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GENERAL

CAPACITORS ARE A VITAL PART OF THE PROGRESS ENERGY FLORIDA SYSTEM. CAPACITORS PERFORM THE DUAL JOB OF MAINTAINING THE SYSTEM VOLTAGE LEVEL AND INCREASING SYSTEM EFFICIENCY. TO ENSURE THAT CAPACITORS PERFORM PROPERLY, THE GUIDELINES OUTLINED IN THESE STANDARDS SHOULD BE CAREFULLY READ AND FOLLOWED.

CAPACITORS ARE GENERALLY INSTALLED IN THREE-PHASE BANK CONFIGURATIONS WITH THE SIZE EXPRESSED IN kVAR. THERE ARE TWO TYPES OF CAPACITOR BANKS; FIXED AND SWITCHED. FIXED BANKS ARE USED WHEN kVAR IS NEEDED 24 HOURS PER DAY. THEY CAN BE MANUALLY ENERGIZED AND DE-ENERGIZED SEASONALLY AS SYSTEM REQUIREMENTS DictATE. SWITCHED BANKS ARE ELECTRONICALLY CONTROLLED AND AUTOMATICALLY COME ON AND GO OFF.

INSPECTION

1. CHECK THE NAMEPLATE FOR SIZE, RATED VOLTAGE AND TYPE OF CAPACITOR TO COMPLY WITH JOB REQUIREMENTS.

2. ALL CAPACITORS SHALL BE SHORTED OUT WHILE NOT INSTALLED. ATTACH WIRE JUMPERS FROM BUSHING TO BUSHING AND THEN TO TANK GROUND. THIS SHALL BE DONE TO ALL UNITS WHEN BROUGHT IN FROM THE FIELD.

3. MAKE A VISUAL INSPECTION OF THE CAPACITOR. DO NOT INSTALL A CAPACITOR WITH ANY OF THE FOLLOWING:
   A. BROKEN INSULATORS.
   B. BULGED TANK (A SIGN OF A DEFECTIVE CAPACITOR).
   C. DEFECTIVE WELDS, BENT HANGERS, LOOSE BUSHINGS.
   D. OIL LEAKS (FOLLOW APPROPRIATE OILS DISPOSAL GUIDELINES).

TESTING - CAPACITOR METER

1. B&K PRECISION METER MODEL 830 OR 830A (C-METER) SHOULD BE USED TO TEST CAPACITORS.

2. WHEN TESTING CAPACITORS IN THE FIELD, CARE SHALL BE TAKEN TO INSURE THAT THE CAPACITOR IS PROPERLY DE-ENERGIZED AND GROUNDED BEFORE ATTEMPTING TO TAKE MEASUREMENTS.

3. REMOVE THE SHORTING JUMPER FROM THE CAPACITOR.

4. ADJUST THE C-METER OFFSET CONTROL. ADJUST THE CAPACITANCE OFFSET POTENTIOMETER ON THE FRONT PANEL ACCORDING TO THE MANUFACTURER’S INSTRUCTIONS UNTIL THE DISPLAY READS ALL ZEROS.

5. OBTAIN MEASUREMENT.

SINGLE-PHASE UNITS (TWO BUSHINGS)

A. CONNECT THE C-METER LEADS FROM BUSHING CONNECTOR TO BUSHING CONNECTOR.

B. IF THE C-METER DISPLAYS A NEGATIVE VALUE, REVERSE THE LEADS AND REPEAT TEST.
PHASE TEST


6. COMPARE THE MEASURED VALUE TO THOSE IN THE TABLE OF ACCEPTABLE CAPACITANCE VALUES ON DWG. 07.00-35.

7. RETURN THE SHORTING JUMPER TO ANY UNIT THAT IS GOING TO BE BROUGHT IN FROM THE FIELD.

MOUNTING

CAPACITORS ARE HEAVY AND NOT EASY TO HANDLE. MANY INDIVIDUAL UNITS DO NOT HAVE LIFTING EYES. CAPACITORS SHOULD NOT BE LIFTED OR MOVED BY THE BUSHINGS.

1. CAPACITORS ARE MANUFACTURED WITH A STANDARD DISTANCE BETWEEN MOUNTINGS. THIS WAY, THEY ARE INTERCHANGEABLE AND FIT IN STANDARD RACKS. HOWEVER, THE HEIGHT AND WIDTH MAY VARY FROM MANUFACTURER TO MANUFACTURER. THIS MAY BE EVIDENT WHEN REPLACING DAMAGED OR DEFECTIVE CANS AS SHOWN IN THE FOLLOWING PICTURE.

![Capacitor Mounting Frame](image)

INSTALLATION

1. CAPACITOR MOUNTING FRAMES (RACKS) ARE TO BE GROUNDED.

2. USE #6 WP SOLID COPPER WIRE FROM THE CAPACITOR BANK TO THE CUTOUT AND FROM THE CUTOUT TO THE HOTLINE CLAMP. #6 WP COPPER SHALL ALSO BE USED BETWEEN CAPACITOR UNITS TO REDUCE POTENTIAL FOR OUTAGES DUE TO ANIMALS.

3. A 10KV ARRESTER SHALL BE MOUNTED ON THE CAPACITOR RACK ON THE SOURCE SIDE OF THE OIL SWITCH. THESE COME PRE-INSTALLED ON NEW BANKS.

4. ON SWITCHED BANKS, LOCATE THE POLE GROUND DOWN LEAD AS FAR AWAY FROM THE CAPACITOR CONTROL CABLE AS POSSIBLE TO REDUCE POTENTIAL DAMAGE TO THE CONTROL IF A LIGHTNING STRIKE IS DISCHARGED THROUGH THE GROUND.

5. ON SWITCHED BANKS INSTALLED ON VERTICAL CONSTRUCTION, THE 1KVA CONTROL TRANSFORMER SHOULD BE CONNECTED TO THE POLE GROUND.

6. ON SWITCHED BANKS, THE CONTROL BOX SHALL BE CONNECTED TO THE POLE GROUND.

7. ON SWITCHED BANKS THE CONTROL BOX SHALL BE CONNECTED TO THE POLE GROUND.

8. ON SWITCHED BANK CONTROLS, INSTALL A 175-VOLT ARRESTER TO REDUCE THE POTENTIAL FOR DAMAGE FROM LIGHTNING.

9. CAPACITOR BANKS SHALL BE INSTALLED ON THE LINE SIDE OF ANY ASSOCIATED PRIMARY METER INSTALLATION.

FUSING

CAPACITOR FUSING SCHEDULE FOR 12.47 KV GROUNDED Y BANKS IS AS FOLLOWS:

<table>
<thead>
<tr>
<th>KVAR CONNECTED PER PHASE</th>
<th>FUSE SIZE</th>
</tr>
</thead>
<tbody>
<tr>
<td>200</td>
<td>40K</td>
</tr>
<tr>
<td>400</td>
<td>65K</td>
</tr>
</tbody>
</table>

APPLICATION BASED ON AVAILABLE CURRENT:

1. CAPACITOR UNITS SHALL NOT BE INSTALLED IN AREAS WHERE THE AVAILABLE PHASE TO GROUND CURRENT EXCEEDS 6000 AMPS PHASE TO GROUND.

2. CONSULT DISTRIBUTION STANDARDS IF AN INSTALLATION NEEDS TO BE MADE WHERE FAULT CURRENT EXCEEDS 6000 AMPS PHASE TO GROUND.

3. SYSTEM ENGINEERING SHOULD BE CONSULTED REGARDING CAPACITOR BANK FUSING IF CAPACITOR BANK IS INSTALLED BEYOND SINGLE-PHASE RECLOSERS RATED LESS THAN 100 AMPS CONTINUOUS.
ENERGIZING

NOTE: DO NOT ENERGIZE CAPACITOR WITH RIGHT-OF-WAY ON THE FEEDER.

FIXED CAPACITORS
1. CHECK TO SEE THAT THE BANK IS INSTALLED TO THESE OVERHEAD DISTRIBUTION SPECIFICATIONS.
2. CLOSE IN THE CUTOUTS WITH AN EXTENDO STICK OR AN 8-FOOT SWITCH STICK.

SWITCHED CAPACITORS
1. CHECK TO SEE THAT THE CAPACITOR BANK IS INSTALLED TO THESE OVERHEAD DISTRIBUTION SPECIFICATIONS.
2. EACH CAPACITOR CONTROL IS SLIGHTLY DIFFERENT. REFER TO THE SECTION OF THIS SPECIFICATION FOR THE CONTROL INVOLVED FOR SPECIFIC MANUAL, AUTOMATIC, TRIP AND CLOSE OPERATING INSTRUCTIONS. UNLOCK THE CONTROL BOX AND PLACE THE CONTROL IN MANUAL AND TRIP POSITIONS.
3. CLOSE THE CUTOUTS ENERGIZING THE CONTROL TRANSFORMER AND LEADS TO THE OIL SWITCHES.

