Brookhaven National Laboratory
Plant Engineering - E&CS Division
Engineering Change Notice Form

PROJECT: CCWF II **JOB No.** 11705

ECN Title: Transformer #3 and #4 Metering **ECN No.** 35

Affected Documents: E-601 and Specification Section 16320

Requested Change: Substation 600B must be outfitted with the proper P.T. and C.T.'s so that BNL can monitor the power consumption. See attached sketch DD-1. One (1) P.T. and four (4) C.T.'s shall be installed in order to properly monitor power consumption. Meter will be furnished by BNL. Contractor shall make necessary wiring and mounting provisions in substation 600B before shipment so that P.T., C.T.'s and meter can be installed in the field. P.T. and C.T.'s shall be furnished by contractor and depending on lead time and completion of substation 600B, shall be shipped separately to BNL job site. See P.T. and C.T. manufacturer's data provided with this ECN. P.T. and C.T.'s shall be mounted inside substation 600B. Meter provided by BNL shall be mounted outside the respective cubicle of substation 600B for maintenance and future troubleshooting.

Substation 600B needs to be outfitted with the proper equipment and wiring/terminations to meter the power consumption. A 2" conduit will be located in each cubicle section of the transformer feeders so communications cable from the output of each meter to the bldg 600 can be installed.

Requested by: D. Danseglio Date: 05/7/10

Resolution:

Meter:
(2) TransData part number EMS60-05-S-1-0-GT
4 Channel, Class 20, Form 5, 3-wire Delta, 2 element, socket base, 120 volt input voltage, no KYZ output, Ethernet card for billing data, telephone modem meter (Provided by BNL)

P.T.:
One (1) - Two Bushing Instrument Transfer P.T. 13200V/120V, Ratio 110:1, Fuses, Catalog # PTG5-2-110-1322FF (Furnished by Contractor)

C.T.:
Four (4) - Model 780 Instrument Transformer C.T. Relay Class C50, Ratio 400:5. Catalog # 780-401. (Furnished by Contractor)

Approvals:

A/E or Proj. Eng.: D. Danseglio Date: 05/10/10

Project Coordinator: A. Raphael Date: 05/10/10

Manager: Date:

Contractor shall take the following action:

- ☐ Await change order from P&PM
- ☒ Proceed with change as described
- ☒ Provide cost proposal for change as described

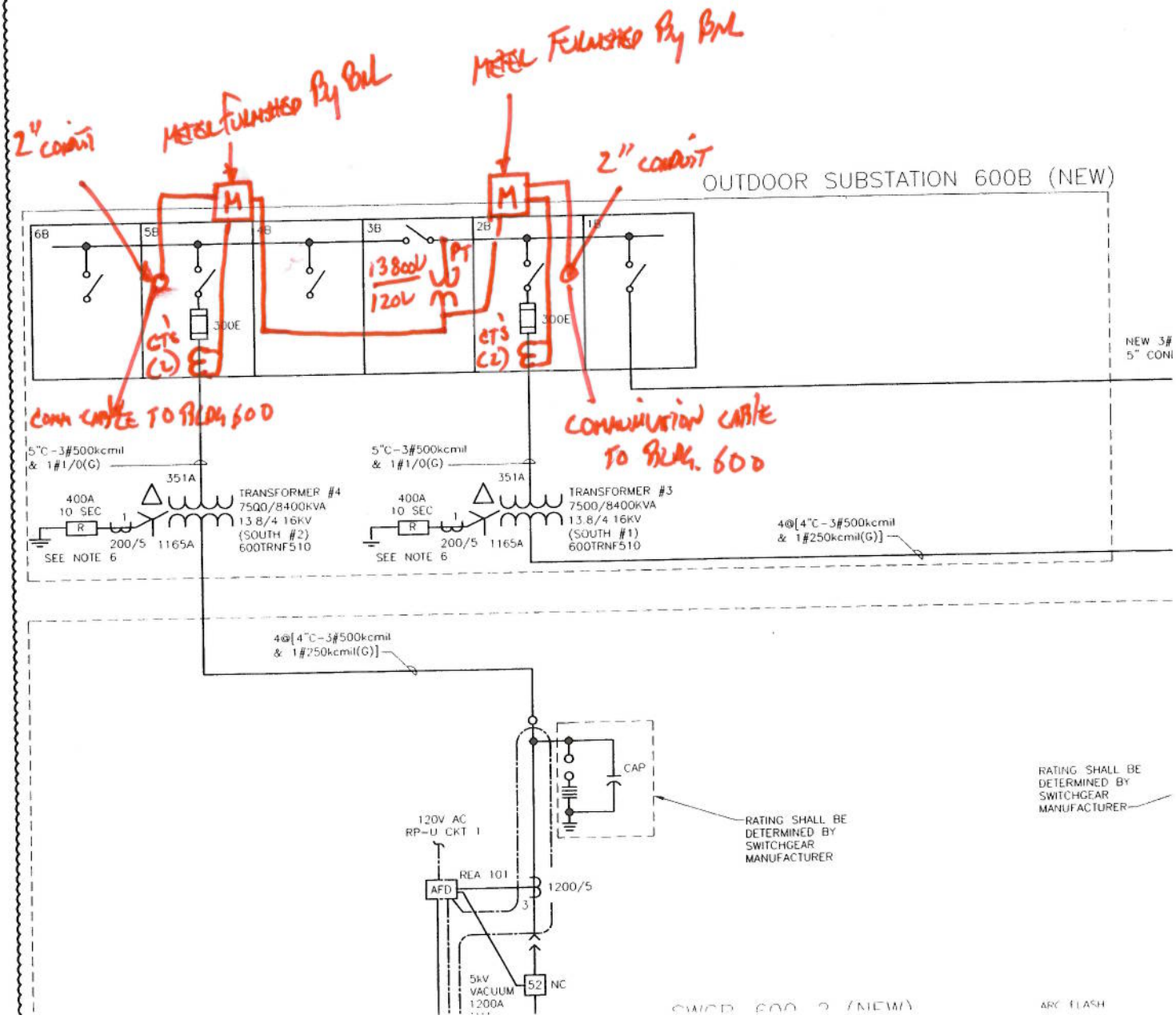
Brookhaven National Laboratory
Plant Engineering - E&CS Division
Engineering Change Notice Form

PROJECT: CCWF II **JOB No.** 11705

ECN Title: Transformer #3 and #4 Metering **ECN No.** 35

Distribution:	E. W. Howell	Giffels	PPM
	E&U	MPO	
	O&M	DOE	
	NSLS II	ECN File	

SKETCH DD-1


METER FURNISHED BY BVL
METER FURNISHED BY BVL
2" CONDUIT
2" CONDUIT
OUTDOOR SUBSTATION 600B (NEW)
6B
5B
4B
3B
2B
1B
13800V
120V
PT
CT'S (2)
300E
CT'S (2)
300E
CONTROL CABLE TO BLDG. 600
COMMUNICATION CABLE TO BLDG. 600
5"C-3#500kcmil & 1#1/0(G)
5"C-3#500kcmil & 1#1/0(G)
351A
400A 10 SEC
R
1
200/5
1165A
TRANSFORMER #4
7500/8400KVA
13.8/4 16KV
(SOUTH #2)
600TRNF510
SEE NOTE 6
351A
400A 10 SEC
R
1
200/5
1165A
TRANSFORMER #3
7500/8400KVA
13.8/4 16KV
(SOUTH #1)
600TRNF510
SEE NOTE 6
4@[4"C-3#500kcmil & 1#250kcmil(G)]
NEW 3#
5" CONI
4@[4"C-3#500kcmil & 1#250kcmil(G)]
CAP
RATING SHALL BE DETERMINED BY SWITCHGEAR MANUFACTURER
120V AC RP-U CKT 1
REA 101
AFD
1200/5
3
5kV VACUUM 1200A
52
NC
RATING SHALL BE DETERMINED BY SWITCHGEAR MANUFACTURER
SWGR 600-2 (NEW)
ARC FLASH

Instrument Transformers, Inc.
a division of GE Multilin

Current Transformer
Model 780
Window Diameter 6.50"

REGULATORY AGENCY APPROVALS
E93779 LR89403
Manufactured to meet the requirements of ANSI/IEEE C57.13.
Classified by U.L. in accordance with IEC 44-1

APPLICATION:
Relaying and metering.

FREQUENCY:
50-400 Hz.

INSULATION LEVEL:
0.6 kV, BIL 10 kV full wave.

CONTINUOUS THERMAL CURRENT RATING FACTOR:
50:5-1200:5 2.0 at 30°C. amb., 1.5 at 55°C. amb.
and 2000:5

1500:5-1600:5 1.5 at 30°C. amb., 1.33 at 55°C. amb.
2500:5-3500:5

4000:5-5000:5 1.0 at 30°C. amb.
6000:5 0.8 at 30°C. amb.

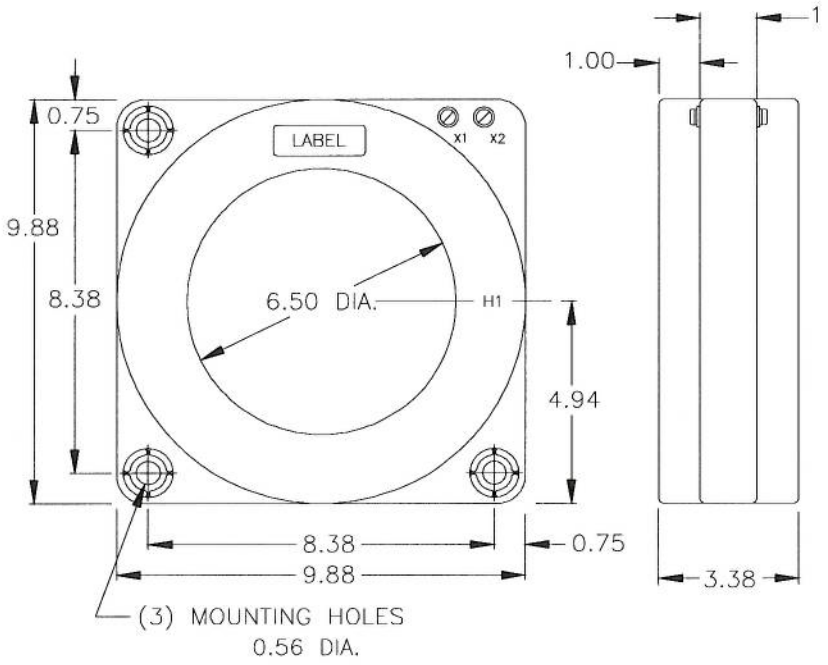
Secondary terminals are brass screws No.10-32 with one flatwasher, lockwasher and regular nut.

Approximate weight 30 lbs.
Excitation data available upon request.

