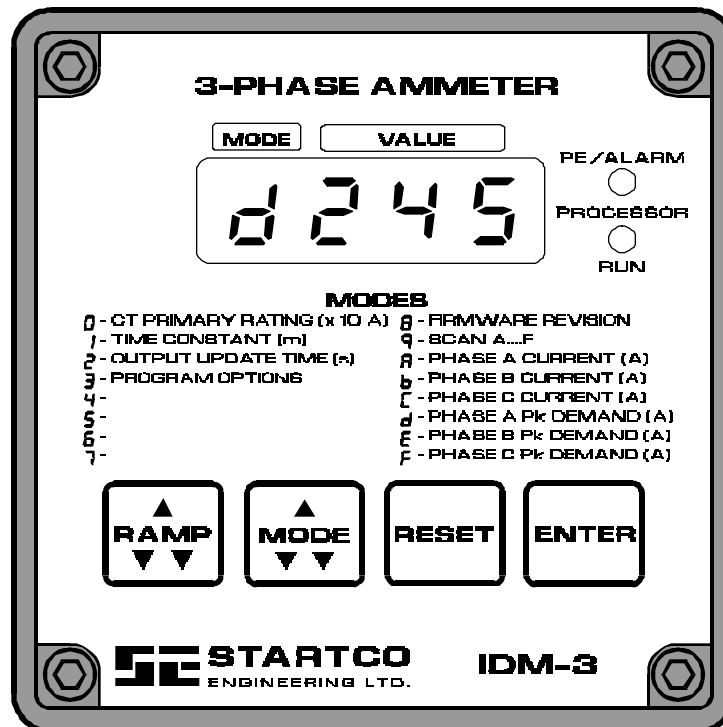# STARTCO ENGINEERING LTD.

IDM-3 MANUAL

3-PHASE AMMETER

REVISION 4

SEPTEMBER 1995

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1. INTRODUCTION

1.1 GENERAL

The IDM-3 is a microprocessor-based three-phase ammeter that provides instantaneous and peak lagged-demand ammeter readings. It uses inputs from 5-A-secondary current transformers connected to an interface CT to simplify installation and eliminate the need for CT shorting contacts. Operational features of the IDM-3 include keypad programming, sampling and digital-integration techniques developed for the MPU-16A motor protection unit, and isolated analog outputs for a data-acquisition system. The CT-primary rating, lagged-demand response time, output update time, and SCADA interface are all programmable from the front-panel keypad.

1.2 FEATURES

— Front-panel programming.
— Program-change lockout.
— Nonvolatile memory.
— Isolated analog outputs.
— -40°C to 60°C operating temperature.
— Liquid-crystal display.
— On-line programming.
— Compact 1/4 DIN size.
— Panel or surface mount.
— ESD shielded.
— Tactile-feedback keypad switches.
— Interface current transformer.
— Digital Display of:
    CT-primary rating
    Demand response time
    Analog output option
    Scanned currents
    Instantaneous currents
    Peak lagged-demand currents.

1.3 ORDERING INFORMATION

— Supplied with ICT-3, ICT-3 interconnection cable (6 m), and mounting hardware.
— Determine IDM-3 model-number code from Table 1.

IDM-3 MODEL-NUMBER CODE

IDM-3 - P126 - 42 - 00

Mount
   P   Panel
   S   Surface

Supply Voltage
   12   120 Vac
   24   240 Vac

Frequency
   5   50 Hz
   6   60 Hz

Analog-Output Type
   42   4—20 mA
   05   0—5 Vdc
   01   0—10 Vdc
   50   0—5 mA
   10   0—1 mA

Reserved for future options
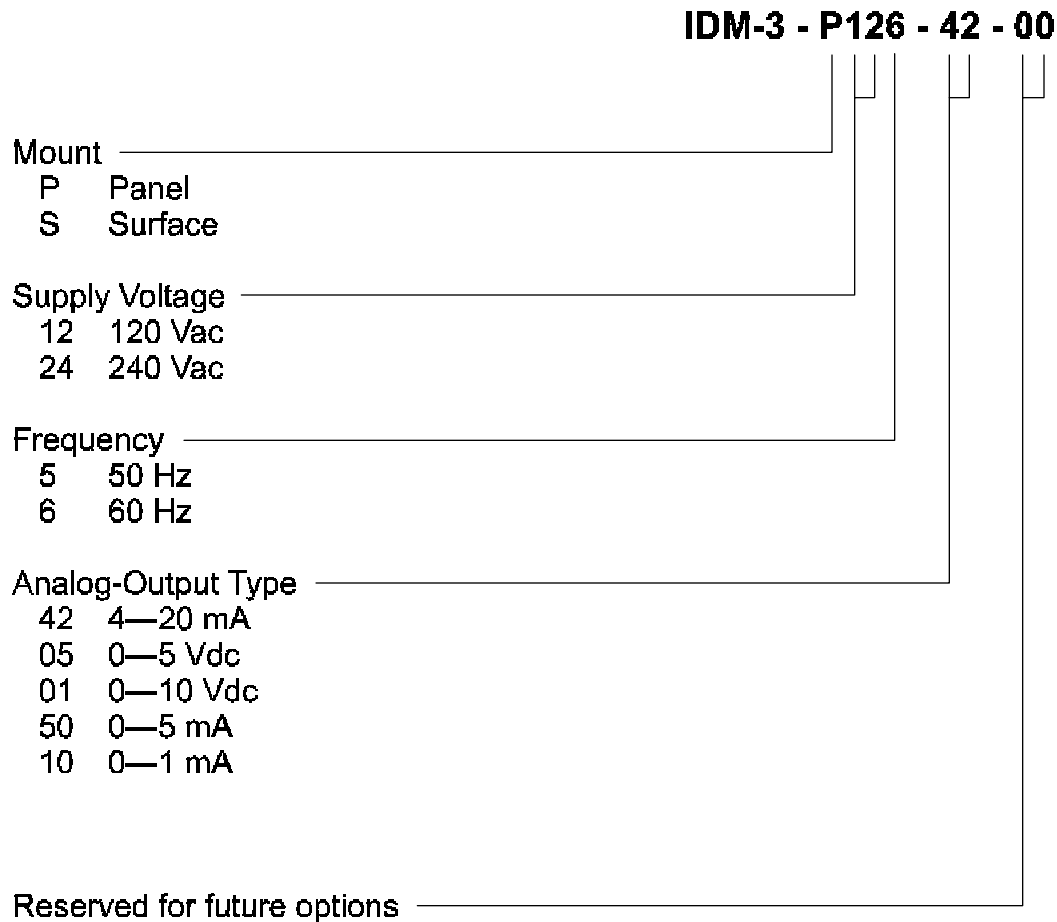
EXAMPLE: IDM-3-P126-42-00 specifies a panel-mount IDM-3 with a 120-Vac, 60-Hz power supply, and 4—20-mA analog outputs.

TABLE 1

2. FRONT-PANEL ANNUNCIATION, INDICATION, AND PROGRAMMING

2.1 GENERAL (See Figure 1)

Two mode columns are listed on the front panel of the IDM-3. Modes in the left column are used to enter system parameters and program options. Modes in the right column are used to select the current displayed.

2.2 LIQUID-CRYSTAL DISPLAY

The left digit of the four-digit liquid-crystal display uses a hexadecimal format (0 to 9, A, b, C, d, E, and F) to indicate the mode displayed. The remaining digits (designated from left to right as value digits 1, 2, and 3) display values and meter readings.