NOTE: IT IS VERY IMPORTANT TO GIVE CAPACITORS FIVE MINUTES TO DRAIN BEFORE ATTEMPTING TO RE-ENERGIZE THEM.

4. IF IT HAS BEEN AT LEAST FIVE MINUTES BEFORE THE CAPACITORS WERE LAST ENERGIZED, INITIATE A CLOSE COMMAND TO THE CONTROL. THE OIL SWITCHES SHOULD RESPOND WITH A CLEAR AUDIBLE SOUND. VERIFY CLOSE POSITION OF ALL THREE OIL SWITCH OPERATING HANDLES.
5. INITIATE A TRIP COMMAND TO THE CONTROL. VERIFY THAT ALL THREE OIL SWITCH HANDLES ARE IN THE OPEN POSITION.

NOTE: AGAIN, IT IS VERY IMPORTANT TO GIVE CAPACITORS FIVE MINUTES TO DRAIN BEFORE ATTEMPTING TO RE-ENERGIZE THEM.

6. IF THE CONTROL SETTINGS HAVE NOT BEEN INSTALLED, LEAVE THE CONTROL IN THE MANUAL AND EITHER CLOSE OR TRIP POSITIONS AS INSTRUCTED BY THE ENGINEER IN THE WORK ORDER DRAWING. NOTIFY THE APPROPRIATE PERSONNEL THAT THE CAPACITOR INSTALLATION IS READY FOR CONTROL SETTINGS.
7. IF THE CONTROL SETTINGS HAVE BEEN INSTALLED, WAIT FIVE MINUTES FOR THE CAPACITORS TO DRAIN. THEN PLACE THE CONTROL IN THE AUTOMATIC MODE. NOTE: THE CAPACITORS MAY CLOSE AT THIS TIME.
8. CLOSE AND LOCK CONTROL BOX.

DE-ENERGIZING

NOTE: BEFORE WORKING ON OR TESTING CAPACITORS, THEY MUST BE COMPLETELY DRAINED. FOLLOW THE PROCEDURES AS DIRECTED UNDER "GROUNDING".

FIXED CAPACITOR BANKS
1. A LOAD BREAK TOOL SHALL BE USED TO DE-ENERGIZE A FIXED CAPACITOR BANK.
2. IF THE BANK IS TO BE LEFT DE-ENERGIZED, REMOVE THE CUTOUT DOORS AND SECURE THEM TO THE POLE IN THE UPRIGHT POSITION TO PREVENT WATER FROM COLLECTING IN THE DOOR TUBE.

SWITCHED CAPACITOR BANKS
1. EACH CAPACITOR CONTROL IS SLIGHTLY DIFFERENT. REFER TO THE SECTION OF THIS SPECIFICATION FOR THE CONTROL INVOLVED FOR SPECIFIC MANUAL, AUTOMATIC, TRIP AND CLOSE OPERATING INSTRUCTIONS. UNLOCK THE CONTROL BOX AND PLACE THE CONTROL IN MANUAL AND INITIATE A TRIP COMMAND.
2. IF THE BANK IS IN THE CLOSE POSITION, THE OIL SWITCHES SHOULD RESPOND AND OPEN WITH AN AUDIBLE SOUND. IF THE BANK IS ALREADY OPEN, NO RESPONSE WILL OCCUR.
3. VERIFY THAT ALL THREE OIL SWITCH HANDLES ARE IN THE OPEN POSITION.
4. OPEN THE CUTOUTS WITH A LOAD BREAK TOOL.
A. IF THE BANK IS BEING DE-ENERGIZED FOR SEASONAL PURPOSES, THE OIL SWITCHES SHOULD BE CHECKED IN THE MANUAL MODE. THE CUTOUT DOORS SHOULD BE LEFT CLOSED TO SUSTAIN THE CONTROL TO PREVENT UNNECESSARY DRAIN ON THE BATTERY.

B. IF THE BANK IS BEING DE-ENERGIZED TO CORRECT A DEFECT OR IN PREPARATION FOR REMOVAL, THE CUTOUT DOOR SHOULD BE REMOVED AND SECURED TO THE POLE IN THE UPRIGHT POSITION TO PREVENT WATER FROM COLLECTING IN THE DOOR TUBE. THE CONTROL BATTERY MAY DRAIN IN A FEW DAYS AND IF POSSIBLE THE BATTERY SHOULD BE REMOVED AND LEFT IN THE CONTROL BOX.

GROUNDING

WHEN GROUNDING A DE-ENERGIZED CAPACITOR, PRIMARY GROUNDING STICKS OR EQUIVALENT SHALL BE USED. DISTRIBUTION CAPACITORS WILL DISCHARGE WITHIN FIVE MINUTES. TO ENSURE COMPLETE DISCHARGING, A PRIMARY GROUNDING STICK CAN BE USED. AFTER DISCHARGING A CAPACITOR AND BEFORE ANY C-METER TESTING IS DONE, A SHUNT WIRE SHOULD BE PUT ACROSS EACH BUSHING TO BE TESTED. IT MAY BE REMOVED BEFORE TESTING AND THEN REPLACED FOR STORING OR SHIPPING THE DE-ENERGIZED CAPACITORS TO THE FIELD. RUBBER GLOVES SHALL BE USED ON POLE-MOUNTED TEST.

CURRENT LIMITING FUSE

THE 80 AMP CURRENT LIMITING FUSES ARE USED ON 1200KVAR BANKS WHERE THE AVAILABLE PHASE TO GROUND FAULT CURRENT IS GREATER THAN 6000 AMPS SYMMETRICAL.

ENGINEERING SHOULD SPECIFY THE LOCATIONS WHERE THIS CURRENT LIMITING FUSE IS NEEDED.

THE CURRENT LIMITING FUSE FITS IN A STANDARD 15KV CUTOUT AS SHOWN IN THE PICTURE. WHEN THE FUSE BLOWS, THE DOOR SHOULD DROP OPEN LIKE A CONVENTIONAL FUSE DOOR.

CURRENT LIMITING FUSES ARE NON-REUSABLE AND MUST BE REPLACED WITH A NEW ONE WHEN BLOWN.

CN 232204

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### PRIMARY VOLTAGE/SHUNT CAPACITOR VALUES - SINGLE-PHASE

<table>
<thead>
<tr>
<th>UNIT RATED VOLTAGE</th>
<th>UNIT RATED KVAR</th>
<th>ACCEPTABLE RANGE OF PHASE CURRENT AND UNIT CAPACITANCE</th>
<th>RATED UNIT KVAR</th>
<th>LOW CURRENT (AMPS)</th>
<th>LOW CAPACITANCE (µF)</th>
<th>HIGH AMPS</th>
<th>HIGH (µF)</th>
<th>HIGH AMPS</th>
<th>HIGH (µF)</th>
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<td>7200</td>
<td>25</td>
<td>ALL UNITS</td>
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<td>3.5</td>
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<td>6.9</td>
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<td>2.94</td>
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<td>100</td>
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<td>13.9</td>
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<td>7620</td>
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<td>14,400</td>
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<td>31.9</td>
<td>5.88</td>
<td>30.6</td>
<td>5.63</td>
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</table>

* CURRENT VALUES ARE CALCULATED BASED ON NAMEPLATE RATED VOLTAGE. IF TWO UNITS ARE PARALLELED ON A PHASE, THE PHASE CURRENT WILL BE 2X UNIT CURRENT.

NOTE: FOR UNITS ON THIS LIST, USE THE FOLLOWING EQUATION TO DETERMINE THE NOMINAL CAPACITANCE VALUE. THE ACCEPTABLE CAPACITANCE RANGE OF A TESTED UNIT IS 100% - 115% OF NOMINAL, FOR UNITS MADE BEFORE 2002. UNITS MADE AFTER 2002 SHOULD TEST BETWEEN 100% AND 110%.

\[
\text{SINGLE-PHASE UNIT CAPACITANCE} = \frac{2.65252 \times (\text{RATED UNIT KVAR})}{(\text{RATED UNIT KV})^2}
\]
NOTES:

1. STRIP WIRE WHERE IT IS TIED TO JUMPER POST.
2. PRIMARIES SHOULD BE COVERED TO REDUCE DAMAGE CAUSED BY ANIMAL CONTACT.
3. SEE DWG. 07.02-25 AND SECTION 01 FOR GROUNDING DETAILS.
4. SEE DWG. 07.02-15B FOR BILL OF MATERIALS.
5. CAPACITOR BANK SHALL BE INSTALLED ON THE LINE SIDE OF ANY ASSOCIATED PRIMARY METER INSTALLATION.
### BILL OF MATERIALS

<table>
<thead>
<tr>
<th>MACRO UNIT</th>
<th>CU ITEM NO.</th>
<th>COMPATIBLE UNIT</th>
<th>QTY REQ'D</th>
<th>CATALOG NUMBER</th>
<th>QTY PER CU</th>
<th>DESCRIPTION</th>
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<td>C1200FX12FM</td>
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<td>CAP1200FX12F</td>
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<td>9220130636</td>
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<td>1</td>
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<td>TFUSE15CO100F</td>
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<td>922009063</td>
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<td>BKTCOLATRISTLF</td>
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<td></td>
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<td>CLAMP, HOT LINE, ALUM, LARGE, 336-795</td>
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</tbody>
</table>

### NOTES:

1. SEE DWG. 07.02-15A FOR DESIGN SPECIFICATIONS.
NOTES:

1. SEE SECTION 01.01 FOR REQUIRED EQUIPMENT-TO-EARTH GROUNDING.

2. WILDLIFE GUARDS ARE NOT SHOWN. INSTALL WILDLIFE GUARDS ON ALL BUSHINGS.

3. BANK ORIENTATION IS TO BE PARALLEL TO THE LINE ON VERTICAL CONSTRUCTION AND PERPENDICULAR TO THE LINE ON HORIZONTAL OR TRIANGULAR CONSTRUCTION.