CATALOG NUMBER	CURRENT RATIO	RELAY CLASS	ANSI METERING CLASS AT 60HZ				
			B0.1	B0.2	B0.5	B0.9	B1.8
780–500	50:5	–	4.8	–	–	–	–
780–750	75:5	C10	4.8	4.8	–	–	–
780–101	100:5	C10	1.2	2.4	4.8	–	–
780–151	150:5 *	C20	0.6	1.2	2.4	2.4	4.8
780–201	200:5 *	C20	0.6	0.6	1.2	2.4	4.8
780–251	250:5 *	C20	0.6	0.6	0.6	1.2	2.4
780–301	300:5 *	C20	0.3	0.6	0.6	1.2	2.4
780–401	400:5 *	C50	0.3	0.3	0.6	0.6	1.2
780–501	500:5 *	C50	0.3	0.3	0.3	0.6	0.6
780–601	600:5 *	C100	0.3	0.3	0.3	0.3	0.6
780–751	750:5 *	C100	0.3	0.3	0.3	0.3	0.6
780–801	800:5 *	C100	0.3	0.3	0.3	0.3	0.3
780–102	1000:5 *	C100	0.3	0.3	0.3	0.3	0.3
780–122	1200:5 *	C200	0.3	0.3	0.3	0.3	0.3
780–152	1500:5 *	C200	0.3	0.3	0.3	0.3	0.3
780–162	1600:5 *	C200	0.3	0.3	0.3	0.3	0.3
780–202	2000:5 *	C200	0.3	0.3	0.3	0.3	0.3
780–252	2500:5 *	C200	0.3	0.3	0.3	0.3	0.3
780–302	3000:5 *	C200	0.3	0.3	0.3	0.3	0.3
780–322	3200:5 *	C200	0.3	0.3	0.3	0.3	0.3
780–352	3500:5 *	C200	0.3	0.3	0.3	0.3	0.3
780–402	4000:5*	C200	0.3	0.3	0.3	0.3	0.3
780–502	5000:5*	C200	0.3	0.3	0.3	0.3	0.3
780–602	6000:5*	C200	0.3	0.3	0.3	0.3	0.3

Approved for revenue metering by Industry Canada No. AE-0656(*)

Model 780



USA, Canada, Asia, Latin America
Tel: +1-800-547-8629
Fax: +1-905-201-2455
e-mail: sales.multilin@ge.com

Europe, Middle East, Africa
Tel: +34-94-485-88-00
Fax: +34-94-485-88-45
e-mail: gemultilin.euro@ge.com

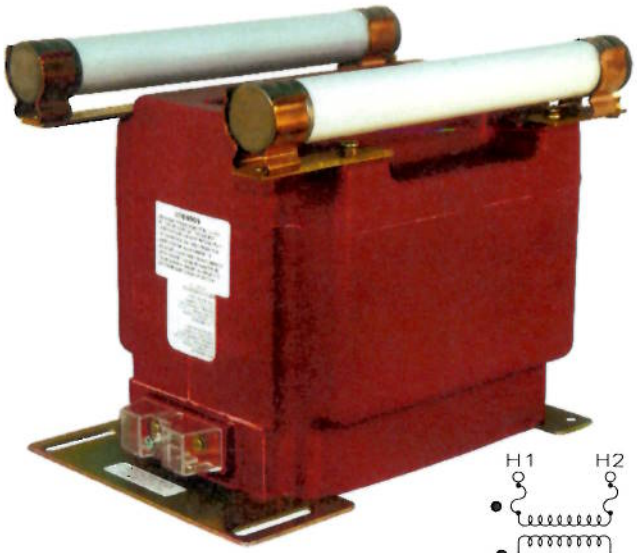
Please refer to our website www.GEMultilin.com for more detailed contact information

CS00A40596 Rev. 1 03/09

Instrument Transformers, Inc.
a division of GE Multilin

Medium Voltage
Indoor Voltage Transformer
Models PTG5-1-110 & PTG5-2-110

REGULATORY AGENCY APPROVALS
E145172 LR89403
Manufactured to meet the requirements of ANSI/IEEE C57.13.



TWO FUSE
Two Bushing

ACCURACY CLASS:
0.3 WXMYZ 1.2ZZ at 100% rated voltage with 120V based ANSI burden.

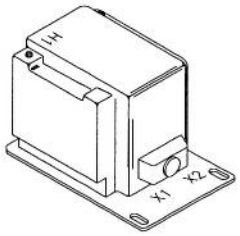
0.3 WXMY, 1.2Z at 58% rated voltage with 69.3V based ANSI burden.

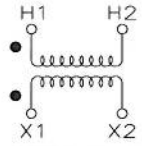
FREQUENCY:
60 Hz.

MAXIMUM SYSTEM VOLTAGE:
15.5kV, BIL 110kV.

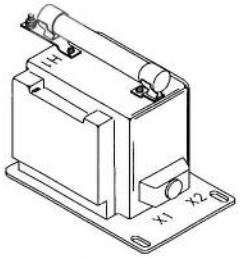
THERMAL RATING:
1500 VA at 30°C amb.
1000 VA at 55°C amb.

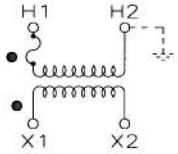
Approximate weight 85 lbs. unfused.



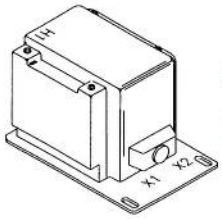


UNFUSED
Two Bushing





ONE FUSE
One Bushing



SWITCHGEAR STYLE
Two Bushing

TWO BUSHING (a)				CATALOG NUMBERS			
GROUP	PRIMARY VOLTAGE	RATIO	SECONDARY VOLTAGE	UNFUSED	FUSES	FUSE CLIPS ONLY	SWITCHGEAR STYLE
1	*7200	60:1	120	PTG5-2-110-722	PTG5-2-110-722FF	PTG5-2-110-722CC	PTG5-2-110-722SS
1	*8400	70:1	120	PTG5-2-110-842	PTG5-2-110-842FF	PTG5-2-110-842CC	PTG5-2-110-842SS
2	11000	100:1	110-50Hz	PTG5-2-110-113	PTG5-2-110-113FF	PTG5-2-110-113CC	PTG5-2-110-113SS
2	*12000	100:1	120	PTG5-2-110-123	PTG5-2-110-123FF	PTG5-2-110-123CC	PTG5-2-110-123SS
2	13200	110:1	120	PTG5-2-110-1322	PTG5-2-110-1322FF	PTG5-2-110-1322CC	PTG5-2-110-1322SS
2	*14400	120:1	120	PTG5-2-110-1442	PTG5-2-110-1442FF	PTG5-2-110-1442CC	PTG5-2-110-1442SS

ONE BUSHING (b)				CATALOG NUMBERS			
GROUP	PRIMARY VOLTAGE	RATIO	SECONDARY VOLTAGE	R_{FR} (c)	FUSES	FUSE CLIPS ONLY	SWITCHGEAR STYLE
4A	*7200	60:1	120	65	PTG5-1-110-722F	PTG5-1-110-722C	PTG5-1-110-722S
4A	*8400	70:1	120	65	PTG5-1-110-842F	PTG5-1-110-842C	PTG5-1-110-842S
4B	11000	100:1	110-50Hz	65	PTG5-1-110-113F	PTG5-1-110-113C	PTG5-1-110-113S
4B	*12000	100:1	120	65	PTG5-1-110-123F	PTG5-1-110-123C	PTG5-1-110-123S
4B	13200	110:1	120	65	PTG5-1-110-1322F	PTG5-1-110-1322C	PTG5-1-110-1322S
4B	*14000	120:1	120	65	PTG5-1-110-1442F	PTG5-1-110-1442C	PTG5-1-110-1442S

NOTE: All Primary voltages marked with an asterisk (*) are approved for revenue metering in Canada by Industry Canada, Approval No. AE-0431 Rev. 01

Models PTG5-1-110 & PTG5-2-110

(a) Two fuse transformers should not be used for Y connections. It is preferred practice to connect one lead from each voltage transformer directly to the neutral terminal, using a fuse in the line side of the primary only. By using this connection a transformer can never be made "live" from the line side by reason of a blown fuse in the neutral side. For continuous operation the transformer primary voltage should not exceed 110% of rated value.

(b) Voltage transformers connected line-to-ground cannot be considered to be grounding transformers and must not be operated with the secondaries in closed delta because excessive currents may flow in the delta.

(c) See page 32, item 1 for ferroresonance considerations. Values in table are in ohms.

Note: It is recommended that system line-to-line voltage not exceed the transformer maximum system voltage level.

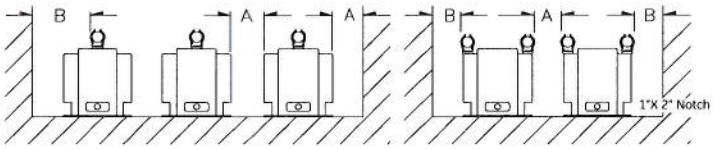
FUSE FOR MODEL PTG5 TRANSFORMER	RATING VOLTS	INTERRUPTING AMPERES (SYM)	SUGGESTED RATING CONTINUOUS AMPERES	CAP DIA. INCHES	LENGTH INCHES	CLIP CENTERS INCHES
7200:120V	15.5kV	80,000	1.0E	1.63	13	11.50
4800:120V	15.5kV	80,000	1.0E	1.63	13	11.50
11000:120V	15.5kV	80,000	0.5E	1.63	13	11.50
12000:120V	15.5kV	80,000	0.5E	1.63	13	11.50
13200:120V	15.5kV	80,000	0.5E	1.63	13	11.50
14200:120V	15.5kV	80,000	0.5E	1.63	13	11.50

- Primary terminals that are unfused are 1/4-20 brass screws with one flatwasher and lockwasher.
- Primary terminals that are fused are 1/4-20 brass screws with one flatwasher and lockwasher and two nuts.
- Secondary terminals are No. 10-32 brass screws with one flatwasher and lockwasher.
- The core and coil assembly is vacuum encapsulated in polyurethane resin.
- Thermal burden rating is for 120 volt secondaries.
- Switch gear style is similar to fused style. No fuse or fuse clip is provide, but inserts for fuse clips are supplied.
- A test card is provided with each unit.

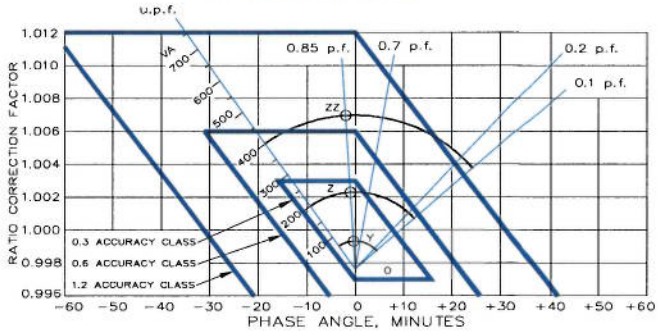
RECOMMENDED MINIMUM SPACINGS

A = Unit to Unit or to Ground = 1.25" minimum.
B = HV to Ground in air = 6.50" minimum.