2.3 KEYPAD

Four keypad switches provide the operator interface to the IDM-3. Tactile-feedback switches are used to provide positive indication that switch contact has been made:

RAMP — This switch is used to adjust values in modes 0, 1, 2, and 3. Under normal operation this switch is inoperative. To make the RAMP switch operative, the program-change lockout must be defeated by connecting terminal 20 to terminal 21. To change a value, ENTER must be pressed within three seconds after RAMP is released. If ENTER is not pressed within three seconds, the display will return to its pre-adjusted value. One arrow up and two arrows down indicate that the RAMP switch is bi-directional. To ramp up—press and hold. To reverse—release, press again within one second and hold.

MODE — This switch is used to select the mode displayed. Bi-directional operation is the same as for RAMP.

RESET — This switch is used to reset peak lagged-demand values.

ENTER — This switch is used to enter values in Modes 0, 1, 2, and 3. Values can only be entered when the program-change lockout is defeated. This prevents unauthorized or unintentional program changes during normal operation. When the program change lockout is defeated, the displayed value will be entered if ENTER is pressed within three seconds after ramp is released.

LIQUID-CRYSTAL DISPLAY

MODE DIGIT   VALUE DIGITS

3-PHASE AMMETER

MODE   VALUE

C 0 8 5

PE/ALARM INDICATOR
RED: ALARM CONDITION
FLASHING RED: LOCKOUT DEFEATED

PE/ALARM

PROCESSOR

RUN

PROCESSOR RUN INDICATOR
GREEN: PROCESSOR FUNCTIONAL

MODES

0 - CT PRIMARY RATING (x 10 A)   8 - FIRMWARE REVISION
1 - TIME CONSTANT (m)   9 - SCAN A...F
2 - OUTPUT UPDATE TIME (s)   A - PHASE A CURRENT (A)
3 - PROGRAM OPTIONS   b - PHASE B CURRENT (A)
4 -   C - PHASE C CURRENT (A)
5 -   d - PHASE A Pk DEMAND (A)
6 -   E - PHASE B Pk DEMAND (A)
7 -   F - PHASE C Pk DEMAND (A)

MODE LIST

▲
RAMP
▼ ▼

▲
MODE
▼ ▼

RESET

ENTER

MEMBRANE SWITCH KEYPAD

STARTCO
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IDM-3

RAMP SWITCH
ADJUSTS
VALUE DIGITS

MODE SWITCH
SELECTS MODES
"0" THROUGH "F"

RESET SWITCH
RESETS
PEAK VALUES

ENTER SWITCH
ENTERS
VALUE DIGITS

IDM-3 FRONT PANEL

FIGURE 1

2.4 LED INDICATORS

The red PE/ALARM LED is on if corrupted EEPROM data has been detected and default values have been loaded in Modes 0, 1, 2, and 3. It flashes when the program-change lockout is defeated (program enable active); however, ON has priority over FLASH. The green PROCESSOR-RUN LED is on when the processor is functional.

2.5 PROGRAMMING

To enable program changes, the program-change lockout must be defeated by connecting terminal 20 to terminal 21. Remove this connection when programming is completed. This will prevent unauthorized or unintentional program changes.

To program values in Modes 0, 1, 2, and 3:
— Press MODE to select the mode,
— Press RAMP to adjust, and within three seconds of release,
— Press ENTER.

A set of default values for Modes 0, 1, 2, and 3 are preprogrammed at the factory. Default values are listed in their respective mode descriptions in Section 3.

All programmed values and peak-demand values are stored in a nonvolatile memory that retains its data indefinitely—even if supply voltage is lost. It is not necessary to reprogram the unit when supply voltage is restored.

3. MODE DESCRIPTIONS

3.1 GENERAL

This section contains a description of each mode. It explains operational characteristics, describes special functions, and lists value ranges, display codes, and default values.

3.2 MODE 0 — CT-PRIMARY RATING

This mode is used to enter the phase-CT-primary rating. The value displayed must be multiplied by 10 to obtain the actual value. For example "0100" indicates a primary rating of 1000 A for a 1000:5 CT.

All programmed values and peak-demand values are stored in nonvolatile memory. When data are retrieved from this memory, error-detection techniques check for corrupted data. If data are suspect, the unit will alarm, "0bAd" will be displayed, and default values will be loaded. If "0bAd" is displayed, defeat the program-change lockout, reprogram the unit, and press RESET in Mode 0.

Range...50 A to 2000 A
Step Size ....50 A
Corrupt Data Alarm Code 0bAd
Default Value ....100 A (0010)

3.3 MODE 1 — TIME CONSTANT

This mode is used to enter the time constant for the lagged-demand current mesurements. The time constant is the nominal time required for 90% of final indication with a constant load suddenly applied.

Range...1 to 20 minutes
Step Size ....1 minute
Default Value ....10 minutes (1010)

3.4 MODE 2 — OUTPUT UPDATE TIME

This mode is used to enter the update, or dwell, time for signals at analog output 1.

Range...1 to 15 seconds
Step Size ....1 second
Default Value ....2 seconds (2002)

3.5   MODE 3 — PROGRAM OPTIONS (SCADA INTERFACE)

This mode is used to select the data group scanned by analog output 1 (terminals 23 and 24). One of four data groups can be selected by entering the appropriate program code:

Program Codes:
       3000 ....Modes A, b, and C Scanned
       3001 ....Modes d, E, and F Scanned
       3002 ....Modes A to F Scanned
       3003 ....0%, 100% Test Cycle

Default value..3000

The level at Output 2 indicates the signal at Output 1:

Output 2 Level:
       0% FS indicates...........................0% FS Test
       12% FS indicates ....Mode A Signal
        25% FS indicates ....Mode b Signal
        37% FS indicates ....Mode C Signal
        50% FS indicates ....Mode d Signal
        62% FS indicates ....Mode E Signal
        75% FS indicates ....Mode F Signal
        100% FS indicates ....100% FS Test

3.6   MODE 8 — FIRMWARE REVISION

This mode is used to display the firmware revision level.

3.7   MODE 9 — SCAN A....F

This mode is used to scan Modes A to F. The display indicates "A2F" and the IDM-3 starts scanning 5 seconds after the mode switch is released. Modes A through F are scanned with a 5-second dwell in each mode. Pressing MODE stops the scan at the mode indicated. Mode 9 is automatically displayed when control power is applied.

3.8   MODES A, b, AND C

These modes are used to display Phase A, B, and C instantaneous current values. For currents above 999 A, the mode digit alternates with the most significant digit of the ammeter display. For example, the display will alternate between A500 and 1500 for a 1500 A reading on Phase A.

When input current to the ICT-3 is 5 A, the ammeter reading is equal to the CT-primary rating programmed in Mode 0.

Overrange...140%

3.9   MODES d, E, AND F

These modes are used to display peak readings of Phase A, B, and C lagged-demand current measurements. The time characteristic for lagged-demand measurements is defined as the time required for 90% of final indication with a constant load suddenly applied. The time constant entered in Mode 1 controls the response time of these three measurements. To reset a peak reading, press RESET in Mode d, E, or F. Peak values are stored in EEPROM memory and are saved if control power is lost.

Overrange...140%

3.10   MODES 4 TO 7

These modes are not used and display the delete code "ddd".

4. INSTALLATION

4.1 GENERAL

A basic system consists of an IDM-3 current monitor, an ICT-3 interface CT, and three customer-supplied phase CT's connected as shown in Figure 2.