4. WHEN MAINTAINING EXISTING BANKS WITH BARE COPPER, REPLACE WITH #6 WP CU SLD SD.
NOTES:

1. ALL BANK HIGH VOLTAGE WIRING TO BE #6 SOLID SD WP CU.

2. BANK ORIENTATION IS TO BE PARALLEL TO THE LINE ON VERTICAL CONSTRUCTION AND PERPENDICULAR TO THE LINE FOR HORIZONTAL OR TRIANGULAR CONSTRUCTION.

3. INSULATED TUBING FOR ANIMAL PROTECTION IS SUPPLIED ON NEW BANKS.

4. ANGLE ARRESTERS AWAY FROM FRAME.
NOTES:

1. LOCATE THE POLE GROUND DOWN LEAD AS FAR FROM THE CONTROL CABLE AS POSSIBLE.

2. THE MOUNTING FRAME, TANKS, TRANSFORMERS AND JUNCTION BOX SHALL BE GROUNDED. SEE DWG. 07.02-02. SEE SECTION 01.01 FOR EQUIPMENT-TO-EARTH GROUNDING.

3. STRIP WIRE WHERE TIED TO INSULATORS.

4. FOR FIXED BANK SPACING DIMENSIONS, SEE DWG. 07.02-15.

5. CAPACITOR BANK SHALL BE INSTALLED ON THE LINE SIDE OF ANY ASSOCIATED PRIMARY METER INSTALLATION.
NOTES:

1. NEITHER TERMINAL OF THE 120 VOLT SOURCE IS TO BE GROUNDED.

2. REPLACEMENT JUNCTION BOX KIT IS CN 9220127270. THIS INCLUDES THE BOX WITH PRE-WIRED LEADS TO THE THREE OIL SWITCHES AND A PT LEAD WITH APPROPRIATE CONNECTORS.

3. REPLACEMENT PT-JUNCTION BOX CABLE (WITH 5-PIN PT CONNECTOR) IS AVAILABLE, CN 9220159493. ON THE 5-PIN CONNECTOR, POSITION 'A' IS THE 120-VOLT LINE (BLACK) WIRE, POSITION 'E' IS THE TRANSFORMER ISOLATED NEUTRAL/COMMON (WHITE) WIRE, AND THE PIGTAIL (GREEN) WIRE IS TO BE CUT OFF (NOT USED).

4. REPLACEMENT SWITCH CABLE IS AVAILABLE, CN 9220159493.
APPROPRIATE SETTINGS FOR THIS CAPACITOR CONTROL ARE DETERMINED BY ENGINEERING. FOLLOW ALL GUIDELINES IN THIS SECTION FOR PROPER INSTALLATION. INFORM ENGINEERING WHEN A NEW CONTROL IS READY FOR SETTINGS TO BE INSTALLED. LEAVE A NEW CONTROL IN MANUAL UNLESS INSTRUCTED BY ENGINEERING. REFER TO ENGINEERING FOR ANY QUESTIONS RELATIVE TO THE SETTINGS OF THIS TYPE OF CAPACITOR CONTROL.

NOTES:

1. OLDER INSTALLATIONS WERE WIRED DIFFERENTLY. THE WIRING SHOWN IS FOR NEW CONTROLS. THE WIRING SHOULD BE CONVERTED AS SHOWN HERE WHEN REPLACING CONTROLS.
1. LCD DISPLAY - WILL DISPLAY CONTROL SETTINGS

2. SWITCH TYPE
   A. MOTOR OP - USE THIS SETTING FOR ALL OIL SWITCHES IF THERE ARE OIL AND VACUUM SWITCHES ON THE SAME CAPACITOR BANK OR IF THERE ARE MOTOR OPERATED AND SOLENOID OPERATED SWITCHES ON THE SAME CAPACITOR BANK.
   B. SOLENOID - USE THIS SETTING FOR ALL VACUUM SWITCHES (SOLENOID OPERATED).

3. SCHEDULE SETTINGS KNOB - OPERATIONS ENGINEER TO DETERMINE SCHEDULE SETTINGS

4. CONTROL SETTINGS KNOB

5. ADJUSTMENT KNOB (USE TO CHANGE ALL SETTINGS)

6. 10 YEAR LITHIUM BATTERY

7. 15A SLO-BLO FUSE

8. RS-232 PORT DB-9 FEMALE FRONT 2400 BAUD

9. MANUAL CLOSE/OPEN TOGGLE SWITCH
## LEGEND
1. LCD READOUT
2. REMOTE/LOCAL BUTTON
3. MANUAL TRIP BUTTON
4. MANUAL CLOSE BUTTON
5. POWER INDICATOR
6. 10 AMP FUSE
7. USB PORT FOR LAPTOP
8. BLUETOOTH PORT
9. J-TAG PORT
10. CONTROLLER RESET BUTTON

## BILL OF MATERIALS

<table>
<thead>
<tr>
<th>CU ITEM NO.</th>
<th>COMPATIBLE UNIT</th>
<th>QTY REQ'D</th>
<th>CATALOG NUMBER</th>
<th>QTY PER CU</th>
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<td>CONTROL, CAPACITOR, AUTOMATED, 2-WAY, CELLULAR COMM.</td>
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## NOTES:

1. SEE DWG. 07.04-12B FOR MANUAL OPERATION INSTRUCTIONS.
2. THE CBC-7000 IS NO LONGER PURCHASED BUT MANY REMAIN IN SERVICE. NEW INSTALLS WILL INCORPORATE THE CBC-8000. SEE DWGS. 07.04-13A AND 07.04-13B.
3. USE THIS CU FOR REMOVAL OR TRANSFER OF THE CBC-7000.
MANUAL OPERATION:

- To put the CBC in the local mode, press the local/remote button on the blue keypad located on the top left of the control panel. At this time, the LED located to the left of "LOCAL" should be lit.

- To return the CBC to the remote/automatic mode, press the "LOCAL/REMOTE" button. At this time, the LED should go off.

- To close the capacitor bank, place the CBC in the local mode and press the blue "CLOSE" button. At this time the "CLOSED" LED will begin flashing. The capacitor bank will move to the closed position in 60 seconds, or 5 minutes on a reclose. After the capacitor bank closes, the "CLOSED" LED will remain on.

- To open or "TRIP" the capacitor bank, place the CBC in the local mode and press the blue "TRIP" button. At this time, the capacitor bank will trip and the trip LED will be lit.

If the CBC is left in local mode for any reason, please contact the DCC to report capacitor bank on reason to be placed in the state of the grid.

Place on Rudi Feeders. This controller is operated automatically by the VMS computer and uses 2-way communications. Control requires feeder level data only available on Rudi Feeders.

All Cannon 7000 controllers must be programmed by meter department personnel before installation, and have communications component activated. Return all removed Cannon 7000 controllers to meter shop. Refer to meter shop for any questions relative to this type of capacitor control.

NOTES:

1. See DWG. 07.04-12A for control details and bill of materials.
NOTES:
1. REMOVE CONTROL FUSE BEFORE INSTALLING OR REMOVING CAPACITOR CONTROL.
2. SEE DWG. 07.04-13B FOR MANUAL OPERATION INSTRUCTIONS.
MANUAL OPERATION:

1. TO PUT THE CBC-8000 IN THE MANUAL MODE, PRESS THE GRAY "MANUAL" BUTTON ON THE BOTTOM
   SECTIONS OF THE CONTROL PANEL. THE LED IN THE UPPER LEFT CORNER OF THE GRAY "MANUAL"
   BUTTON SHOULD ILLUMINATE RED. THE LED IN THE UPPER LEFT CORNERS OF THE "REMOTE" AND "AUTO"
   GRAY BUTTONS SHOULD NOT BE LIT RED.