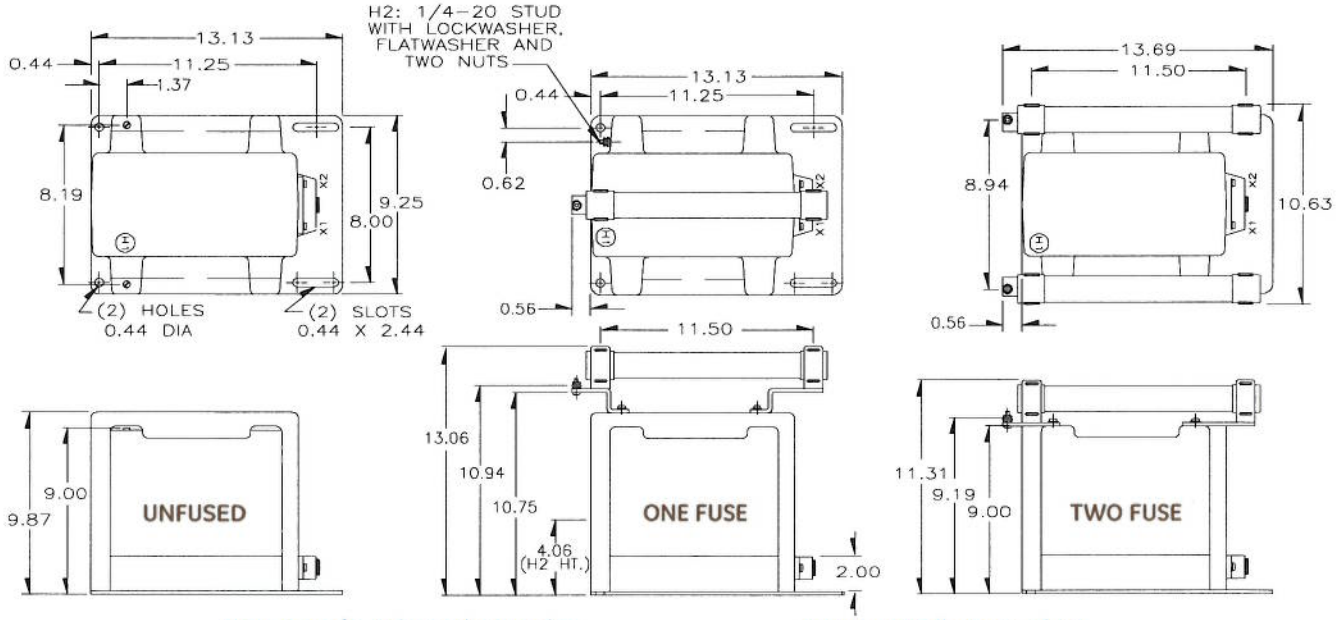
Recommended spacing are for guidance only. User needs to set appropriate values to assure performance for high potential test, impulse test, high humidity, partial discharge, high altitude, and other considerations like configuration.



CIRCLE DIAGRAM



The circle diagram can be used to predict the performance of a transformer for various loads and power factors. A convenient scale of volt-ampere is shown on the unity power factor line (u.p.f) and commences at the zero or no-load locus. To use the diagram, measure the known V.A. and scribe an arc about the "Zero" locus of a length that contains the angle of the burden power factor. The point at which the arc terminates is the error locus in phase angle minutes and ratio correction factor.



USA, Canada, Asia, Latin America
Tel: +1-800-547-8629
Fax: +1-905-201-2455
e-mail: sales.multilin@ge.com

Europe, Middle East, Africa
Tel: +34-94-485-88-00
Fax: +34-94-485-88-45
e-mail: gemultilin.euro@ge.com

TRANSDATA®

MARK-V SERIES ENERGY METER
2009 QUICK REFERENCE & INSTALLATION GUIDE

2560 TARPLEY ROAD • CARROLLTON, TEXAS 75006 USA
TEL (972) 418-7717 • TOLL FREE 800.342.9993
FAX (972) 418-7774 • www.transdatainc.com
E-mail: sales@transdatainc.com

Technical Support:
techsupport@transdatainc.com • (972) 418-7717

22A377B

MARK-V Meter Ordering Guide 2009

Example:
Model Number – EMS60 - E - 09 - S - 1 - 4S - EQT

Real-Time Analog Outputs Available for SCADA Applications. Please call for details.

A. Meter And Load Profile Recorder Designation
E - 4 Channel Meter/Recorder with 128K Memory (149 days of 15-min interval data, 4-channels)
L - 8 Channel Meter/Recorder with 128K Memory (75.5 days of 15-min interval data, 8-channels)
X - 8 Channel Meter/Recorder, 512K Memory (225 days of 15-min interval data, 8-channels)

B. Meter Form Designation and Class Amps Rating
Class 20 Meter (0 to 20 Amps Input Range)
05 - Form 5, 3-Phase, 3-Wire Delta, 2 Elements
06 - Form 6, 3-Phase, 4-Wire WYE, 2.5 Elements
08 - Form 8, 3-Phase, 4-Wire Delta, 2.5 Elements
09 - Form 9, 3-Phase, 4-Wire WYE, 3 Elements
10 - Form 10, 3-Phase, 4-Wire WYE, 3 Elements

Class 10 Meter (0-10 Amps Range)
95 - Form 5, 3-Phase, 3-Wire Delta
96 - Form 6, 3-Phase, 4-Wire WYE
98 - Form 8, 3-Phase, 4-Wire Delta
99 - Form 9, 3-Phase, 4-Wire WYE

Class 2 Meter (0 to 2 Amps Range)
85 - Form 5, 3-Phase, 3-Wire Delta
86 - Form 6, 3-Phase, 4-Wire WYE
88 - Form 8, 3-Phase, 4-Wire Delta
89 - Form 9, 3-Phase, 4-Wire WYE

C. Case Style and Mounting Configuration
S - Socket Base
A - A-Base
H - Switchboard Case (Short S1)
R - Expanded Output (Short S1) Switchboard Case
J - Switchboard Case (Tall M2)
T - DSW Retrofit Chassis
X - Surface Mount, Front-Connected Switchboard Case

D. Voltage Input Rating*
0 - 69 Volts
1 - 120 Volts
2 - 240 Volts
3 - 277 Volts
4 - 480 Volts
9 - TBD
*Phase-to-Phase Voltage on Delta and Phase-to-Neutral Voltage on WYE connected meters.

E. Solid State KYZ Relay Pulse Outputs
0 - No KYZ Relay Outputs
1S - 1 Form-C KYZ Relay Pulse Output
2S - 2 Form-C KYZ Relay Pulse Outputs
3S - 3 Form-C KYZ Relay Pulse Outputs
4S - 4 Form-C KYZ Relay Pulse Outputs
2CE - 2 Form-C KYZ Pulse Outputs and End-of-Interval (EOI) Contact on Color Coded Wired Cable

F. Communications, I/O Options and Accessories
A - Auxiliary AC Power Supply for Socket and A-Base Meters, (Specify Nominal Operating Voltage)
E - End-of-Interval (EOI) Contact Output
G - Ethernet Communications Card 100/10Base T, Internal for Billing Register Data Port
H - Ethernet Communications Card 100/10Base T, Internal for SCADA Port
I - Dual Ethernet SCADA Communication Ports
J - Internal 1XRTT CDMA Digital Cellular Modem, 800/1900 MHz Dual-Band; Circuit-Switched/Packet
K - Self-Powered Switchboard Case Meter Powered by the "A" Phase Voltage Input
M - (5) Programmable Control/Alert Outputs for End of Interval, Demand Threshold, TOU Rate Change, Power Factor Alert, Diagnostics
P - (2) Pulse/Status Inputs for Recorder Input, Demand Synch, Totalizing, Rate Change, Metering On/Off Switch and Meter Rate Channel Switch
Q - SCADA/EMS Real-Time Metering Port with DNP 3.0, Modbus RTU and TransData DTO Protocols, Selectable RS232/RS485 Serial Interface
R - RS232 Billing Register/Recorder Serial Data Port (Not Available with Digital PCS/Cellular Modem)
S - RS485 Billing Register/Recorder Serial Data Port (Not Available with Digital PCS/Cellular Modem)
T - Telephone Modem, Internal 2400 Baud with Multi-Drop and Off-Hook Detection Circuitry

MARK-V Meter Specifications

Ratings
Voltage: 69,120,240,277,480 volts
Current: Class 2, Class 10, Class 20
Frequency: 50 Hz, 60 Hz (depends upon model)

Operating Ranges (meets all specifications)
Voltage: +/- 20% of rated voltage
Current: 0 to class amps
Frequency: 50/60 Hz
Temperature: -40 C to +85 C
-30 C to +85 C for LCD operation
Humidity: 0 to 95% non-condensing

Absolute Maximums Without Damage
Voltage: 125% of rated voltage continuous
Current: 120% of Class amps continuous
Temperature: -40 C to +85 C
Humidity: 0 to 95% non-condensing
Dielectric Breakdown: 2500 VRMS, 60Hz, 1 minute

Burdens
Power Supply:
Socket Meter Phase "A": 10 VA maximum
A-Base Meter Phase "A": 10 VA maximum
Switchboard Meter Auxiliary Power Terminals: 10 VA maximum
Phase "B" and Phase "C" Voltage:
Socket Meter Phase "B" and Phase "C": .02 VA
A-Base Meter Phase "B" and Phase "C": .02 VA
Switchboard Meter Phase "B" and Phase "C": .02 VA
Current Each Phase:
Socket Meter: .15 VA
A-Base Meter: .15 VA
Switchboard Meter: .30 VA

Accuracy
Typical Accuracy at 23C +/- 2C and rated voltage
- 0.1% at full load
- 0.1% at 50% Power Factor
- 0.15% at light load

Starting Load:
- Class 2 Meter: 2 mA
- Class 10 Meter: 10 mA
- Class 20 Meter: 20 mA

Creep: No registration below 5 mA typical

Quick Start Guide: Start Up Procedure and Pause Display

1. Unpack the meter from the carton and check for damage. Contact the factory immediately if any damage is detected. Installation instructions are packed with each meter.

2. Perform any necessary testing on the meter at this time. The meter comes programmed with a default/generic program. You can reprogram the meter using the WinMarkV programming software. The manuals are provided on the MARK-V programming software CD (software manual P/N 22A313, hardware manual P/N 22A312).

3. The meter is now ready for installation. There is no battery to install. There are two lithium cells that are encapsulated on the memory chip of the meter. The meter has 10 years of carryover capacity at normal operating temperatures. The lithium cells are only active when the meter is deenergized.

4. Install the meter and energize the potentials. The display should turn on.
Important! Socket type meters and A-base meters are typically powered from the "A" phase potential input. The power supply voltage typically matches the potential input voltage with regard to magnitude. The power supply of the meter is powered from an AC voltage in all cases.

