Vision Meter Family
User's Manual

i-meter®

Innovative Metering Solutions

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1125 Squires Beach Road, Pickering, ON, L1W 3T9 • Tel: (905) 839-9199

Introduction

The Vision Meter Family consists of a variety of single phase and poly phase meters with network connectivity options. Meters can be ordered to include either Data on Demand ™, Airpoint ™, or both hardware options. All Vision meters are programmed through the Vision 20/20 software which is included in all Vision meters. All meters are designed with a lifetime to exceed 20 years, meeting or exceeding ANSI standards, using digital measurement technology.

1. Product Description

The Vision Metering family of meters includes single phase (ST) meters and poly phase (XT) meters. The meters are configured to the customer's specifications within a tolerance of (+/-0.15%) from the factory, ensuring a smooth installation process and accurate measurement. Also standard is the ability to complete delivered, received, and net metering.

1.1 ST Single Phase Meter

The standard (ST) model meter has been designed with cost in mind, yet considers upgradability by offering features that can be added on at a later date.

The ST single phase meter can be configured for a number of options:

- Available in Form 1S, 2S, 3S, 4S, & 12S. Other forms are available upon request.
- Available in 120V, 240V, or 480V rated Voltage.
- Displays kWh, instantaneous demand, volts, and amperes
- Standard functions include Time of Use, Load Profile, Demand.
- Comes in Class 320, Class 200, 100, and transformer rated types.
- Optional 15 Year Battery
- Optional radio with Data On Demand or ERT transmission capabilities
- ERC and FCC/NTC Approved
- Customer Programmable (with Vision 20/20 software)

Vision ST

Figure 1

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1.2 XT Poly Phase Meter

The XT Poly Phase meter is equipped with the features present in the ST meter model with the following features in addition:

- Available in ANSI Forms:
  1S, 2S, 3S, 5S, 6S, 8S/9S, 12S/25S, 13S, 15S/16S, 35S, 45S
- Power Supply capable of handling 120V – 480V
- Optional KYZ output for additional pulse generation capabilities

The XT meter has been designed to accommodate all metering forms and to provide a platform for AMR/AMI manufacturers to add communication hardware as needed to the meter unit. Literature is available to assist customers.

Vision XT

Figure 2

1.3 Network Connectivity

The XT meter includes an internal HP RF radio that operates on the 900 MHz band transmitting SCM data. The ST and XT models can be ordered to include Airpoint high power automatic meter reading hardware.

1.4 Weight

The shipping weight for each type of meter is different and is as follows:

- Single Phase ST meter with Polycarbonate Housing
  - Single meter: 1.5 lbs
  - 4 meter box: 7.0 lbs
  - Pallet of 120: 229 lbs
- Polyphase ST meter with Polycarbonate Cover
  - Single meter: 2.0 lbs
  - 4 meter box: 9 lbs
  - Pallet of 96: 241 lbs

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- Singlephase XT meter with Glass Cover
  - Single meter: 2.4 lbs
  - 4 meter box: 10.6 lbs
  - Pallet of 120: 337 lbs

1.5 Temperature

Vision meters are specified to perform from -40° C to 85° C. The LCD may cease to function in adverse cold weather below -30 ° C, or excessive heat, above 80° C. Storage temperature should be between -40° C to 85° C.

1.6 Frequency

Vision meters can accurately measure energy associated with 50 Hz or 60 Hz electric systems. Operating frequency is set at the factory and must be specified when ordering the meter.

1.7 Catalog Information

The catalog displays information regarding the different meters included in the catalog through an alphanumeric code, as shown in ***Figure 3***.