2. TO RETURN THE CBC-8000 TO THE REMOTE MODE, PRESS THE GRAY "REMOTE" BUTTON ON THE BOTTOM
   SECTIONS OF THE CONTROL PANEL. THE LED IN THE UPPER LEFT CORNER OF THE GRAY "REMOTE"
   BUTTON SHOULD ILLUMINATE RED. THE LED IN THE UPPER LEFT CORNERS OF THE "MANUAL" AND "AUTO"
   GRAY BUTTONS SHOULD NOT BE LIT RED.

3. TO MANUALLY CLOSE THE CAPACITOR BANK, PLACE THE CBC-8000 IN THE MANUAL MODE AND PRESS THE
   RED "CLOSE" BUTTON. AT THIS TIME, THE LED IN THE UPPER LEFT CORNER OF THE RED CLOSE BUTTON
   WILL BEGIN FLASHING. THE CAPACITOR BANK WILL MOVE TO THE CLOSE POSITION IN 60 SECONDS, OR
   5 MINUTES ON A RECLOSE. AFTER THE CAPACITOR BANK CLOSES, THE LED LIGHT IN THE UPPER LEFT
   CORNER OF THE RED CLOSE BUTTON WILL REMAIN ILLUMINATED.

4. TO MANUALLY OPEN THE CAPACITOR BANK, PLACE THE CBC-8000 IN THE MANUAL MODE AND PRESS THE
   GREEN "TRIP" BUTTON. THE LED LIGHT IN THE UPPER LEFT CORNER OF THE "TRIP" BUTTON WILL
   ILLUMINATE.

IF THE CBC-8000 IS LEFT IN THE "MANUAL" OR "AUTO" MODE FOR ANY REASON, PLEASE CONTACT THE DCC
TO REPORT CAPACITOR BANK ON REASON TO BE PLACED IN THE STATE OF THE GRID.

PLACE ON RUDI FEEDERS. THIS CONTROLLER IS OPERATED REMOTELY BY THE VMS COMPUTER AND USES
2-WAY COMMUNICATIONS. CONTROL REQUIRES FEEDER LEVEL DATA ONLY AVAILABLE ON RUDI FEEDERS.

ALL CANNON CBC-8000 CONTROLLERS MUST BE PROGRAMMED BY METER DEPARTMENT PERSONNEL
BEFORE INSTALLATION, AND HAVE COMMUNICATIONS COMPONENT ACTIVATED. RETURN ALL REMOVED
CANNON CBC-8000 CONTROLLERS TO THE METER SHOP. REFER TO METER SHOP FOR ANY QUESTIONS
RELATIVE TO THIS TYPE OF CAPACITOR CONTROL.

NOTES:

1. SEE DWG. 07.04-13A FOR CONTROL DETAILS AND BILL OF MATERIALS.
NOTES:

1. CONNECT TO POLE GROUND USING CRIMP TYPE CONNECTOR.

2. CONTROL CABLE SHALL BE UNDER MOLDING.
NOTES:

1. MOUNT BRACKET WITH SENSOR ON THE BACK OF THE CAPACITOR BANK TOP THROUGH BOLT.

2. RUN NEUTRAL FROM CAPACITOR BANK THROUGH SENSOR TO SYSTEM NEUTRAL USING #4 COVERED COPPER.

3. THE NEUTRAL FROM THE CAPACITOR THROUGH THE SENSOR MUST NOT HAVE ANY GROUNDS. IT SHOULD NOT TOUCH THE POLE OR BRACKET. THERE SHOULD BE NO OTHER GROUNDS ATTACHED TO THE CAPACITOR NEUTRAL. ALL NEUTRAL CURRENT FROM THE CAPACITOR MUST TRAVEL THROUGH THE SENSOR. ONCE THE CAPACITOR NEUTRAL PASSES THROUGH THE SENSOR FROM THE CAPACITOR, IT MAY BE GROUNDED AND BONDED TO THE SYSTEM NEUTRAL.

4. THE SENSOR SHALL BE UTILIZED ONLY FOR FIXED CAPACITORS.

5. IF THE FIXED CAPACITOR BANK IS REMOVED OR RELOCATED, REMOVE OR RELOCATE THE SENSOR WITH THE CAPACITOR BANK.
### BILL OF MATERIALS

<table>
<thead>
<tr>
<th>MACRO UNIT</th>
<th>CU ITEM NO.</th>
<th>COMPATIBLE UNIT</th>
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**NOTES:**

1. SENSOR FITS OVER 3/4" CONDUIT.
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<tr>
<th>CATALOG NUMBER/CU</th>
<th>RATED VOLTS</th>
<th>VOLTS (KV) SET</th>
<th>KVA RATED</th>
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<th>AMPS ±5%</th>
<th>A-65°C ±5% **</th>
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* BASE MOUNTING DIMENSIONS VARY BY VENDOR.

** THE A-65°C ±5% RATING IS A CONTINUOUS AMPERE RATING BASED ON THE REGULATION BEING LIMITED TO ±5%. CONSULT WITH DISTRIBUTION STANDARDS FOR MAXIMUM AMPERE RATING WHEN REGULATION IS LIMITED TO SOME OTHER VALUE.

NOTES:

1. ALL OPTIONS INCLUDE REVERSE POWER FLOW, VOLTAGE REDUCTION, VOLTAGE LIMIT AND METERING.

2. 7.62 REGULATORS MAY BE USED ON 7.62 OR 7.2KV TAP. THEY COME SET FROM THE FACTORY FOUR USE ON 7.2KV TAP. WILDWOOD REPAIR SHOP MUST CONVERT THEM FOR USE ON 7.62 SYSTEM.

3. 14.4 REGULATORS MAY BE USED ON 14.4 OR 7.2KV TAP. THEY COME SET FROM THE FACTORY FOR USE ON 14.4KV TAP. FOR USE IN HOLOPAW.

4. SEE DWG. 12.07-01 FOR STAINLESS STEEL REGULATORS. THESE UNITS ARE ONLY TO BE USED IN DESIGNATED COASTAL AREAS.
PROCEDURE TO DETERMINE WHEN REGULATOR TAP-CHANGER IS ON-NEUTRAL POSITION

PURPOSE:
TO PROVIDE OPERATING PROCEDURES FOR PROGRESS ENERGY DISTRIBUTION OPERATIONS PERSONNEL WHEN BYPASSING REGULATORS.

GENERAL:
IF REGULATORS ARE NOT IN THE NEUTRAL POSITION WHEN BYPASSED, THEY WILL FREQUENTLY FAIL AS A RESULT OF HIGH CIRCULATING CURRENTS INSIDE THE REGULATOR. THESE CIRCULATING CURRENTS ARE CAUSED BY A SHORT-CIRCUITING OF THE SERIES WINDING, AND ARE NOT DETECTED BY DISTRIBUTION LINE PROTECTIVE EQUIPMENT UNTIL THE FAULT CURRENT HAS DAMAGED THE REGULATOR.

TO BYPASS A REGULATOR, THE REGULATOR TAP-CHANGER MUST FIRST BE PLACED IN THE NEUTRAL POSITION. IF A LINEMAN PROCEEDS TO CLOSE THE BYPASS SWITCH WITH THE TAP-CHANGER AT SOME POSITION OTHER THAN NEUTRAL, PART OR ALL OF THE SERIES WINDING WILL BE SHORT-CIRCUITED. CIRCULATING CURRENTS CAN RANGE FROM 10,000 TO 30,000 AMPS.

SET REGULATOR TO NEUTRAL POSITION:
THERE ARE SEVERAL METHODS OF DETERMINING THE NEUTRAL POSITION. LISTED ARE FIVE METHODS; USE AS MANY METHODS AS NEEDED TO ASSURE REGULATOR IS ON NEUTRAL (2 OR MORE).

1. POSITION INDICATOR - THE POSITION INDICATOR IS MECHANICALLY DRIVEN BY THE TAP CHANGER. IT REGISTERS ALL 32 STEPS AND NEUTRAL. THIS IS THE MOST RELIABLE METHOD BUT IS NOT FOOLPROOF.
   A. CHECK THE POSITION INDICATOR'S SETTING.
   B. TURN REGULATOR "AUTO- OFF- RAISE/LOWER" CONTROL SWITCH TO THE DESIRED POSITION FOR RAISING OR LOWERING THE REGULATOR SETTING.
   C. RAISE OR LOWER THE REGULATOR SETTING TO REACH "NEUTRAL" INDICATION.

