TRANSDATA®

MARK-V SERIES ENERGY METER
QUICK REFERENCE & INSTALLATION GUIDE

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22A377K

MARK-V Meter Ordering Guide 2024

Model Number – EMS60 A B C D E F
Example: EMS60 X 09 S 1 4S HQSU3

Special Communications, Output, Cabling, Antenna, Retrofit, Power, and other options available.
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
H - Switchboard Case (Short S1)
J - Switchboard Case (Tall M2)
R - Expanded Output (Short S1) Switchboard Case
T - DSW Retrofit Chassis (Q and G case retrofits available)
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 / A-Base Meters, (Add –50 for Self/Aux Cable Switchable)
E - End-of-Interval (EOI) Contact Output
G - Ethernet Communications Card 100/10Base T, Internal for Billing Register Data Port
G option with H and U1, U2, or U3 option provides a second separate network Ethernet connection
H - Ethernet Communications Card 100/10Base T, Internal for SCADA Port
H option with U1, U2, or U3 option provides multiport simultaneous Billing and SCADA Port communications
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 (N - for 1 Pulse Input)
Q - SCADA/EMS Real-Time Port with DNP 3.0 and Modbus RTU Protocols; Selectable RS232/RS485
Q Option with U1 or U3 provides up to 4 Universal RS232/RS485 Serial Ports
R - RS232 Billing Register/Recorder Serial Data Port
S - RS485 Billing Register/Recorder Serial Data Port; Selectable RS232/RS485 with Q or U options
T - Telephone Modem, Internal 2400 Baud, Multi-Drop, Off-Hook Detection (Not available with U Option)
U1 - uCom Option w/ LTE Wireless Communications Module; Up to 4 Universal RS232/RS485 Serial Ports
U2 - uCom Option including LTE Wireless Communications Module only
U3 - uCom option Not including Wireless Module, and Up to 4 Universal RS232/RS485 Serial Ports

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

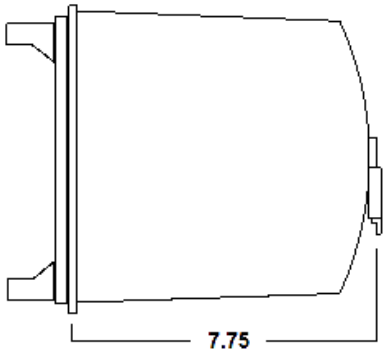
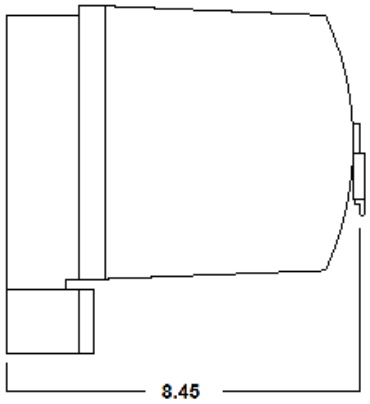


Figure 1.2: A-Base Meter



9.60 for Socket in A-Base Adapter

Figure 1.3: A-Base Meter Mounting Guide

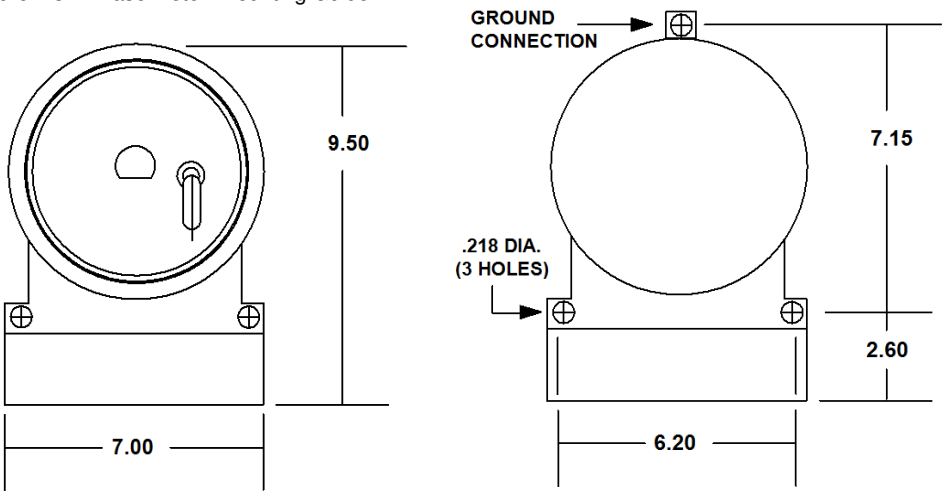


Figure 1.4: Short Switchboard Dimensions (“H” Case)

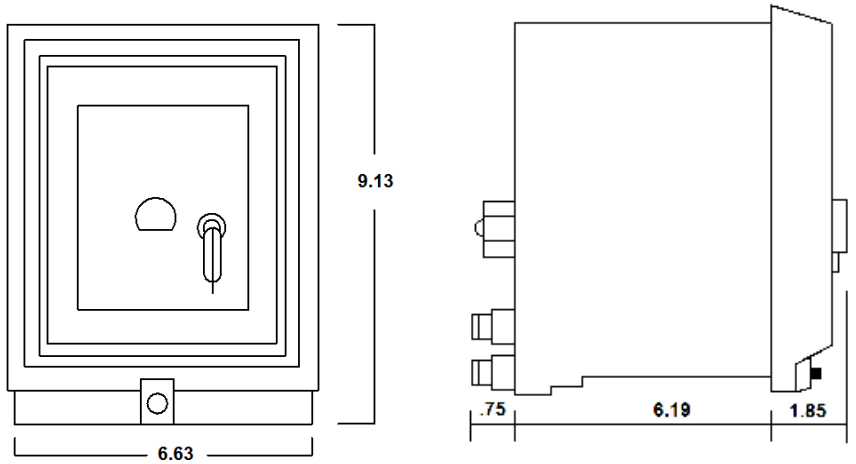


Figure 1.5: Short Switchboard Cutout (“H” Case)