Socket type meters and A-base meters can be ordered with the "A" option, which provides the meter with external/auxiliary power terminals. In this case, the meter is not powered from the "A" phase potential input. This allows the customer to power the meter from a power source independent of the potential inputs.

A switchboard meter is equipped with external/auxiliary power terminals to energize the power supply of the meter. The power supply of a switchboard meter typically requires 120VAC regardless of the potential inputs to the meter.

Switchboard meters can be ordered with the "K" option. With the addition of this option, the power supply of the meter is no longer energized from external/auxiliary power terminals. The power supply of the meter is energized from the "A" phase potential input.

5. Pause Display: If the meter has been sitting on a shelf for a long time, the LCD display will turn on showing the message "pause". This is not a failure. The meter is going through the normal process of filling interval data memory with pulse counts of zero. The duration of this display is dependent upon the length of time that the meter was deenergized. This can range from 1 second to 10 minutes or more. This process can be bypassed by simultaneously pressing the "SET" and "ADV" buttons for at least 3 seconds. This will clear the existing interval recorder data.

6. Final Checkout: The potential indicators should not be flashing. A flashing indicator reveals a magnitude problem for that particular phase.

Meter Form	Active Potential Indicators
5	"A", "C"
6	"A", "C"
8	"A", "C"
9	"A","B","C"

The display should be scrolling from one register to the next. The BATT and TEST indicators should be off.

SECTION 1: METER DIMENSIONS

Figure 1.1: Socket Meter

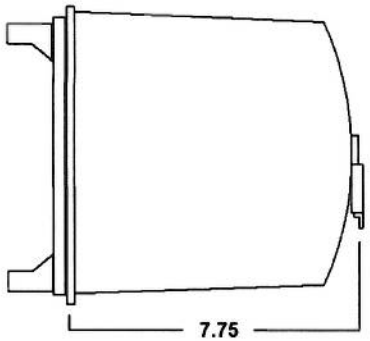


Figure 1.2: A-Base Meter

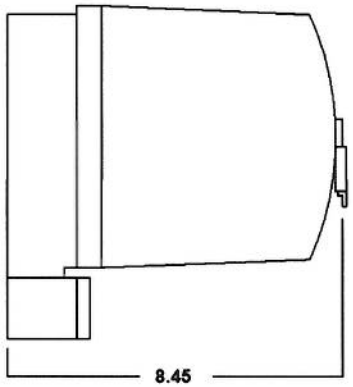


Figure 1.3: A-Base Meter Mounting Guide

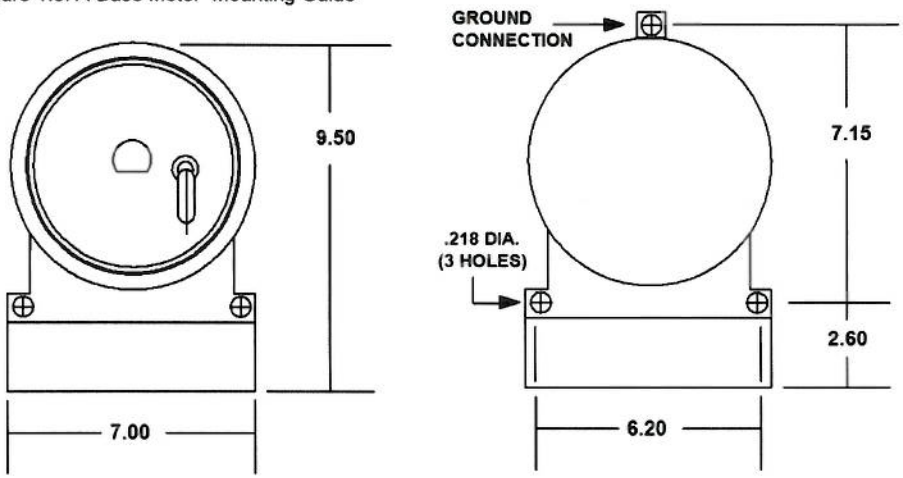


Figure 1.4: Short Switchboard Dimensions ("H" Case)

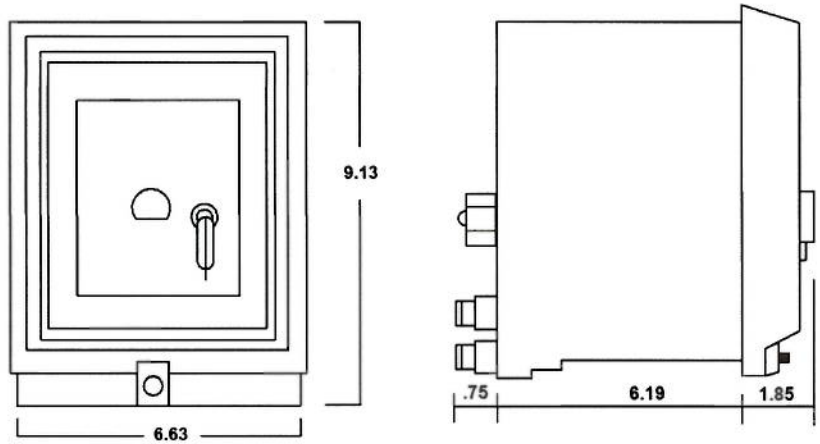


Figure 1.5: Short Switchboard Cutout ("H" Case)

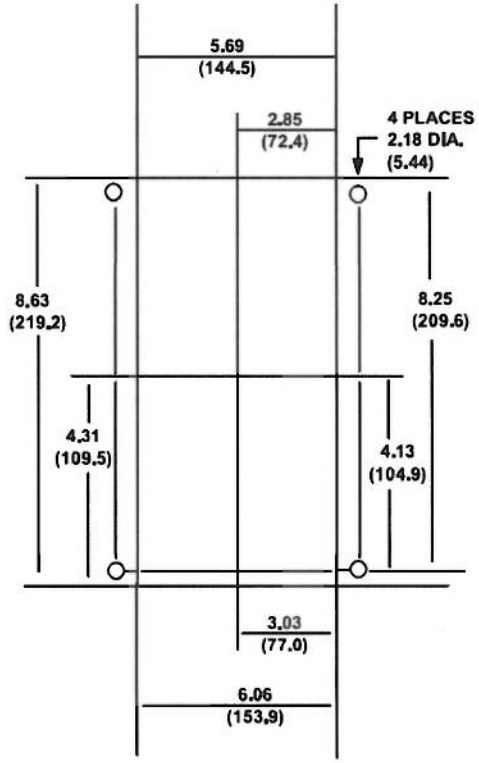
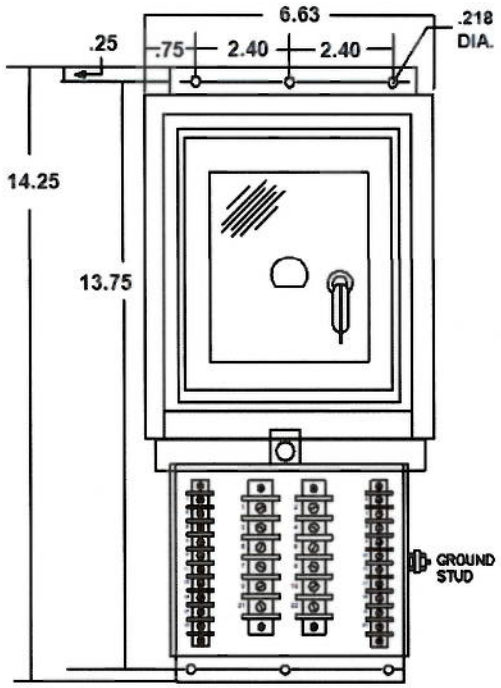


Figure 1.6: Surface-Mount Switchboard ("X" Case)



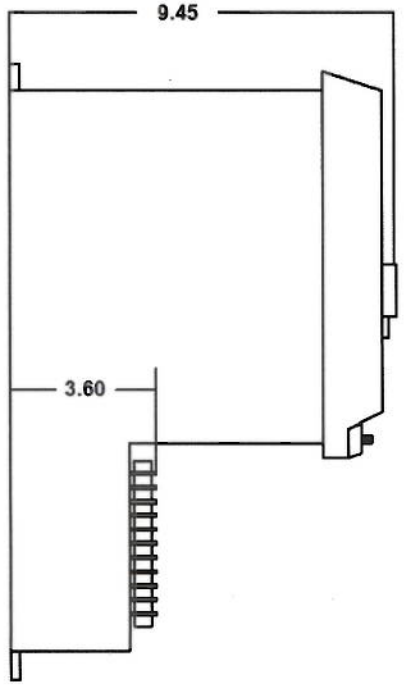


Figure 1.7: Tall Switchboard Dimensions ("J" Case)

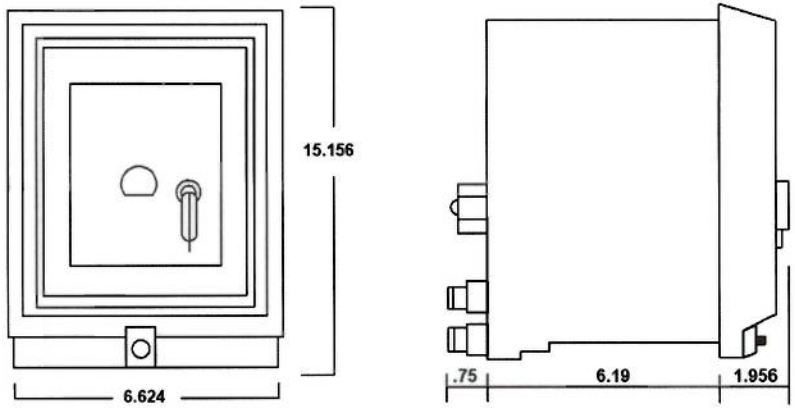
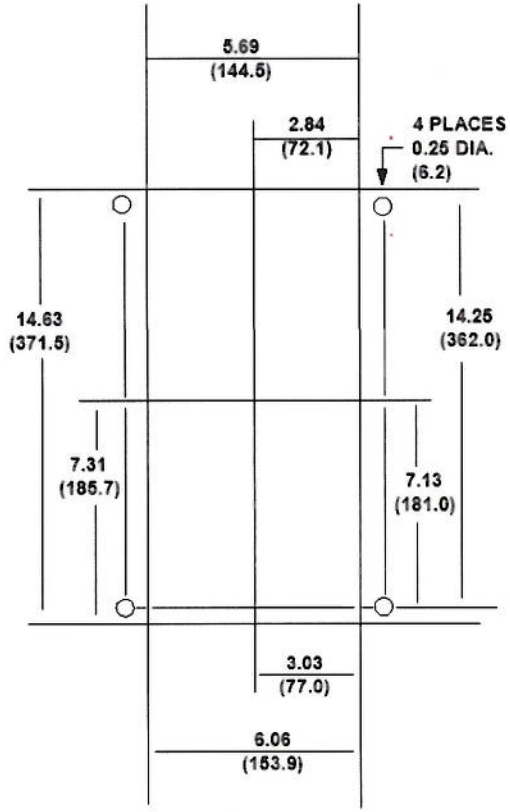