2. NEUTRAL INDICATOR LIGHT - THE LIGHT IS ACTIVATED BY A SWITCH ON THE TAP CHANGER WHICH CLOSES THE LIGHT CIRCUIT WHEN THE NEUTRAL POSITION IS REACHED. CHECK THE NEUTRAL INDICATOR LIGHT TO ENSURE IT IS "ON" WHEN THE REGULATOR POSITION INDICATOR POINTS TO NEUTRAL POSITION.

3. "HASTINGS REGULATOR NEUTRAL DETECTOR (RND) ON APPROVED HOT STICK". - THE HASTINGS RND, CATALOG NUMBER 6709-1, MUST BE USED IN CONJUNCTION WITH AN INSULATED HOT STICK. THE RND PROBES MUST BE PLACED BETWEEN ONLY THE SOURCE AND LOAD CONDUCTORS OF THE REGULATOR, IN A POSITION AWAY FROM ANY GROUND POTENTIAL. THE NEUTRAL POSITION WILL BE THE POSITION IN WHICH THE LOWEST RND READING IS OBTAINED. RND TESTING PROCEDURES ARE INSIDE THE RND CASE.

4. PD 50 PHASING VOLTMETER
   A. SELECT 2KV ON SELECTOR SWITCH ON METER PROBE.
   B. TAKE READING BETWEEN "S" AND "L" BUSHING USING PD 50 ATTACHED TO APPROPRIATE LENGTH STICK. READING LESS THAN 5 VOLTS CAN BE CONSIDERED IN THE NEUTRAL POSITION. IF READING GREATER THAN 5 VOLTS, STEP IN EITHER DIRECTION AND RECHECK WITH PD 50. IF LESS THAN 5 VOLT READING IS NOT OBTAINABLE, CONTACT DCC AND DE-ENERGIZE LINE AT AN UPSTREAM DEVICE.
   ADDITIONAL INFORMATION REGARDING PD 50 OPERATIONS CAN BE FOUND IN THE OPERATIONS QUICK REFERENCE MANUAL.

5. MANUAL STEPPING OF REGULATOR FROM MAXIMUM RAISE OR LOWER POSITION TO NEUTRAL (LEAST PREFERRED METHOD):
   A. SHOULDN'T THE NEUTRAL INDICATOR LIGHT FAIL TO GIVE AN INDICATION AND ONLY ONE NEUTRAL INDICATION IS DETERMINED, THEN CHECK THE REGULATED VOLTAGE ON THE PANEL TO ASSIST IN DETERMINING IF THE REGULATOR CAN BE RAISED TO FULL RAISE POSITION WITHOUT RISKING A VOLTAGE LEVEL ABOVE THE REGULATED LIMIT, OR IF THE REGULATOR CAN BE LOWERED TO THE LOWEST POSITION WITHOUT RISKING A VOLTAGE LEVEL BELOW THE REGULATED LIMIT.
   B. THE NEUTRAL POSITION CAN BE FOUND BY MANUALLY STEPPING THE REGULATOR FROM MAXIMUM LOWER OR MAXIMUM RAISE POSITION AND COUNTING ALL THE STEPS. THE NUMBER OF STEPS REQUIRED TO REACH NEUTRAL WILL VARY DEPENDING ON WHAT THE REGULATION IS SET TO ON THE TAP-CHANGER HEAD:
      1. ±10% REGULATION WILL REQUIRE 16 STEPS TO REACH NEUTRAL.
      2. ±8.75% REGULATION WILL REQUIRE 14 STEPS TO REACH NEUTRAL.
      3. ±7.5% REGULATION WILL REQUIRE 12 STEPS TO REACH NEUTRAL.
      4. ±6.25% REGULATION WILL REQUIRE 10 STEPS TO REACH NEUTRAL.
      5. ±5% REGULATION WILL REQUIRE 8 STEPS TO REACH NEUTRAL.
1. CALL DCC AND NOTIFY OF PLANNED WORK TO ENERGIZE REGULATOR. PROVIDE FEEDER NAME AND LOCID NUMBER AT THE SITE.

2. PRE-JOB BRIEFING SHALL INCLUDE THE WARNING THAT SOURCE AND LOAD DISCONNECTS FOR REGULATOR SHALL NEVER BE BOTH CLOSED UNLESS REGULATOR IS IN NEUTRAL POSITION AND VERIFIED TO BE IN NEUTRAL BY TWO METHODS AS DESCRIBED IN DISTRIBUTION SPECIFICATIONS.

3. PLACE HOT LINE TAG ON NEAREST SOURCE SIDE DEVICE IN ACCORDANCE WITH STANDARD PROCEDURE. IF WORKING OFF-SYSTEM (I.E. T/D JOB) COORDINATE HOT LINE TAG WITH APPROPRIATE OFF-SYSTEM OPERATIONS PERSONNEL.

4. REGULATOR SHOULD BE INSTALLED WITH BYPASS DISCONNECT CLOSED AND SOURCE AND LOAD DISCONNECTS OPEN AND ALL PERMANENT JUMPERS INSTALLED (PREFERRED CONSTRUCTION). IF A TEMPORARY JUMPER HAS BEEN INSTALLED AROUND THE INLINE DEAD-END, THE SOURCE AND LOAD DISCONNECTS SHALL BE VERIFIED TO BE OPEN. CLOSE BYPASS DISCONNECT AND REMOVE THE TEMPORARY JUMPER.

5. VERIFY THAT REGULATOR IS IN NEUTRAL POSITION. IF NOT, CLOSE SOURCE DISCONNECT AND SWITCH THE REGULATOR CONTROL TO MANUAL POSITION AND OPERATE REGULATOR TO NEUTRAL POSITION. VERIFY NEUTRAL POSITION BY TWO METHODS IN ACCORDANCE WITH DISTRIBUTION SPECIFICATIONS. WHEN NEUTRAL POSITION IS VERIFIED TURN CONTROL TO OFF POSITION AND REMOVE ALL CONTROL FUSES.

6. PERSON IN CHARGE SHALL VERIFY THAT BYPASS DISCONNECT IS CLOSED, SOURCE DISCONNECT IS CLOSED, LOAD DISCONNECT IS OPEN, REGULATOR IS ON NEUTRAL POSITION, CONTROL IS OFF, AND ALL CONTROL FUSES ARE REMOVED. PERSON IN CHARGE SHALL EXAMINE THE WORK ZONE AND STOP ANY ACTIVITY THAT MAY BE DISTRACTING TO THE PERSON IN CHARGE OR THE PERSON WHO WILL CLOSE THE LOAD DISCONNECT. PERSON IN CHARGE WILL THEN AUTHORIZE THAT LOAD SIDE DISCONNECT BE CLOSED.

7. CLOSE LOAD SIDE DISCONNECT. VERIFY THAT BYPASS, SOURCE AND LOAD DISCONNECTS ARE ALL CLOSED, AND OPEN BYPASS DISCONNECT.

8. INSTALL ALL CONTROL FUSES. SWITCH CONTROL TO AUTO POSITION.

9. REPEAT PROCESS IF MULTIPLE REGULATORS ARE INSTALLED, SUCH AS A THREE PHASE BANK.

10. REMOVE HOT LINE TAG.

11. NOTIFY DCC THAT WORK IS COMPLETE, AND REGULATOR IS IN SERVICE.

12. NOTIFY LOCAL ENGINEER THAT REGULATOR IS IN SERVICE.
PROCEDURE TO DE-ENERGIZE SINGLE-PHASE DISTRIBUTION LINE VOLTAGE REGULATOR(S)

1. CALL DCC AND NOTIFY OF PLANNED WORK TO DE-ENERGIZE REGULATOR. PROVIDE FEEDER NAME AND LOCID NUMBER AT THE SITE.

2. PRE-JOB BRIEFING SHALL INCLUDE THE WARNING THAT BYPASS DISCONNECT SHALL NEVER BE CLOSED UNLESS REGULATOR IS IN NEUTRAL POSITION AND VERIFIED TO BE IN NEUTRAL BY TWO METHODS AS DESCRIBED IN DISTRIBUTION SPECIFICATIONS. CONTROL MUST ALSO BE IN THE OFF POSITION WITH ALL CONTROL FUSES REMOVED.

3. A HOT LINE TAG NORMALLY IS NOT REQUIRED TO DE-ENERGIZE A LINE REGULATOR. HOWEVER, PERSON IN CHARGE MAY DECIDE TO PLACE ONE IF DEEMED NECESSARY. PLACE HOT LINE TAG ON NEAREST SOURCE SIDE DEVICE IN ACCORDANCE WITH STANDARD PROCEDURE. IF WORKING OFF-SYSTEM (I.E. T/O JOB) COORDINATE HOT LINE TAG WITH APPROPRIATE OFF-SYSTEM OPERATIONS PERSONNEL.

