

Three Phase Capacitor Bank Control M-6283A



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)
- ports (232, 485, Fiber or Bluetooth)
 Optional full 10/100 Mbps auto-sensing, autonegotiable 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

Three Phase Sensing 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
- Full three phase voltage and current sensing
- Compatible with traditional VT's, Line Post Sensors and multi-core LPS
- Three phase (Ganged) capacitor switch operation with optional Independent Phase switching
- 8 Setting profiles with programmable automatic or SCADA controlled profile switching
- Patent pending neutral current detection algorithm

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 $\mbox{s/c}$
- Three phase overcurrent detection for through fault monitoring

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



Standard Features

- Three-phase sensing voltage (std) and current (optional)
- Operation based on per phase or average of the three phases
- Three phase (Ganged) capacitor switch operation with optional Independent Phase switching
- Three control modes of operation:
 - Classic Automatic (Voltage, optional VAr Control or optional Current Control)
 - Remote
 - Manual
- Two override modes of operation:
 - Temperature
 - Time
- 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 Setpoints 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 for each phase (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
- Time sync via DNP3.0 Set Time Command
- DNP mapping templates to match SCADA historical databases
- FULL DNP implementation Including DNP File Transfer, multi-addressing, unsolicited response, source address validation
- DNP+Ethernet Send/receive DNP configuration files using DNP File Transfer Protocol
- Adaptive Delta Voltage sensing during switch operations
- Daily Operations Counter Limit with Alarm
- CapTalk[®] S-6283 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

Standard Features (Cont.)

- 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
- 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
- Complies with California Password Law (SB-327)

Optional Control Features

- Independent Phase Switching
- Automatic VAr Control Mode option includes: 0 to 10 V Line Post Sensor input (Impedance ≈ 1 MΩ)
- COM2, RS-232 Communications 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-6283A can be housed in a Molded Lexan, Cold Rolled Steel or Stainless Steel Control cabinet. (See <u>"M-2980A Capacitor Control Cabinet"</u> section of this specification for detailed information).

CAPACITOR BANK CONTROL OPERATION

Control Modes of Operation

Depending on the control mode of operation, the control parameter can be either Voltage, VArs* or Current*. For example the control Voltage is the measurement used in the control algorithm to make the load voltage regulation decision. The control parameter is user selectable.

The three user selectable options are:

- Single Phase Selection (A, B, or C)
- Three Phase Average/Total
- Single Independent Phase Switch (Optional)

Single Phase Selection

This option will allow the user to choose which phase: A, B or C is used as the controlling parameter. Once this is selected, the control will use that phase value in Classic voltage control mode to make a decision on how to regulate the load voltage. The option is valid for all three methods of control: Voltage, VArs and Current. In addition, each individual Open or Close contact will operate simultaneously during a Trip or Close operation.

Three Phase Average/Total

This option will average the value of all three phase quantities and this average will be used to make the control decision. The option is valid for all three methods of control: Voltage, VArs and Current. It is important to note that when the control is using VAr Control, the averaging is replaced by the total sum of the VArs of all three phases.

In addition when the option is selected the CT Multiplier is assumed to be equal. In Control Mode Limits the maximum and minimum of the 3 phases is used to evaluate whether the voltage is violating the user assigned limits. In addition, each individual Open or Close contact will operate simultaneously during a Trip or Close operation.

Independent Phase Switching (Optional)

This option will allow the user to independently operate each phase of a Capacitor Bank switch based on the chosen Control Mode of Operation. The chosen operational mode's settings are not duplicated for each phase but instead use one group of settings which are used by all three phases to make Independent Phase Switching decisions. Each phase will have a dedicated set of Close and Open contacts.

Control Modes of Operation

■ NOTE: Open or close operations in Automatic mode will be blocked if the sensing voltage is less than 85 V. This block was designed to prevent capacitor switches from operating when voltage is low on the system. As of firmware version 05.09.01, this block does not apply to Local/Manual or Remote operations.

Automatic 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: 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.
- 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 Line Post Current Sensor inputs to provide phase current measurement to the control.

- 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: 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.
- 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 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 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: 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.
- 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.