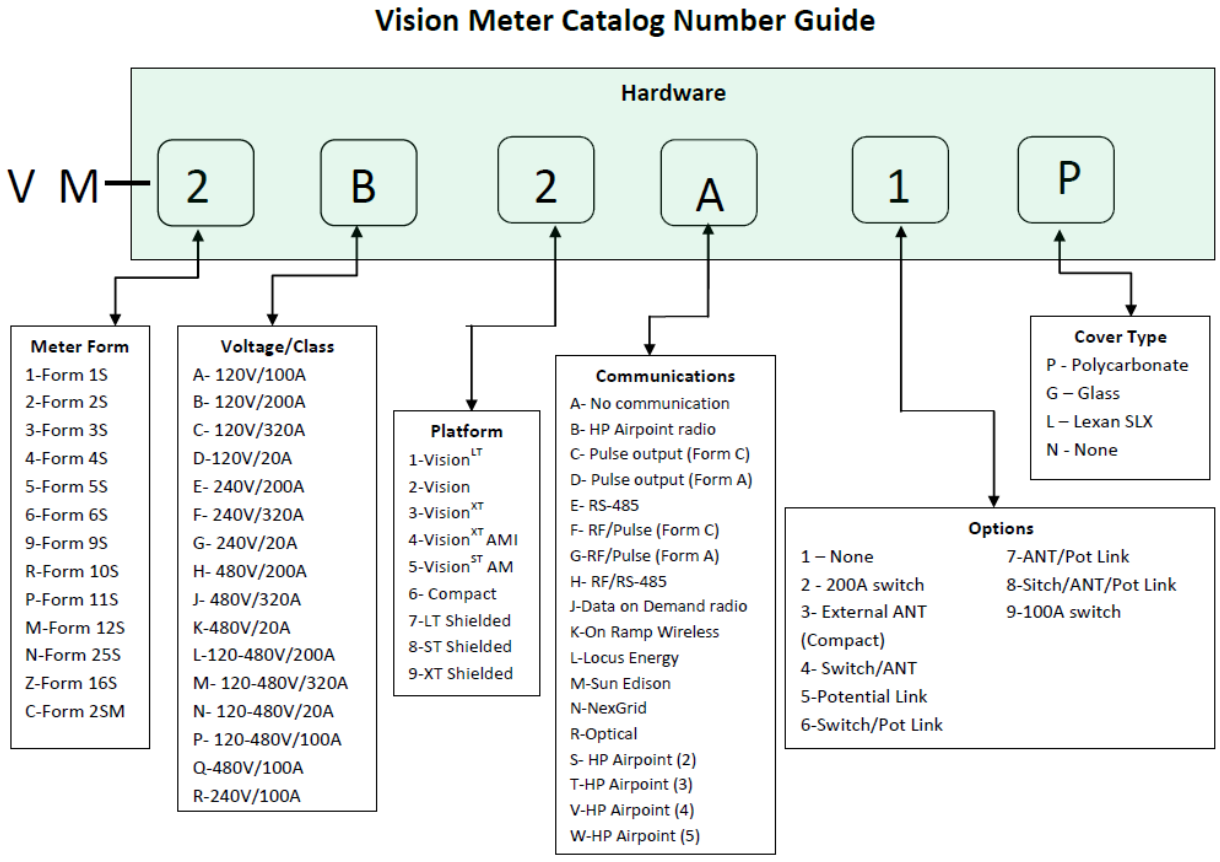

Figure 3

Note: Demand meters must be built on the Vision XT platform with a 120V-480V power supply.

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1.8 Operational Theory

The operations within the meter are explained as follows:

- The meter is driven by a microcontroller powered by a DC source drawing power from line voltage. An analog to digital converter is connected to before and after the current transformer to measure Watt-hours.
- The microcontroller stores accumulated data in the NVRAM and displays the data as programmed in Vision 20/20. This data is stored in RAM that is non-volatile, thus power does not need to be applied for the data to be retained.
- The LCD is powered through the microcontroller and displays according to the user's settings.

