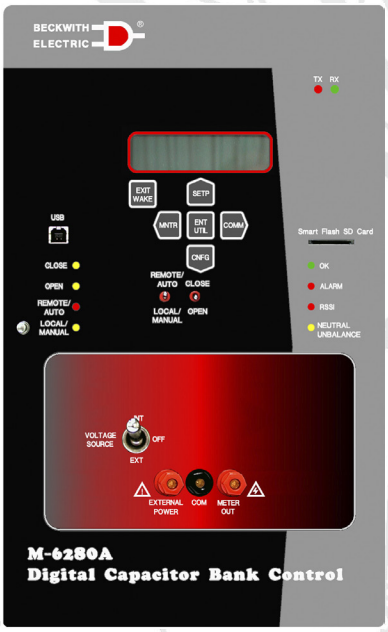
BECKWITH ELECTRIC®

CONTROLS

Capacitor Bank Control M-6280A



Digital Capacitor Bank Control for Remote Capacitor Automation, Monitoring and Protection

Control

- Universal control offering automatic Voltage, VAr, Current, Time (seasonality) or Temperature operation with programmable voltage override
- Compatible with traditional VT's and Line Post Sensors
- 8 Setting profiles with programmable automatic or SCADA controlled profile switching
- Patent pending neutral current detection algorithm

Automation/Communications

- Front panel USB port for local programming and data transfer
- Smart Flash SD Card Slot for Quick Uploading of Configurations, Settings, Firmware Upgrades, and Supports Control Cloning
- Flexible Communication Options for Wired or Wireless Networks with two independent serial ports (232, 485, Fiber or Bluetooth)
- Optional full 10/100 Mbps auto-sensing, auto-negotiable true Ethernet (copper or fiber) port with multi-user and multi-protocol support
- Protocols supported include MODBUS, DNP3.0
- Full DNP implementation with support for read/write of digital and analog values, file transfer, multicasting, unsolicited response, monitoring and remote control
- Compatible with most popular Volt-Var Optimization (VVO) and Conservation Voltage Reduction (CVR) implementations
- Embedded Cybersecurity features to implement NERC/CIP v5 requirements, including IPsec and RADIUS server security
- Meets IEEE 1686 Password Requirement

Monitoring

- Advanced metering with integrated Power Quality monitoring including voltage and current harmonics up to the 31st, THD, detection of sags, swells and sub-synchronous transients
- Advanced Data Logging and Load Profile Recorder – Data stored in non-volatile memory requiring no battery backup
- 132 Event Sequence of Events (SoE) Recorder
- Oscillographic records with adjustable sampling rate up to 64 s/c

CapTalk

- Uncomplicated Windows based application software for easy local or remote programming, monitoring, operation or downloading of recorded information

Flexibility

- Optional M-2980A Control Cabinet offers a wide range of Pole top mounting options and accessories for communication hardware

HUBBELL®

Standard Features

- Seven control modes of operation:
  - Classic Automatic (Voltage, optional VAr Control or optional Current Control)
  - Autodaptive® Classic mode (Fixed or Averaging)
  - Autodaptive® Enhanced mode
  - Remote
  - Manual
  - Time Control (in CapTalk only)
  - Temperature Control (in CapTalk only)
- Two override modes of operation:
  - Temperature
  - Time (Classic or Enhanced)
- Time Delay – Definite and Inverse
- Adjustable Maximum/Minimum Voltage Limits
- Neutral Unbalance current detection
  - Bank/Switch Failed
  - Bank Closed
  - Bank Open
  - Supports 200 mA input to control
- Setpoint Profiles (8) Triggerable by SCADA, Seasonal (4), Above/Below Temperature, and Reverse Power
- Compare Settings Tool
- User selectable Overvoltage limit/Undervoltage limit and time delay for remote control supervision
- Adjustable warning timers for Close/Open/Re-close
- Adjustable Close/Open output pulse duration
- Real-Time Metering of measured and calculated parameters
- VT Ratio Correction, VT and CT (Phase and Neutral) Multiplier
- Operations Counter (Configurable)
- Resettable Operations Counter with Alarm
- Harmonic Analysis of Voltage and Current Signals, up to the 31st plus THD
- THD Voltage and Current Tripping and Lockout
- Data Logging
- Remote/Auto – Local/Manual switch
- Outputs: Close, Open and Alarm
- Minimum Time Between Operations Delay
- 20 Character by 2 Row LCD display (LED backlit)
- Up to 30 unique 15 character User Access Codes (Level 1 or Level 2)
- CBEMA monitoring to detect sags and swells within a range of 90 Vac to 180 Vac, and trigger data collection
- Smart Flash SD Card Slot supports standard SD Memory Cards: SD, SDHC, SDXC, UHS-I
- Smart Flash SD Card can be linked to one or multiple controls providing a physical security "Key" which provides User Access Level 2 Access to the control when the SD Card is inserted for settings manipulation
- Sequence of Events (SOE) recorder
- Device Discovery
- Source Address Validation
- Oscillography
- Front Panel LEDs for Remote/Auto, Local/Manual, Alarm, Close, Open, OK, RSSI, Neutral Unbalance, (TX) Transmit and (RX) Receive
- Programmable Alarms
- Front Panel Hot Buttons provide direct access to menu headers
- Front Panel testing:
  - Int/Ext Voltage Source switch
  - External Power input terminals
  - Meter Out terminals
- Communication Protocols DNP3.0 and MODBUS®
- Adaptive Delta Voltage sensing during switch operations
- Daily Operations Counter Limit with Alarm
- CapTalk® S-6280 Communications Software
- Capacitor Bank switch status inputs for phase A, B and C
- Graphical display of real-time harmonic spectrum of voltage and current using CapTalk Communications Software
- Communication Ports:
  - USB
  - RS-232
- SCADA "HeartBeat" (with DNP3.0 only)
- Supports Station and Feeder Level DNP addressing in addition to individual addressing for Smart Grid applications

Standard Features (Cont.)

- One pushbutton access to user configurable Wakeup screen for manual data recording with Smart Flash SD Card saving feature
- One set (3) of spare fuses are included
- Capacitor Bank Switch selection "Solenoid Driven" or "Motor Driven" for Close/Open Pulse Duration
- 200 mA Neutral Current input for Neutral Unbalance detection
- SCADA Test Mode
- IEEE 1686 Standard Compliant Cyber Security
- IPsec (Internet Protocol Security)
- RADIUS Client Capability to manage local and remote access to the control
- Battery Low Voltage Alarm

Optional Control Features

- Automatic VAr Control Mode options include:
  - 5 A phase current input
  - 0 to 10 V Line Post Sensor input (Impedance ≈ 200 KΩ)
- COM2, RS-232 Communication Port or Bluetooth*

  *Bluetooth option is not available in 50 Hz units shipped to locations subject to Radio Equipment Directive RE-D 2014/53/EU. Contact the factory for more information.
- Ethernet Port (10/100 Base-T) is available through a RJ-45 jack or Fiber Optic ST Connector. This port supports DNP over TCP/IP and UDP; MODBUS over TCP/IP; and SNTP.
- 5 A Neutral Current input for Neutral Unbalance detection
- Line Post Current Sensor input for Neutral Unbalance detection (Impedance ≈ 200 KΩ)
- Communications Ports:
  - ST Fiber Optic
  - V-pin Fiber Optic
  - RS-485
- External Temperature Sensor
- The M-6280A can be housed in a Molded Lexan®, Cold Rolled Steel, or Stainless Steel Control cabinet. Refer to the M-2980A Cabinet Specification.

CAPACITOR BANK CONTROL OPERATION

Control Modes of Operation

The control includes three standard modes of Automatic **Voltage Control** (Classic Voltage Control, Autodaptive® Classic Voltage Control and Autodaptive® Enhanced Voltage Control), Optional **VAr Control** mode and **Current Control** mode are available.

In addition, **Time Control** mode and **Temperature Control** mode are available through CapTalk S-6280 Communications Software.

Classic Voltage Control Mode

The control will make its Open and Close switching decisions based on measured Line Voltage conditions and Time and/or Temperature overrides when applied. Voltage excursions beyond the set value for greater duration than the time delay will result in appropriate control operation.

- **Control Open Voltage:** Adjustable from 95.0 to 140.0 V in 0.1 V increments
- **Control Close Voltage:** Adjustable from 95.0 to 140.0 V in 0.1 V increments
- **Close and Open Time Delays:** Definite or Inverse; adjustable from 0 seconds to 600 seconds, in 1 second increments. Timer reset can be selected as instantaneous or integrating.
- **Time Override (Classic or Enhanced):** In the Auto Control Mode a Time Override can be applied to capacitor bank Open and Close operations. The Time Override feature considers Start Date, Start Time, End Date, End Time, Duration, Recurrence Pattern and a Range Of Occurrences to implement the override. In the Enhanced Mode, a 2nd Time Override is available, within a 24 hour period.
- **Temperature Override:** In the Auto Control Mode a Temperature Override can be applied to capacitor bank Open and Close operations. The Temperature Override feature considers sensed ambient temperature and implements override action (Open, Close or None) for either above or below temperature setpoint conditions.

■ **NOTE:** Time and Temperature Overrides can be overridden by Control Mode Limits.

Autodaptive Classic Voltage Control Mode

This feature contains two control methods, Fixed or Average. The Fixed method provides a Bandcenter setting the control compares to measure voltage to open or close the Capacitor bank. The Average method uses an Effective Bandcenter based on a long term average of the input voltage to compare to measure voltage to open or close the capacitor bank. Both methods employ an inverse timer and Bandwidth to optimize bank operation and eliminate unnecessary switching. Also, Time and/or Temperature overrides can be applied.

- **Fixed-Band Center:** Adjustable from 100.0 to 135.0 V in 0.1 increments
- **Bandwidth (Multiple of Delta V):** Adjustable from 1.0 to 2.0 in 0.1 increments
- **Close and Open Time Delays:** Inverse only; adjustable from 60 to 3600 seconds, in 1 second increments. Timer reset is fixed as integrating.
- **Time Override (Classic or Enhanced):** In the Auto Control Mode a Time Override can be applied to capacitor bank Open and Close operations. The Time Override feature considers Start Date, Start Time, End Date, End Time, Duration, Recurrence Pattern and a Range Of Occurrences to implement the override. In the Enhanced Mode, a 2nd Time Override is available, within a 24 hour period.
- **Temperature Override:** In the Auto Control Mode a Temperature Override can be applied to capacitor bank Open and Close operations. The Temperature Override feature considers sensed ambient temperature and implements override action (Open, Close or None) for either above or below temperature setpoint conditions.

■ **NOTE:** Time and Temperature Overrides can be overridden by Control Mode Limits.

*Only available with VAr and Current Control Mode option.