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

When enabled, if control operation will result in voltage outside of the Control Mode 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. Control Mode Limits can be selected as: Disable All, Enable in Auto, Enable in Remote, Enable in Manual. Any combination of Enable in Auto, Enable in Remote and Enable in Manual 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 (Non Individual Phase Operation):
 - 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
- Close/Open Pulse Duration (Individual Phase Operation):
 - Solenoid Driven Switch Type Adjustable from 50 to 300 ms in 1 ms increments
 - Motor Driven Switch Type Adjustable from 5 to 30 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 individual phases of 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 individual phases of 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 individual phase 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 for Three Phase Switching

Current measured by the Neutral Unbalance Current Detection feature is used to detect bank or switch failures as well as bank Open or Close status. The M-6283A Digital Capacitor Bank Control makes use of a neutral current input from the neutral circuit. This input is developed in a number of ways, as an input to the cap bank control.

Utilizing a direct measurement of current flowing in the neutral, and comparing the value with either Bank Status Open/Closed current limit, or hardwired bank switch status auxiliary contacts, the control can make differentiations as to the cause of the unbalance current flow.

Neutral Unbalance Current is measured using one of the following:

- 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 and should be chosen if either a Voltage or Current Line Post Sensor will be used.

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 1 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.

Neutral Unbalance Current Detection for Optional Independent Phase Switching

In Independent Phase Switching mode, the control will determine whether an operation is successful depending on the magnitude of the Neutral Current of the phase angle measurement with references to a user selected phase. The level above which a neutral unbalance is detected is identified by the nominal voltage and max cap bank size settings.

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 CapTalk Metering and Status Screen (Figure 2). 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: When the Operation Counter reaches this limit, any further operation is blocked until 12:00 AM. The user is alerted either by communications and/or a programmable alarm. The limit is settable from 2 to 99. The counter can be enabled or disabled in "Remote" and/ or "Manual" Mode. This counter is always enabled in "Auto" Mode.

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.

Maximum Voltage Limit

Resettable Counter Limit

Current Harmonics*

- Minimum Voltage Limit
- Remote Undervoltage Limit
 - Daily Operation Counter Limit
 Voltage Harmonics
 - Remote Manual
- Leading VAr* Lagging VAr*
- Current THD Lockout*
 - Leading 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
- Remote Overvoltage Limit
- Neutral Magnitude Unbalance Neutral Phase Unbalance
- Voltage Harmonics Delta Voltage Alarm

Minimum Voltage Limit

- Current Harmonics* Phase Overcurrent*
- Leading VAr* Lagging VAr*
- Bank Failed Level 2 Lagging Power Factor*

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

- Voltage (Phase A, B, C) • RMS Voltage (Phase A, B, C) • Delta Voltage (Phase A, B, C) Primary Volt. (Phase A, B, C) Frequency Neutral Current
- Real Power (Phase A, B, C) Neutral Current Phase Angle
- Current (Phase A, B, C) Active Profile

• Reactive Power (Ph. A, B, C)

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
- Minimum Voltage Limit Remote Overvoltage Limit
- Neutral Magnitude Unbalance Neutral Phase Unbalance
- Voltage Harmonics Current Harmonics*
- Phase Overcurrent Delta Voltage Alarm
- Lagging VAr* Leading Power Factor*
- CBEMA 1 Through 4
 - Leading VAr*
 - Lagging Power Factor*

Primary Neutral Current

Maximum Voltage Limit

Remote Undervoltage Limit

SCADA HeartBeat (DNP only)

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 Frequency

- Delta Voltage
- Operation Counter
- Capacitor Bank Status
- Temperature
- Resettable Counter Real Power

Reactive Power

- Remote Overvoltage Limit
- Neutral Magnitude Unbalance
 Neutral Phase Unbalance

 - Self Test
 - Voltage THD Lockout
 - Lagging Power Factor*

- Maximum Voltage Limit
- Remote Undervoltage Limit
- SCADA HeartBeat (DNP only)
 - CBEMA 1 through 4
 - HMI Active
 - Leading Power Factor*

Metering

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



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



Figure 2 provides an example of the Independent Phase Status Dialog Screen.



Figure 2 Independent Phase Status Dialog Screen

Inputs

Switch Power Input: Nominal 120 Vac, 60 Hz (50 Hz optional); operates properly from 95 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.

V1, V2, and V3 Monitor Voltage Inputs: 0 - 10 Vac Line Post Voltage Sensor input, optional 0 to 150 Vac VT input. These inputs are suitable for use with high impedance voltage dividers. Input impedance is approximately 1 M Ω . The inputs will withstand twice the maximum voltage rating for one second and four times the maximum voltage rating for one cycle.