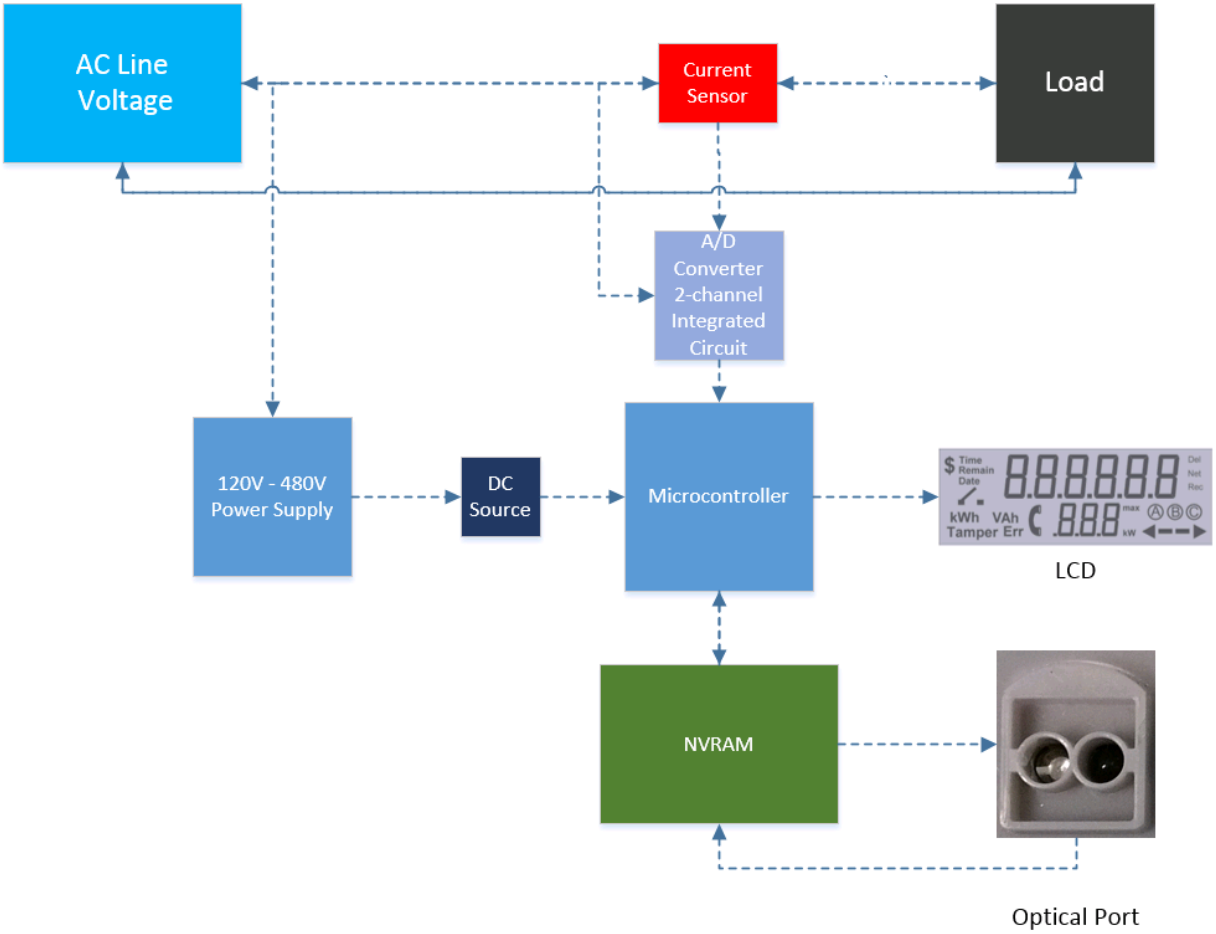

Figure 4

The block diagram in ***Figure 4*** shows the component interaction within the Vision family of meters.

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2. Installation

WARNING: The Vision ST and XT models contain dangerous levels of voltage. The meter should never be disassembled, exposure to electrical connections within an energized meter can result in serious injury or death.

Both the Vision ST and XT models come in a variety of ANSI standard forms. The physical dimensions of the ST and XT models are different, as are the features on the polycarbonate cover. The XT polycarbonate cover includes a turnkey feature that enables connection with the internal button interface without removing the polycarbonate protective housing.

2.1 Meter Installation

The installation of the Vision meters should be handled by licensed professionals. The meter is plugged into the meter socket jaws, engaging the terminals and connecting the meter to the grid. Refer to Section 6 for supplementary diagrams of the common ANSI electric meter forms.

Upon powering the meter, verify meter operations by checking the display. As shown in ***Figure 5***, the LCD display will energize.

Figure 5

As each meter is configured to the specifications provided by the customer, the meter settings will already be installed on the meter as tested at the factory. After installation and powering of the meter, the meter settings should be checked for proper operation of the meter. As shown in ***Figure 6*** on page 8, the front of the meter contains the optical port connection necessary for communicating with meter.

The LCD display meets or exceeds ANSI C12.1, C12.10, C12.20, C37.90.1 standards.

Note: Both an optical port and Vision 20/20 are required to read the meter settings. Refer to the Vision Metering website for a current version of the Vision 20/20 software as well as the associated user's manual.

Figure 6

Figure 7

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Attach the optical port as shown in ***Figure 7*** on page 8. Using the Vision 20/20 software, click **Read Meter** to transfer the data on the meter to the Vision 20/20 software. If the configuration screen in Vision 20/20 is populated with the correct test data, the meter can be concluded to be operating correctly.

3. Operational Instructions

3.1. Nameplate Information

As shown in ***Figure 6*** and in ***Figure 7*** on page 8, the nameplates have different layouts. Displayed on the front of the meter is the operating voltage, the current measurement class, the form type, the **Kh** value, and the test amperage value.

The nameplate information is displayed differently on the ST and the XT variants, though the information displayed on either nameplate is the same.

Figure 8

The nameplate information shown in ***Figure 8*** is as follows:

1. Power Supply Voltage Rating
2. Current Class
3. Watts used by the meter
4. Form Type based on ANSI C12.10
5. **Kt** value for one revolution, in Wh
6. Test Amperage Rating

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3.2. Display Information

The liquid crystal display (LCD) on the front of the meter can be programmed to display variety of values. On the top row of the display, the accumulated information is displayed. Both the accumulated and displayed information can be programmed using the included Vision 20/20 software. The ability to check if a switch is present in the meter is also included in the Vision 20/20 software suite.