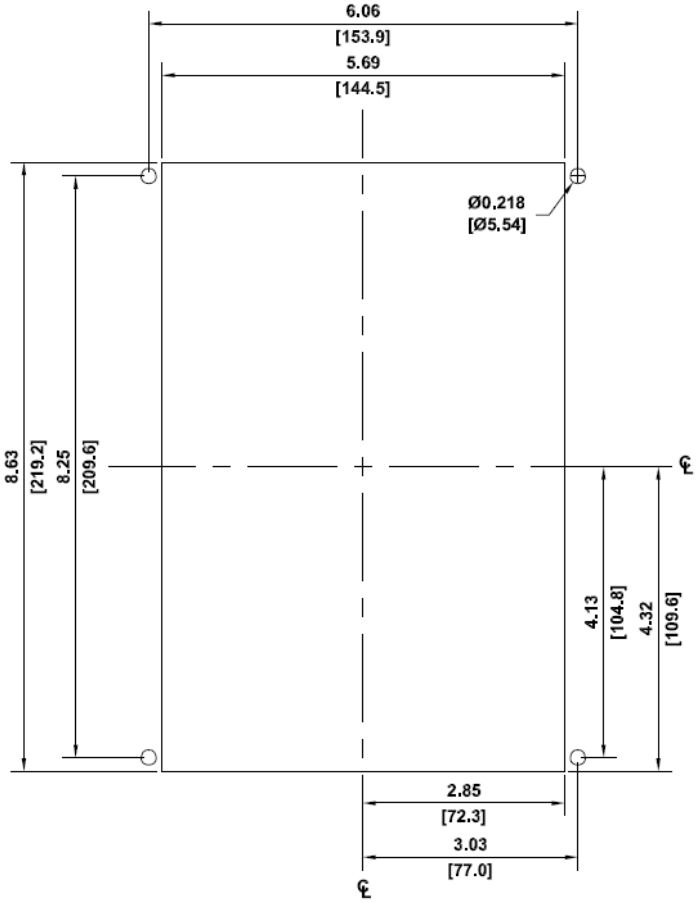


Figure 1.6: Surface-Mount Switchboard (“X” Case)

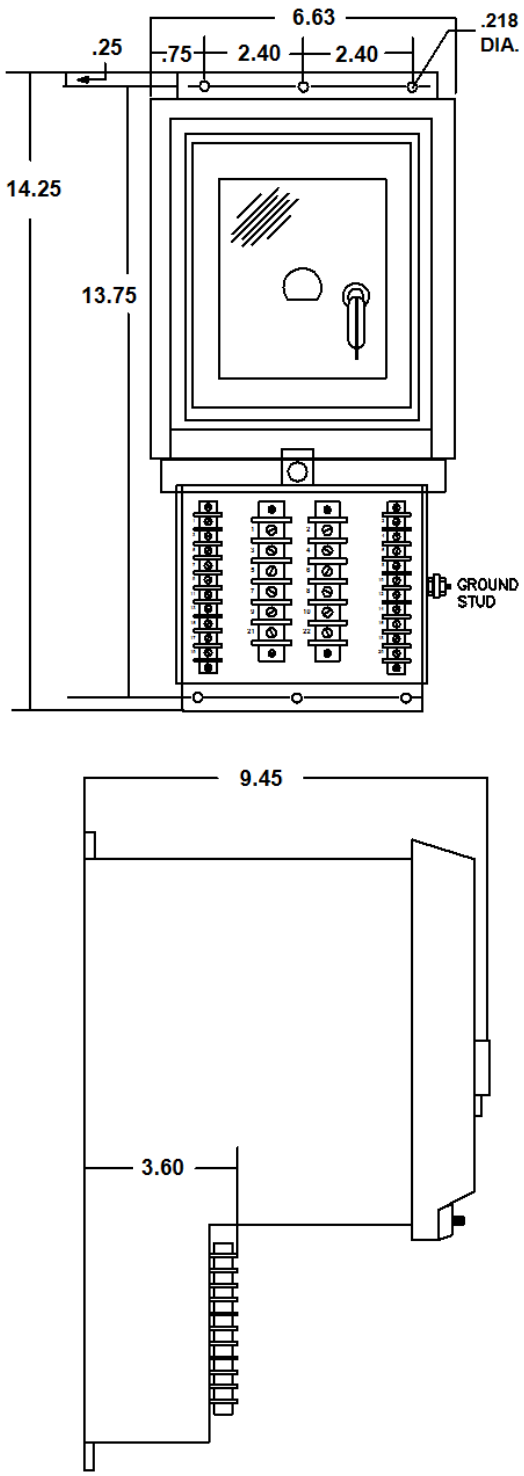


Figure 1.7: Tall Switchboard Dimensions (“J” Case)

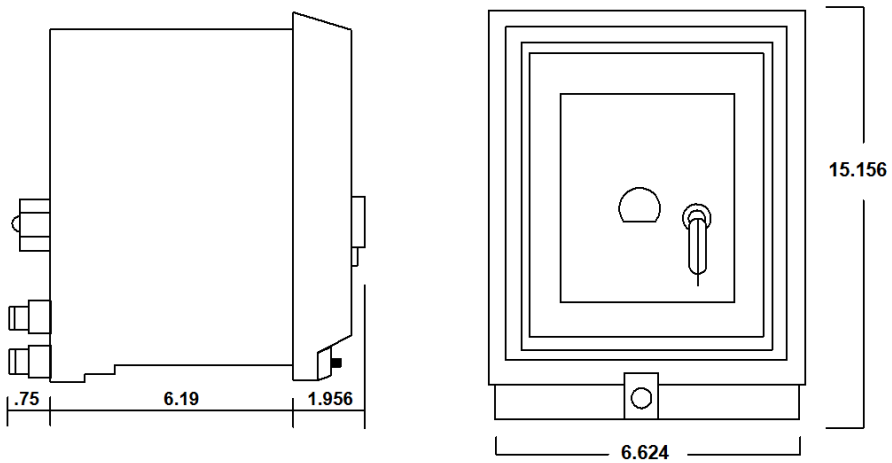
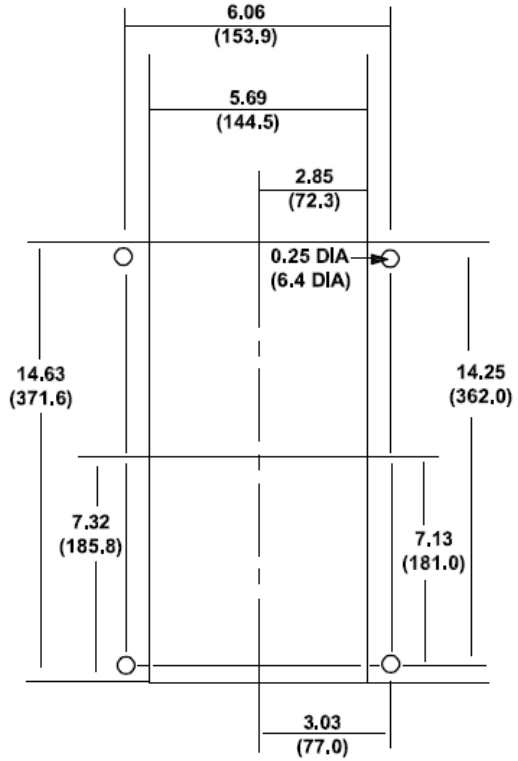


Figure 1.8: Tall Switchboard Cutout (“J” Case)