Phase Current Input: 0 – 10 Vac Line Post Current Sensor input. External current to voltage conversion is required if 5 A CT is to be used. Appropriate multiplier is utilized to calculate the primary phase current. Line Post Current Sensor option also includes a phase shift compensation setting.

Neutral Unbalance Current Input: 0 – 10 Vac Line Post Current Sensor, 200 mA, or 5 A input will also be supported. Appropriate multiplier is utilized to calculate the primary neutral unbalance current.

Outputs

One Close Output (Three Close Outputs with Independent Phase Switching option): Capable of switching 10 A for 30 sec or 45 A for 25 ms.

One Open Output (Three Open Outputs with Independent Phase Switching option): 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.

Unit Identifier

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

Smart Flash SD Card Slot

Allows the user to perform the following functions:

- Load Setpoints
- Save Oscillograph Records
- Save DNP Config
- SD Card User Access (Physical Security Key)
- Save Data Log

· Clone Save

Save Setpoints

- Clone Load
- Multiuser Access Code Log
- Save Metering Data

- Quick Capture
- Save Sequence of Events
- Load DNP Config
- Save Wake Screen Data
- Multiuser Access Code
- 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-6283 Communications Software or SCADA communications software.

Protocols: The standard protocols included in the M-6283A 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-6283A 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-6283A. 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.

Optional Bluetooth: The optional Bluetooth (V2.0 +EDR Class 1 Type) provides wireless access to the M-6283A. 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-6283A allows networking of multiple M-6283A'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.

- Firmware Update
- \$2



Figure 3 Direct Connection

Cyber Security

NERC CIP Compliance: The M-6283A provides all the necessary tools to help customers be NERC and Cyber Security compliant. The M-6283A 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-6283A. 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

M-6283A Digital Capacitor Bank Control – Specification



Straight DB25 Connection to Computer RS-232 COM Port



ST Multi-mode or Vpin 62/125 or 200 Micron Optical Fiber

Figure 4 Fiber Optic Connection Loop



Figure 5 RS-485 Network Connection



Figure 6 Optional Ethernet Network Connection



Figure 7 Cellular Modem Network

Environmental

Temperature: Control operates from -50° C to +85° C.

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

IEC 60068-2-1	Cold, -50°C (-58°F)
IEC 60068-2-2	Dry Heat, +85°C (+185°F)
IEC 60068-2-78	Damp Heat, +40°С @ 95% _{RH}
IEC 60068-2-30	Damp Heat condensation cycles +25°C, +55°C @ 95% _{RH}
IEC 60068-2-38	Damp Heat condensation / frost cycles +25°C, +65°C, -10°C @ 95% _{RH}
IEC 60664-3	Conformal coat grade UV40-250 board protection -50° C (-58° F) to +125° C (+257° F) CAT IV

Tests and Standards

Surge Withstand Capability

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

IEC 61000-4-18 ±2,500 Vpk Oscillatory 1MHz

Electrostatic Discharge

IEC 61000-4-2	±8kV Contact ±15kV Air
IEEE C37.90.3	±8kV Contact ±15kV Air

Radiated Field Immunity

IEC 61000-4-3 10 V/m 80MHz – 1000MHz

Fast Transient/Burst Immunity

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

Surge Immunity

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

Conducted Disturbance Immunity

IEC 61000-4-6 10 V_{rms} 150kHz – 80MHz

Power Frequency Magnetic Field Immunity

IEC 61000-4-8 50A/m continuous, 300A/m short duration

Voltage Interruptions Immunity

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

Power Frequency Conducted Immunity DC Bank Switch Status Input Ports

IEC 61000-4-16	100v 50/60Hz differential mode coupling
	150v 50/60Hz differential mode coupling
	300v 50/60Hz common mode coupling

Voltage Withstand

IEC 60255-27	Impulse ±5 kV
	Dielectric 2 kVac
	Insulation >3 G Ω
IEC 60664-1	Category IV

Electromagnetic Emissions

EN 55022 Radiated	30 MHz-2000 MHz Class A Limits
EN 55022 Conducted	150 kHz-30 MHz Class A Limits
	(when used with B-1722 RJ45 Cable Adapter)

Mechanical Environment

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

Physical

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 M-6283A Three Phase Digital Capacitor Bank Control is covered by U.S. Patent No. 10,122,162.