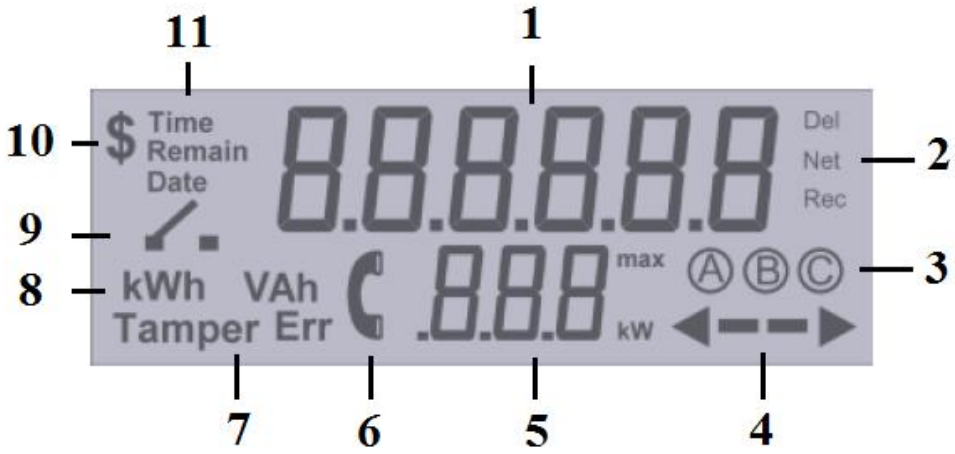

Figure 9

As shown in ***Figure 9***, the LCD displays a variety of information:

1. The main six digit display shows the programmed data as set in Vision 20/20
2. Operating Mode indicator
3. Phase Letter indicator
4. When displayed, the arrow to the right indicates energy is being delivered to the load, the arrow to the left indicates the customer is generating energy to the grid. This set of four symbols is also used to emulate a Watt-hour disk unit.
5. Max Demand displayed in kW
6. Phone Symbol – When displayed, indicates that communication is in progress. If icon is constant, indicates transmission of data, if blinking, indicates data loss.
7. Tamper error indicator
8. kWh/VAh mode for six digit segment
9. Switch Open indicator – if blinking, indicates a switch failure
10. Dollar Sign – Not Used
11. Time Display Settings

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3.3. Accumulation Modes

Accumulated information can be set to display the following modes:

Net Metering (Delivered – Received):
The Net Metering mode measures both the delivered and received power and takes the difference. This mode is most appropriate for renewable energy generation provided by a grid connected customer that draws more power than generated.

Delivered Only:
The Delivered Only mode allows only the power delivered to the customer to be recorded. This mode is the most common metering mode on residential systems. It is anti - tampering mode as well. If power is flowing in received direction, meter will also record it as delivered.

Received Only:
The Received Only mode allows only the power delivered from the customer to the grid to be measured. This mode is most appropriate when the customer has a large generation facility with no demand.

3.4. Instantaneous Power

When enabled in the display settings, the lower three digit display will display the instantaneous demand experienced by the meter. Decimal location and demand range can be set by changing the Precision Settings using Vision 20/20 software.

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4. Maintenance

4.1. Test Procedures

All Vision Meters are equipped with a Light Emitting Diode (LED) and a phototransistor for ensuring proper calibration of the meter according to ANSI standard C12.20. The infrared LED emits pulses indicating kWh accumulation. Each pulse represents **Kt**, measured in Wh of energy accumulated by the meter. An optical probe and the associated driver is required to communicate the pulse information from the optical port to the connected computer.

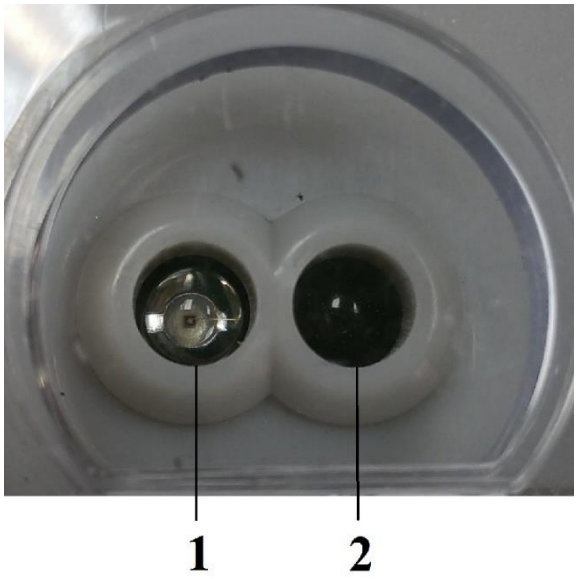

Figure 10

Figure 10 shows the Optical Port, showing both the LED and the Phototransistor in the configuration present on all Vision Metering optical ports:

1. Infrared LED
2. Phototransistor

Testing of the meter unit involves reading test data fed to the meter, which if the meter operates correctly, should be read with the desired accuracy to the Vision 20/20 software.

Emulation of a disk analog system is accomplished using the symbol in the bottom right corner of the LCD as shown in ***Figure 11*** on page 13. The emulation procedure consists of blinking the various sections of the symbol to show that a revolution has occurred. The 10-step emulation procedure is shown in ***Figure 11*** on page 13.