Autodaptive Enhanced Voltage Control Mode

The control makes its OPEN and CLOSE switching decisions based on the following parameters:

- Measured line voltage
- Calculated Delta Voltage after an OPEN or CLOSE operation
- Individually calculated time delay for OPEN and CLOSE operations which is biased proportionally by the calculated delta voltage and the ratio of the Base Kvar to the Capbank size.
- Calculated resultant OPEN and CLOSE voltage

The algorithm uses a definite timer type for the analysis period with a time delay which varies according to the value of the delta voltage and capacitor bank size. This produces an overall effect of an inverse timer type through out the distribution system.

- **Operations in Delta V Average:** Adjustable from 100.0 to 135.0 V in 0.1 increments
- **Band Width (Adder to Delta V):** Adjustable from 0.0 to 5.0 V in 0.1 V increments
- **Line Resistance Band Center Correction:** Adjustable from 0.2 to 10
- **Operations in Delta V Average:** Adjustable from 2 to 30
- **Maximum Time Delay:** Adjustable from 10 to 1200 Seconds
- **Minimum Time Delay:** Adjustable from 1 to 600 Seconds
- **Maximum Delta Voltage:** Adjustable from 1.0 to 15.0 Volts in 0.1 increments
- **Minimum Delta Voltage:** Adjustable from 0.4 to 5.0 Volts in 0.1 increments
- **KVAr Base:** Adjustable from 75 to 4800 KVAr
- **Days Without Operation:** Adjustable from 1 to 365 Days
- **Time Override (Classic or Enhanced):** In the Auto Control Mode a Time Override can be applied to capacitor bank Open and Close operations. The Time Override feature considers Start Date, Start Time, Duration, Recurrence Pattern and a Range Of Occurrences to implement the override. In the Enhanced Mode, a 2nd Time Override is available, within a 24 hour period.
- **Temperature Override:** In the Auto Control Mode a Temperature Override can be applied to capacitor bank Open and Close operations. The Temperature Override feature considers sensed ambient temperature and implements override action (Open, Close or None) for either above or below temperature setpoint conditions.

■ **NOTE:** Time and Temperature Overrides can be overridden by Control Mode Limits.

Automatic VAr Control Mode Option*

The control will make its Open and Close switching decisions based on measured line VAr conditions and Time and/or Temperature overrides when applied. VAr excursions beyond the set value for greater duration than the time delay will result in appropriate control operation. The control can be ordered with either a 5 A CT or Line Post Current Sensor inputs to provide phase current measurement to the control.

The control has the added capability to use Bank Status to calculate VArs during Reverse Power. This feature allows the VAr Control Mode to work properly during feeder reconfiguration, and is enabled through CapTalk Communications software.

- **Control Open VArs:** -100 % to 100 % of single-phase capacitor Bank size in 1% increments
- **Control Close VArs:** 0 % to 100 % of single-phase capacitor Bank size in 1% increments
- **Close and Open Time Delays:** Definite only; adjustable from 0 seconds to 600 seconds, in 1 second increments. Timer reset can be selected as instantaneous or integrating.
- **Time Override (Classic or Enhanced):** In the Auto Control Mode a Time Override can be applied to capacitor bank Open and Close operations. The Time Override feature considers Start Date, Start Time, End Date, End Time, Duration, Recurrence Pattern and a Range Of Occurrences to implement the override. In the Enhanced Mode, a 2nd Time Override is available, within a 24 hour period.
- **Temperature Override:** In the Auto Control Mode a Temperature Override can be applied to capacitor bank Open and Close operations. The Temperature Override feature considers sensed ambient temperature and implements override action (Open, Close or None) for either above or below temperature setpoint conditions.

■ **NOTE:** Time and Temperature Overrides can be overridden by Control Mode Limits.

*Only available with VAr and Current Control Mode option.

Automatic Current Control Mode Option*

The control will make its switching decisions based on measured Line Current conditions and Time and/or Temperature overrides when applied. Current excursions beyond the set value for greater duration that the time delay will result in appropriate control operation. The control can be ordered with either 5 A CT or Line Post Sensor inputs to provide phase current measurement to the control.

- **Control Open Current:** Adjustable from 10 to 600 Amps
- **Control Close Current:** Adjustable from 10 to 600 Amps
- **Close and Open Time Delays:** Definite only; adjustable from 0 seconds to 600 seconds, in 1 second increments. Timer reset can be selected as instantaneous or integrating.
- **Time Override (Classic or Enhanced):** In the Auto Control Mode a Time Override can be applied to capacitor bank Open and Close operations. The Time Override feature considers Start Date, Start Time, End Date, End Time, Duration, Recurrence Pattern and a Range Of Occurrences to implement the override. In the Enhanced Mode, a 2nd Time Override is available, within a 24 hour period.
- **Temperature Override:** In the Auto Control Mode a Temperature Override can be applied to capacitor bank Open and Close operations. The Temperature Override feature considers sensed ambient temperature and implements override action (Open, Close or None) for either above or below temperature setpoint conditions.

■ **NOTE:** Time and Temperature Overrides can be overridden by Control Mode Limits.

Automatic Time Control Mode (CapTalk Only)

The "Enable Time Control" selection in CapTalk, allows the M-6280A to operate solely as a 24/7 Time Control. The Bank Operation time settings (Start, End, Open, and Close Duration) are automatically calculated to equal 24 hours. The Time Control mode requires the Enhanced Time Override Option which allows two Open/Close times per 24 hour period.

- **Start and End Times:** Adjustable in hours, minutes, and seconds. Automatically calculated to equal 24 hours exactly.
- **Open and Close Duration:** Adjustable from 0.0 to 24.0 hours. Automatically calculated for a combined Open/Close duration of no more than 24 hours.

Automatic Temperature Control Mode (CapTalk Only)

The "Enable Temperature Control" selection in CapTalk, allows the M-6280A to operate solely as a Temperature Control. Enabling Temperature Control mode uses Voltage Control mode, and makes the following changes to allow 24/7 Temperature Control with Voltage override capability:

- The Voltage Control mode is selected.
- The Control Open and Close voltage settings will be set to the Control Mode Limits (maximum and minimum voltage limit) to prevent the control from operating on Voltage Control when the temperature is between the Open and Close limits.
- The Voltage Control Time Delay will be changed to Definite Time if it was set to Inverse Time.
- The Control Mode Limits Definite Time value will be assigned to both the Close and Open Definite timers.

■ **NOTE:** The control will respond to Voltage exceeding the Control Mode Limits and those limits are required to be used.

- **Above Temperature:** Adjustable from -40° to +185° F (-40° to +85° C)
- **Below Temperature:** Adjustable from -40° to +185° F (-40° to +85° C)
- **Operation:** Selectable as either Close or Open. Selecting "Open" for Above Temperature Operation automatically selects "Close" for Below Temperature Operation, and vice versa.

*Only available with VAr and Current Control Mode option.

Remote Control Mode

In this mode, the control receives commands through communications for Closing or Opening of the Capacitor Bank.

Remote Control Mode Limits: These limits can be disabled or enabled. If control operation will result in voltage outside of these limits operation will be **blocked** and notification will be sent to the sender. If measured voltage is outside of these limits, the control will **initiate** an operation in the direction to return voltage within limits.

- **Overvoltage Limit:** Adjustable from 95.0 to 140.0 V in 0.1 V increments
- **Undervoltage Limit:** Adjustable from 95.0 to 140.0 V in 0.1 V increments
- **Voltage Limits Timer:** Definite or Inverse; adjustable from 0 seconds to 600 seconds, in 1 second increments. Timer reset can be selected as instantaneous or integrating.

Control Mode Limits

If control operation will result in voltage outside of these limits, operation will be blocked. If measured voltage is outside of these limits, the control will **initiate** an operation in the direction to return voltage within limits after the set time delay. Only the **block** and not the **initiate** operation is implemented in remote manual mode due to personnel safety considerations. These control mode limits can be; "Disable All", "Enable in Auto", "Enable in Manual", "Enable in Local". Any combination of "Enable in Auto", "Enable in Manual" and "Enable in Local" can be selected. These limits will apply regardless of the control mode of operation selected providing voltage override functionality in all operational modes.

- **Maximum Voltage Limit:** Adjustable from 95.0 to 140.0 V in 0.1 V increments
- **Minimum Voltage Limit:** Adjustable from 95.0 to 140.0 V in 0.1 V increments
- **Definite Time:** Adjustable from 0 to 60 seconds in 1 second increments

Local Manual Mode

In this mode the control will disable Automatic and Remote Control modes. In this mode, the control will respond to the front panel CLOSE/OPEN switch position.

Bank Operational Delays:

- **Minimum Time Between Operations:** Adjustable from 0 to 3600 seconds in 1 second increments
- **Close Warning Delay:** Adjustable from 0 to 90 seconds in 1 second increments (Enable/Disable)
- **Open Warning Delay:** Adjustable from 0 to 90 seconds in 1 second increments (Enable/Disable)
- **Re-Close Delay:** Adjustable from 300 to 600 seconds in 1 second increments
- **Close/Open Pulse Duration:**

  Solenoid Driven Switch Type – Adjustable from 50 to 100 ms in 1 ms increments

  Motor Driven Switch Type – Adjustable from 5 to 15 seconds in 1 second increments

■ **NOTE:** The Close and Open Warning Delays "Auto" and "Remote" can be enabled or disabled. However, "Manual" is always enabled.

Voltage and Current Total Harmonic Distortion (THD) Trip and Lockout

The Voltage and Current THD Trip and Lockout feature will Trip and Lockout the capacitor bank when either Voltage or Current THD exceeds its associated THD Trip Pickup Setting.

When Voltage or Current THD increases above its associated THD Trip Pickup Setting for the period defined by its THD Trip Time Delay setting, the control will Trip the capacitor bank and Lockout further operation. If THD is still present above the THD Trip Pickup Setting after the trip has occurred, the Lockout will remain in effect until THD decreases to less than the Voltage or Current THD Lockout Reset setting for the duration of it's THD Lockout Reset Delay setting.

Neutral Unbalance Current Detection

Current measured by the Neutral Balance Current Detection feature is used to detect bank or switch failures as well as bank Open or Close status. Neutral Unbalance Current is measured using one of three input options:

- **200 mA CT Input:** This option is offered by default in the unit.
- **5 A CT Input:** This option must be specified when ordered.
- **10 V Line Post Current Sensor:** This option must be specified when ordered.