The M-6283A Three Phase Digital Capacitor Bank Control is covered by a ten year warranty from date of shipment.



Figure 8 M-6283A Control Outline Dimensions

Hardware Change Notification

M-6283A Controls with Serial Numbers 25000 and higher include a new hardware version. The inclusion of the hardware change can be verified by confirmation that TB4 is on the rear of the control. The Line Post Sensor inputs of the M-6283A were redesigned to minimize variation of the input impedance and reduce noise, thereby improving the accuracy of voltage and current measurements.

Hardware Compatibility

A new 14-pin Cannon Harness (Beckwith Electric Assembly B-1843) has been created for compatibility with the improved hardware. Retrofitting an M-6283A with the improved Line Post Sensor Inputs into existing cabinets will require a field modification of 14-pin Cannon Harness (Beckwith Electric Assembly B-1400). This simple modification requires removal of the terminal lugs that connect to TB1 and TB2, stripping the wires where the terminal lugs were removed, and redressing the harness to connect to TB4.

■ NOTE: Previous connections to TB1 and TB2 for phase voltages and phase currents are **not used** with this hardware update.



Figure 9 M-6283A Typical External Connections

M-6283A Digital Capacitor Bank Control – Specification



Figure 10 M-6283A Rear View with Independent Phase Switching Option

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 11)

- 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) (<u>Table 1</u>)
- Optional custom Meter Socket Plug wiring configurations are available (refer to Table 1)

Direct Pole-Mount with cabled Meter Socket Plug (see Figure 12)

- 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) (<u>Table 1</u>)
- Optional cable lengths available in five foot increments up to 50 feet
- Optional custom Meter Socket Plug wiring configurations are available (<u>Table 1</u>)

M-6283A Three-Phase Control – Meter Socket Wiring							
		4 Blade Selec					
Config	1	2	3	4			
4S	Line	Neutral	OPEN	CLOSE		2	Base
41	Line	Neutral	CLOSE	OPEN	∏3	4	Dusc
42	Neutral	Line	OPEN	CLOSE			
43	Neutral	Line	CLOSE	OPEN			
Config	1	2	3	4	5		5 Jaw Base
5S	Line	Neutral	OPEN	CLOSE	NC POL		
			6 Blade Selec	ction			
Config	1	2	3	4	5	6	
63	Line	Neutral	NC RTN	NC POL	OPEN	CLOSE	
67		Neutral	Line	OPEN		CLOSE	
69	Line	Neutral			OPEN	CLOSE	6 Jaw Base
		View	as shown, is lool	king into female N	Veter 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 (<u>Table 2</u>)
- 8-Pin Cannon Connector (Table 3)
- 19-Pin Cannon Connector (<u>Table 4</u>)
- · Optional cable lengths available in five foot increments up to 50 feet
- Optional custom Cannon 5-Pin, 8-Pin, 19-Pin wiring configurations available (Table 2 through Table 4)

▲ 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.



Lexan[®] Cabinet with Integrated Meter Socket Mount

Figure 11 Lexan Cabinet with Integrated Meter Socket Mount



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

Figure 12 Lexan Pole Mount Cabinet and Meter Socket Plug

M-6283A – 5-Pin Cannon Configurations							
	PIN						
D∘ °A	Config	А	В	С	D	E	
C° °B 5-Pin Plug	5E	Line	Neutral	CLOSE	OPEN		
	5N	Line	Neutral	CLOSE	OPEN	Neutral Current Polarity	

Table 25-Pin Cannon Plug Configurations

M-6283A 8-Pin Cannon Configurations									
	PIN								
	Config	А	В	С	D	E	F	G	Н
F° H° C E D	8A	LINE	NEUTRAL	CLOSE	OPEN	Switch Status 1	Switch Status 2	Switch Status 3	Status RTN
8-Pin PLUG	8C	V1	V2	V3	CLOSE	OPEN	NEUTRAL		

 Table 3
 8-Pin Cannon Plug Configurations

M-6283A 19-Pin Cannon Configurations – Independent Phase Switching								
		PIN						
	Config	A	В	С	D	E		
		POWER	NEUTRAL	PHASE 1 OPEN	PHASE 1 CLOSE	NEUTRAL		
		F	G	н	J	к		
	19 and 9S*	PHASE 2 OPEN	PHASE 2 CLOSE	NEUTRAL	PHASE 3 OPEN	PHASE 3 CLOSE		
		L	М	N	Р	R		
		NEUTRAL		SW STATUS 1		SW STATUS 2		
		S	Т	U	V			
19-Pin Plug			SW STATUS 3	WETTING SUP.				
*9S 19-Pin Cannon Connector for 120V Switch Status Contact (Single Pole Switching). NOTE: Wetting supply (U) is not connected through the wiring harness.								