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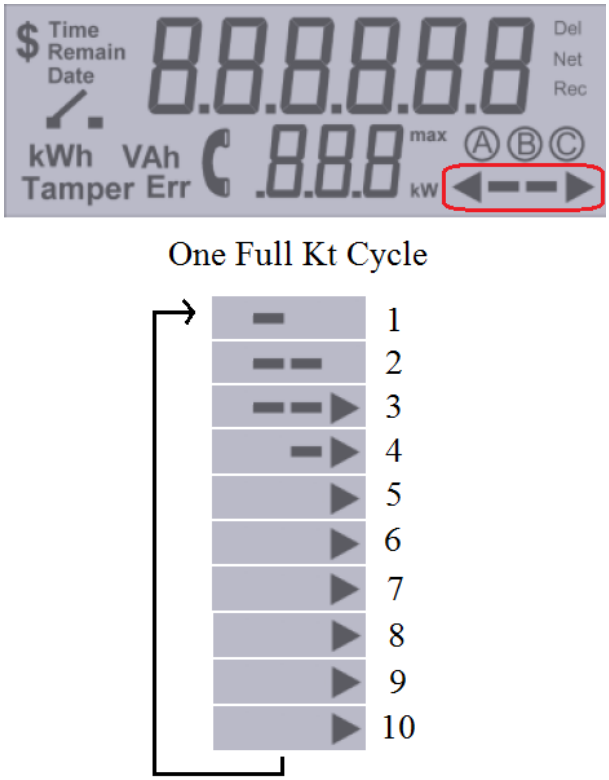

Figure 11

The emulation procedure starts as soon as load is applied. It is preferable that this load be well known and constant for the test procedure. The disk emulation is completed by timing the full cycle for Kt. For higher accuracy, increase the number of cycles per test.

A general testing procedure for disk emulation of electric meters is listed below:

1. Record the Kt value recorded on the nameplate of the meter.
2. Select the desired voltage and current on test equipment, ensuring the device ratings are within the range of the desired specifications.
3. Install the meter to the test socket, ensuring the correct form socket is selected
4. Attach the optical probe to the optical port.
5. Using standard test procedure, begin testing after 15 seconds so the demand is stabilized.
6. To ensure accurate measurement, establish a minimum of 30 seconds test time to reduce human error caused by the imprecise start and stop times.
7. Compare the values given from the test to the values displayed on the unit. If the values are within a reasonable error margin, the meter can be concluded to be working properly.

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4.2. Service

Vision Meters are calibrated at the factory and do not require any maintenance. If there are issues with the meter, contact Vision Metering for assistance.

4.3. Storage

Vision meters are durable devices, yet they should be stored with care. Extreme temperature and humidity levels should be avoided during storage.

4.4. Troubleshooting

Troubleshooting of Vision Meters is accomplished by reading the error codes given by the meter and performing the correct repair procedures. The complete table of error codes and the required actions, is given in the table on pages 13-14.

Name	Code	Display Blocking	Cause	Required Action
ERR_UNPROGRAMMED	001	No	Meter is not programmed or in a factory default state	This error is set when firmware takes default setting data during initialization after power was up.
ERR_CONFIG	002	Yes	Meter detected a configuration error	Currently not supported by meter
ERR_SELFCHK	003	Yes	Meter detected a self-check error: Meter tried to recover reading data from backup memory after power was up and did not found any good records	Reset the meter.
ERR_RAMFAILURE	004	Yes	Meter detected a RAM Memory failure	Currently not supported by meter
ERR_ROMFAILURE	005	Yes	Meter detected a ROM Memory failure	Currently not supported by meter
ERR_NONVOLMEMFAILURE	006	Yes	Meter detected a non-volatile memory failure. Meter tried to save reading data in the EEPROM memory unsuccessfully.	Call to the manufacturer if this error has not gone after 5 minutes.
ERR_CLOCK	007	No	Meter detected a clock error	Currently not supported by meter
ERR_MEASUREMENT	008	Yes	Meter detected a measurement element error	Currently not supported by meter
ERR_LOWBATTERY	009	No	Meter detected a low battery error	Replace the battery
ERR_LOWLOSSPOTENTIAL	010	No	Meter detected one of the device potential that is below a predetermined	Check the meter connection to the network.

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			value.	Check if the meter form-factor settings matches the faceplate label.
ERR_DEMANDOVERLOAD	011	No	Meter detected a demand threshold overload	Currently not supported by meter
ERR_POWERFAILURE	012	No	Meter detected a power failure. Power register in the computation engine was corrupt	Cycle meter power. Call to the manufacturer if this error has not gone.
ERR_TAMPERDETECT	013	Yes	Meter detected tamper activity. Used on meters with the tamper sensors	Reset the tamper flag.
ERR_REVERSEROTATION	014	No	Meter detected reverse rotation	Currently not supported by meter
ERR_RADIO	101	Yes	Meter detected an error in the radio chip. Used on meters with the radio communication	Cycle meter power. Call to the manufacturer if this error has not gone.
ERR_POWERSWITCH	102	No	Meter detected a power switch error. Used on meters with the connect/disconnect switch. Can be switch board or switch malfunctioning	Replace switch board or power switch
ERR_NOTCALIBRATED	103	No	Meter is not calibrated	Calibrate the meter

5. Diagrams

The physical dimensions of both types of meters are shown below. It may be desired to acquire more information about the different types of form standards, it is recommended to reference a reliable source for this information. Refer to meteringforlinemen.com/diagrams for sample information about ANSI form standards.