4.2 COMPONENT MOUNTING

4.2.1 PANEL-MOUNT CONFIGURATION

Outline dimensions and mounting details for the panel-mount IDM-3 are shown in Figure 3. The IDM-3 mounts in a 92-mm (3.62-in) square cutout (1/4 DIN Format) and is secured to the panel by the panel-mount clamp. To mount the IDM-3, insert it through the panel cutout and slip the panel-mount clamp over the IDM-3 body. Slide the clamp forward until the latch tabs snap into the mating holes. Lock the unit in place by tightening the four clamp screws against the mounting panel.
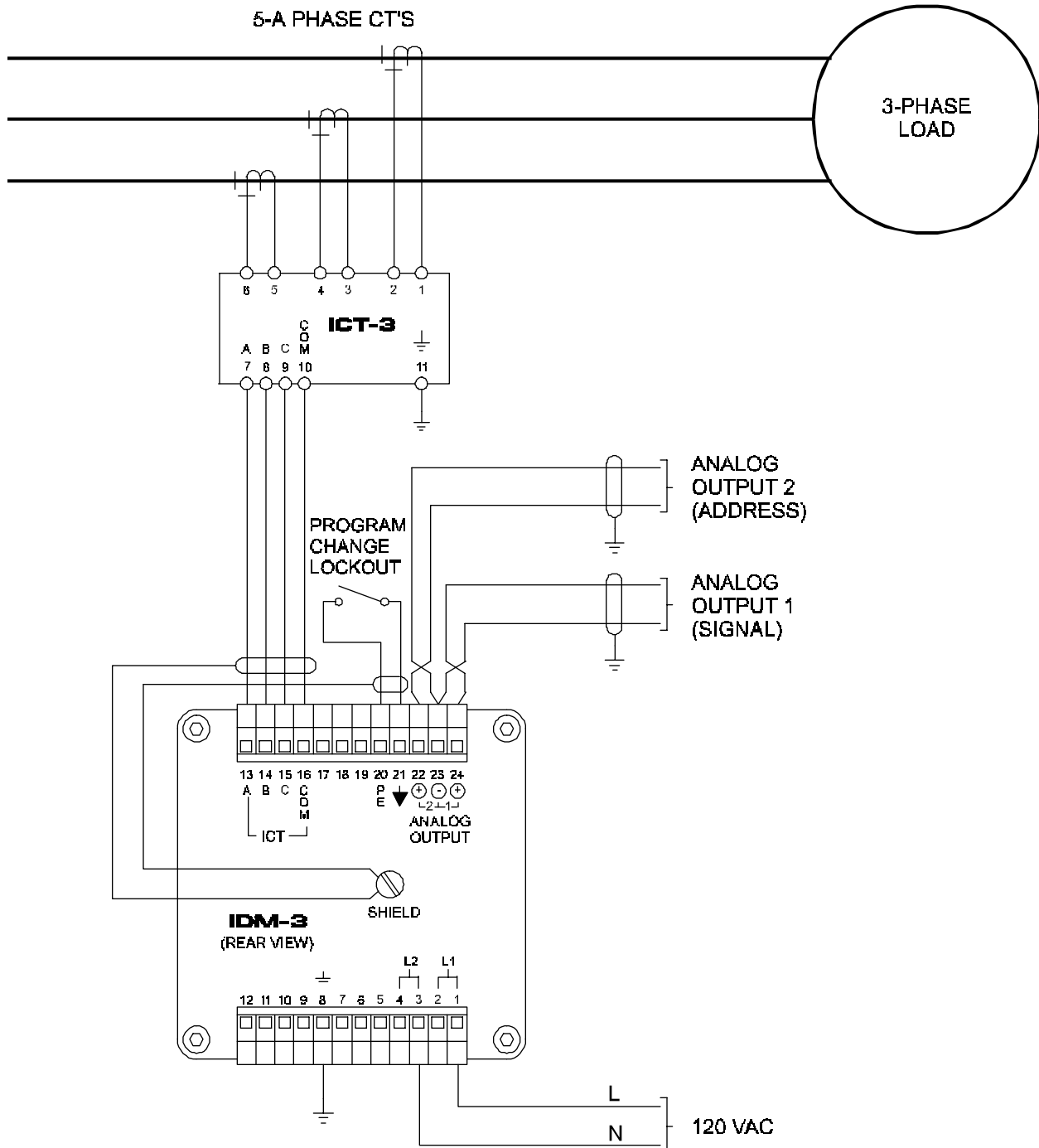
- - - CAUTION - - -

OVER TIGHTENING THE CLAMP SCREWS WILL DEFORM THE CLAMP AND CAUSE THE LATCH TABS TO RELEASE.

4.2.2 SURFACE-MOUNT CONFIGURATION

Outline dimensions and mounting details for the surface-mount IDM-3 are shown in Figure 4. Mount the IDM-3 using M4 (No. 8) screws and external-tooth lockwashers. Surface-mount IDM-3's have panel-mount-clamp latch holes and are supplied with panel-mount clamps and hole plugs. This allows surface-mount units to be panel mounted as described in Section 4.2.1; however, 100-mm (3.94-in) mounting centres cannot be maintained. If the unit is surface mounted, insert hole plugs in the latch holes.
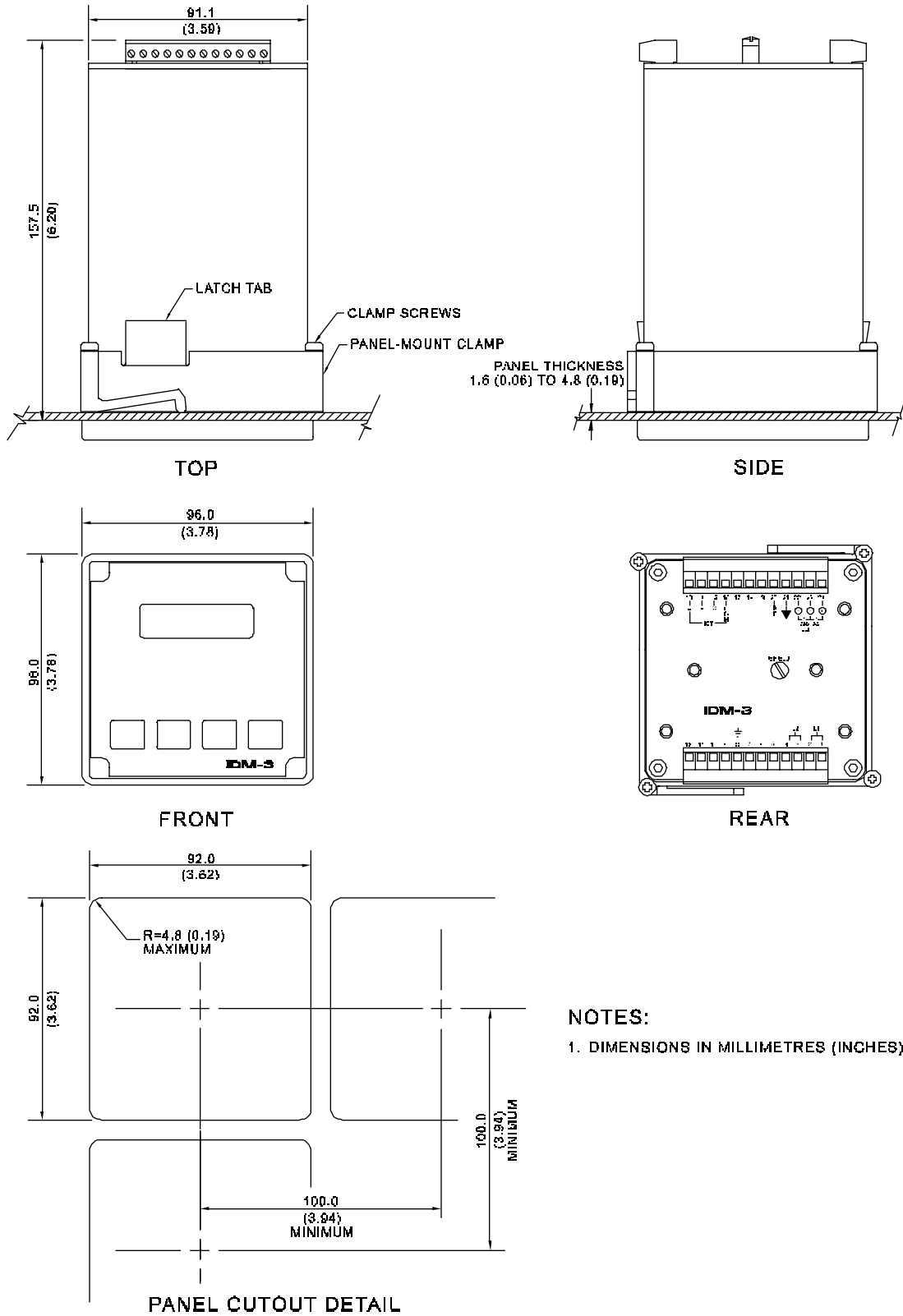
4.2.3 INTERFACE CT