SECTION 2: INPUT WIRING DIAGRAMS

SOCKET METERS

Figure 2.1: Form 5S

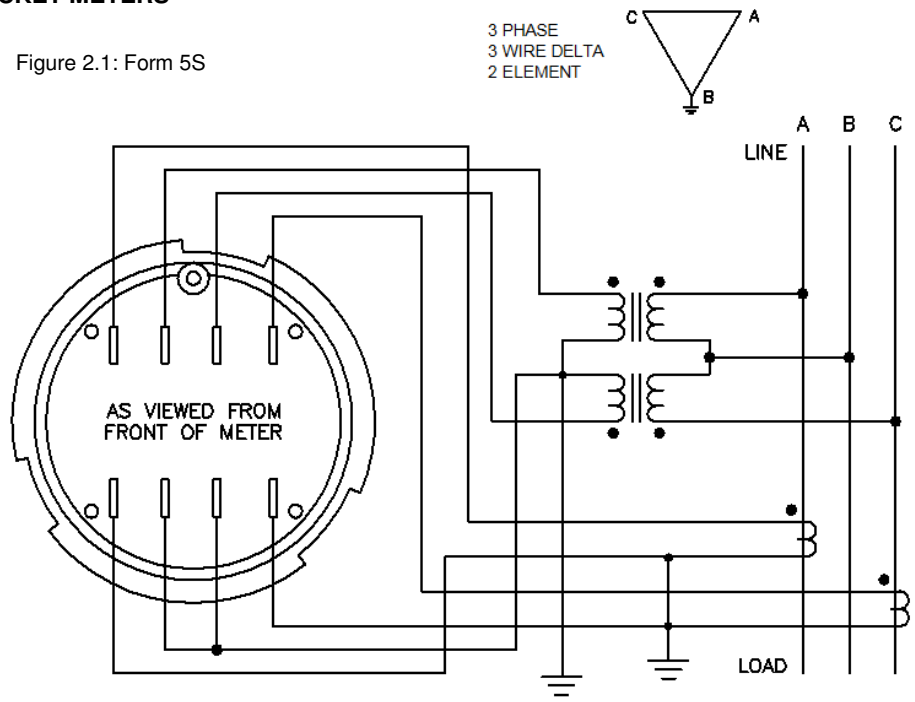


Figure 2.2: Form 6S

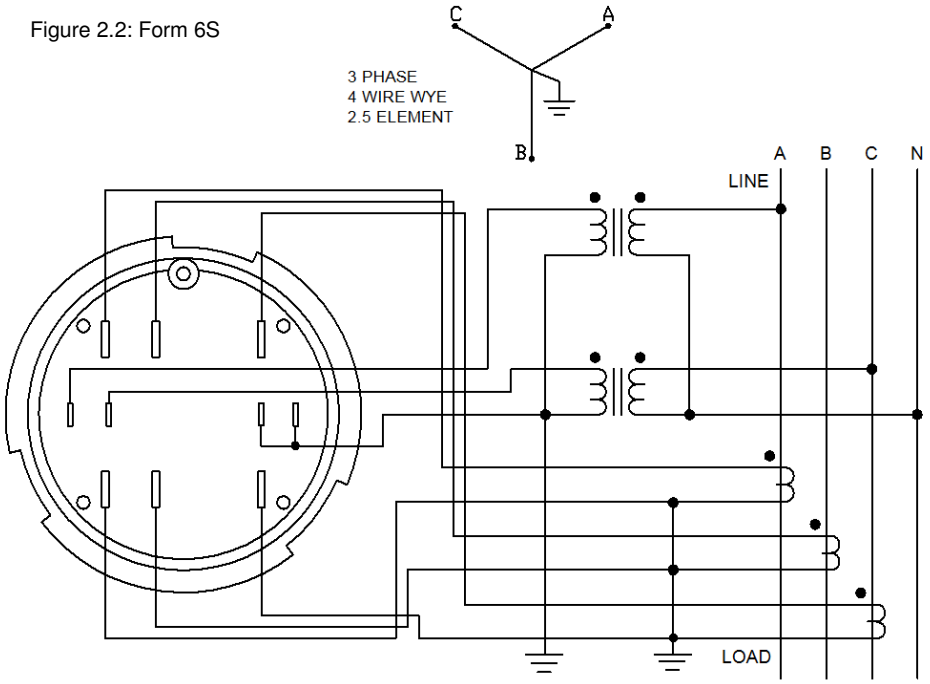


Figure 2.3: Form 8S