Figure 1.8: Tall Switchboard Cutout ("J" Case)



SECTION 2: INPUT WIRING DIAGRAMS

SOCKET METERS

Figure 2.1: Form 5S

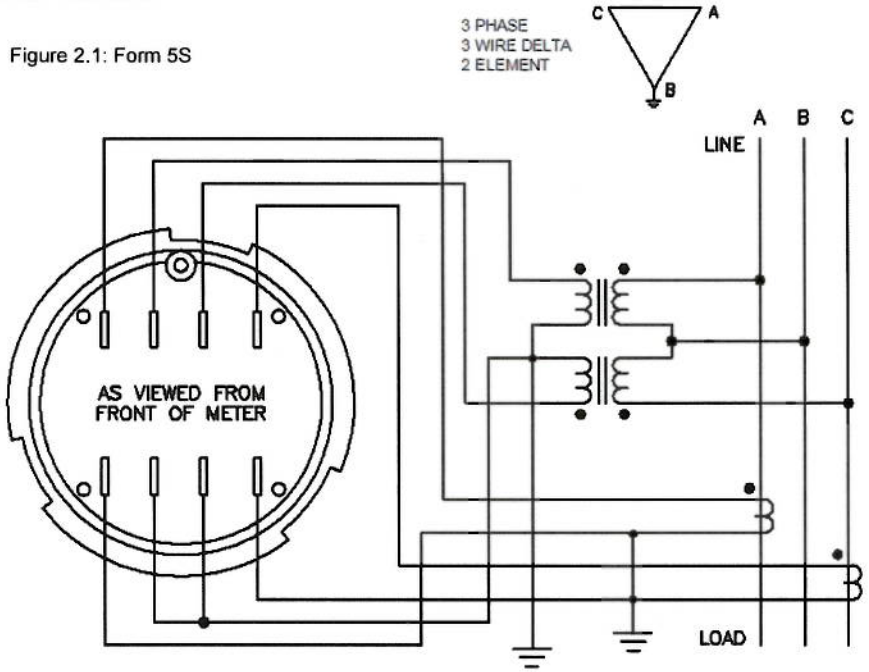


Figure 2.2: Form 6S

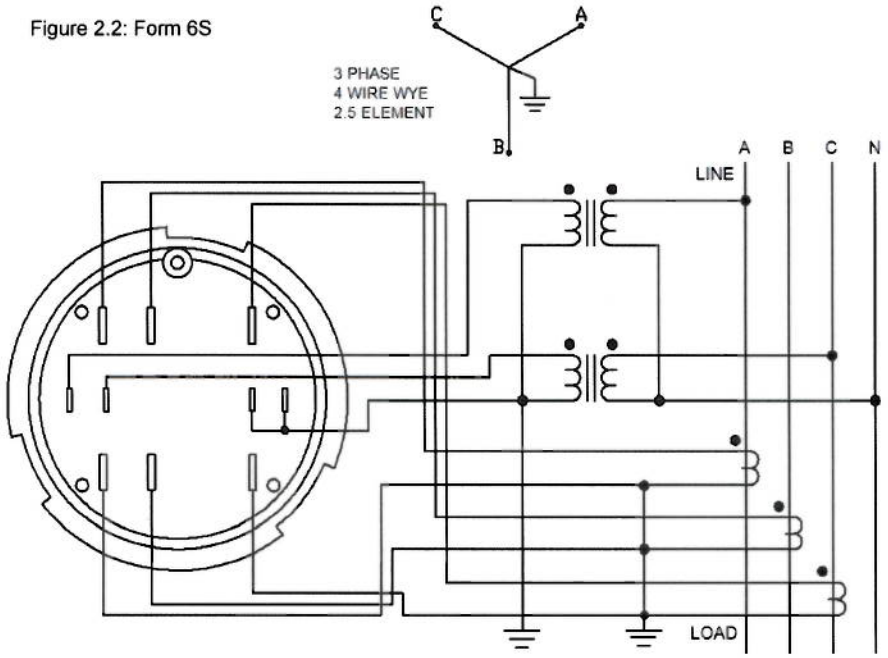


Figure 2.3: Form 8S

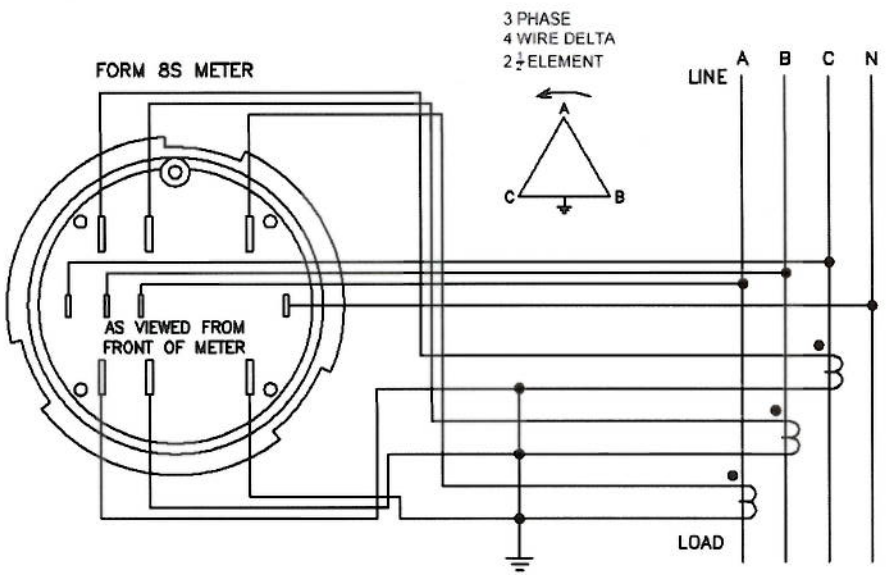


Figure 2.4: Form 9S

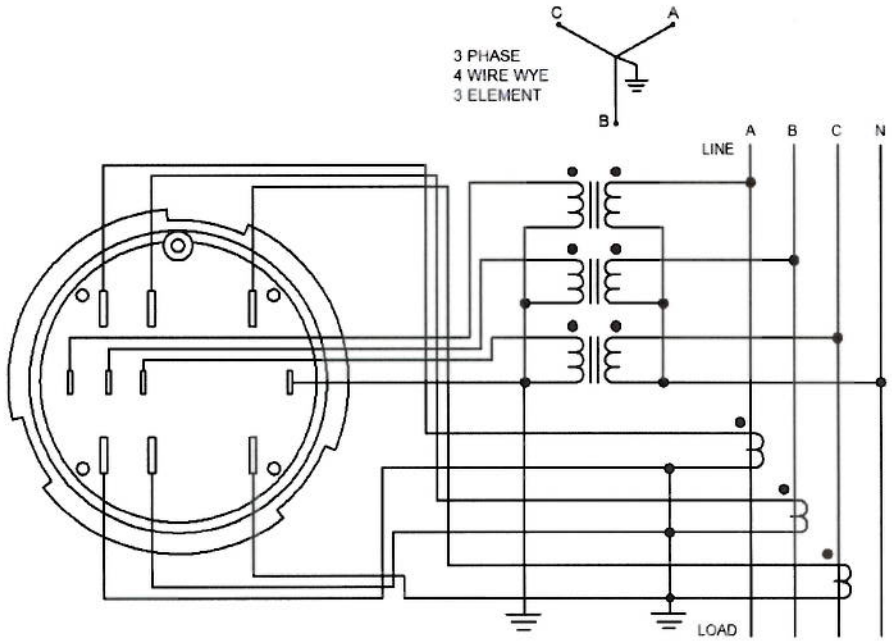


Figure 2.5: Form 5S with Auxiliary Power

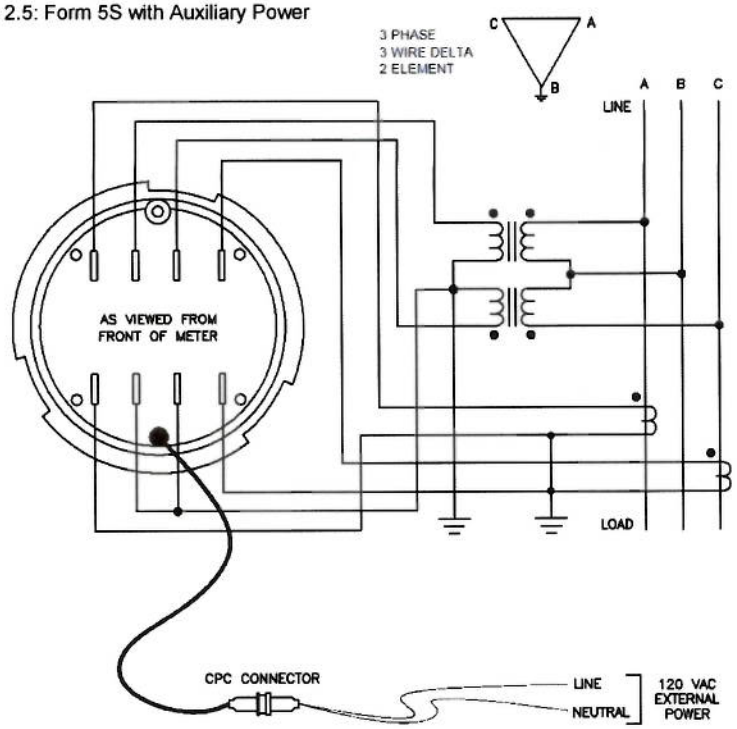
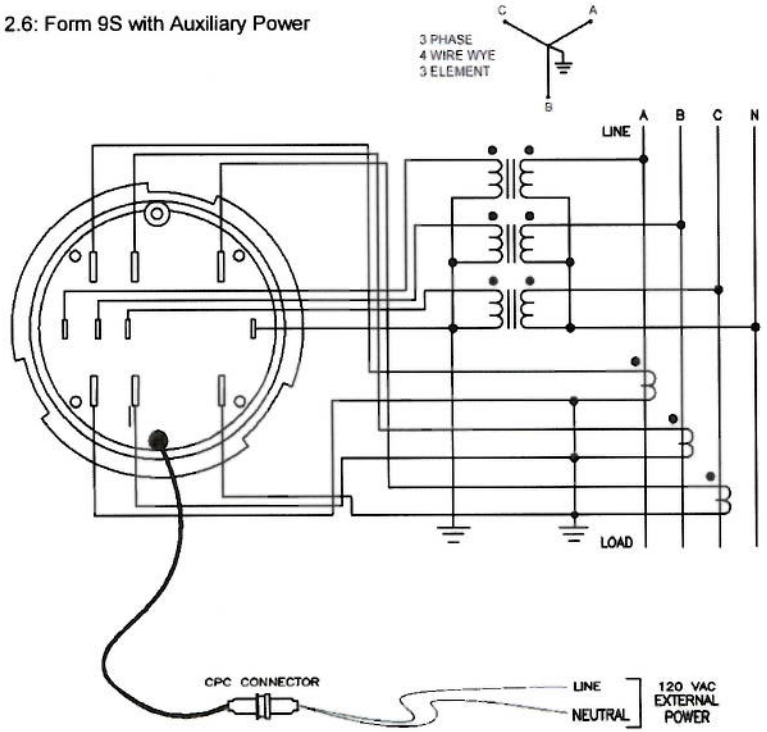