Outline dimensions and mounting details for the ICT-3 interface CT are shown in Figure 5. Locate the ICT-3 near the phase CT's.

5-A PHASE CT'S

3-PHASE LOAD

ICT-3

6 5 4 3 2 1

C
O
M
A B C

7 8 9 10   11

ANALOG OUTPUT 2 (ADDRESS)

ANALOG OUTPUT 1 (SIGNAL)

PROGRAM CHANGE LOCKOUT

13 14 15 16 17 18 19 20 21 22 23 24
A B C C
      O
      M
P
E

⎯ ICT ⎯

ANALOG OUTPUT

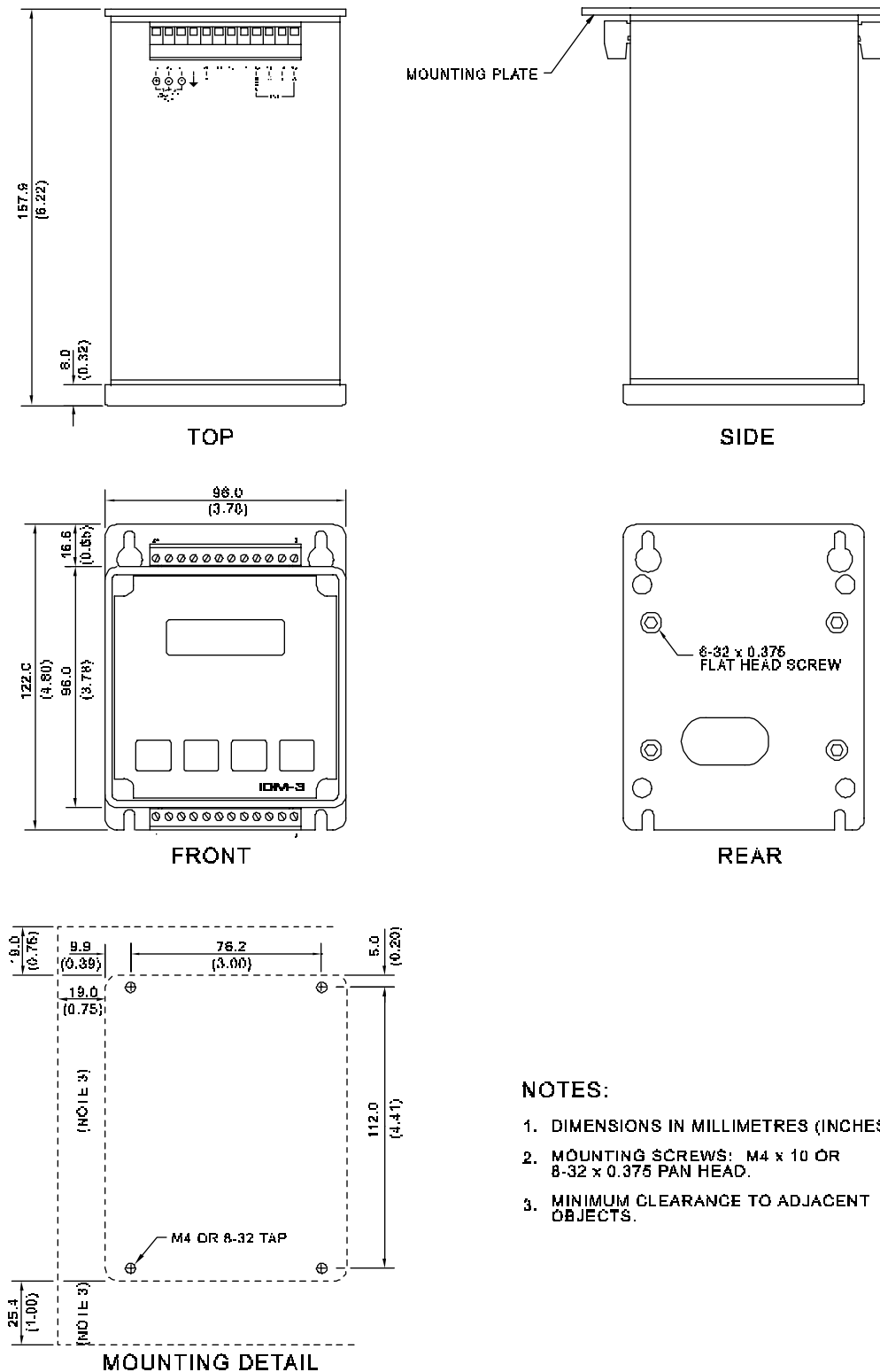SHIELD

IDM-3 (REAR VIEW)