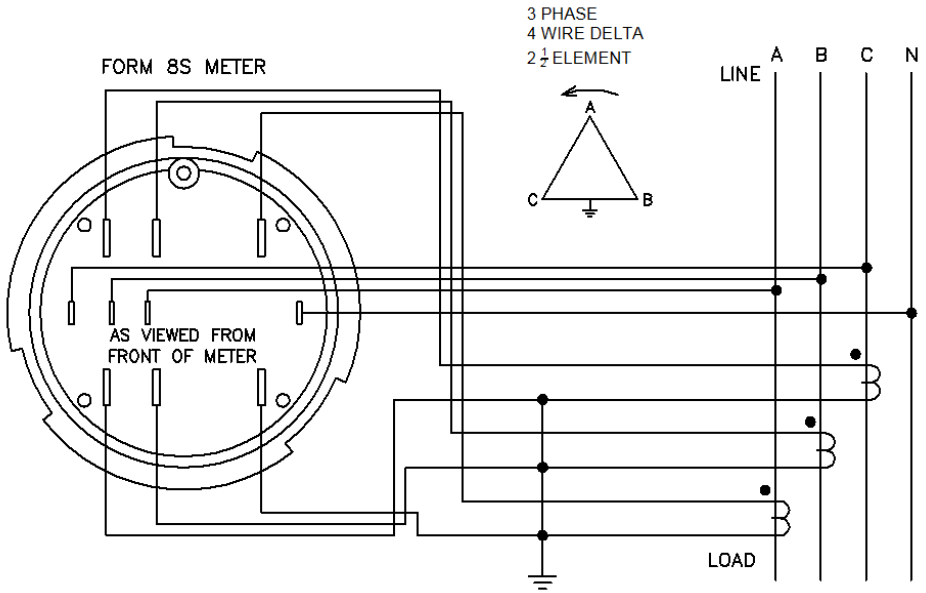


Figure 2.4: Form 9S

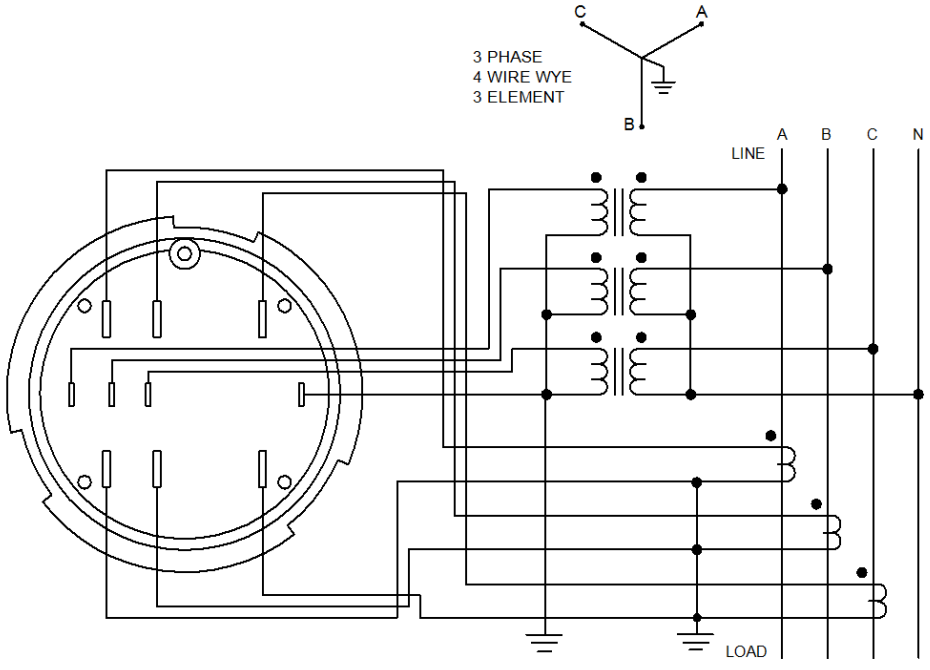


Figure 2.5: Form 5S with Auxiliary Power

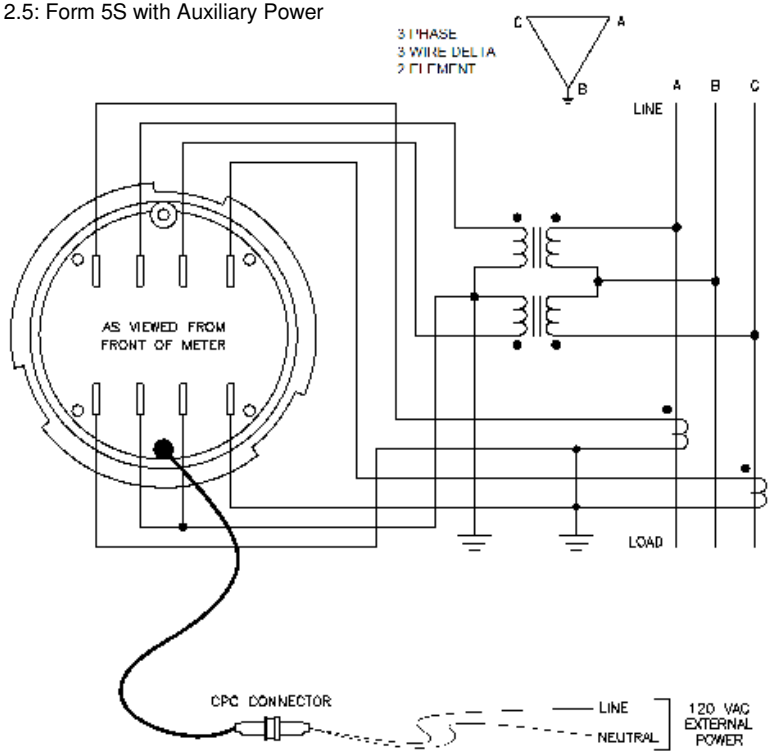
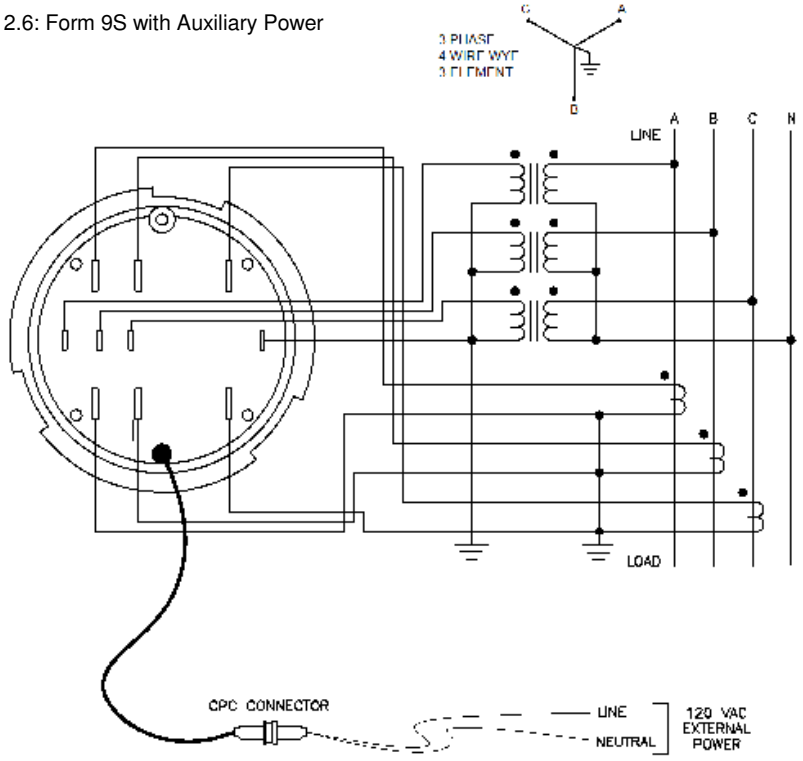