Figure 2.6: Form 9S with Auxiliary Power



A-BASE METERS

Figure 2.7: Form 5A

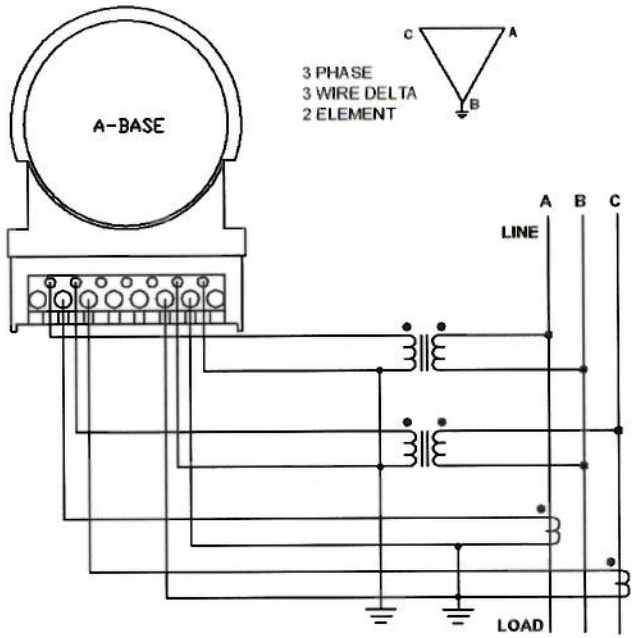


Figure 2.8: Form 6A

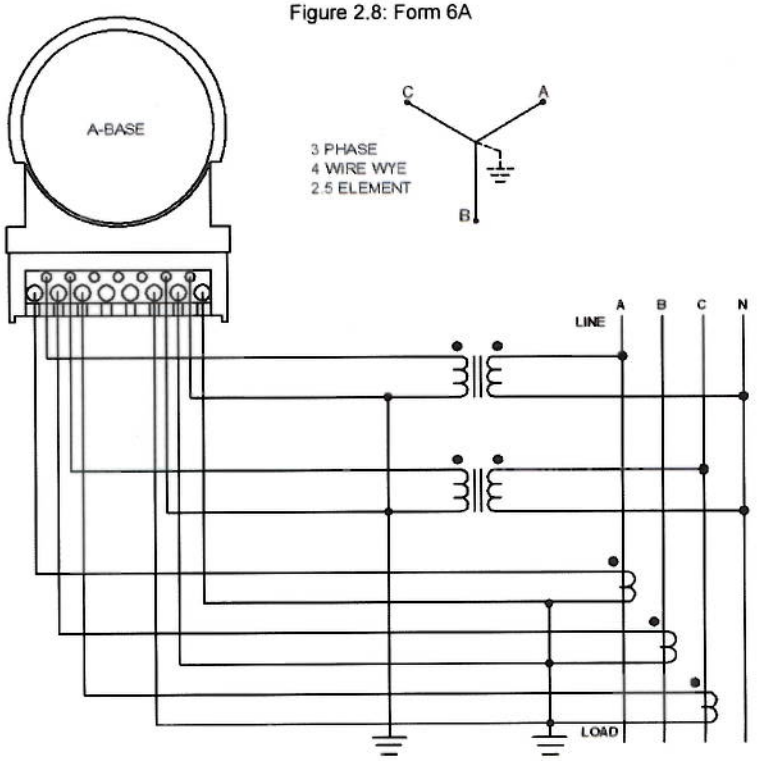
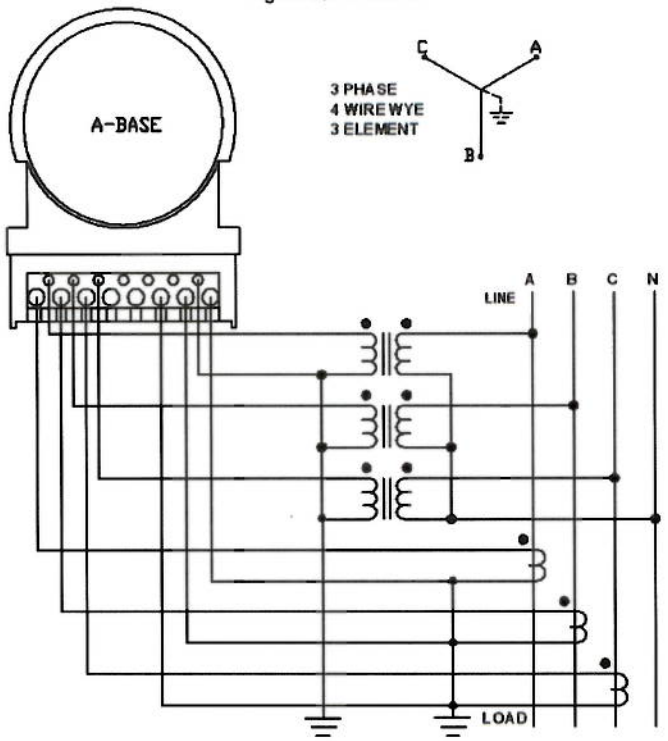


Figure 2.9: Form 9A



SHORT SWITCHBOARD METERS

Figure 2.10: Form 5H

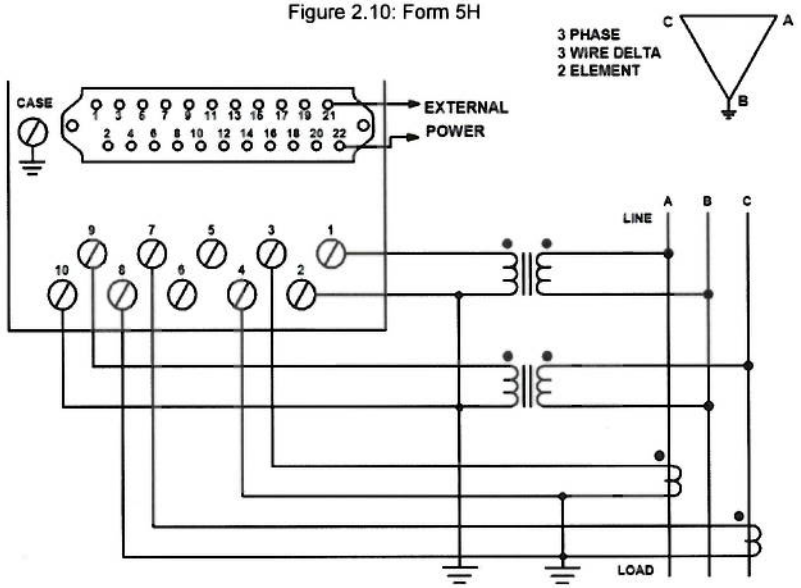


Figure 2.11: Form 6H

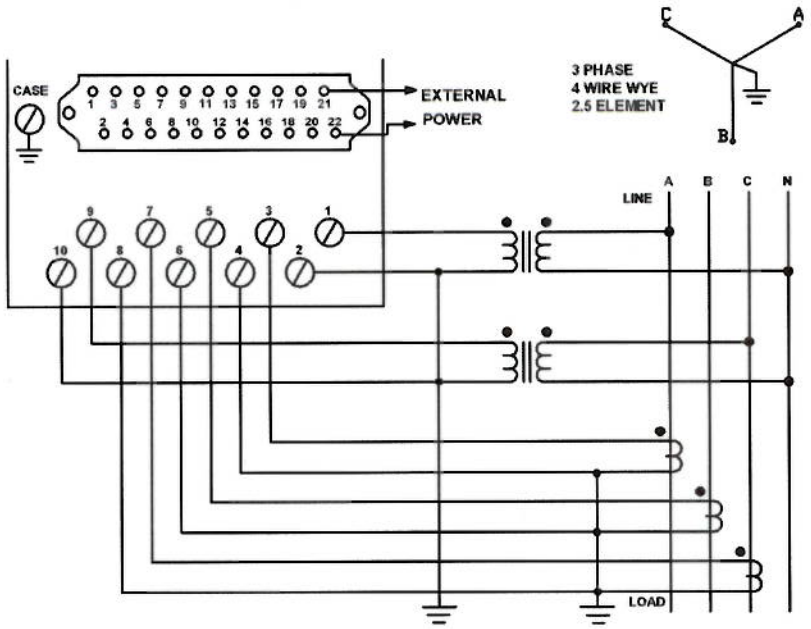
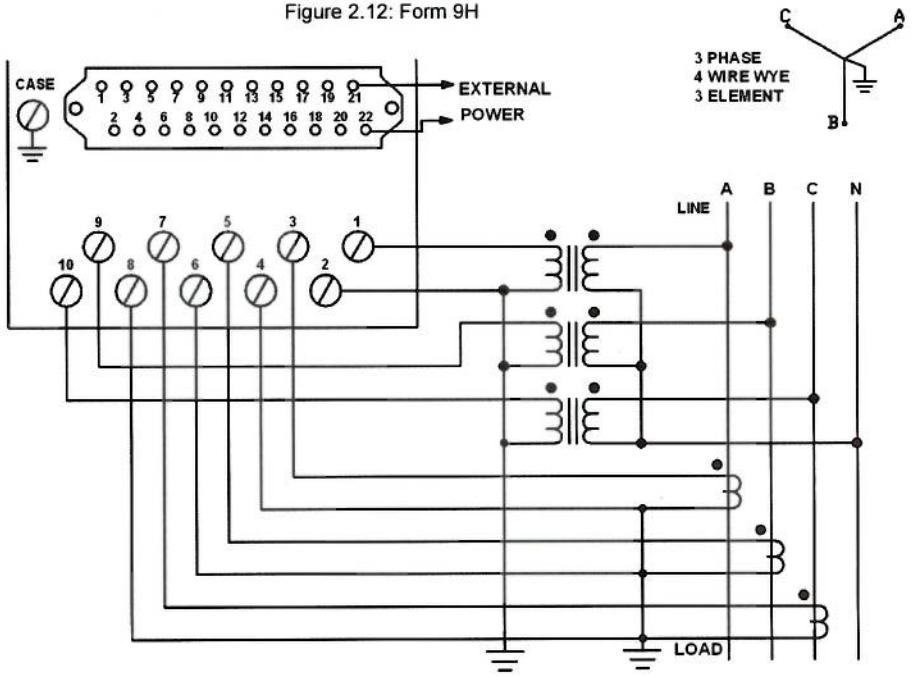