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5.1 ST Single Phase Meter

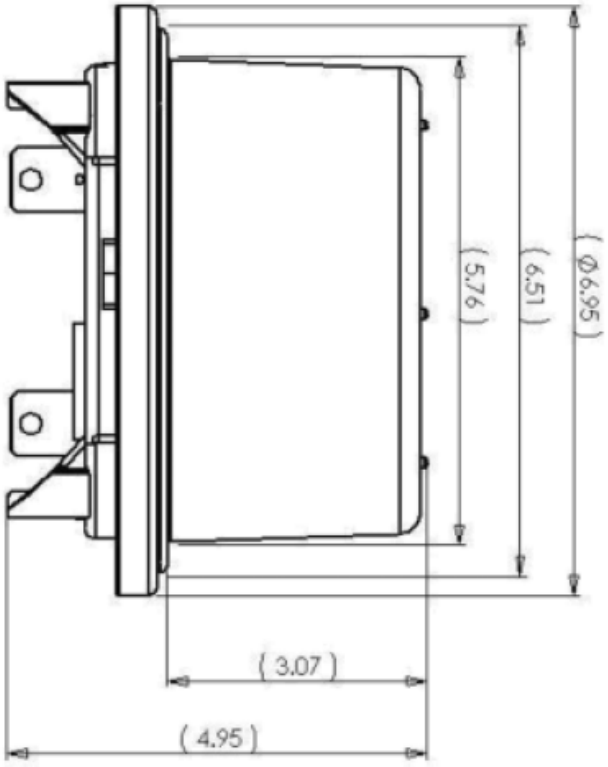

Figure 12

The ST single phase meter has a different physical layout than the XT model. The ST series of meters do not have as many features available and the exterior housing reflects the difference. ST meters are available in both polycarbonate and glass housing types.

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Figure 13

5.2 XT Poly Phase Meter

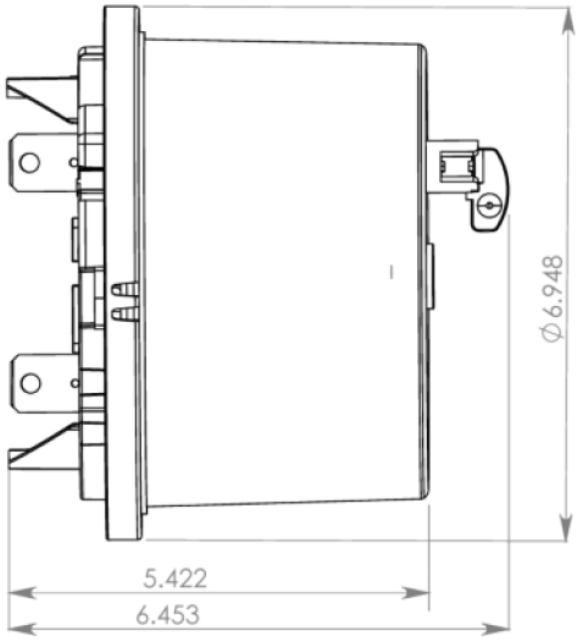

Figure 14

Figure 15

The XT series meters have a different layout which includes an external switch to select the settings for the meter. The XT series are readily available only in a polycarbonate housing. To obtain an exterior housing in glass on the XT meters, a custom order must be made, contact Vision Metering for custom orders.

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6. Supplementary Information