Neutral Unbalance Current Levels:

Bank/Switch Failed Level 1 (can be enabled or disabled)

- **Bank/Switch Failed:** Adjustable from 1.0 to 200.0 A in 0.1 A increments

Bank/Switch Failed Level 2 (can be enabled or disabled)

- **Bank/Switch Failed Level 2:** Adjustable from 1.0 to 200.0 A in 0.1 A increments
- **Time Delay:** Adjustable from 10 to 300 seconds in 1 second increments
- **Prior Operation:**

  Action Taken: Retry Operation, Reverse Operation and Block, Reset Block

  Number of Attempts: 1 to 9

  Block Reset Time Delay: Adjustable from 0 to 72 hours in 1 hour increments

- **No Prior Operation: (can be enabled or disabled)**

  Open and Lockout Time Delay: Adjustable from 1 to 4320 minutes in 1 minute increments

  Reset Lockout: Can be enabled or disabled

  Lockout Reset Time Delay: Adjustable from 0 to 72 hours in 1 hour increments

Bank Status (can be enabled or disabled)

- **Bank Status Closed:** Adjustable from 0.10 to 10.00 A in 0.01 A increments. If Neutral Current is greater than this setting, the bank is confirmed to be closed.
- **Bank Status Open:** Adjustable from 0.10 to 10.00 A in 0.01 A increments. If Neutral Current is less than this setting, the bank is confirmed to be open.
- **Bank Status Time Delay:** Adjustable from 10 to 300 seconds in 1 second increments for both (Close and Open)
- **Action Taken:** If bank status indicates an unsuccessful operation, the control can be programmed to take no action or retry the operation.

Bank Switch Status Feedback

Switch auxiliary position contacts can be connected to the control to confirm individual phase switch positions. Individual phase switch position indicators can be observed on the Metering and Status Screen (Figure 1).

Bank Switch Status detection can be disabled or enabled.

Settings Profiles and Profile Triggering

The Settings Profiles are groupings of settings within the control created to allow changing from one group to another quickly based on internal or external triggers. Additionally, several methods of Triggering a change from one Setting Profile to another automatically are provided.

Settings Profiles – Settings Profiles are defined as a group of settings in the control that can be selected as the Active Profile either automatically based on selected triggers, or via SCADA. The Active Profile is defined as the Settings Profile currently in use providing the parameters the control is operating with. There are eight Settings Profiles that can be created in the control.

Profile Triggers – Once a trigger has been selected as a trigger for one profile, it is no longer available as a trigger for the other profiles. Only one trigger can be assigned to a profile with the exception of the SCADA trigger. Triggers may also be prioritized from 2 to 8 with the exception being SCADA, which is always priority 1.

- **SCADA Profile Trigger** – SCADA can be selected to trigger any profile up to all eight. An Analog Output DNP point named "SCADAHB Profile Switch" allows the user to change what Settings Profile is the Active Profile in the control as long as the Heartbeat is active.
- **Season Profile Trigger** – Each Season Trigger allows the user to set the following parameters:
  - Start Date
  - End Date
  - Start Time
  - End Time – Selecting the End Time Calculates the Duration and displays it rounded to the nearest tenth of a minute.
  - Duration – Selecting Duration calculates the End Time and displays it rounded to the nearest tenth of a minute.
  - Recurrence Pattern – Provides a choice between Daily and Weekly.
- **Above and Below Temperature Profile Trigger** – The Above and Below Temperature Triggers provide the user with the ability to set a temperature between -40° and 185° F, or -40° and 85° C that will trigger a Settings Profile change when exceeded.
- **Reverse Power Profile Trigger** – When Reverse Power is sensed, the selected Settings Profile will be switched to.

Additional Settings

VT/CT Setup:

- **Voltage Multiplier:** Adjustable from 0.1 to 3260.0 in 0.1 increments
- **VT Correction:** Adjustable from -15.0 V to +15.0 V in 0.1 V increments
- **Phase Current Multiplier*:** Adjustable from 1.00 to 200.00 in .01 increments
- **Neutral Current Multiplier:**

  5 A Neutral CT and Line Post Sensor – Adjustable from 1.0 to 150.0 in 0.1 increments

  200 mA Neutral CT – Adjustable from 1.0 to 3260.0 in 0.1 increments

Counters:

- **Resettable Counter:** A software counter that increments by one count per Close or Open operation. Resettable to 0.
- **Operation Counter Preset:** A software counter which increments by one count per Close Only or, Open or Close operation. Presettable from 0 to 999,999.
- **Resettable Counter Alarm Limit:** A limit that alerts the user either by communications and/or a programmable alarm. It is settable from 0 to 999,999.
- **Daily Operation Counter Limit:** A limit that will block any further Close/Open operation until 12**:**00 AM and alerts the user either by communications and/or a programmable alarm. It is settable from 2 to 99 and can be enabled or disabled in "Remote" and/or "Manual" Mode. This counter is always enabled in "Auto" Mode.

*Only available with VAr and Current Control Mode option.

Monitoring

Harmonic Analysis: Provides the total harmonic distortion and the harmonic content of the voltage and current up to the 31st harmonic.

Alarms: The alarm relay is user-programmable with a non-latching output contact. The output contact can be configured to not operate (Alarm LED only) on one or more of the following conditions:

- Maximum Voltage Limit
- Minimum Voltage Limit
- Remote Overvoltage Limit
- Remote Undervoltage Limit
- Bank/Switch Failed - Level 2
- Bank/Switch Failed - Level 1
- Resettable Counter Limit
- Daily Operation Counter Limit
- Voltage Harmonics
- Current Harmonics*
- Remote Manual
- Self Test
- Delta Voltage Alarm
- Current THD Lockout*
- Voltage THD Lockout
- Leading VAr*
- Lagging VAr*
- Leading Power Factor*
- Lagging Power Factor*

Sequence of Events: A built-in Sequence of Events (SOE) Recorder has the capability to record up to 132 events. It allows trigger events to be AND'ed and OR'ed for Pickup and Dropout. Trigger Events include:

- Close Command
- Open Command
- Maximum Voltage Limit
- Minimum Voltage Limit
- Remote Overvoltage Limit
- Remote Undervoltage Limit
- Bank/Switch Failed - Level 2
- Bank/Switch Failed - Level 1
- SCADA HeartBeat (DNP3.0 only)
- Voltage Harmonics
- Current Harmonics*
- CBEMA 1 through 4
- Delta Voltage Alarm
- Phase Overcurrent*
- HMI Active
- Leading VAr*
- Lagging VAr*
- Leading Power Factor*
- Lagging Power Factor*

Parameters that are captured with each Sequence of Events Record include:

- Voltage
- Delta Voltage
- Frequency
- Operation Counter
- Primary Voltage
- Neutral Current
- Resettable Counter
- Phase Current
- RMS Voltage
- Power Factor
- Reactive Power
- Reason for Last Operation
- Active Profile

Oscillography: A built-in Oscillograph Recorder continuously records voltage and current waveform data in a buffer memory. This memory can be configured from 1 to 16 partitions. When triggered, a snapshot of waveform data from 321 to 2730 cycles is captured. The data captured can be specified from 5% to 95% post-trigger event. The remainder of the percentage is pre-trigger data (samples per cycle is selectable as 16, 32 or 64 samples/cycle). Trigger Events include:

- Close Command
- Open Command
- Maximum Voltage Limit
- Minimum Voltage Limit
- Remote Overvoltage Limit
- Remote Undervoltage Limit
- Bank/Switch Failed - Level 2
- Bank/Switch Failed - Level 1
- SCADA HeartBeat (DNP3.0 only)
- Voltage Harmonics
- Current Harmonics*
- CBEMA 1 Through 4
- Delta Voltage Alarm
- Phase Overcurrent
- Leading VAr*
- Lagging VAr*
- Leading Power Factor*
- Lagging Power Factor*

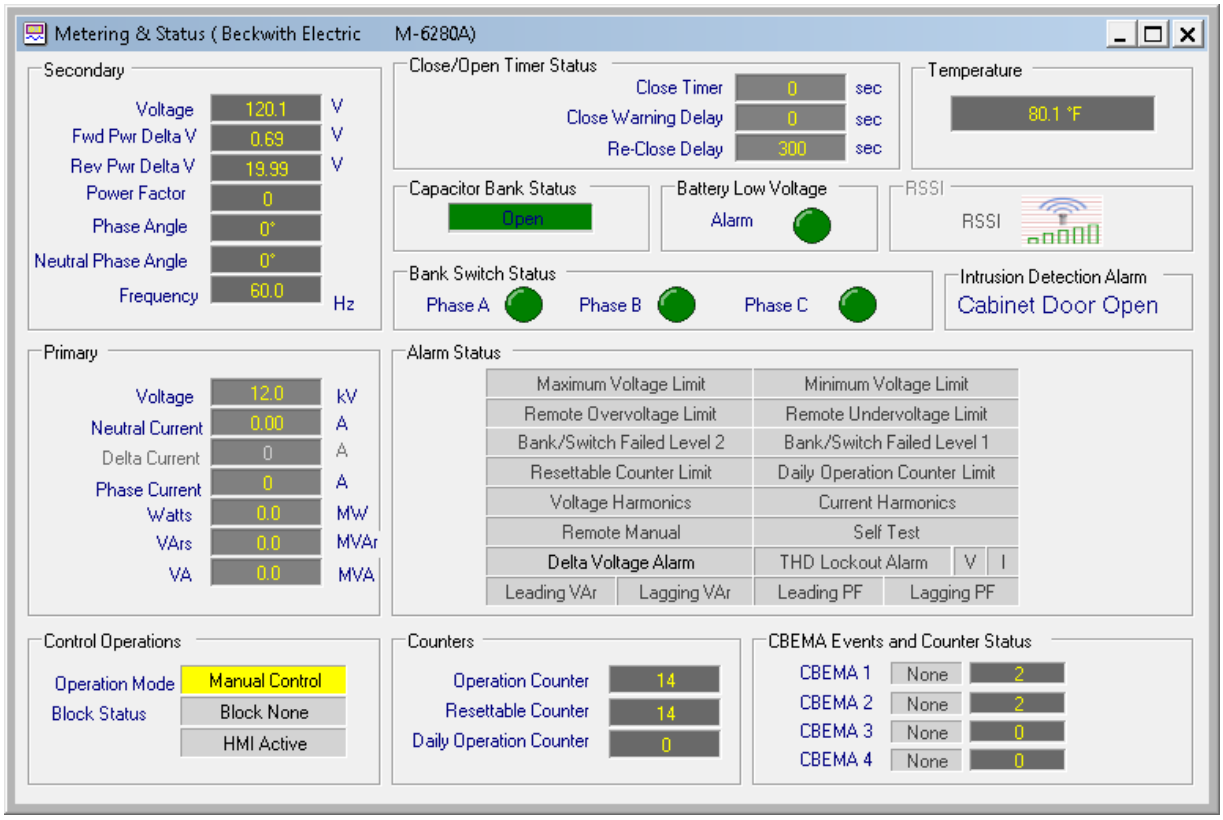
*Only available with VAr and Current Control Mode option.

Data Logging: A built-in Data Logging Recorder that continually records data in non-volatile memory. Data logging will continue indefinitely as long as the data interval is set to a non-zero value. Data to be retrieved:

- Voltage
- Autodaptive
- Operation Counter
- Temperature
- Primary Watts*
- Reason for Last Operation
- Primary Voltage
- Primary Neutral Current
- Resettable Counter
- Primary Phase Current*
- Primary VArs*
- Delta Voltage
- Frequency
- Capacitor Bank Status
- Power Factor*
- Primary VA*

Metering

Figure 1 provides an example of the Metering parameters that are available from the control.