4. VERIFY THAT SOURCE AND LOAD DISCONNECTS ARE CLOSED AND BYPASS DISCONNECT IS OPEN.

5. SWITCH THE REGULATOR CONTROL TO MANUAL POSITION AND OPERATE REGULATOR TO NEUTRAL POSITION. VERIFY NEUTRAL POSITION BY TWO METHODS IN ACCORDANCE WITH DISTRIBUTION SPECIFICATIONS. WHEN NEUTRAL POSITION IS VERIFIED TURN CONTROL TO OFF POSITION AND REMOVE ALL CONTROL FUSES.

6. PERSON IN CHARGE SHALL VERIFY THAT SOURCE AND LOAD DISCONNECTS ARE CLOSED, BYPASS SWITCH IS OPEN, REGULATOR IS ON NEUTRAL POSITION, CONTROL IS OFF, AND ALL CONTROL FUSES ARE REMOVED. PERSON IN CHARGE SHALL EXAMINE THE WORK ZONE AND STOP ANY ACTIVITY THAT MAY BE DISTRACTING TO THE PERSON IN CHARGE OR THE PERSON WHO WILL CLOSE THE BY-PASS DISCONNECT. PERSON IN CHARGE WILL THEN AUTHORIZE THAT BY-PASS DISCONNECT BE CLOSED.

7. CLOSE BYPASS DISCONNECT. VERIFY THAT BYPASS, SOURCE AND LOAD DISCONNECTS ARE ALL CLOSED. OPEN LOAD DISCONNECT. OPEN SOURCE DISCONNECT.

8. INSTALL ALL CONTROL FUSES.

9. REPEAT PROCESS IF MULTIPLE REGULATORS ARE INSTALLED, SUCH AS A THREE-PHASE BANK.

10. REMOVE HOT LINE TAG IF ONE WAS PLACED.

11. NOTIFY DCC THAT WORK IS COMPLETE AND REGULATOR IS OUT OF SERVICE.
PROCEDURE TO DE-ENERGIZE SINGLE-PHASE DISTRIBUTION LINE VOLTAGE REGULATOR
THAT IS NOT OPERATING AND IS OFF-NEUTRAL POSITION

1. (PEC ONLY) NOTIFY DISTRIBUTION I & C GRID TECH THAT A REGULATOR IS STUCK OFF-NEUTRAL AND
   SHOULD BE REPAIRED. IF POSSIBLE, DISTRIBUTION GRID TECH SHOULD PERFORM THIS PROCEDURE. IF
   FAILS, GO TO STEP 2.

2. DISTRIBUTION PERSONNEL TO CALL DCC AND NOTIFY OF PLANNED WORK TO DE-ENERGIZE A REGULATOR
   STUCK OFF NEUTRAL. PROVIDE FEEDER NAME AND LOCID NUMBER AT THE SITE.

3. PRE-JOB BRIEFING SHALL INCLUDE THE WARNING THAT BYPASS DISCONNECT FOR REGULATOR SHALL NEVER
   BE CLOSED UNLESS REGULATOR IS DE-ENERGIZED OR IN NEUTRAL POSITION AND VERIFIED TO BE IN
   NEUTRAL BY TWO METHODS AS DESCRIBED IN DISTRIBUTION SPECIFICATIONS.

4. PLACE HOT LINE TAG ON NEAREST SOURCE SIDE DEVICE IN ACCORDANCE WITH STANDARD PROCEDURE. IF
   WORKING OFF-SYSTEM (I. E. T/D JOB) COORDINATE HOT LINE TAG WITH APPROPRIATE OFF-SYSTEM
   OPERATIONS PERSONNEL.

5. IF POSSIBLE, MAKE REPAIR TO REGULATOR SO THAT IT CAN BE STEPPED TO NEUTRAL POSITION AND IF
   ADDITIONAL MAINTENANCE IS REQUIRED WHICH REQUIRES THE REGULATOR TO BE REMOVED FROM SERVICE
   FOLLOW STANDARD PROCEDURE FOR REMOVING A REGULATOR FROM SERVICE.

6. IF REGULATOR CAN NOT BE STEPPED TO NEUTRAL THE REGULATOR WILL HAVE TO BE DE-ENERGIZED TO
   REMOVE FROM SERVICE.

7. REGULATOR MUST BE DROPPED BY NEAREST SOURCE-SIDE LOAD BREAK DEVICE. IF THERE IS NO NEARBY
   LOADBREAK SINGLE-PHASE (PREFERRED) OR THREE-PHASE SWITCH THAT CAN BE OPENED TO CLEAR THE
   REGULATOR THEN A LINE CREW SHOULD BE ARRANGED TO INSTALL A SINGLE-PHASE LOAD BREAK SWITCH
   ON THE NEAREST SOURCE-SIDE POLE TO THE REGULATOR. NORMALLY, THE CIRCUIT BREAKER SHOULD NOT
   BE OPENED TO CLEAR A SINGLE-PHASE REGULATOR STUCK OFF NEUTRAL.

8. OPEN THE NEAREST SOURCE SIDE LOAD BREAK SWITCH. OPEN THE SOURCE AND LOAD-SIDE DISCONNECTS
   FOR THE REGULATOR AND CLOSE THE BYPASS DISCONNECT. CLOSE THE NEAREST SOURCE SIDE LOAD BREAK
   SWITCH.

9. REMOVE HOT LINE TAG IF ONE WAS PLACED.

10. NOTIFY DCC THAT WORK IS COMPLETE AND REGULATOR IS OUT OF SERVICE.
PROCEDURE TO BYPASS LINE REGULATORS FROM A DEAD LINE

If it is necessary to bypass line regulators from a dead line in order to back feed a circuit, the regulators shall be bypassed as follows:

Steps required to bypass regulators from service:
1. Open load side disconnect.
2. Close bypass disconnect.
3. Leave source side disconnect in close position.

Steps required to return regulators to service after line is energized:
1. Verify that regulator is in neutral position. If not, switch the regulator control to manual position and operate regulator to neutral position. Verify neutral position by two methods in accordance with distribution specifications. When neutral position is verified turn control to off position and remove all control fuses.
2. Close load side disconnects.
3. Open bypass disconnects.
4. Install all control fuses. Switch control to auto position.
1. A STRAIGHT DESIGN REGULATOR IS ONE IN WHICH THE SOURCE (S) BUSHING IS CONNECTED TO THE EXCITING WINDING AND THE LOAD (L) BUSHING IS CONNECTED TO THE TAP CHANGER MECHANISM ON THE SERIES WINDING TO RAISE AND LOWER THE LOAD VOLTAGE.

2. AN INVERTED DESIGN REGULATOR IS ONE IN WHICH THE LOAD (L) BUSHING IS CONNECTED TO THE EXCITING WINDING AND THE SOURCE (S) BUSHING IS CONNECTED TO THE TAP CHANGER MECHANISM ON THE SERIES WINDING TO RAISE AND LOWER THE LOAD VOLTAGE.

3. THE SL BUSHING IS THE GROUNDED NEUTRAL CONNECTION POINT.
NOTES:

1. SEE DWG. 07.20-10B FOR BILL OF MATERIALS AND NOTES.

2. FOR THREE-PHASE REGULATOR INSTALLATIONS, A THREE REGULATOR PLATFORM IS PREFERRED OVER SINGLE-PLATFORM INSTALLATION.

REGULATOR ASSEMBLY, VERTICAL CONSTRUCTION,
POLE MOUNTED FOR 167KVA AND SMALLER
REGULATOR ASSEMBLY, VERTICAL CONSTRUCTION,
POLE MOUNTED FOR 167KVA AND SMALLER