6.1. ANSI C12.10 Internal Connections

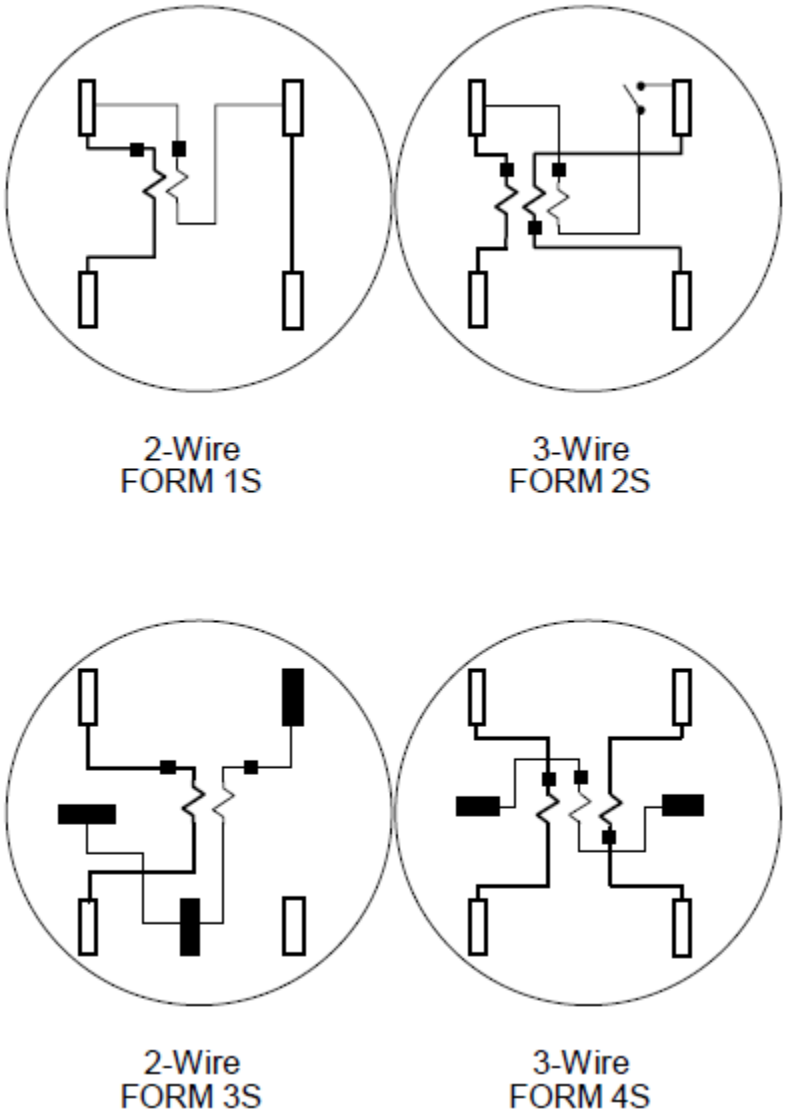

Figure 16

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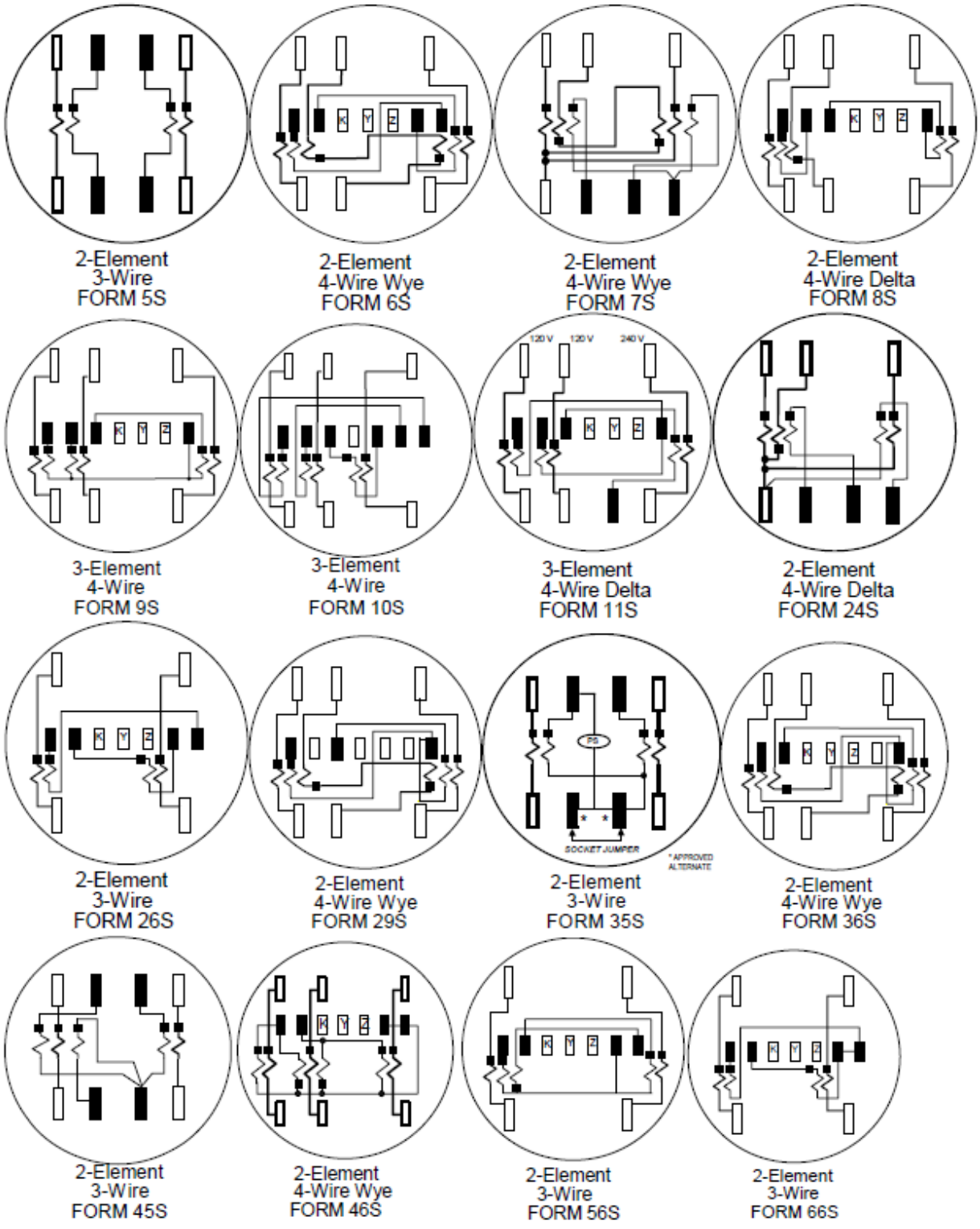