■ **NOTE:** Power Factor, Phase Angle, Phase Current, Watts, VArs and VA are only available when the VAr Control Mode option is present.

Figure 1 Metering and Status Screen

Resultant Autodaptive® Enhanced Settings: When the Autodaptive Enhanced Voltage Control Mode is selected the following metering parameters are available:

- Band Center
- Band Width
- Close Time Delay
- Open Time Delay

*Only available with VAr and Current Control Mode option.

Inputs

Switch Power Input: Nominal 120 Vac, 60 Hz (50 Hz optional); operates properly from 95 Vac to 140 Vac. If set at 60 Hz, the operating system frequency is from 55 to 65 Hz; if set at 50 Hz, the operating system frequency is from 45 to 55 Hz. The burden imposed on the input is 8 VA or less. The unit will withstand twice the nominal voltage for one second and four times the nominal voltage input for one cycle.

Phase Current Input: Optional 5 A Nominal CT or 10 Vac Line Post Current Sensor input. Appropriate multiplier is utilized to calculate the primary phase current. Line Post Current Sensor option also contains a Phase Shift Compensation setting. (Line Post Current Sensor Input Impedance ≈ 200 KΩ)

Neutral Unbalance Current Input: 200 mA. Appropriate multiplier is utilized to calculate the primary Neutral Unbalance Current.

An optional 10 Vac Line Post Current Sensor or 5 A (nominal) CT input is available. (Line Post Current Sensor Input Impedance ≈ 200 KΩ)

Switch Power Input: Nominal 120 Vac.

Outputs

Close Output: Capable of switching 10 A for 30 sec or 45 A for 25 ms.

Open Output: Capable of switching 10 A for 30 sec or 45 A for 25 ms.

User-Programmable Alarm Output: One Form "C" contact capable of switching 6 A at 125 Vac or 0.2 A at 125 Vdc.

Digital Inputs

Three 12 Vdc Inputs for switch status and one internally wetted intrusion detection input.

Front Panel Controls

Menu-driven access to all functions by way of six pushbuttons and a two-line alphanumeric display. There are up to 30 programmable User Access Codes (Level 1 or Level 2) available to provide various levels of access to the control functions.

The Capacitor Bank control offers a 2-line by 20 character LCD display (LED backlit) for enhanced viewing in direct sunlight.

CLOSE/OPEN switch allows local manual Close and Open commands to be initiated.

REMOTE/AUTO - LOCAL/MANUAL switch allows Automatic operation of the control or Manual operation from the front panel by using the CLOSE/OPEN toggle switch.

VOLTAGE SOURCE switch disconnects all power from the unit when selected to the **OFF** position. The **EXT** position allows the control to be powered from the front panel test jacks.

EXTERNAL POWER binding posts allow application of a 120 V RMS nominal voltage to the unit for testing.

METER OUT binding posts allow reading of the input voltage.

Smart Flash SD Card Slot

Allows the user to perform the following functions:

- Load Setpoints
- Save Setpoints
- Save Data Log
- Save Sequence of Events
- Save Oscillograph Records
- Clone Save
- Clone Load
- Load DNP Config
- Save DNP Config
- Firmware Update
- Save Metering Data
- Save Wake Screen Data
- SD Card User Access (Physical Security Key)
- Quick Capture
- Multiuser Access Code
- Multiuser Access Code Log
- Load User Config.
- Load IPsec Config.
- Save IPsec Config.

■ **NOTE:** The Smart Flash SD Card slot supports standard SD Memory Cards: **SD**, **SDHC**, **SDXC**, **and UHS-I** format. The following formats are **NOT** supported: SDUC, UHS-II, UHS-III, and UHS-I Express.

LED Indicators

Front panel LED indicators show the following control conditions: **REMOTE/AUTO, LOCAL/MANUAL**, **ALARM, NEUTRAL UNBALANCE, CLOSE, OPEN, CPU OK**, **RSSI** and **TX** (Transmit) and **RX** (Receive).

Communications

The communication ports provide access to all features, including metering, software updates, and programming of all functions. This is accomplished using a connection from any Windows® compatible computer running the CapTalk® S-6280 Communications Software or SCADA communications software.

Protocols: The standard protocols included in the M-6280A are DNP3.0 and MODBUS®. The USB port uses MODBUS for local communications. The optional Ethernet Port supports DNP3.0 and MODBUS protocols simultaneously. DNP Master Source Address Authentication is supported allowing multiple SCADA Masters to coexist on the same communications network.

Communications Via Direct Connection: CapTalk supports direct communication (MODBUS protocol) with the M-6280A using the applicable connector (USB cable) for the computer. Additionally, the standard RS-232 communications port as well as the 2-wire RS-485 and Serial Fiber (ST or Vpin) optional communications ports can be used to communicate via CapTalk.

Optional Ethernet Port: The optional Ethernet Port provides an RJ-45 (10/100 Base-T) or a (100 Base-Fx) Fiber Optic interface for ethernet communication to the M-6280A. The protocols supported are: MODBUS over TCP, DNP3.0 over TCP and DNP3.0 over UDP. The port supports up to eight concurrent connections. The maximum number of allowed DNP connections is five for each protocol (5 for UDP, 5 for TCP). The maximum number of MODBUS connections is eight. Ethernet Port settings can be configured manually or via DHCP protocol. MODBUS protocol "Port Number" and DNP Protocol "Port Number" can be changed manually from default values. DNP Master Source Address Authentication is supported allowing multiple SCADA Masters to coexist on the same communications network. This option can be field installed. Also, SNTP (Simple Network Time Protocol) Protocol is available to synchronize the control's RTC clock with the network server.

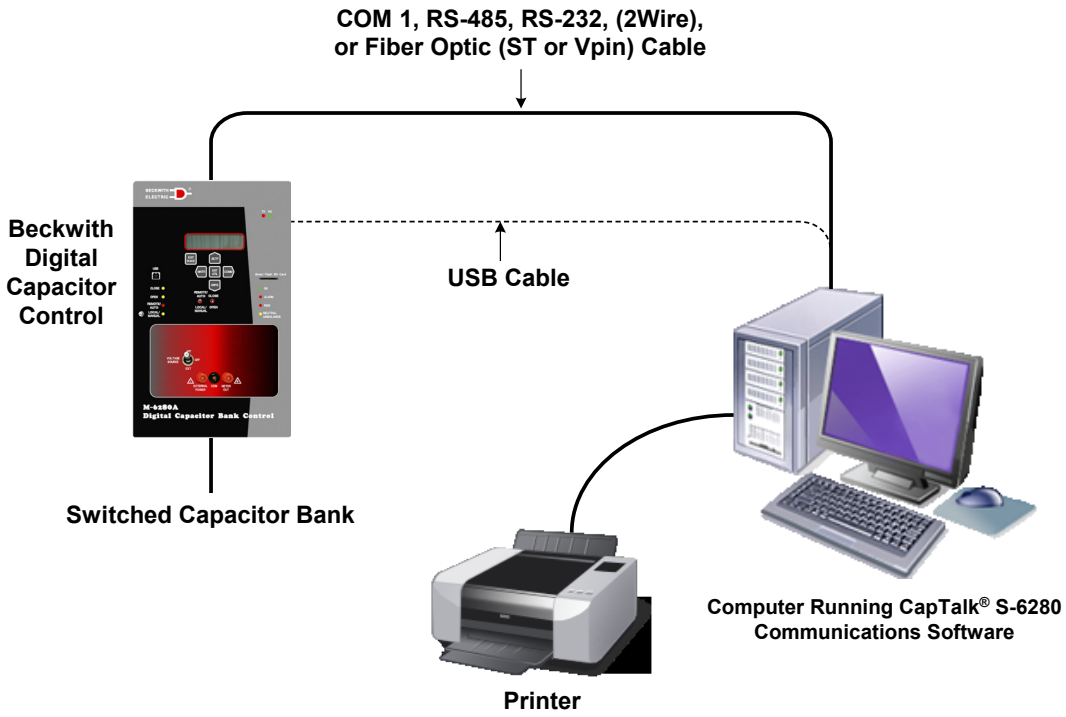


Figure 2 Direct Connection

Optional Bluetooth: The optional Bluetooth® (V2.0 +EDR Class 1 Type) provides wireless access to the M-6280A. With Bluetooth the user is able to configure the control, read status and metering values as well as change setpoints. This option can be field installed. There are two modes of operation for the Bluetooth:

Mode 0 – The device is discoverable and connectable to any client station.

Mode 1 – The device is non-discoverable but it is connectable to any client station who knows the control Bluetooth device address indicated under "**Control BT Device**" in the HMI. Mode 1 has been added to meet CIP requirement. (CIP-0007-4 System Security Management) (R2.3)

Communications Using Networking: The addressing capability of the M-6280A allows networking of multiple M-6280A's. Each capacitor bank control can be assigned an Address, Feeder Address or Substation Address ranging from 1 to 65519. Selected commands may be broadcast to all controls on the network. Figures 3, 4 and 5 illustrate typical network configurations. Addresses 1-255 can be assigned to MODBUS and 1-65519 for DNP 3.0.

Cyber Security

NERC CIP Compliance: The M-6280A provides all the necessary tools to help customers be NERC and Cyber Security compliant. The M-6280A meets or exceeds the following standards:

- IEEE 1686-2007 Compliant
- FIPS180-2, 186-2
- IEC 62351-1, -2, -3, -5
- ISO/IEC 9798-4
- IPsec using Internet Key Exchange (IKE) Version 1 and 2, compliant with: RFC 2367, 2393, 2394, 2401, 2402, 2406, 2407, 2408, 2409, 2411, 2412, 3456, 3706, 3947 and 3948
- RADIUS Server Support (optional), compliant with: RFC 2865 and 2866

BECO Standard Security: The default Level Access Code Security provides authentication and multi level access codes. A Smart Flash SD card may also serve as a cyber security hard-key with a user access audit log.

Application

Using CapTalk Communications Software, the operator has real-time, remote access to all functions of the M-6280A. The protocols implement half-duplex, two-way communications. This allows all functions, which would otherwise require the presence of an operator at the control, to be performed remotely. Communication capabilities include:

- Interrogation and modification of setpoints
- Broadcast of commands
- Recognition of alarm conditions, such as voltage extremes
- Unsolicited exception reporting
- Multicast capability using UDP

Unit Identifier

A 2-row by 20-character alphanumeric sequence, set by the user, can be used for unit identification.