Figure 2.6: Form 9S with Auxiliary Power



A-BASE METERS

Figure 2.7: Form 5A

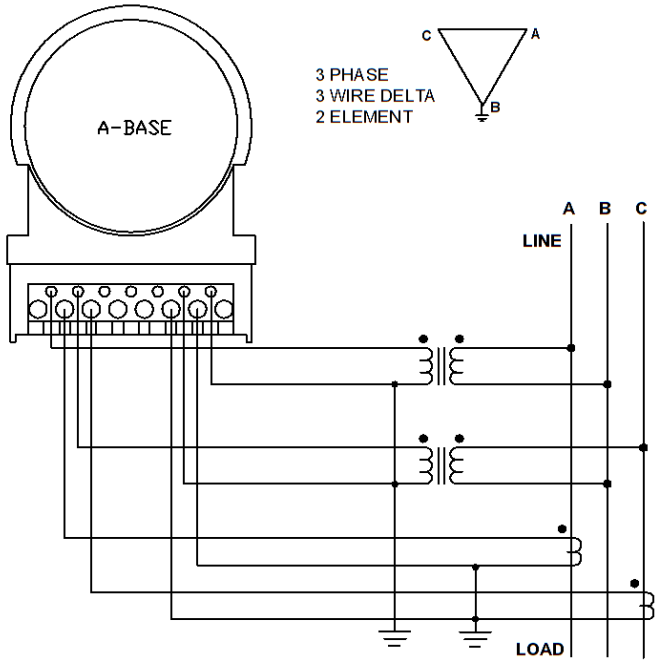


Figure 2.8: Form 6A

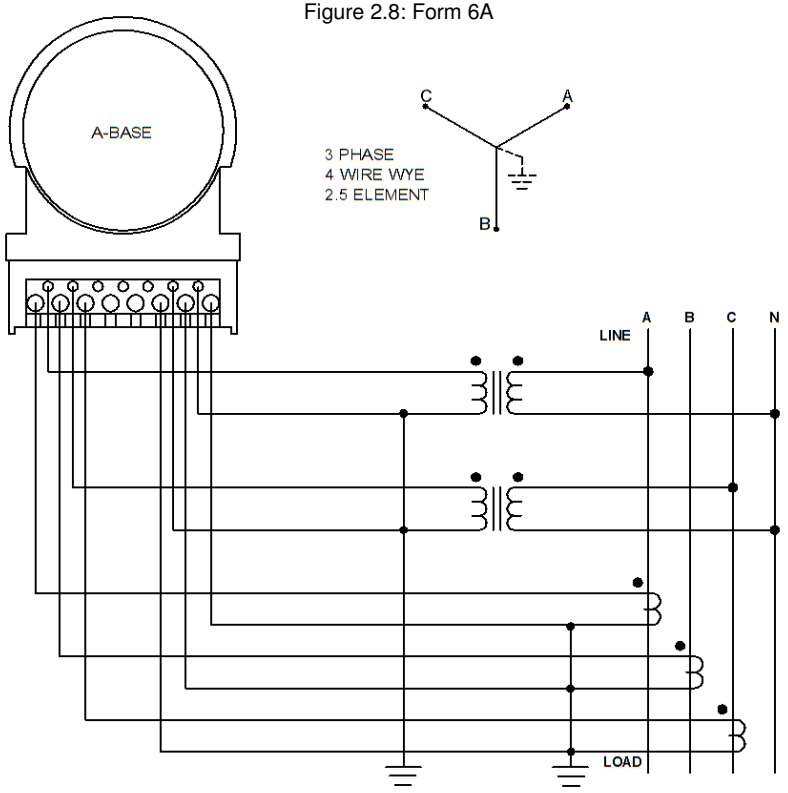
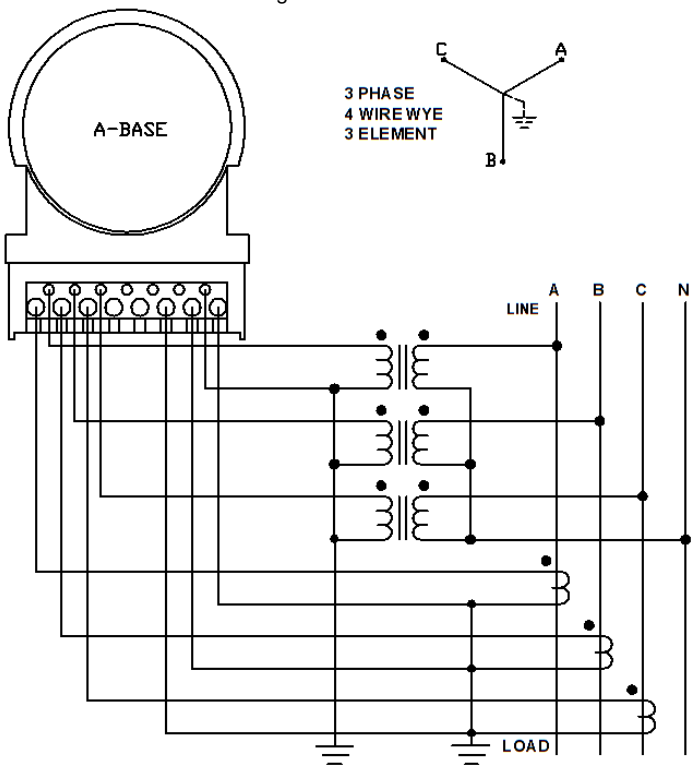


Figure 2.9: Form 9A



SHORT SWITCHBOARD METERS

Figure 2.10: Form 5H

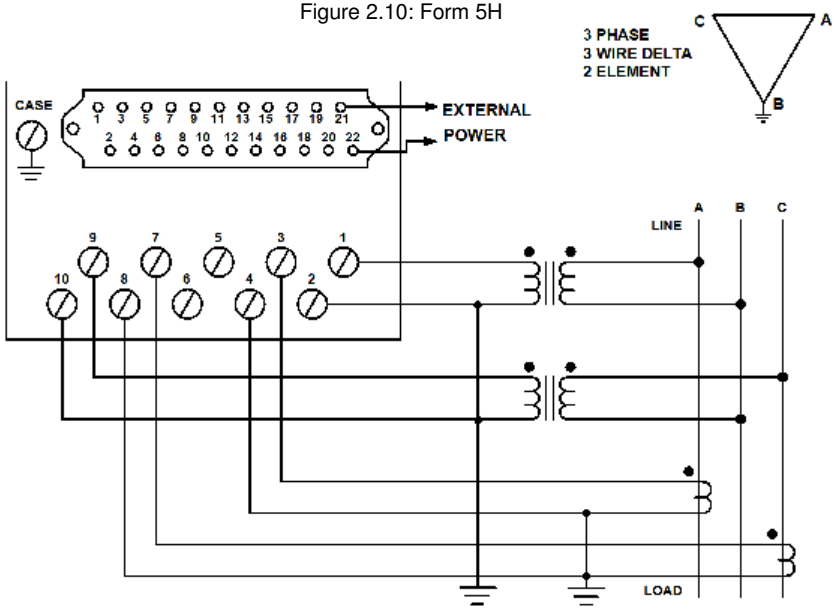


Figure 2.11: Form 6H

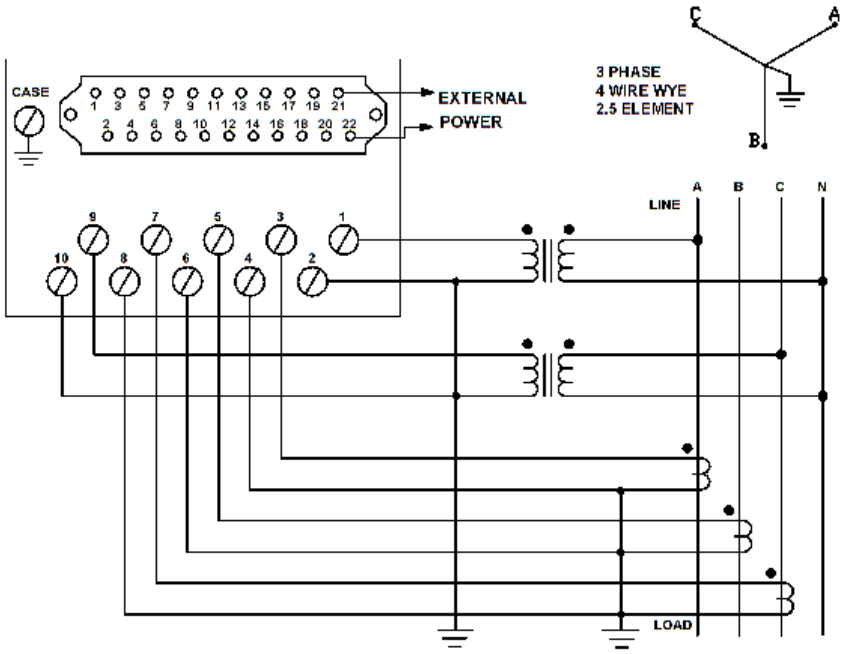
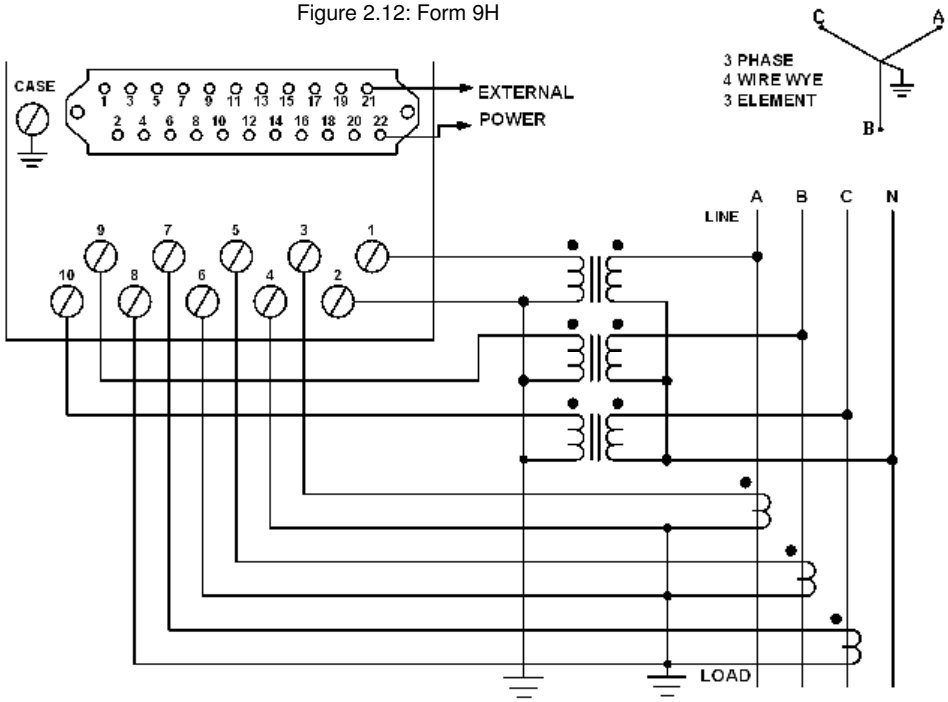