L2   L1

12 11 10 9 8 7 6 5 4 3 2 1

L
N   120 VAC

TYPICAL IDM-3 CONNECTION DIAGRAM

FIGURE 2

PANEL-MOUNT IDM-3 OUTLINE AND MOUNTING DETAILS

FIGURE 3

TOP

SIDE

MOUNTING PLATE

FRONT

REAR

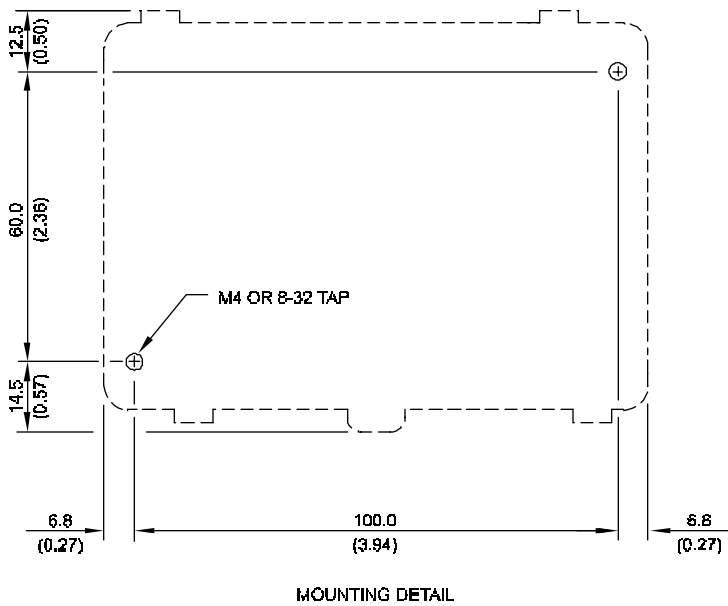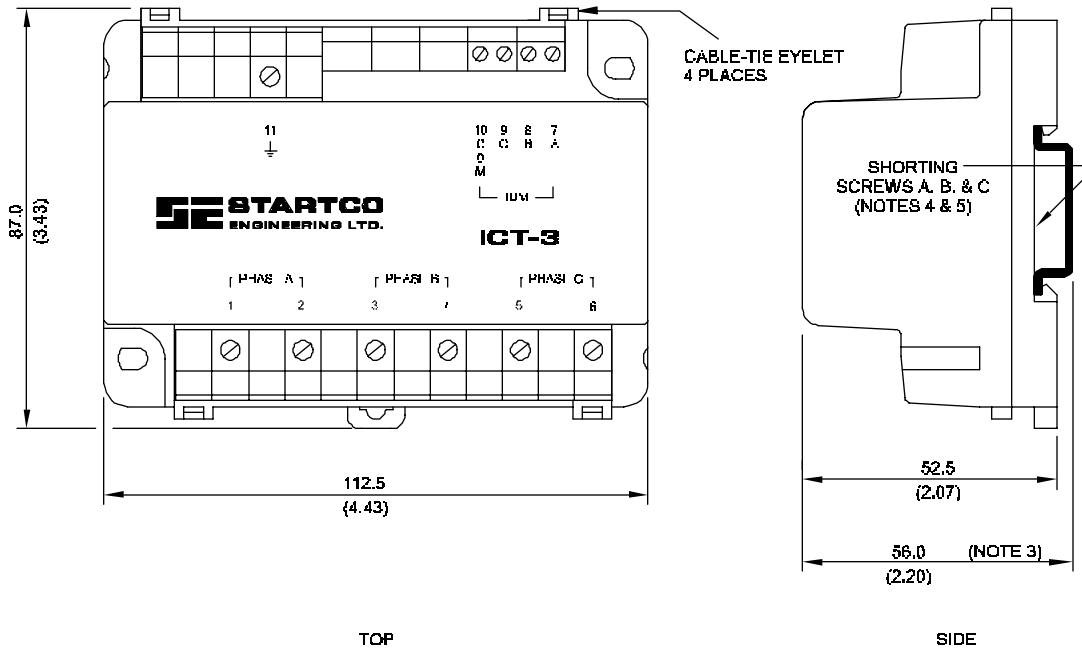6-32 x 0.375
FLAT HEAD SCREW

MOUNTING DETAIL

M4 OR 8-32 TAP

NOTES:

1. DIMENSIONS IN MILLIMETRES (INCHES).

2. MOUNTING SCREWS: M4 x 10 OR 8-32 x 0.375 PAN HEAD.

3. MINIMUM CLEARANCE TO ADJACENT OBJECTS.

SURFACE-MOUNT IDM-3 OUTLINE AND MOUNTING DETAILS

FIGURE 4

TOP

SIDE

CABLE-TIE EYELET
4 PLACES

SHORTING
SCREWS A, B, & C
(NOTES 4 & 5)

MOUNTING DETAIL

M4 OR 8-32 TAP

NOTES:

1. DIMENSIONS IN MILLIMETRES (INCHES).

2. MOUNTING SCREWS: M4 × 20 OR 8-32 × 0.875.

3. OVERALL HEIGHT WHEN MOUNTED ON DIN 2N50022 35-mm × 7.5-mm TOP-HAT RAIL.

4. SHORTING SCREWS ARE ACCESSIBLE FROM BOTTOM OF ICT-3.

5. SHORTING SCREWS: 6-32 × 0.375 NICKEL-PLATED-BRASS BINDING HEAD. DO NOT SUBSTITUTE.

ICT-3 OUTLINE AND MOUNTING DETAILS

FIGURE 5

4.3   SHIELDED CABLES

Metering equipment must operate in an electrically noisy environment. Use shielded, twisted cables for all low-level signals to minimize electrostatic and electromagnetic coupling. The shield must enclose the signal conductors as completely as possible and the shield must have only one connection to ground.

Input-cable shields from the ICT-3 and the remote program-enable switch must be grounded at the IDM-3 end only. Analog-output cables should be grounded at the receiver end only.

Terminate foil-shielded input cables as shown in Figure 6:
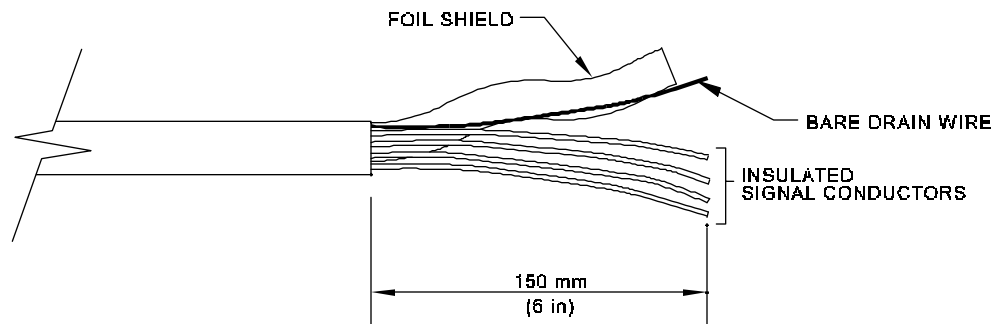
1.   Strip 150 mm (6") of outer jacket from the cable.

2.   Peel and strip the foil shield from the drain and insulated wires.

3.   Trim the insulated wires to 50 mm (2"), and strip 6 mm (1/4") of insulation from each wire. Leave the drain wire full length.

4.   Connect the insulated wires to the terminal block.

5.   Group the drain wires from all shielded input cables and twist them together. Trim the drain wires to length and attach the crimp-type ground lug provided. For panel-mount units, fasten the lug with the shield screw. For surface-mount units, install the lug between the screw head and the lockwasher on one of the IDM-3 mounting screws.

6.   Repeat steps 1 and 2 at the other end of the cable. Cut off the drain wire and use heat-shrink sleeving or tape to insulate the shield from ground.

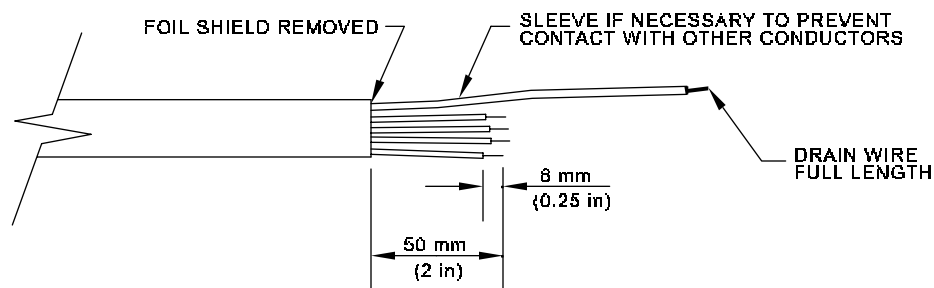Terminate output cables in the same manner. Ground the drain wires at the receiver ends only.