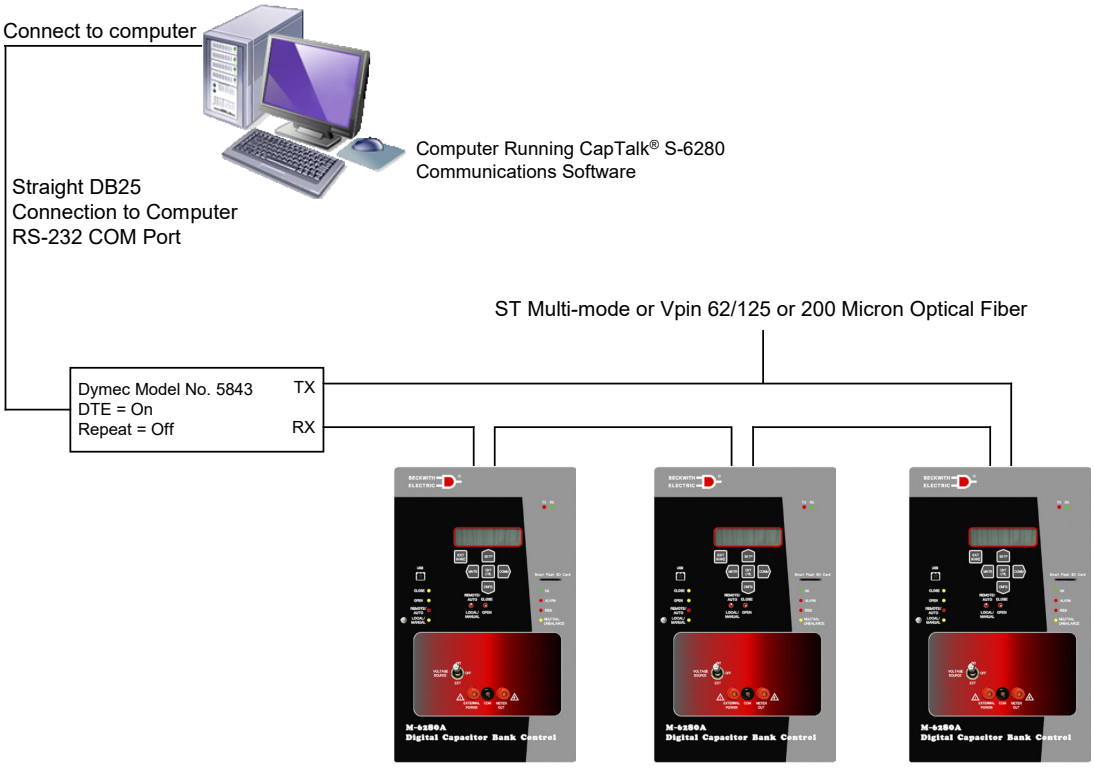


Figure 3 Fiber Optic Connection Loop

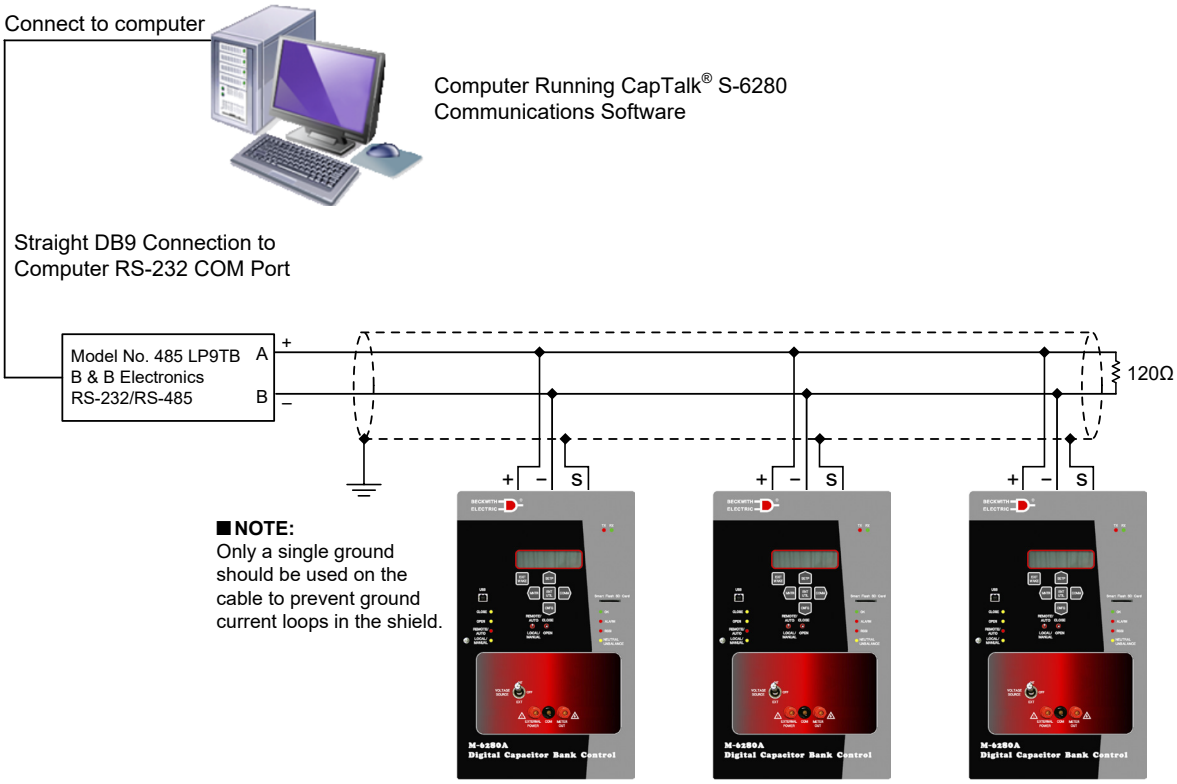


Figure 4 RS-485 Connection Diagram

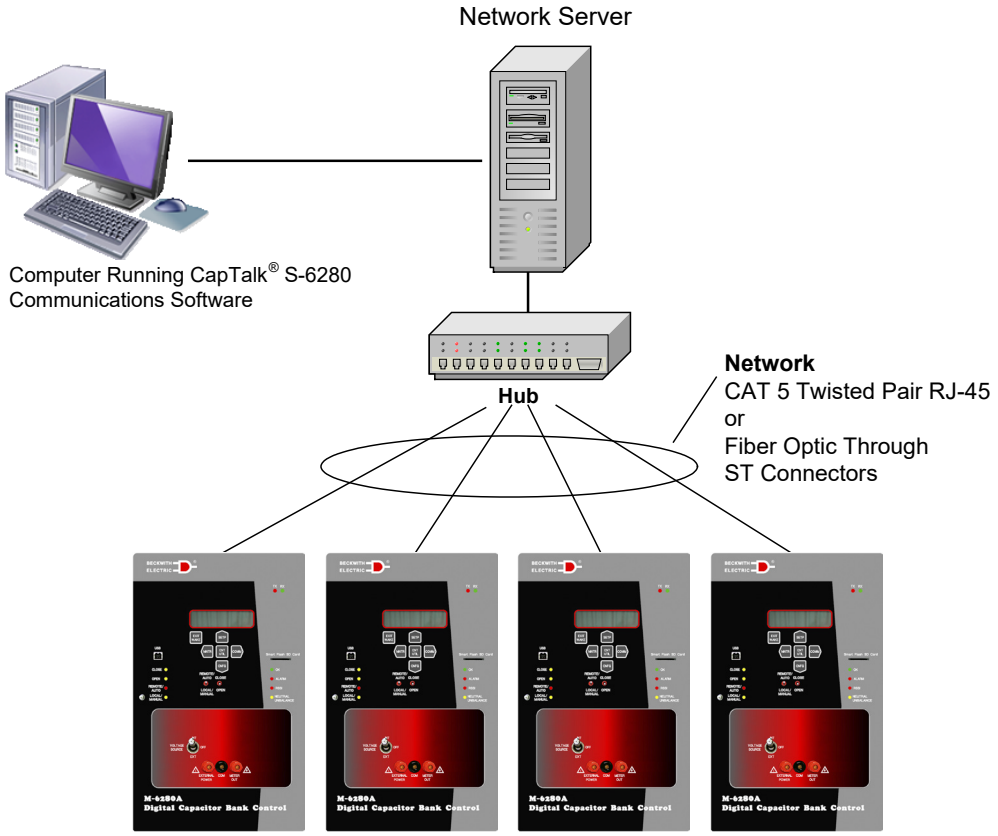


Figure 5 Optional Ethernet Network Connection

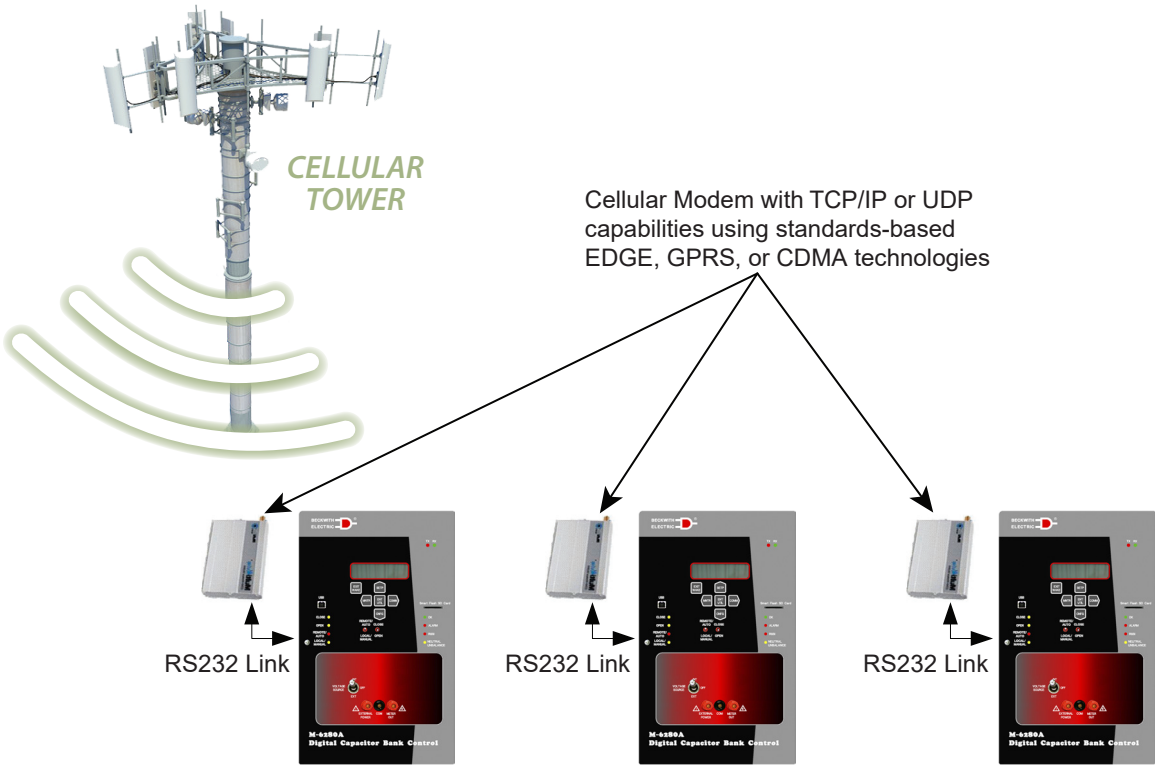


Figure 6 Cellular Modem Network

Environmental

Temperature: Control operates from -40° C to + 85° C.