Figure 2.12: Form 9H



SURFACE-MOUNT SWITCHBOARD METERS

Figure 2.13: Form 5X

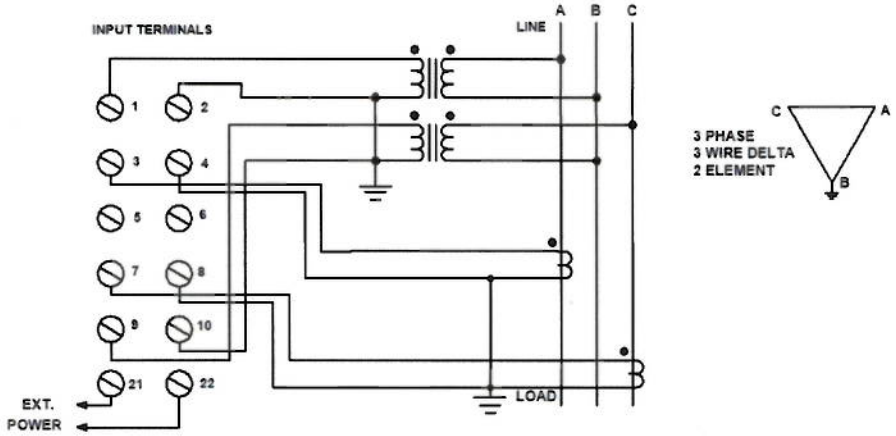


Figure 2.14: Form 6X

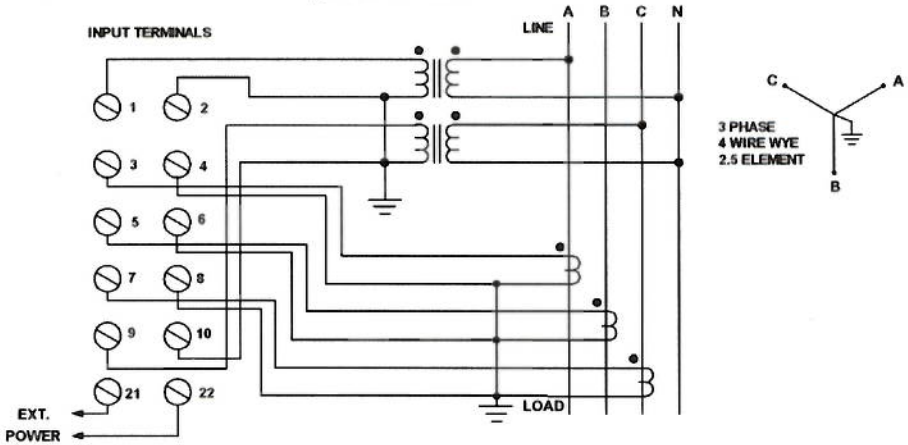
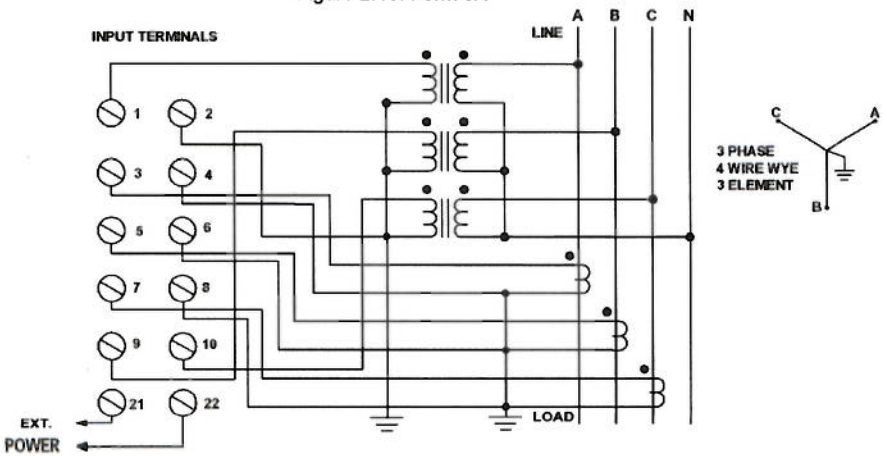


Figure 2.15: Form 9X



TALL SWITCHBOARD METERS

Figure 2.16: Form 5J

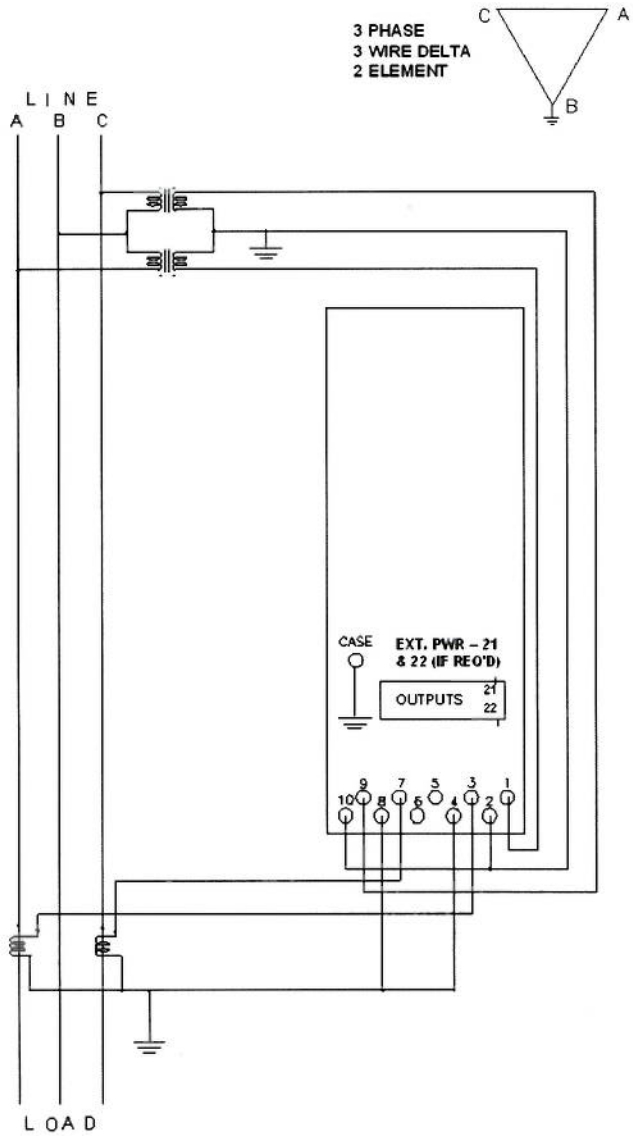


Figure 2.17: Form 9J

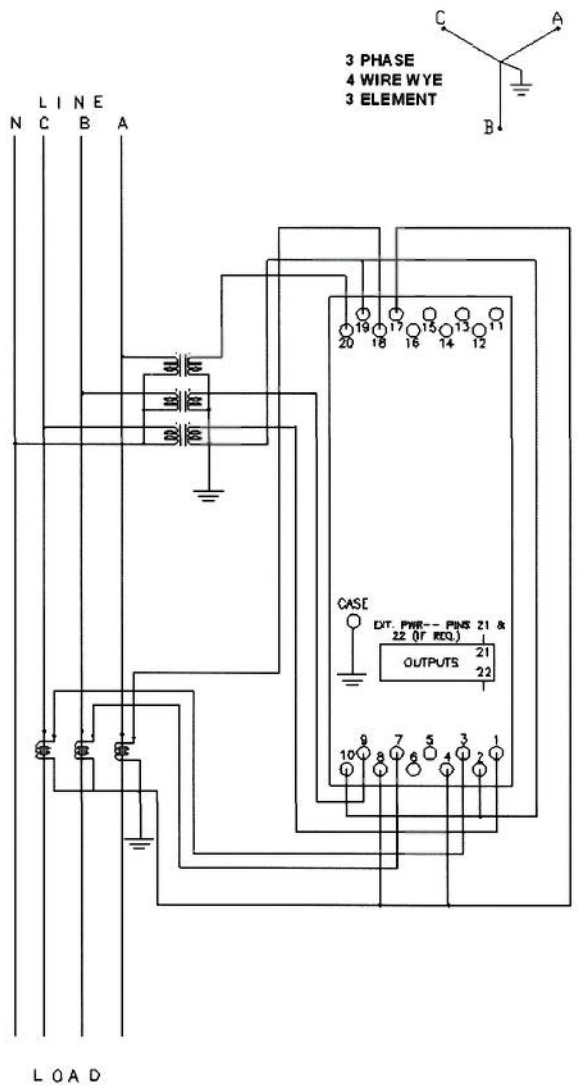
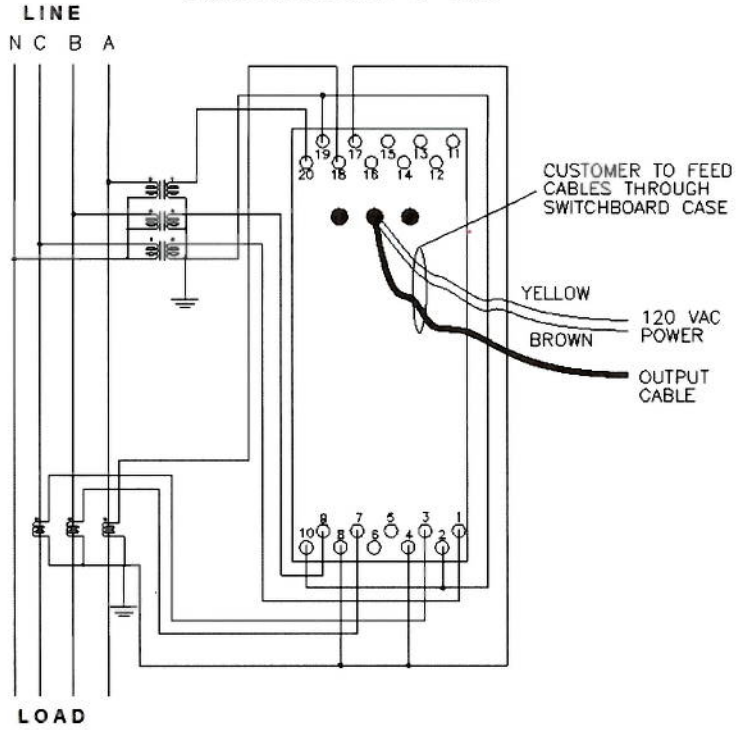