4.4   IDM-3 CONNECTIONS

All connections to the IDM-3 are made through two plug-in, wire-clamping terminal blocks. Each terminal will accept one No. 14 AWG conductor. The control-voltage terminal block has a keying pin blocking terminal 9 so that control voltages cannot be applied to the signal terminals.

a) OUTER JACKET REMOVED AND FOIL SHIELD PEELED

FOIL SHIELD

BARE DRAIN WIRE

INSULATED
SIGNAL CONDUCTORS

150 mm
(6 in)

b) CONDUCTORS PREPARED FOR TERMINATION

FOIL SHIELD REMOVED

SLEEVE IF NECESSARY TO PREVENT
CONTACT WITH OTHER CONDUCTORS

DRAIN WIRE
FULL LENGTH

6 mm
(0.25 in)

50 mm
(2 in)

SHIELD-GROUND END

SHIELD AND DRAIN WIRE
CUT OFF AT JACKET EDGE

HEAT-SHRINK SLEEVING OR TAPE TO
PREVENT SHIELD CONTACT WITH GROUND
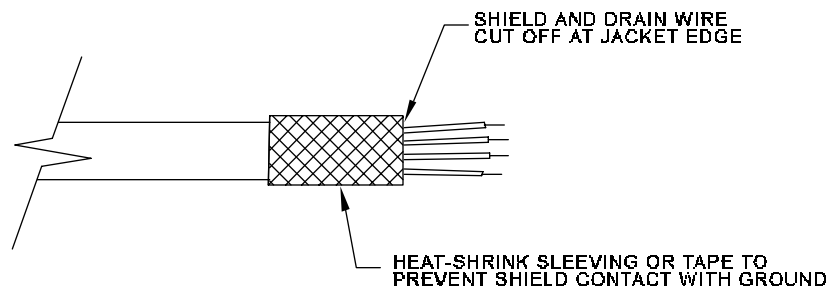
UNGROUNDED END

SHIELDED-CABLE PREPARATION

FIGURE 6

4.4.1 ICT-3 INTERCONNECTION CABLE

Connect the IDM-3 to the ICT-3 with the interconnection cable supplied. See Figure 2. Prepare the shielded cable as outlined in Section 4.3. The following colour code is recommended:

A	Black
B	White
C	Red
COM	Green

4.4.2 POWER SUPPLY

The IDM-3 can be ordered for either 120- or 240-Vac operation at 50 or 60 Hz. Supply requirements are indicated on the IDM-3 nameplate. Connect supply voltage to terminals 1 and 3 (L1 and L2) as shown in Figure 2. In 120-Vac systems, L2 is usually designated as the neutral conductor. Ground terminal 8.

### 4.4.3 PROGRAM-CHANGE LOCKOUT

As explained in Sections 2.3 and 2.5, program-change lockout prevents unauthorized or unintentional program changes. It is recommended that a keylock switch be connected to terminals 20 and 21 to allow programming. If the switch is mounted more than 1 m (3 ft) from the IDM-3, use shileded cable and ground the shield at the IDM-3 end only.

4.4.4 ANALOG OUTPUTS

Two isolated analog outputs are available at terminals 22, 23, and 24. Terminal 23 is the negative return for both analog channels. Use shielded cable and ground the cable shield at the receiver.

4.5 ICT-3 CONNECTIONS

The IDM-3 uses an ICT-3 interface CT to simplify wiring and to minimize CT burden. The ICT-3 contains three signal-conditioning interface transformers which are interconnected as shown in Figure 7. These transformers isolate the IDM-3 from the phase CT's. Also, they eliminate the need for CT shorting contacts when the IDM-3 is disconnected. Phase-CT secondaries can be simultaneously grounded through terminal 11. For in-line applications, the CT secondaries can be isolated by removing shorting screws A, B, and C through holes in the bottom of the ICT-3. See Figure 7.
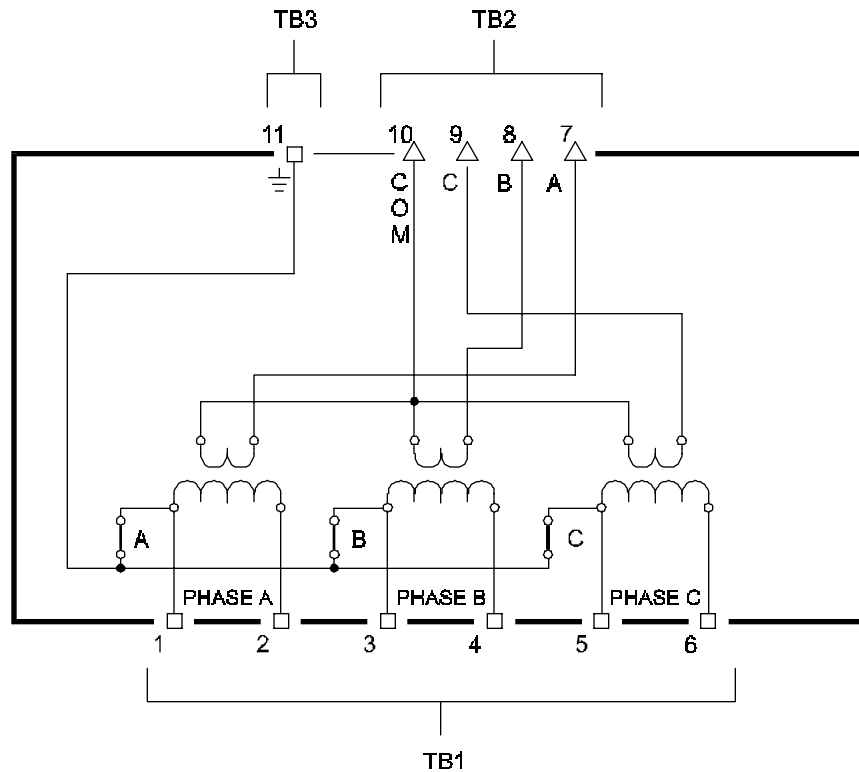
NOTES:

1. REMOVE SHORTING SCREWS A, B, AND C TO ISOLATE PHASE-CT SECONDARIES FOR IN-LINE APPLICATIONS.

2. SHORTING SCREWS A, B, AND C: 6-32 X 0.375 NICKEL-PLATED-BRASS BINDING HEAD. DO NOT SUBSTITUTE.

3. EACH TERMINAL ON TB1 AND TB3 WILL ACCEPT ONE NO. 10 AWG CONDUCTOR.

ICT-3 SCHEMATIC

FIGURE 7

4.6   CABLE RESTRAINT

All conductors should be restrained within 100 mm (4") of the terminal block as shown in Figure 8. Three sizes of adjustable "P" clips are provided for this purpose. For surface-mounted units, restrain the conductors by fastening the "P" clips to the mounting surface. For panel-mounted units, secure the "P" clips to the IDM-3 rear panel. Secure cables to the ICT-3 using the cable-tie eyelets and the cable ties provided.