NOTES:
1. SEE DWG. 07.20-10A FOR DESIGN SPECIFICATIONS.
2. BILL OF MATERIALS IS BASED ON SUPPLY OF 1 REGULATOR.
3. REGULATORS SHOULD HAVE ARRESTERS PRE-INSTALLED ON THE TANK FOR THE SOURCE AND LOAD BUSHINGS.
4. ONE 10 FOOT SECTION OF 2-1/4" U-GUARD (CU CRIS1UGVPC225WF) SHALL BE INSTALLED TO COMPLETELY COVER CONTROL CABINET UNLESS CONTROL CABINET IS ALREADY IN FLEXIBLE CONDUIT. USE CONDUIT STRAP (CN 30637805) TO ATTACH FLEX CONDUIT TO POLE EVERY 3 FEET.
5. SIZE RISER (JUMPER) FROM REGULATOR TO BYPASS SWITCH FOR REGULATOR RATED CURRENT. SIZE RISER (JUMPER) FROM BYPASS SWITCH TO THE PRIMARY LINE TO BE EQUIVALENT TO THE PRIMARY LINE SIZE. WHEN CONNECTING ALUMINUM CONDUCTOR TO REGULATOR BUSHINGS, TERMINATE WITH A STEM CONNECTOR (DWG. 06.03-04). CONNECTORS USED ON INSULATED WIRE TO BE SEALED BY APPLYING AQUA SEAL AND WRAPPING WITH ELECTRICAL TAPE TO PREVENT WATER INTRUSION.
6. SEE SECTION 01 FOR ADDITIONAL GROUNDING INFORMATION.
7. GROUND CONTROL BOX WITH #6 SD BC. REGULATOR GROUND TO CONSIST OF #2 SD BC RUN FROM SL BUSHINGS TO REGULATOR TANK GROUND, THEN TO NEUTRAL TANK GROUND, THEN TO CONTROL CABINET.
8. CAUTION: WHEN IT IS NECESSARY TO BYPASS THE REGULATOR, SEE DWGS. 07.10-15A, 07.10-15B, 07.10-15C, 07.10-15D AND 07.10-15E. CONNECTORS USED ON INSULATED WIRE TO BE SEALED BY APPLYING AQUA SEAL AND WRAPPING WITH ELECTRICAL TAPE TO PREVENT WATER INTRUSION.
9. A SIDE GUY IS REQUIRED TO KEEP POLE FROM LEANING. IF POLE CANNOT BE GUED, USE CLASS 3 POLE THAT IS 5' TALLER THAN NECESSARY, BURY 5' DEEPER AND USE POLESET (CN 9220108823).
10. CLEARANCE OF REGULATOR ABOVE GROUND REQUIREMENT IS 15', UNLESS JOINT USERS EXIST. IF JOINT USERS EXIST ON THE POLE, THE HEIGHT OF THE REGULATOR MUST BE INCREASED TO ALLOW FOR JOINT USERS TO ATTACH TO THE POLE SUCH THAT THEY HAVE ADEQUATE GROUND CLEARANCE UNDER THE REGULATOR AND IN ADJACENT SPANS (JOINT USERS NEED 15.5'). CLEARANCE FROM THE HIGHEST JOINT USE ATTACHMENT TO THE BOTTOM OF THE REGULATOR IS 2.5' (IF COMMUNICATIONS MESSENGER IS BONDED TO THE NEUTRAL) SO MINIMUM HEIGHT OF THE REGULATOR FOR A LINE WITH A SINGLE JOINT USER IS 18.0'. INCREASE SPACING AS NEEDED TO ALLOW FOR MULTIPLE JOINT USERS AND SAG IN ADJACENT SPANS, UP TO 25' MAX. IF JOINT USERS CAN NOT GET ADEQUATE CLEARANCE WITH 25' HEIGHT OF REGULATOR, SELECT ANOTHER LOCATION FOR THE REGULATOR.
11. SOURCE BUSHING ON REGULATOR SHOULD ALWAYS BE CONNECTED TO PRIMARY SOURCE. SOURCE AND LOAD LEADS GOING TO THE BYPASS SWITCH CAN BE CROSSED AS LONG AS 12" CLEARANCE IS MAINTAINED.
12. SEE DWG. 07.10-05 FOR REGULATOR WEIGHTS, MOUNTING DIMENSIONS AND SAFETY REQUIREMENTS. ANCHOR EACH REGULATOR TO PLATFORM WITH A BOLT ON EACH CORNER.
13. SEE DWG. 08.10-10 FOR 600 AMP BY-PASS TYPE SWITCH.
NOTES:

1. SEE DWG. 07.20-25B FOR BILL OF MATERIALS AND NOTES.
### BILL OF MATERIALS

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**NOTES:**

1. GROUND CONTROL BOXES AND PLATFORM WITH #6 5D BC. GROUND PLATFORM WITH COPPER GROUNDING LUG. REGULATOR GROUND TO CONSIST OF #2 5D BC RUN FROM SL BUSHING TO REGULATOR TANK GROUND, THEN TO SYSTEM NEUTRAL.

2. SEE DWG. 07.20-25A FOR DESIGN SPECIFICATIONS.

3. SIZE RISER (JUMPER) FROM REGULATOR TO BYPASS SWITCHES FOR REGULATOR RATED CURRENT. SIZE RISER (JUMPER) FROM BYPASS SWITCH TO THE PRIMARY LINE TO BE EQUIVALENT TO THE PRIMARY LINE SIZE. WHEN CONNECTING ALUMINUM CONDUCTOR TO REGULATOR BUSHRINGS, TERMINATE WITH STEM CONNECTOR (DWG. 06.03-04). CONNECTORS USED ON INSULATED WIRE TO BE SEALED BY APPLYING AQUA SEAL AND WRAPPING WITH ELECTRICAL TAPE TO PREVENT WATER INTRUSION.

4. SEE DWG. 07.10-05 FOR REGULATOR WEIGHTS, MOUNTING DIMENSIONS AND SAFETY REQUIREMENTS. ANCHOR EACH REGULATOR TO PLATFORM WITH BOLT ON EACH CORNER.

5. MOUNT PLATFORM WITH 3/4" BOLTS (2 PER SIDE - TOTAL OF 4). ADD CENTER STUB FOR WEIGHTS GREATER THAN 13,800 POUNDS; SEE DWG. 06.08-03.


7. NEW REGULATORS SHOULD HAVE LIGHTNING ARRESTERS PRE-INSTALLED AT THE SOURCE AND LOAD BUSHINGS. IF NOT, CN 14012030 INCLUDES 10KV ARRESTERS, TANK MOUNTING BRACKET AND PRIMARY TAP LEAD.

8. ONE 10 FOOT SECTION OF 2-1/4" U-GUARD (CU CR150UGPV225WF) SHALL BE INSTALLED TO COMPLETELY COVER CONTROL CABLE AT CONTROL CABINET UNLESS CONTROL CABLE IS ALREADY IN FLEXIBLE CONDUIT. USE CONDUIT STRAP (CN 30637805) TO ATTACH FLEX CONDUIT TO POLE EVERY 3 FEET. WHEN USING U-GUARD, ALLOW 1.5 FEET OF VERTICAL CLEARANCE BETWEEN BOTTOM OF U-GUARD AND TOP OF CONTROL BOX TO ELIMINATE OVERSTRESSING THE CONDUIT CONNECTION TO THE CONTROL BOX.

9. SEE DWG. 06.08-03 FOR PLATFORM SPECIFICATIONS.

10. SEE DWG. 08.10-10 FOR 600 AMP BY-PASS TYPE SWITCH.

11. BILL OF MATERIALS IS BASED ON SUPPLY OF 3 REGULATORS. SINGLE REGULATOR REQUIREMENTS WILL HAVE TO BE ADJUSTED ACCORDINGLY.

12. CLEARANCE TO BOTTOM OF PLATFORM CAN BE 11" ONLY IF THE AREA UNDER THE PLATFORM IS SUBJECT TO PEDESTRIANS OR RESTRICTED TRAFFIC. IF AREA UNDER PLATFORM IS SUBJECT TO RIDERS ON HORSEBACK OR OTHER LARGE ANIMALS, VEHICLES OR OTHER MOBILE UNITS EXCEEDING 8' IN HEIGHT, THE DIMENSION TO THE BOTTOM OF THE PLATFORM SHALL BE 15' MINIMUM. HEIGHT OF PLATFORM MUST BE INCREASED TO ALLOW FOR JOINT USERS TO ATTACH TO THE POLES SO THEY HAVE ADEQUATE GROUND CLEARANCE UNDER THE PLATFORM AND IN ADJACENT SPANS (JOINT USERS NEED 15.5'). CLEARANCE FROM THE HIGHEST JOINT USE ATTACHMENT TO BOTTOM OF PLATFORM IS 2.5' (IF COMMUNICATIONS MESSENGER IS BONDED TO THE NEUTRAL) SO MINIMUM HEIGHT OF PLATFORM FOR A LINE WITH A SINGLE JOINT USER IS 18'. INCREASE SPACING AS NEEDED TO ALLOW FOR MULTIPLE JOINT USERS AND SAG IN ADJACENT SPANS, UP TO 25' MAX. IF JOINT USERS CAN NOT GET ADEQUATE CLEARANCE WITH 25' HEIGHT OF PLATFORM, SELECT ANOTHER LOCATION FOR THE PLATFORM.

13. SOURCE BUSHING ON REGULATOR SHOULD ALWAYS BE CONNECTED TO PRIMARY SOURCE. BYPASS SOURCE AND LOAD LEADS MAY BE CROSSED - MAINTAIN MINIMUM 12" CLEARANCE BETWEEN LEADS.

14. WHEN CENTER STUB IS USED, MOUNT CONTROLS ON CENTER STUB AND INSTALL GROUND RODS AT CENTER STUB INSTEAD OF END POLE.
NOTES:
1. SEE DWG. 07.20-30B FOR BILL OF MATERIALS AND NOTES.
**NOTES:**

1. GROUND CONTROL BOXES AND PLATFORM WITH #6 SD BC. REGULATOR GROUND TO CONSIST OF #2 SD BC RUN FROM SL BUSHING TO REGULATOR TANK GROUND, THEN TO NEUTRAL LOOP.