Figure 2.18: Retrofit "9T" Case



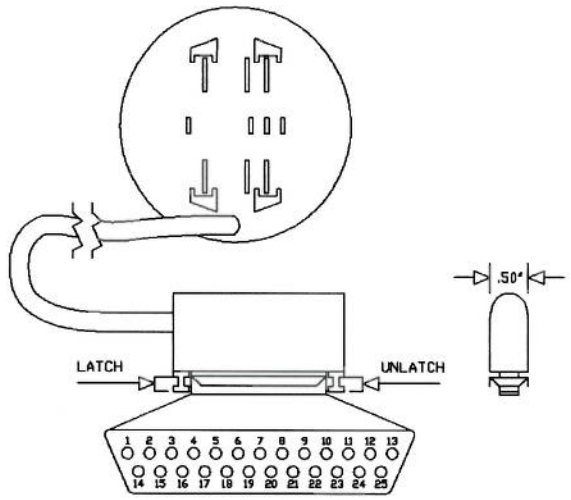
Typical Retrofit "T" Case Output Wiring

Pin	Color	Output
1	White	Y1
2	Blue/Black	K1
3	Green/White/Black	K2
4	Red/White/Black	K3
5	White/Red/Black	K4
6	Black/White/Red	Z4
9	Blue	SCADA RS232 RTS
10	Red/Green	SCADA RS232 RX, RS485 B(-)
11	Blue/Red	Ground
12	Green	Modem Ring
13	Orange/Red	Unused
14	White/Black	Z1
15	Green/Black	Y2
16	Black	Z2
17	Orange/Black	Y3
18	Black/White	Z3
19	Red/White	Y4
23	Orange	SCADA RS232 TX, RS485 A(+)
24	Red	Modem Tip

* All other wires are unused

SECTION 3: OUTPUT WIRING DIAGRAMS

Figure 3.1: Socket Meter Pigtail Cable Output Wiring



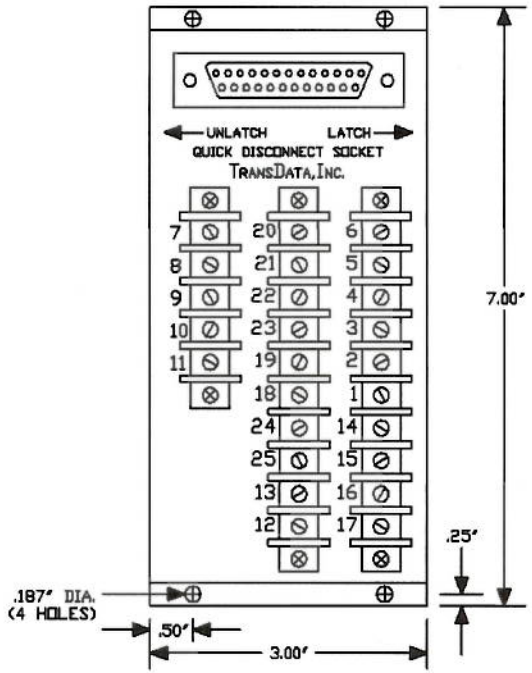
25 Pin Male D Connector Front View

Pin	KYZ Output		Pin	Output
1	Y1		24	Tip Line (T0) for modem
2	K1	Relay 1	12	Ring Line (R0) for modem
14	Z1		13	Register RS232 RX
15	Y2		25	Register RS232 TX
3	K2	Relay 2	10	SCADA RS232/485 RX (B/-)
16	Z2		23	SCADA RS232/485 TX (A/+)
17	Y3		11	RS232 Ground
4	K3	Relay 3	21	Dem. Threshold / Control Output #3
18	Z3		9	Cap Bank Lag / Control Output #4
19	Y4		22	Cap Bank Lead / Control Output #5
5	K4	Relay 4	20	EOI / Control Output #1
6	Z4		8	Harmonic Alarm / Control Output #2
			7	Common for 21, 9, 22, 20, 8

Socket and A-Base Meters: If output connections are necessary, an 18" pigtail cable extending from the base of the meter is typically provided. The connector at the end of the cable is a 25-pin male D type with latching mechanism. This connector is designed to work with switchgear mounted sockets, allowing the cable to be put through the socket opening for wiring behind the panel. Plastic connectors are also available.

Note: The use isolation relays between control outputs and end equipment is recommended. Check the model number for optional outputs. Please consult the factory for other available output connections.

Figure 3.2: Quick Disconnect Socket Connections
Model QD-1



Pin	KYZ Output		Pin	Output
1	Y1		24	Tip Line (T0) for modem
2	K1	Relay 1	12	Ring Line (R0) for modem
14	Z1		13	Register RS232 RX
15	Y2		25	Register RS232 TX
3	K2	Relay 2	10	SCADA RS232/485 RX (B/-)
16	Z2		23	SCADA RS232/485 TX (A/+)
17	Y3		11	RS232 Ground
4	K3	Relay 3	21	Dem. Threshold / Control Output #3
18	Z3		9	Cap Bank Lag / Control Output #4
19	Y4		22	Cap Bank Lead / Control Output #5
5	K4	Relay 4	20	EOI / Control Output #1
6	Z4		8	Harmonic Alarm / Control Output #2
			7	Common for 21, 9, 22, 20, 8

Quick Disconnect Sockets: A quick disconnect socket is available to mate with the pigtail D connector. This allows easy disconnection of the outputs but provides barrier block terminals for permanent wiring to other devices.

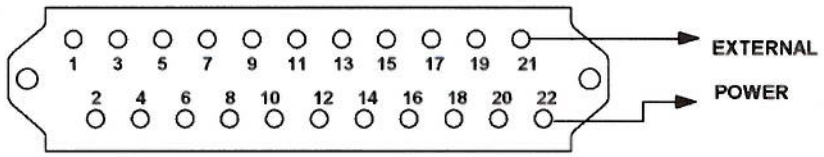
Note: The use isolation relays between control outputs and end equipment is recommended. Check the model number for optional outputs. Please consult the factory for other available output connections.

Figure 3.3: Output Wiring for 61A146 Cable

Pin	Color	Output
1	White	Y1
2	Blue/Black	K1
3	Green/White/Black	K2
4	Red/White/Black	K3
5	White/Red/Black	K4
6	Black/White/Red	Z4
7	Red/Black	Control Output - Common
8	Orange/Green	Control Output #2
9	Blue	Control Output #4
10	Red/Green	SCADA RS232 RX, RS485 B(-)
11	Blue/Red	Ground
12	Green	Modem Ring
13	Orange/Red	Register RX
14	White/Black	Z1
15	Green/Black	Y2
16	Black	Z2
17	Orange/Black	Y3
18	Black/White	Z3
19	Red/White	Y4
20	Green/White	Control Output #1
21	Blue/White	Control Output #3
22	White/Red	Control Output #5
23	Orange	SCADA RS232 TX, RS485 A(+)
24	Red	Modem Tip
25	Black/Red	Register TX

Note: The 61A146 cable can be used in place of the QD-1. This cable has a 25-pin connector on one end that attaches directly to the meter's pigtail cable. The other end of the 61A146 cable contains color-coded wires for the outputs listed above.

Figure 3.4: Switchboard Output Wiring



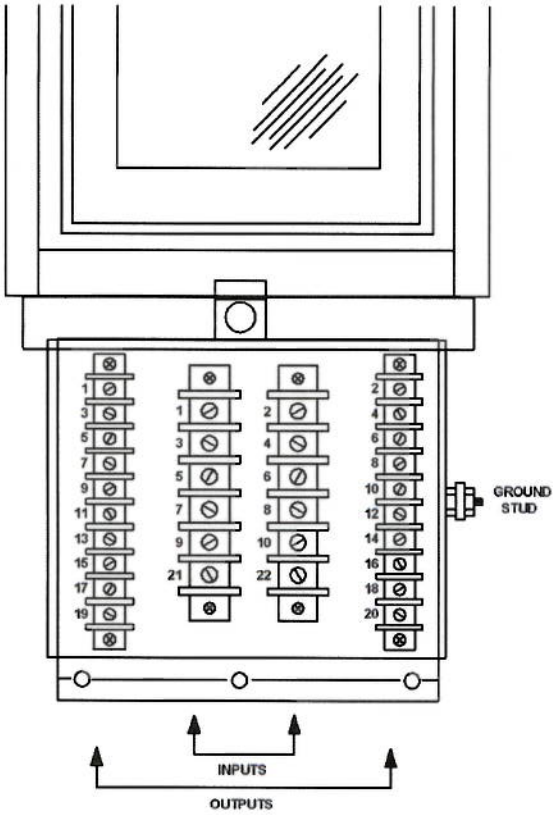
Output Terminal Block on Back of Switchboard Case

Pin	KYZ Output	
2	Y1	
4	K1	Relay 1
6	Z1	
1	Y2	
3	K2	Relay 2
5	Z2	
8	Y3	
10	K3	Relay 3
12	Z3	
7	Y4	
9	K4	Relay 4
11	Z4	

Pin	Output
14	Tip Line (T0) for modem
18	Ring Line (R0) for modem
17	SCADA RS232/485 RX (B/-)
15	SCADA RS232/485 TX(A/+)
19	RS232 Ground

Note: Wiring Diagrams vary according to specific model numbers. Always consult wiring diagram on back of meter case for correct output connections. Terminals can accept up to 14 AWG wire.

Figure 3.5: Surface-Mount Switchboard Output Wiring



Pin	KYZ Output		Pin	Output
2	Y1		14	Tip Line (T0) for modem
4	K1	Relay 1	18	Ring Line (R0) for modem
6	Z1			
1	Y2			
3	K2	Relay 2	17	SCADA RS232/485 RX (B/-)
5	Z2		15	SCADA RS232/485 TX(A/+)
8	Y3		19	RS232 Ground
10	K3	Relay 3		
12	Z3			
7	Y4			
9	K4	Relay 4		
11	Z4			

Note: Wiring Diagrams vary according to specific model numbers. Always consult wiring diagram on back of meter case for correct output connections. Terminals can accept up to 14 AWG wire.

TRANSDATA®

Advanced Energy Metering and Data Telemetry Products Since 1969...

TransData's fifth-generation meter, the MARK-V, establishes new standards for digital measuring performance, and pioneers the use of new communications technologies. Like all of our products, the MARK-V meter is fully "Made in USA" where we maintain complete control over the entire manufacturing process to ensure maximum quality, reliability and customer satisfaction.

For questions or assistance with the MARK-V meter, please contact us at tdmeters@transdatainc.com.

Other Available Products:

- Solid-State Load Profiling Demand Recorder and Pulse Totalizer for Metering Applications, also available with built-in CDMA digital cellular modem
- DSW Meter Field Retrofit Chassis: A Direct, Plug-in Replacement for DSW-63, DSW-64 and DSW-65 Meters Using the Existing Hard-wired Switchboard Case and Cover
- Star-Burst Data Transceiver Provides a Direct Replacement for Analog Cellular AMR Telemetry Gear Using CDMA Digital Cellular Technology
- Isolation Relays for Advanced Surge Protection of Utility and Industrial Metering Applications
- Utility-Grade Electrical Power Transducers for SCADA and Energy Management Applications
- Portable Meter Test Set for On-Site Accuracy Certification of Revenue Metering Installations

For a complete list of products, please visit our website:
www.transdatainc.com