a) SURFACE MOUNT

"P" CLIP SCREWED TO
MOUNTING PANEL

GROUND LUG

b) PANEL MOUNT

6-32 x 0.375
BINDING-HEAD SCREW

GROUND LUG

SHIELD-GROUND
TERMINAL

ADJUSTABLE
'P' CLIP
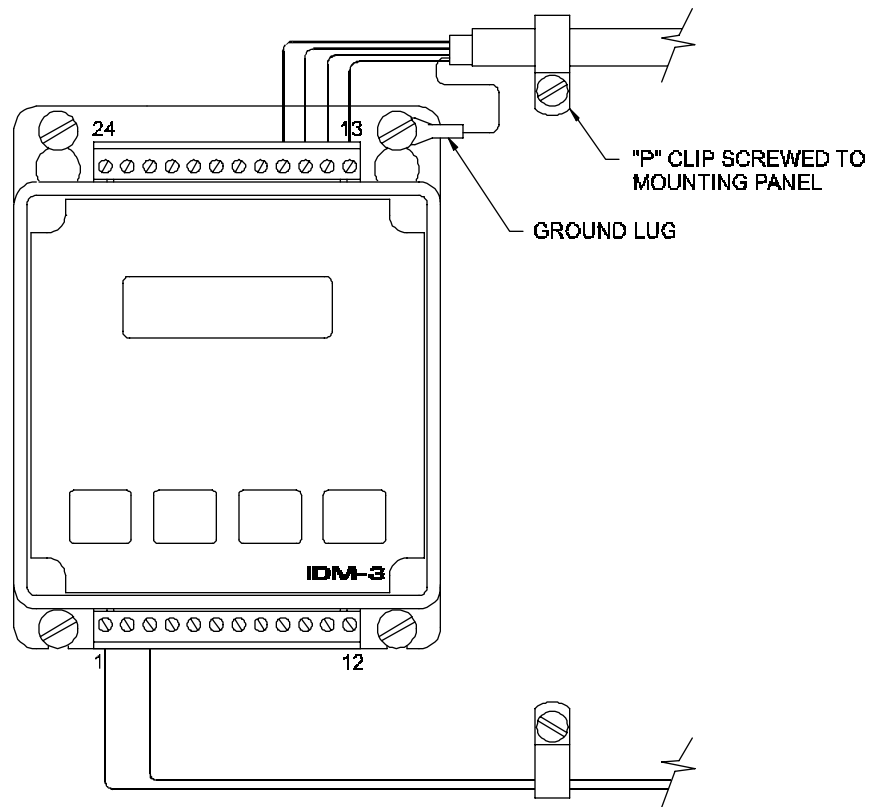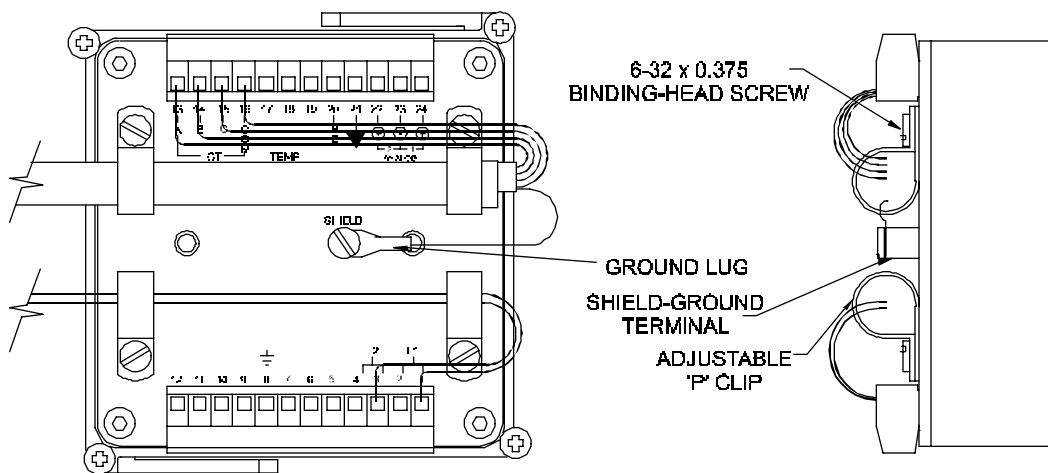
CABLE TERMINATION AND RESTRAINT

FIGURE 8

5. THEORY OF OPERATION

5.1 GENERAL (See Figure 9)

The IDM-3 consists of a display module, a power-supply module, a processor module, and an analog module. The display module is also a "motherboard" for the other modules.

5.2 DISPLAY MODULE

The display module has two functions. It is the operator interface and it provides the main bus network for the system. The display module contains the LCD, LCD display driver, LED indicators, and bus connectors. The power-supply, processor, and analog modules plug into the bus connectors. A sealed-membrane-switch keypad containing four switches and an ESD shield also connect to the bus. A direct drive LCD allows operation to -40°C.

5.3 POWER-SUPPLY MODULE

A transformer-isolated power supply provides 5, 12, and 20 Vdc for the other modules. The transformer primary can be connected for 120- or 240-Vac operation.

5.4 PROCESSOR MODULE

The processor module contains a CMOS 6805 microprocessor, EPROM memory, nonvolatile EEPROM memory, and watchdog circuit.

The EEPROM memory provides 64, 8-bit memory locations to store programmed values and peak-demand values. When control power is lost, a power-fail circuit generates an interrupt and data are written into the EEPROM memory. Hysteresis in the power-fail circuit ensures that the IDM-3 will not attempt to operate unless the supply voltage is within specifications.

The watchdog connected to the CPU reset line will reset the CPU if a watchdog pulse has not been detected for 0.25 second. The watchdog prevents changes to the EEPROM contents until the CPU is reset. If the CPU does not reset, the green PROCESSOR-RUN LED is turned off.
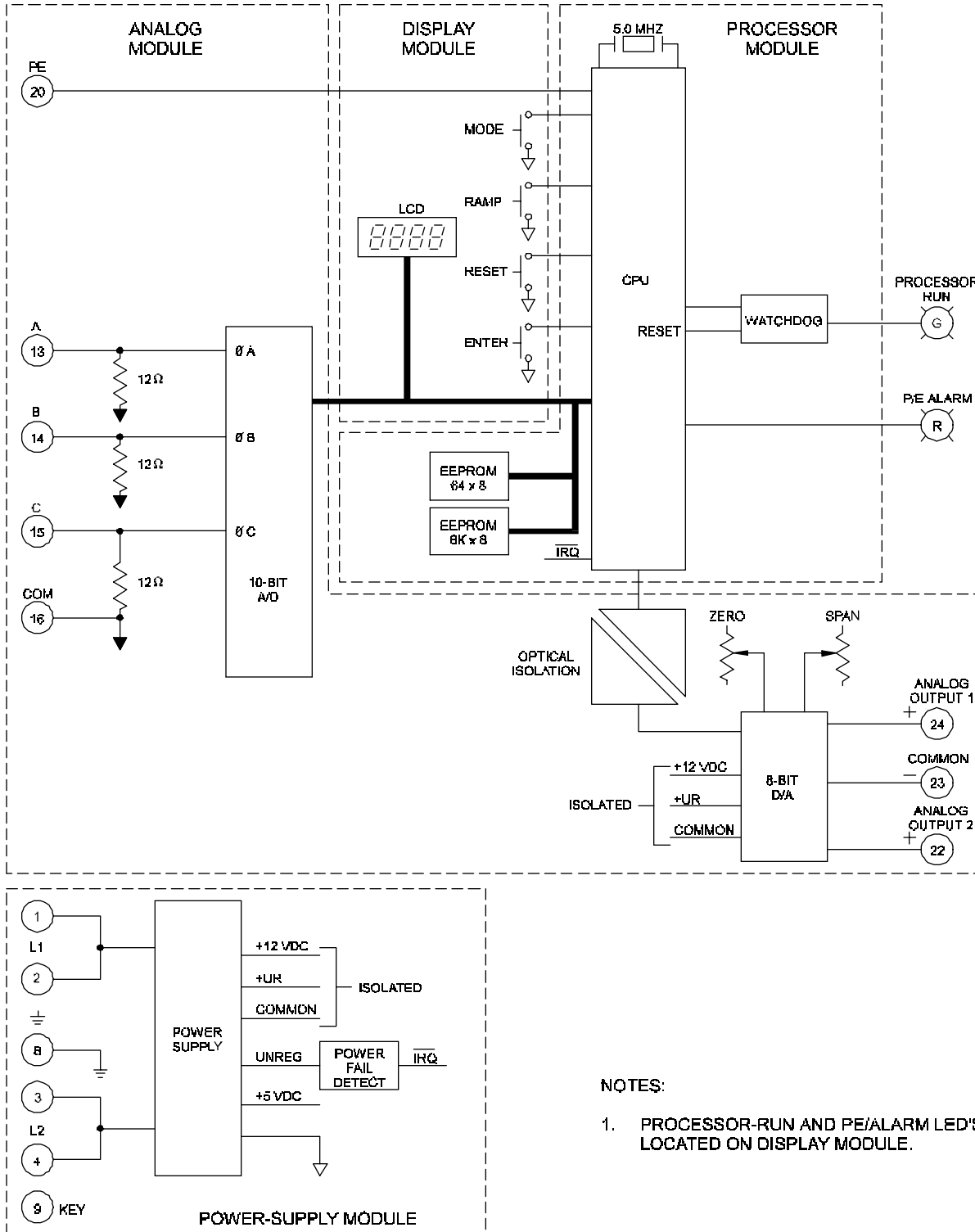
IDM-3 BLOCK DIAGRAM