IEC 60068-2-1	Cold, -40°C (-40° F)
IEC 60068-2-2	Dry Heat, +85° C (+185° F)
IEC 60068-2-30	Damp Heat condensation cycles +25° C, +55° C @ 95% RH
IEC 60664-3	Conformal coat grade UV40-250 board protection -50° C (-58° F) to +125° C (+257° F) CAT IV

■ **NOTE:** The LCD display's visible temperature range is -20° C to +70° C.

Tests and Standards

Surge Withstand Capability

IEEE C37.90.1	±2,500 Vpk Oscillatory 1 MHz ±4,000 Vpk Fast Transient Burst 5 kHz
IEEE C37.90.1-1989	±2,500 Vpk Oscillatory 1 MHz ±5,000 Vpk Fast Transient 1 MHz
IEC 61000-4-18	±2,500 Vpk Oscillatory 1 MHz

Electrostatic Discharge

IEC 61000-4-2	±8 kV Contact ±15 kV Air

Radiated Field Immunity

IEC 61000-4-3	10 V/m 80 MHz – 1000 MHz

Fast Transient/Burst Immunity

IEC 61000-4-4	±4,000 Vpk Fast Transient Burst 5kHz

Surge Immunity

IEC 61000-4-5	±4,000 Vpk 12Ω power / sensing voltage port, 40Ω I/O ports

■ **NOTE:** For compliance with IEEE C62.41.2 Standard (± 6,000Vpk 3kA), Beckwith Electric offers the B-1953 6kV Surge Protection Module optional accessory. This module installs directly onto the M-6280A TB1 Terminal Block. The module is available for field installation or as a factory installed option.

Voltage Interruptions Immunity

IEC 61000-4-11	10 cycles maximum hold-up duration

Voltage Withstand

IEC 60255-27	Impulse ±5 kV Dielectric 2 k Vac Insulation > 1GΩ

Mechanical Environment

IEC 60255-21-1	Vibration Response Class 1	0.5 g
	Vibration Endurance Class 1	1 g
IEC 60255-21-2	Shock Response Class 1	5 g
	Shock Withstand Class 1	15 g
	Bump Endurance Class 1	10 g

Physical

M-6280A

Size: 9.18" wide x 15" high x 3.22" deep (23.32 cm x 38.1 cm x 8.18 cm)

Approximate Weight: 6 lbs, 5 oz (2.92 kg)

Approximate Shipping Weight: 10 lbs, 5 oz (4.56 kg) est.

Disposal and Recycling

Disposal of E-Waste for Beckwith Electric Products

The customer shall be responsible for and bear the cost of ensuring all governmental regulations within their jurisdiction are followed when disposing or recycling electronic equipment removed from a fixed installation.

Equipment may also be shipped back to Beckwith Electric for recycling or disposal. The customer is responsible for the shipping cost, and Beckwith Electric shall cover the recycling cost. Contact Beckwith Electric for an RMA # to return equipment for recycling.

Patent & Warranty

The Capacitor Control is covered by pending U.S. Patents.

The Capacitor Control is covered by a ten year warranty from date of shipment.

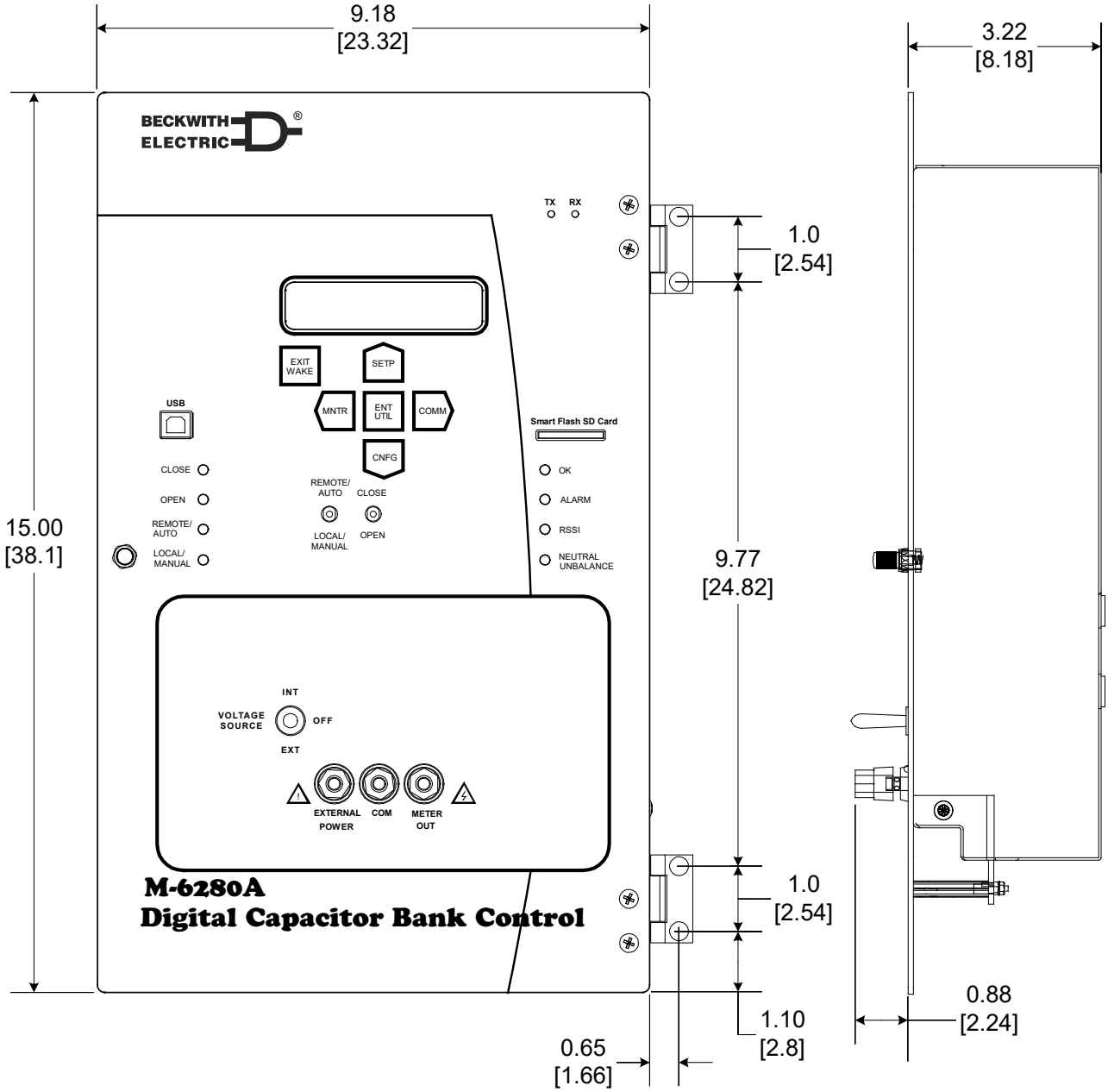


Figure 7 M-6280A Control Outline Dimensions

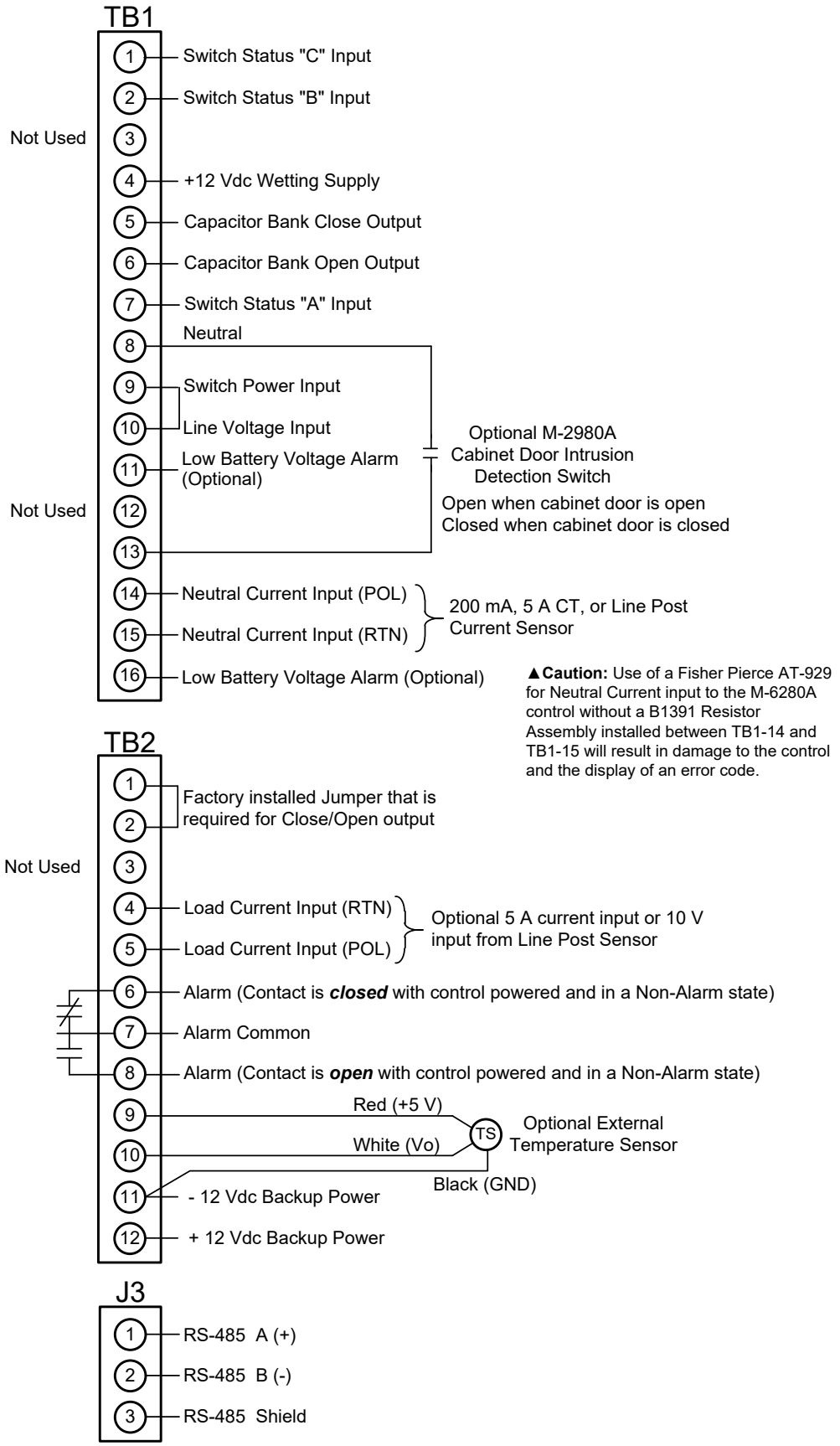
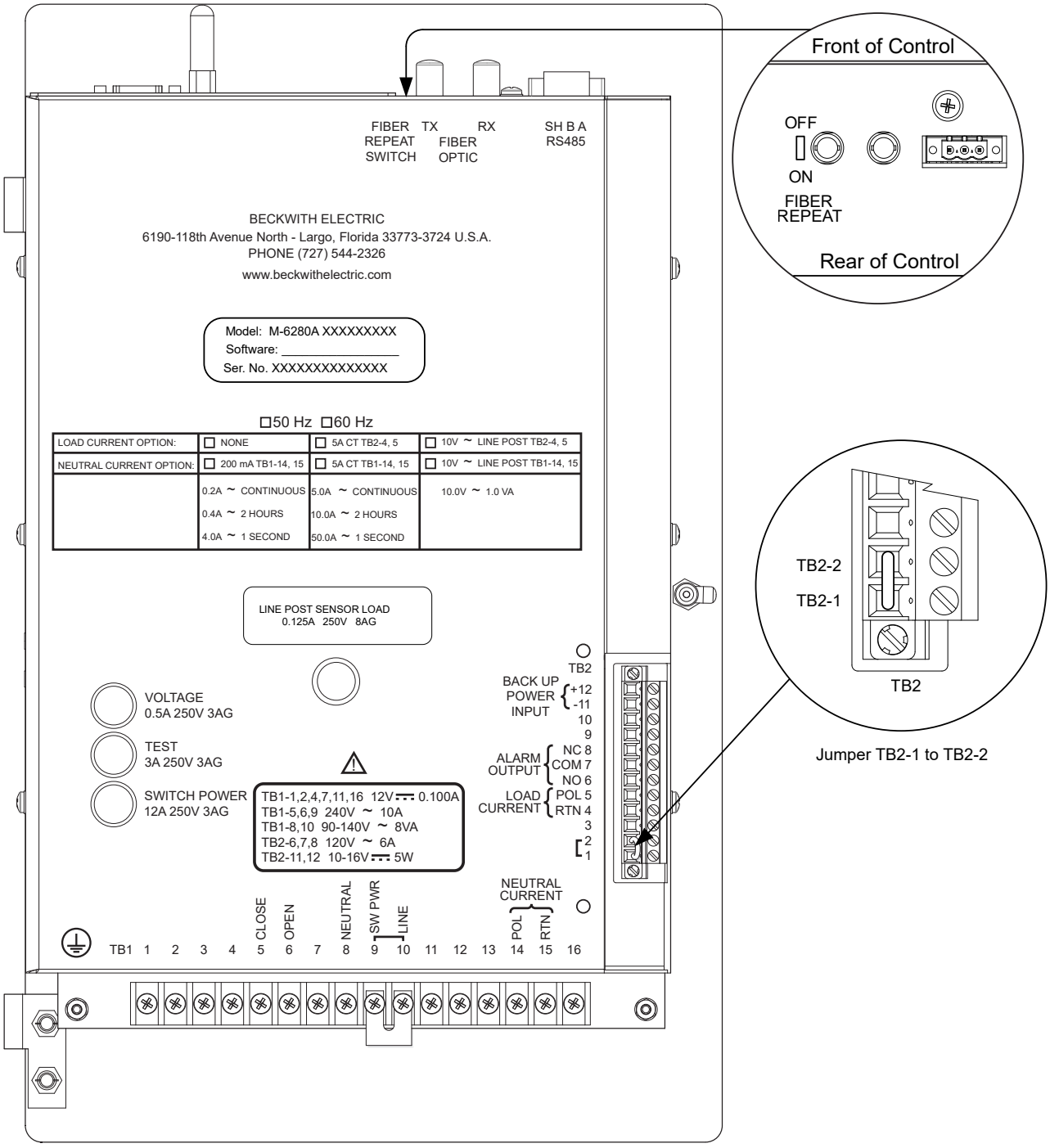