Figure 17

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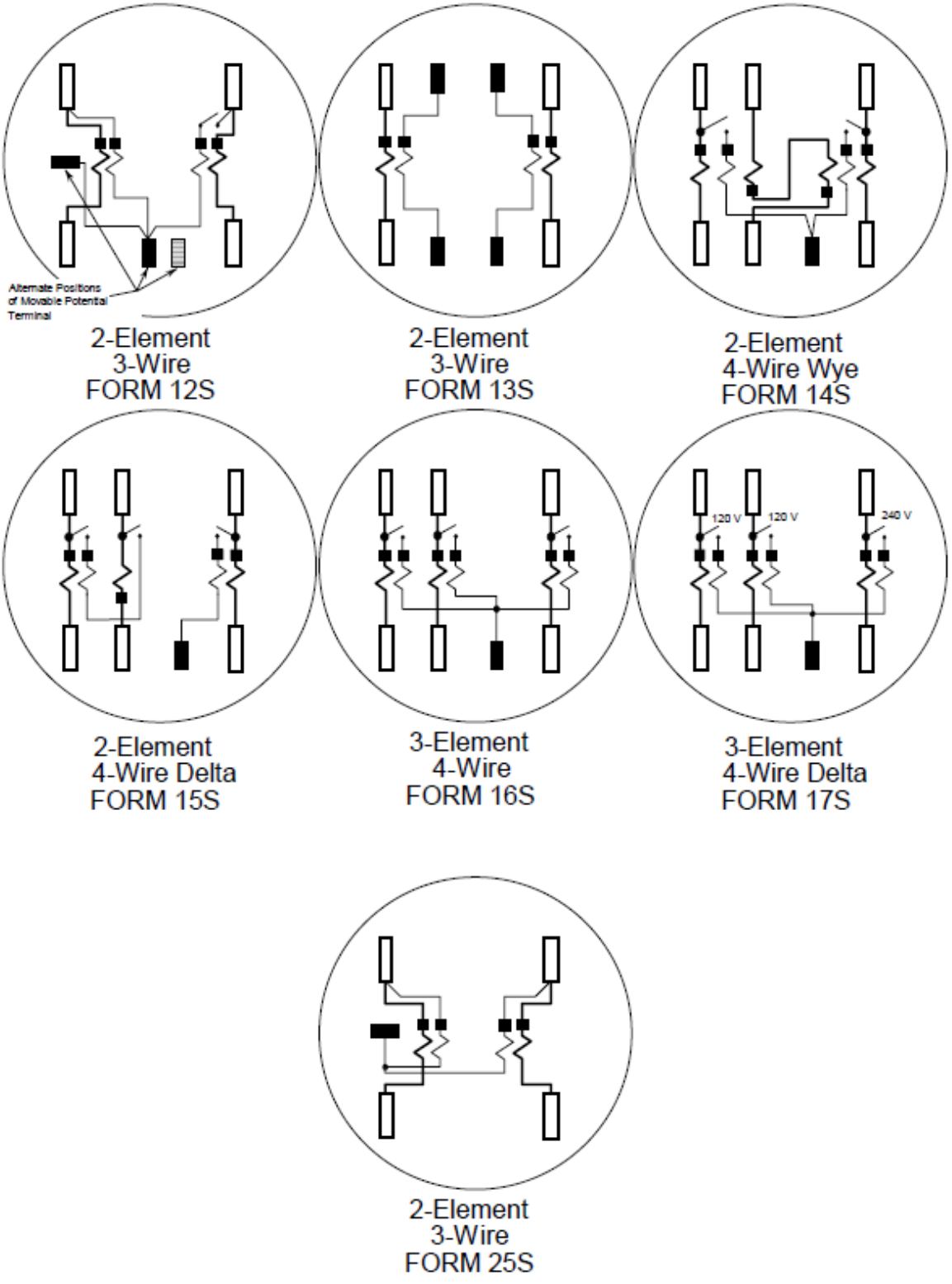

Figure 18

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