FIGURE 9

5.5   ANALOG MODULE

The analog module contains phase-current input circuits, a multiplexed, ten-bit, analog-to-digital converter, and an isolated analog-output circuit. All inputs and outputs have MOV protection against electrical transients.

Serial data are transferred to the isolated analog-output circuits through a dual-channel optical isolator. The analog signals are scaled and buffered to provide the required current or voltage outputs.

5.6   FIRMWARE

The IDM-3 completes four program scans per second. In 60-Hz applications, each scan has an eleven-cycle sampling interval followed by a four-cycle calculation interval. Each phase-current measurement is a digital integration of 240 samples uniformly spaced throughout each sampling interval. Instantaneous-current values (Modes A, b, and C) are updated at 0.25-second intervals. Peak-lagged-demand-current values (Modes d, E, and F) are updated at 1.0-second intervals.

Each demand measurement uses two 16-bit registers. Register 1 responds to phase current with the time constant selected in Mode 1. Register 2 stores the peak value of register 1. When the peak value is reset, both registers are set to zero. Register 1 is set to zero each time control power is applied.

6. IDM-3 TECHNICAL SPECIFICATIONS

THE IDM-3 IS DESIGNED FOR FIXED-FREQUENCY APPLICATIONS ONLY.

Supply:
    120/240 Vac, 50/60 ± 1 Hz...........10 VA
    Maximum Continuous ....135/265 Vac
    Minimum Continuous ....85/170 Vac
    Power-Up Voltage.......................100/200 Vac

Dimensions (Panel Mount):
    Height..96 mm (3.8")
    Width..96 mm (3.8")
    Depth ....158 mm (6.2")

Interface-CT Inputs:
    Thermal Withstand
        Continuous...........................8 A
        1-Second.............................80 A
    Burden ....<0.05 Ω

Accuracy (Interface CT included):
    Ammeter Accuracy ....±3% CT-Primary Rating

Environment:
    Operating Temperature...............-40°C to 60°C
    Storage Temperature ....-55°C to 80°C

SCADA Interface:
    Type..Dual Analog Output
    Configuration ....Output 1—Signal Amplitude
                           Output 2—Address Code
    Output-1 Range.........................0 to 100% CT-Primary Rating
    Output-1 Overrange...................125% Full Scale

    Output Drive:
        4—20mA..............................700 Ω
        0—5mA ....3 kΩ
        0—1mA ....15 kΩ
        0—5V ....25 mA
        0—1V ....25 mA

    Resolution ....±1% Full Scale
    Isolation to Ground ....300 Vac Continuous
    Dielectric Strength ....1500 Vac

IDM-3 MANUAL COMPATABILITY

Startco Engineering Ltd. constantly strives to improve its products. These product improvements are upwardly compatable so that a unit can be replaced by a unit of more recent manufacture. As features or enhancements are incorporated, the manual is revised to reflect the changes made. It is important that the manual revision corresponds to both the IDM-3 revision level and the firmware revision level. Consult Table 1 to determine the correct manual for a particular IDM-3.

MANUAL REVISION LEVELS

REVISION LEVELS					COMMENTS
IDM-3		FIRMWARE		MANUAL	
60 Hz	50 Hz	60 Hz	50 Hz		
0	50	0	50	0	Initial Release.
1	51	1	51	1	Mode-1 step size 50 A.
2	52	1	51	1	Processor hardware change.
3	53	1	51	2	Analog module change, ICT-3 released, and manual revised.
4	54	100	150	3	Processor module enhanced and manual revised.
4	54	100	150	4	Minor manual changes.

TABLE 2

The IDM-3 revision level is shown on its nameplate and the firmware revision level is accessed by selecting Mode 8. The manual revision level is listed on the manual title page.

WARRANTY POLICY

The Startco Engineering IDM-3 ammeter is warranted to be free from defects in material and workmanship for a period of 12 months from installation, or 18 months from date of invoice, whichever comes first. Startco Engineering Ltd. will (at Startco's option) repair, replace, or refund the original purchase price of a unit which is determined by Startco to be defective if it is returned to Startco, prepaid, within the warranty period. This warranty does not apply to any ammeter which has been subjected to misuse, negligence, or accident, or has been misapplied, modified, or improperly installed.

The foregoing provisions are the sole obligation of Startco Engineering Ltd. and exclude all other warranties or guarantees. No warranty or representation is to be taken to have been given or implied from anything said or written in the negotiations between the customer and Startco Engineering Ltd., or their respective representatives, prior to the granting of this warranty, and any statutory or other warranty or condition, expressed or implied, as to the state, quality, or fitness of the goods subject to this warranty is hereby expressly excluded. No agent, distributor, or employee is authorized to extend or enlarge upon this warranty by any verbal or written statement or advertisement.

Under no circumstances shall Startco Engineering Ltd. be liable to the customer or to any person for injury to person, or damage to or loss of property or value caused by unit malfunction, misapplication, modification, or adjustment. Under no circumstances shall Startco Engineering Ltd. be liable for any incidental, consequential, or special damages, losses or expenses in connection with the use of, or inability to use the product for any purpose whatsoever. Disclaimers apply both during and after the term of this warranty.

IDM-3 WARRANTY REGISTRATION

Completed warranty registration must be returned within 30 days of purchase.

MODEL NO. IDM-3 _____ SERIAL NO._____

PURCHASED FROM _____

PURCHASE DATE _____ INSTALLATION DATE _____

PURCHASED BY _____

STREET ADDRESS _____

CITY_____ PROV. OR STATE_____

POSTAL OR ZIP CODE _____ SIGNATURE_____