Figure 8 M-6280A External Connections



▲**CAUTION:** Use of a Fisher Pierce AT-929 for Neutral Current input to the M-6280A control without a B-1391 Resistor Assembly installed between TB1-14 and TB1-15 will result in damage to the control and the display of an error code.

Figure 9 M-6280A Rear View

M-2980A Capacitor Control Cabinet

Construction

Molded Lexan®

- Body and door fabricated from molded Lexan
- EXL 9330 Copolymer (.150" nominal thickness)
- UV Inhibitor
- Passed drop test on all eight corners
- Flame Retardant UL 94V-0
- NEMA 3RX water ingress and corrosion protection
- Stronger than standard polycarbonate
- Excellent low temperature impact strength (11 $^{ft.\ lb.}/_{in.}$ @ -60° F) ASTM D256
- Silicone closed cell gasket
- External adjustable mounting bracket
- Integral door hinges with stainless steel hinge pin
- Enclosure door accommodates optional power supplies, battery and communications devices
- External Grounding stud provided

Cold Rolled Steel/Stainless Steel (304)

- Body and door fabricated from 14/16 gauge steel
- Continuously welded seams ground smooth
- Closed cell neoprene gasket
- External adjustable mounting bracket
- Stainless steel door hinge
- Enclosure accommodates optional power supplies, battery and communications devices
- External Grounding stud provided
- Powder coated, ANSI 70 Grey

Cabinet to Capacitor Bank Interface Type

Direct Pole-Mount with 4 Wire Cable ONLY (no connector)

Integrated Meter Socket Mount (not available for Cold Rolled Steel/Stainless Steel Cabinets) (see Figure 10)

- Integrated 4, 5 or 6 Blade Meter Socket Plug
- Meter Socket Plug wiring is available in Standard 4, 5 and 6 Blade configurations (4S, 5S and 6S) (Table 1)
- Optional custom Meter Socket Plug wiring configurations are available (refer to Table 1)

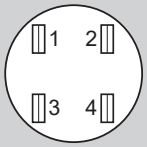
Direct Pole-Mount with cabled Meter Socket Plug (see Figure 11)

- 4, 5, or 6 Blade Meter Socket Plug with standard five foot control cable
- Meter Socket Plug wiring is available in Standard 4, 5 and 6 Blade configurations (4S, 5S and 6S) (Table 1)
- Optional cable lengths available in five foot increments up to 50 feet
- Optional custom Meter Socket Plug wiring configurations are available (Table 1)

M-2980A Capacitor Control Cabinet (Cont.)

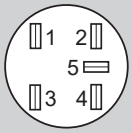
M-6280A Single-Phase Control – Meter Socket Wiring

4 Blade Selection				
Config	1	2	3	4
4S	Line	Neutral	OPEN	CLOSE
41	Line	Neutral	CLOSE	OPEN
42	Neutral	Line	OPEN	CLOSE
43	Neutral	Line	CLOSE	OPEN



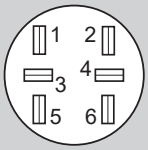
4 Jaw Base

5 Blade Selection					
Config	1	2	3	4	5
5S	Line	Neutral	OPEN	CLOSE	NC POL
51	Line	Neutral	OPEN	CLOSE	LC POL



5 Jaw Base

6 Blade Selection						
Config	1	2	3	4	5	6
6S	Line	Neutral	LC POL	NC POL	OPEN	CLOSE
61	Line	Neutral	LC RTN	LC POL	OPEN	CLOSE
62	LC RTN	Neutral	Line	OPEN	LC POL	CLOSE
63	Line	Neutral	NC RTN	NC POL	OPEN	CLOSE
64	Line	Neutral	NC POL	LC POL	OPEN	CLOSE
65	LC POL	Neutral	Line	OPEN	ALT LC POL	CLOSE
66	LC POL	Neutral	Line	OPEN	LC RTN	CLOSE
67	------	Neutral	Line	OPEN	------	CLOSE
68	LC POL	Neutral	Line	OPEN	------	CLOSE
69	Line	Neutral	------	------	OPEN	CLOSE



6 Jaw Base

View as shown, is looking into female Meter Socket

▲**CAUTION:** Neutral Current or Phase Current input wires located in the same physical cable as Line-in, Open, and Close wiring may experience induced Neutral Current and/or Phase Current transients during Opening and Closing operations.

Table 1 Meter Socket Wiring Configurations

Direct Pole-Mount with Cannon Connector (Integrated or Cabled)

- 5-Pin Cannon Connector (Table 2)
- 7-Pin Cannon Connector (Table 3)
- Optional cable lengths available in five foot increments up to 50 feet
- Optional custom Cannon 5-Pin and 7-Pin wiring configurations available (Table 2 and Table 3)

▲**CAUTION:** Neutral Current or Phase Current input wires located in the same physical cable as Line-in, Open, and Close wiring may experience induced Neutral Current and/or Phase Current transients during Opening and Closing operations.

M-2980A Capacitor Control Cabinet (Cont.)