Figure 2.12: Form 9H



SURFACE-MOUNT SWITCHBOARD METERS

Figure 2.14: Form 5X

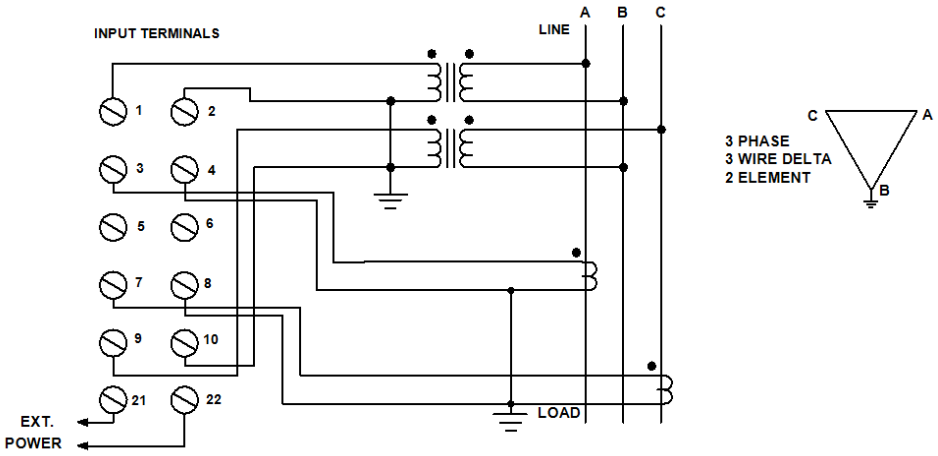


Figure 2.15: Form 6X

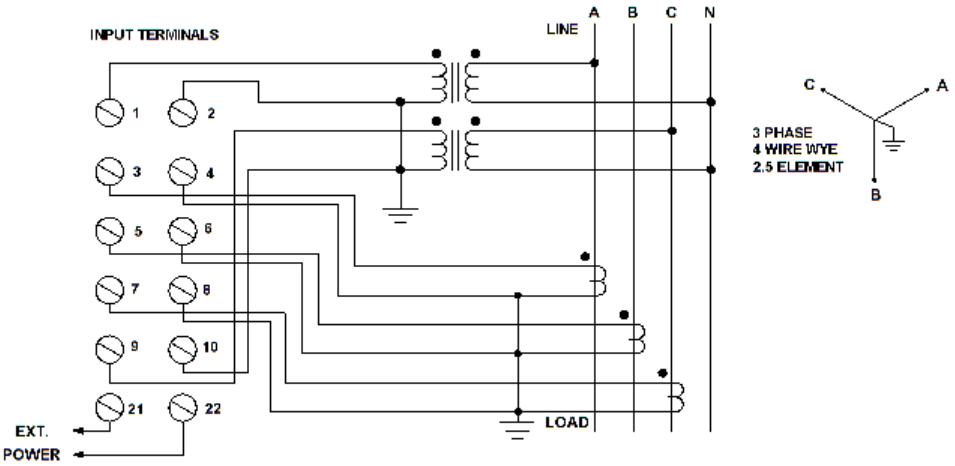
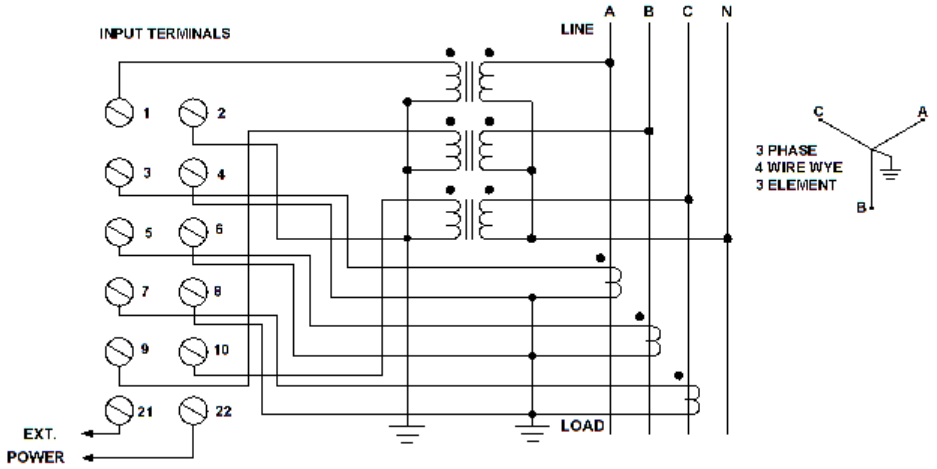