Table 4 19-Pin Cannon Plug Configurations

Neutral Current Wiring Option

M-6283A 3-Pin Cannon Configuration									
		PIN							
C° A	Config	A	В	С					
○B 3-Pin Plug (Cabinet Side)	Neutral Current 50:0.2 CT	Neutral Current Polarity	Neutral Current Return	Ground					

Table 5	3-Pin	Cannon	Plug	Configuration	(Neutral	Current)
---------	-------	--------	------	---------------	----------	----------

Three-Phase Sensor Input Wiring Option

M-6283A 14-Pin Cannon Configuration – Three-Phase Sensor Interface											
		PIN									
	Config	А	В	С	D	E					
A	1, 3, L Matches Sensing Voltage Input Selection*	V1 RTN (connected but not used Configs 1, 3)	V2 RTN (connected but not used Config 3)	or NC POL (with Neutral Current option)	or NC RTN (with Neutral Current option)	(Configs 1,3) or V1 POL (Config L)					
		F	G	н	J	К					
$ \begin{array}{c c} & & & & \\ & & & & \\ & & & & \\ & & & & $		(Config 3) or V2 POL (Configs 1, L)	(Config 3) or V3 POL (Configs 1, L)	V1, 2, 3 RTN (connected but not used Config 3)	I1 POL	I1 RTN					
		L	М	N	Р						
14-Pin Plug		I2 POL	I2 RTN	I3 POL	I3 RTN						
	*Sensing Voltage Input Selections										
	Config 1: Phase 1 = 120 Vac, Phases 2 & 3 = 0-10 V Line Post Sensor										
	Config 3: Phases 1, 2, & 3 = 120 Vac										
	Config L: Phases 1, 2 & 3 = 0-10 V Line Post Sensor										
	NOTE: Any phase that uses 120 Vac for Voltage Sensing does not run through the 14-Pin Cannon.										

▲ 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 6
 14-Pin Cannon Plug Configuration (for Three-Phase Sensor Input)

M-2980A Cabinet – Optional Equipment/Accessories

- Three-Phase Sensor Input Options (see <u>Table 6</u>):
 - 15 kV Lindsey Multicore Voltage and Current Sensor
 - Cannon Converter Cable connects B-1400-1 to Lindsey sensor
 - 15 kV Lindsey Voltage Sensor
 - Lindsey Connector with cable assembly
 - Current Sensor 15 kV Lindsey Line Post Sensor
 - Cable for Lindsey Line Post Sensor (20, 30, or 45 foot)
- Neutral Current Sensor Options (see <u>Table 5</u>):
 - 50:0.2 CT Neutral Current Sensor terminated with 3-Pin Cannon connector 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

CAUTION: Use of a Fisher Pierce AT-929 for Neutral Current input to the M-6283A Control without Jumper JP1 placed in the A-B position 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 12)
- DB9 to DB25: RS-232 Cable Converter
- External Temperature Sensor
- Intrusion Detection Microswitch: the cabinet door intrusion detection microswitch (Figure 9) status is monitored by the M-6283A and is available in the CapTalk Status screen. 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 1725 @ 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

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

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-6283A Digital Capacitor Bank Control: 18 lbs (8.17 kg) Approximate Shipping Weight with M-6283A 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-6283A Digital Capacitor Bank Control: 23 lbs, 8 oz (12.36 kg) Approximate Shipping Weight with M-6283A 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

All brand or product names referenced in this document may be trademarks or registered trademarks of their respective holders.

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

BECKWITH ELECTRIC

6190 118th Avenue North • Largo, Florida 33773-3724 U.S.A. PHONE (727) 544-2326 beckwithelectricsupport@hubbell.com www.beckwithelectric.com ISO 9001:2015



HUBBELL A proud member of the Hubbell family.