Lexan® Cabinet with Integrated Meter Socket Mount

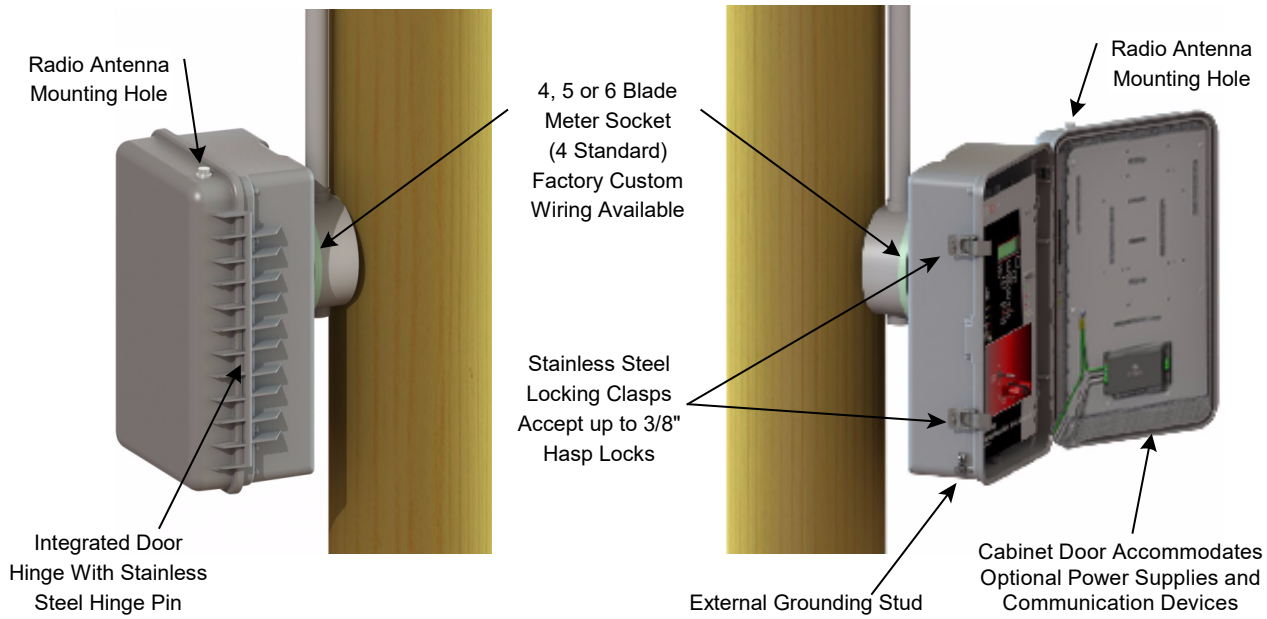


Figure 10 Lexan Cabinet with Integrated Meter Socket Mount

Lexan® Cabinet Direct Pole-Mount with cabled Meter Socket Plug

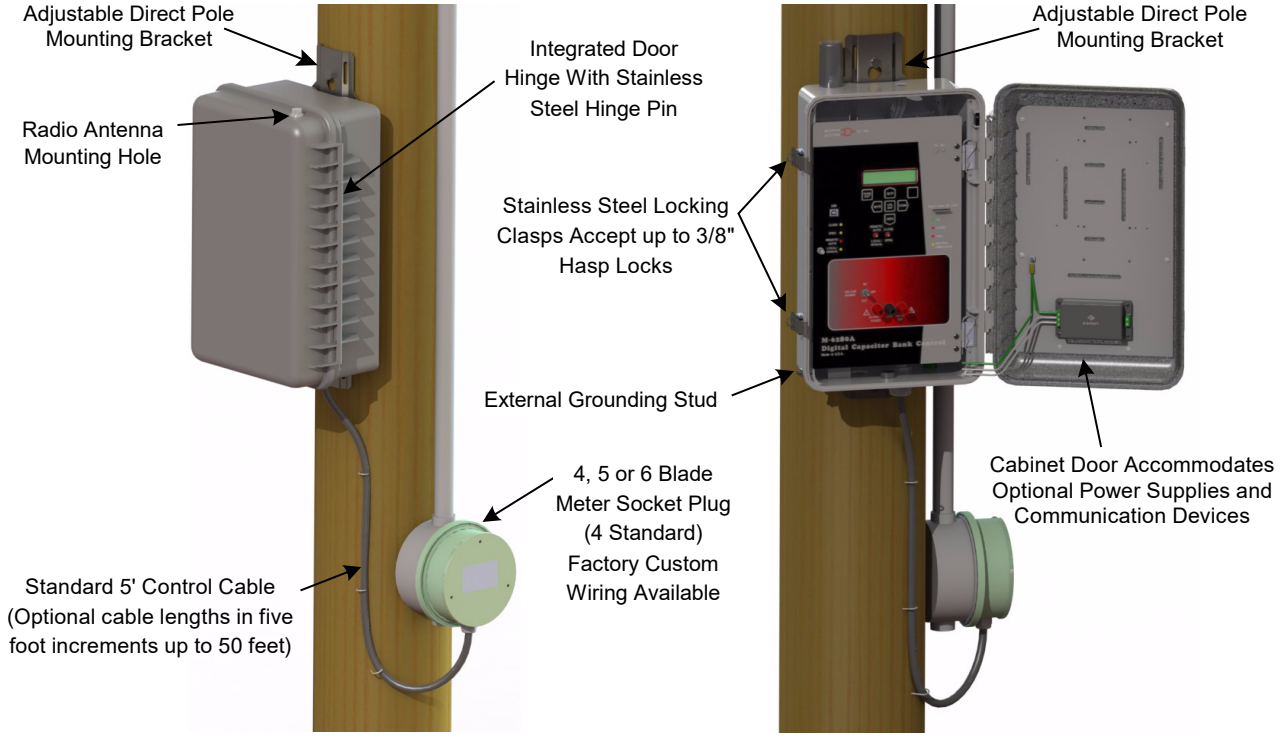
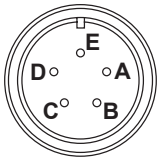


Figure 11 Lexan Cabinet Direct Pole-Mount with cabled Meter Socket Plug

M-2980A Capacitor Control Cabinet (Cont.)

M-6280A – 5-Pin Cannon Configurations

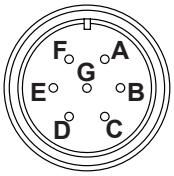


5-Pin Plug

	PIN				
Config	A	B	C	D	E
5E	Line	Neutral	CLOSE	OPEN	- - - - - -
5N	Line	Neutral	CLOSE	OPEN	Neutral Current Polarity
5L	Line	Neutral	CLOSE	OPEN	Line Current Polarity

Table 2 5-Pin Cannon Plug Configurations

M-6280A – 7-Pin Cannon Configurations



7-Pin Plug

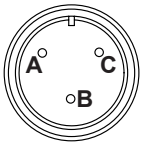
	PIN							
Config	Shell Size	A	B	C	D	E	F	G
7A	20	Line	OPEN	CLOSE	- - - - - -	NC POL	- - - - - -	Neutral
7B	16	Line	OPEN	CLOSE	- - - - - -	NC POL	LC POL	Neutral
7C	20	Line	Neutral	- - - - - -	CLOSE	OPEN	LC POL	LC RTN
7D	22	LC POL	NC POL	Line	NC & LC RTN	CLOSE	OPEN	- - - - - -
7E	20	Line	OPEN	CLOSE	NC & LC RTN	NC POL	LC POL	Neutral
7F	20	Line	Neutral	GROUND	CLOSE	OPEN	LC POL	LC RTN

NC POL = Neutral Current Polarity LC POL = Load Current Polarity
NC RTN = Neutral Current Return LC RTN = Load Current Return

Table 3 7-Pin Cannon Plug Configurations

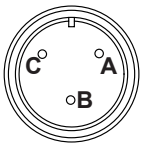
Load/Neutral Current Wiring Options

M-6280A 3-Pin Cannon Configurations



3-Pin Plug
(Cabinet Side)

	PIN			
Config	A	B	C	
Line Post Sensor	Line Current Polarity	Load Current Return	Ground	



3-Pin Plug
(Cabinet Side)

	PIN			
Config	A	B	C	
Neutral Current 50:0.2 CT	Neutral Current Polarity	Neutral Current Return	Ground	

Table 4 3-Pin Cannon Plug Configurations

M-2980A Cabinet – Optional Equipment/Accessories

- Load Current Sensor Options:
  - 15 kV Fisher Pierce Line Post Sensor – includes 35 ft. cable with 3-Pin Cannon connector
  - 15 kV Single Core Lindsey Line Post Sensor
  - 30 Foot Cable for Lindsey Line Post Sensor
- Neutral Current Sensor Options:
  - 50**:**0.2 CT Neutral Current Sensor terminated with 3-Pin Cannon connector (Table 4) using customer specified (10, 20, 35, or 45 foot) length of shielded twisted pair cable. Includes Cabinet Side Connections installed.
  - 50**:**0.2 CT Neutral Current Sensor with customer specified (10, 20, 35, or 45 foot) length of shielded twisted pair cable
  - Cannon Connector, cabinet side 3-Pin (Table 4)

▲**CAUTION:** Use of a Fisher Pierce AT-929 for Neutral Current input to the M-6280A control without a B-1391 Resistor Assembly installed between TB1-14 and TB1-15 will result in damage to the control and the display of an error code.

Radio/Communication Accessories

■ **NOTE:** Consult the Factory for the latest Antenna, Lightning Protection, and Radio options.

- Antennas
- Antenna Cable & Bulkhead Connector (for installation with antennas mounting direct to cabinet)
- Lightning Protection (for installations with external antennas)
- Radio Options including: 2 Way VHF (154 MHz) radio, 2 Way (130 MHz to 7 GHz) radio modems, and Digital Cellular Modems
- Radio ready options including: Universal Radio Bracket, Bracket with 12 or 24 Vdc power supply, and Bracket with customer supplied power supply installed
- Radio Factory Installation for both Beckwith supplied radio, or customer supplied radio
- RS-232 and Ethernet Radio Communication Cables
- Universal Radio/Modem Bracket (for field mounting in the door of the M-2980A Cabinet)
- Power Supply for radio: available in 12 Vdc or 24 Vdc
- Universal Power Cable provides fused 120 Vac to a radio power supply (included on all radio brackets)

Miscellaneous Accessories

- Pole-Mount bracket (Figure 11)
- DB9 to DB25: RS-232 Cable Converter
- External Temperature Sensor
- Intrusion Detection Microswitch assembly (available on Lexan Cabinet only): the cabinet door intrusion detection microswitch (Figure 8) status (Close/Open Condition) is monitored by the M-6280A. If an Open Condition is detected, a DNP binary input point for intrusion detection will be set and will generate a DNP event. The intrusion detection will also be monitored using MODBUS register 1791 @ bit 3.
- 1/2" HEYCO Liquid Tight Cordgrip to secure cable coming into cabinet
- 25 foot N male to N male LMR-400 antenna extension cable
- 120 V Switch Status Contact for Direct Field Wiring (N-2980A-SSC): This factory installed accessory adds capacitor bank switch status monitoring and includes the B-1939 Switch Status Converter module. The module converts an external signal voltage of 120 Vac to 10 Vdc output for connection to the control's 12 Vdc Switch Status inputs. Contact Customer Technical Support for more information.

Battery Backup Power

This option provides backup power to the control, and radio (if equipped). The Battery Backup system consists of:

- MEAN WELL Power Supply: Model Number PSC-100A-C
- Battery Cell Pack: CYCLON® Battery BC Single Cell Model Number 0850-0108

M-2980A Capacitor Control Cabinet (Cont.)

Physical

Molded Lexan Cabinet

Size: 18.38" high x 12.43" wide x 7.81" deep (46.7 cm x 31.6 cm x 19.84 cm)

Approximate Weight: 10 lbs, 8 oz (4.76 kg)

Approximate Shipping Weight: 12 lbs (5.44 kg)

Approximate Weight with M-6280A Digital Capacitor Bank Control: 18 lbs (8.17 kg)

Approximate Shipping Weight with M-6280A Control: 21 lbs, 8 oz (9.75 kg)

Cold Rolled Steel/Stainless Steel (304) B7B346

Size: 22.6" high x 11.38" wide x 10.09" deep (57.5 cm x 28.91 cm x 27.69 cm)

Approximate Weight: 16 lbs, 8 oz (7.48 kg)

Approximate Shipping Weight: 24 lbs (10.89 kg)

Approximate Weight with M-6280A Digital Capacitor Bank Control: 23 lbs, 8 oz (12.36 kg)

Approximate Shipping Weight with M-6280A Control: 36 lbs (16.33 kg)

■ **NOTE:** Add approximately 7.5 lbs (3.4 kg) when equipped with Battery Backup option.

Warranty

The M-2980A Weatherproof Capacitor Control Cabinet is covered by a ten year warranty from date of shipment. Third party mounted options will carry their respective manufacturer's warranty, passed along through Beckwith Electric.

Trademarks

Specification subject to change without notice. Beckwith Electric has approved only the English version of this document.

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ISO 9001:2015

A proud member of the Hubbell family.

M-6280A-SP-21 12/23