Figure 2.16: Form 9X



TALL SWITCHBOARD METERS

Figure 2.16: Form 5J

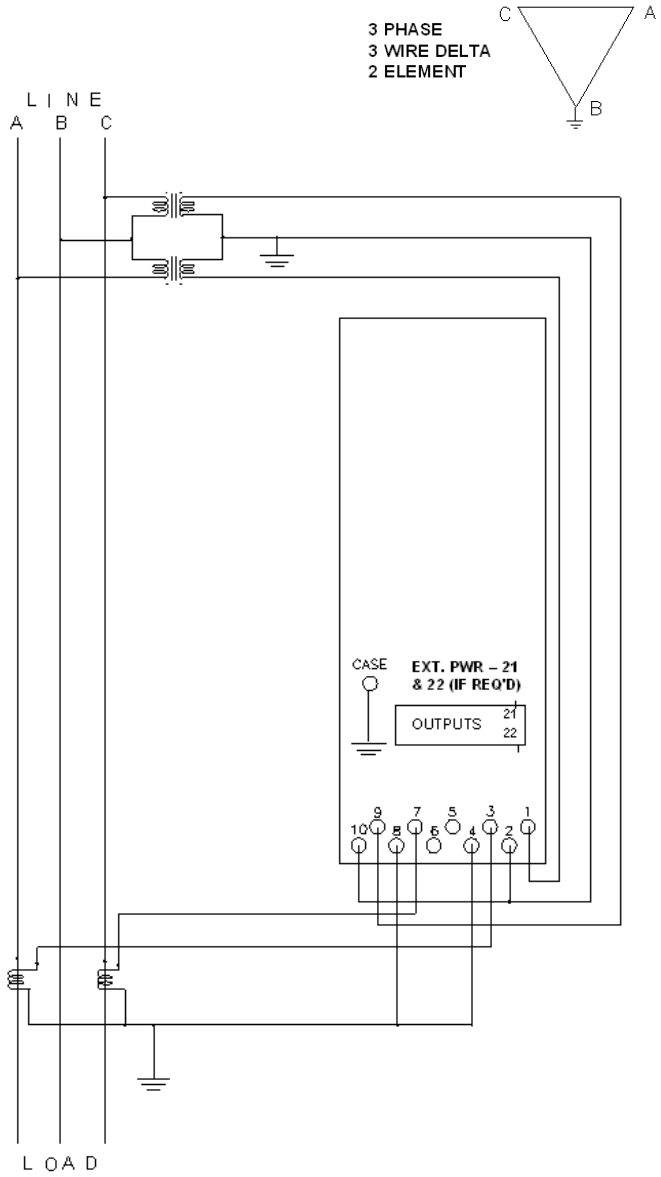


Figure 2.17: Form 9J

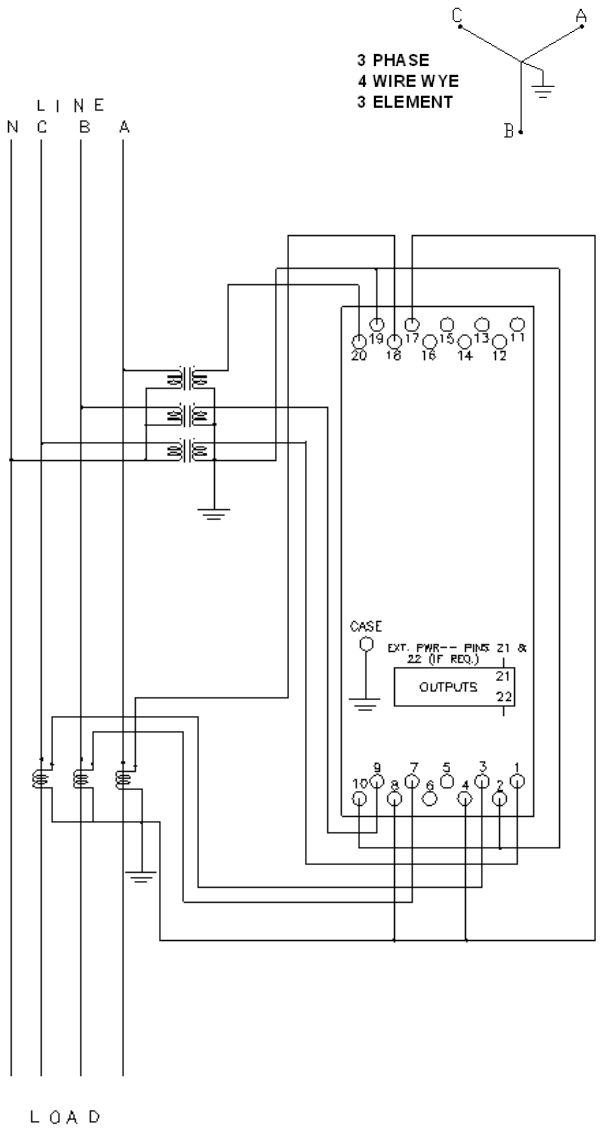
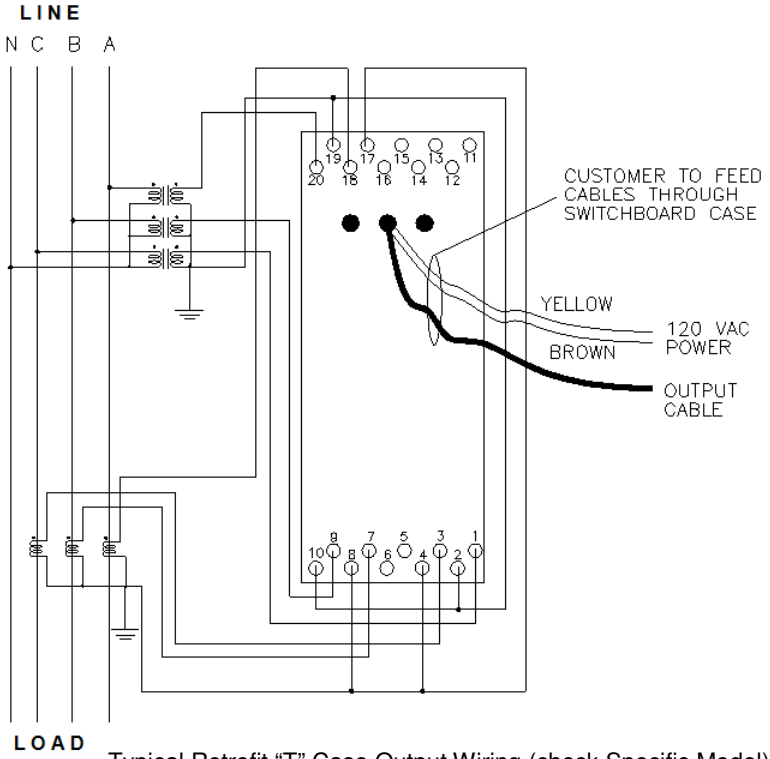


Figure 2.17: Retrofit “9T” Case



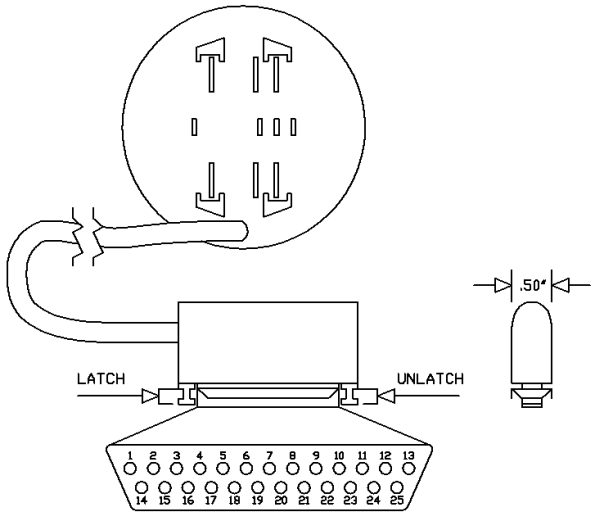
Typical Retrofit “T” Case Output Wiring (check Specific Model)

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: Typical Socket Meter Pigtail Cable Output Wiring (Check Specific Model)



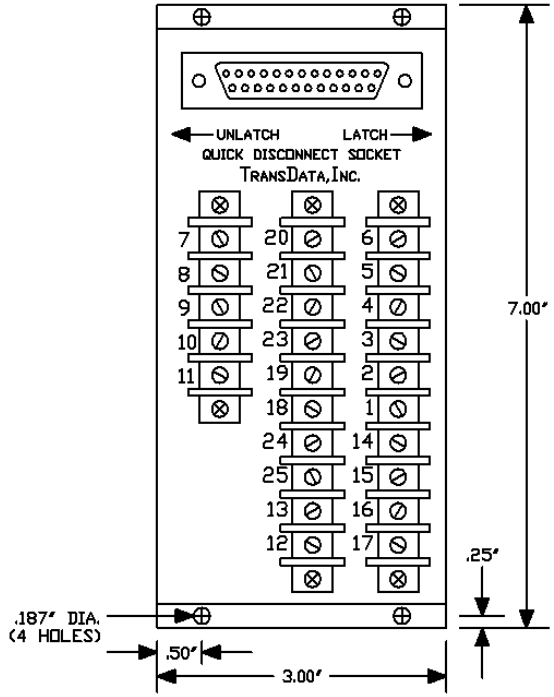
25 Pin Male D Connector Front View

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 (or COM1) RS232 RX
15	Y2		25	Register (or COM1) RS232 TX
3	K2	Relay 2	10	SCADA (or COM 2) RS232/485 RX (B/-)
16	Z2		23	SCADA (or COM 2) 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: Typical Quick Disconnect Socket Connections
Model QD-1 (Check for Specific Model)



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 (or COM1) RS232 RX
15	Y2		25	Register (or COM1) RS232 TX
3	K2	Relay 2	10	SCADA (or COM2) RS232/485 RX (B/-)
16	Z2		23	SCADA (or COM2) 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.

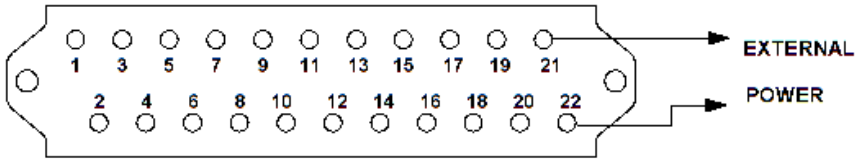
Note: The use isolation relays between control outputs and end equipment is recommended. Check the model number for optional outputs. Please consult the factory for other available output connections.

Figure 3.3: Typical Output Wiring for 61A146 Cable
(Check for Specific Moels)

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 (or COM2) RS232 RX, RS485 B(-)
11	Blue/Red	Ground
12	Green	Modem Ring
13	Orange/Red	Register (or COM1) 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 (or COM2)RS232 TX, RS485 A(+)
24	Red	Modem Tip
25	Black/Red	Register (or COM1)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: Typical Switchboard Output Wiring (Check Specific Model)



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 2.13: Form 8H

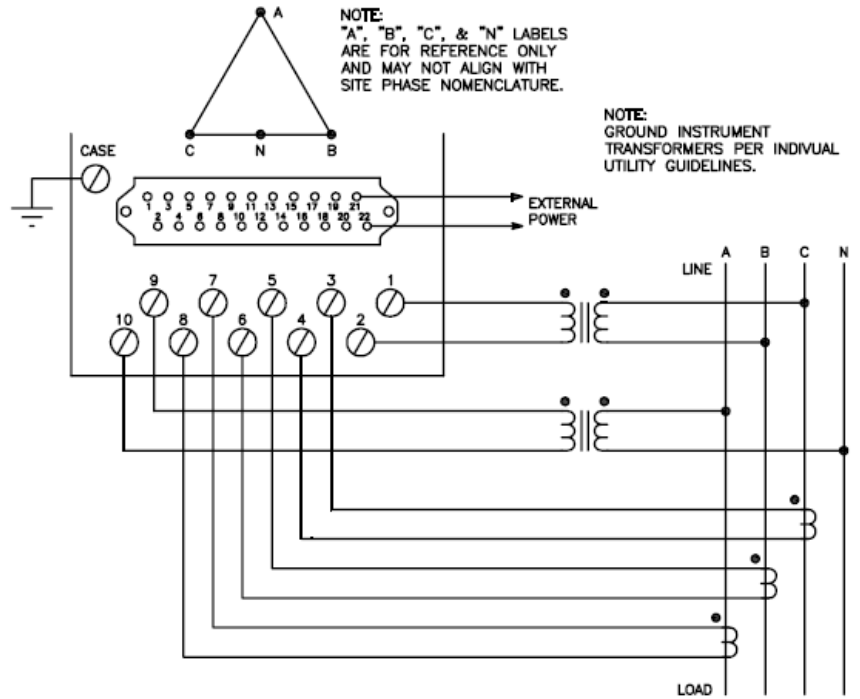
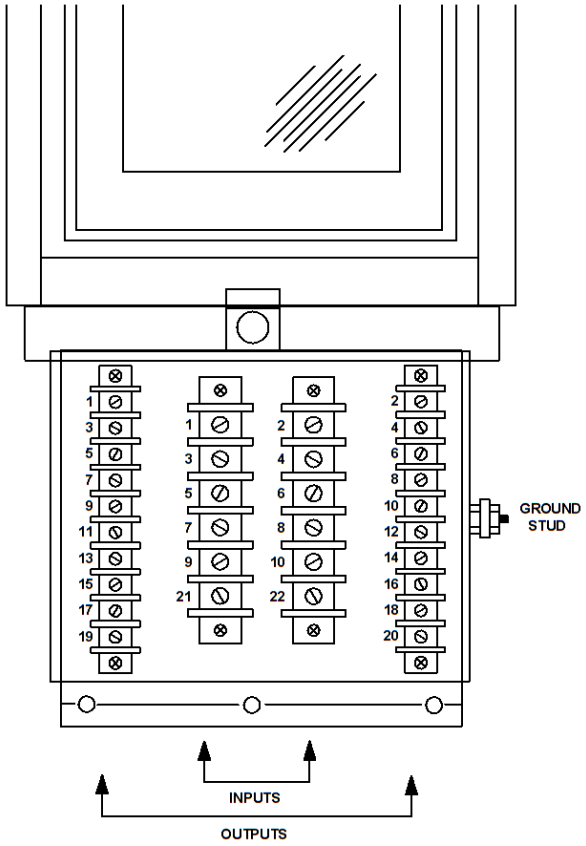


Figure 3.5: Typical Surface-Mount Switchboard Output Wiring (Check Specific Model)



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.

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