2. SIZE RISER (JUMPER) FROM REGULATOR TO BYPASS SWITCHES FOR REGULATOR RATED CURRENT. SIZE RISER (JUMPER) FROM BYPASS SWITCHES TO THE PRIMARY LINE TO BE EQUIVALENT TO THE PRIMARY LINE SIZE. WHEN CONNECTING ALUMINUM CONDUCTOR TO REGULATOR BUSHINGS, CONNECT WITH STEEL CONNECTORS (SEE DWG. 06.03-04). INSULATED WIRE TO BE SEALED BY APPLYING AQUA SEAL AND WRAPPING WITH ELECTRICAL TAPE TO PREVENT WATER INTRUSION.

3. MOUNT PLATFORM WITH 3/4" BOLTS (2 PER SIDE - TOTAL OF 4). SEE DWG. 07.10-05 FOR REGULATOR WEIGHTS, MOUNTING DIMENSIONS AND SAFETY REQUIREMENTS. ANCHOR EACH REGULATOR TO PLATFORM WITH BOLT ON EACH CORNER.

4. ADD CENTER STUB FOR WEIGHTS GREATER THAN 13,800 POUNDS; SEE DWG. 06.08-03.

5. NEW REGULATORS SHOULD HAVE LIGHTNING ARRESTERS PRE-INSTALLED AT THE SOURCE AND LOAD BUSHINGS. IF NOT, CONN 14012033 INCLUDES 10KV ARRESTERS, TANK MOUNTING BRACKET AND PRIMARY TAP LEAD.

6. ONE 10 FOOT SECTION OF 2-1/4" U-GUARD (CU CRIS15UGPVC225W9F) SHALL BE INSTALLED TO COMPLETELY COVER CONTROL CABLE AT CONTROL CABINET UNLESS CONTROL CABLE IS ALREADY IN FLEXIBLE CONDUIT. USE CONDUIT STRAP (CN 30637805) TO ATTACH FLEX CONDUIT TO POLE EVERY 3 FEET.

7. BILL OF MATERIALS IS BASED ON SUPPLY OF 3 REGULATORS. SINGLE REGULATOR REQUIREMENTS WILL HAVE TO BE ADJUSTED ACCORDINGLY.

8. CLEARANCE OF PLATFORM ABOVE GROUND REQUIREMENT IS 15', LESS JOINT USERS EXIST. IF JOINT USE EXISTS ON THE POLE, THE HEIGHT OF THE PLATFORM MUST BE INCREASED TO ALLOW FOR JOINT USERS TO ATTACH TO THE POLE SUCH THAT THEY HAVE ADEQUATE GROUND CLEARANCE UNDER THE PLATFORM AND IN ADJACENT SPANS (JOINT USERS NEED 15.2'). CLEARANCE FROM THE HIGHEST JOINT USE ATTACHMENT TO THE BOTTOM OF THE PLATFORM IS 2.2' (IF COMMUNICATIONS MESSENGER IS BONDED TO THE NEUTRAL) SO MINIMUM HEIGHT OF THE PLATFORM FOR A LINE WITH A SINGLE JOINT USER IS 18.0'. INCREASE SPACING AS NEEDED TO ALLOW FOR MULTIPLE JOINT USERS AND SAG IN ADJACENT SPANS, UP TO 25' MAX. IF JOINT USERS CAN NOT GET ADEQUATE CLEARANCE OF PLATFORM, SELECT ANOTHER LOCATION FOR THE PLATFORM.

9. SOURCE BUSHING ON REGULATOR SHOULD ALWAYS BE CONNECTED TO PRIMARY SOURCE. BYPASS SOURCE AND LOAD LEADS MAY BE CROSSED - MAINTAIN MINIMUM 12" CLEARANCE BETWEEN LEADS.

10. WHEN CENTER STUB IS USED, MOUNT FULLS AND INSTALL GROUND RODS AT CENTER STUB INSTEAD OF END POLE.

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SIEMENS MJ-XL SINGLE-PHASE REGULATOR CONTROL

Indicators:
- Alert
- Reverse Power Flow
- Remote Auto Inhibit
- High Band
- In Band
- Low Band
- Raise
- Lower

16 Character Display
Change Keys
Data Port
Regulator Fast-Path Keys
Voltage Reduction Control Active Indicator
VRC Select Fast-Path Key
Neutralite Indicator
Neutralite Test Key
Power Switch
Remote/Auto Manual Switch
Tap Position Raise/Lower Switch
External Power Binding Posts
External Power Fuse

Menu Selection and Scroll Keys
Quick Menu Key
Operation Counter Fast-Path Key
Alert Status Fast-Path Key
Line Drop Compensation Fast-Path Keys
Voltage Limit Control Select Fast-Path Key
VLC Indicators
Drag Hands Reset Key
U2/P2 Key
Voltage Cal. Binding Posts
Power Fuse
Sensing Fuse
FEATURES:
- MICROCONTROLLER-BASED LTC TRANSFORMER AND REGULATOR CONTROL PROVIDES RELIABLE OPERATION AND EXPANDED CAPABILITIES.
- TWO ACTIVE SERIAL COMMUNICATIONS PORTS, THROUGH RS-232, RS-485, OR FIBER OPTICS
- FIELD-UPDATABLE PROGRAMMING
- REVERSE POWER DETECTION/OPERATION
- DEMAND METERING
- TIME/DATE STAMPING OF MAXIMUM/MINIMUM SYSTEM CONDITIONS
- DATA LOGGING OF METERED PARAMETERS
- SELF-TEST ALARM AND USER-PROGRAMMABLE ALARM
- LINE OVERCURRENT TAPCHANGE INHIBIT
- LDC WITH R & X OR Z-COMPENSATION
- DEFINITE OR INVERSE TIME DELAY
- VOLTAGE LIMITS WITH AUTOMATIC RUNBACK, TAP POSITION LIMITS
- SEE BECKWITH INSTALLATION/OPERATION MANUAL FOR FUNCTIONS TO STEP THROUGH MENU
GE SM3 SINGLE-PHASE REGULATOR CONTROL

- **Control Status LED's**: Show status of various options.
- **Display Data LED**: Shows power flow direction.
- **Softkeys**: Provide interaction with displayed menus.
- **LEDs**: Indicate which menu is currently active.
- **RS-232 Port**: For communications with Windows-based configuration software.
- **Neutral Indicator**: Indicates when regulator is in neutral position.
- **Output Voltage Test Studs**: Allow you to measure system voltage with an external meter.
- **Control Power Supply Studs**: Allow you to supply external power to unit.
- **Drag Hand Reset Button**: Returns the drag hands to present position and allows the user to test the neutral indicator.
- **Multiline, Highly-Visible Vacuum-Fluorescent Display**: Shows metering data and allows easy programming.
- **Menu Select Keypad**: Enables easy menu navigation.
- **Motor Control**: Lets you select automatic or manual control; in manual mode, motor control switch lets you operate the motor directly to raise or lower the position of the tap changer.
- **Fuses**: Provide separate protection for the control and the tap change motor.
- **Error Alert LED**: Displays immediate error status.
- **Band Edge Indicators**: Alert you to out-of-band high or low conditions.
- **Display Data LED**: Shows power flow direction.
- **Softkeys**: Provide interaction with displayed menus.
- **LEDs**: Indicate which menu is currently active.
- **RS-232 Port**: For communications with Windows-based configuration software.
- **Neutral Indicator**: Indicates when regulator is in neutral position.
- **Output Voltage Test Studs**: Allow you to measure system voltage with an external meter.
- **Control Power Supply Studs**: Allow you to supply external power to unit.
- **Drag Hand Reset Button**: Returns the drag hands to present position and allows the user to test the neutral indicator.
### Bill of Materials

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<tr>
<th>MACRO UNIT</th>
<th>ITEM NO.</th>
<th>COMPATIBLE UNIT</th>
<th>QTY</th>
<th>CATALOG NUMBER</th>
<th>QTY PER CU</th>
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### Notes:

1. REPLACEMENT 2 AMP (TYPE ABC) FUSE FOR THE UVR-1 PANEL IS CN 9220229396.
2. REPLACEMENT 6 AMP (TYPE MDA) FUSE FOR THE UVR-1 PANEL IS CN 9220229395.
FROM JUNCTION BOX
BLACK
GREEN
RED
BLACK
GREEN
WHITE
BLACK
POLE GROUND
L/A
WIRING SCHEMATIC - BECKWITH TYPE CONTROL (FMO)
1. AUTO/MANUAL SWITCH CAN BE ACCESSED BY REMOVING LEXAN COVER. ALLOWS MANUAL INITIATION OPEN OR CLOSE AFTER 30 SECOND DELAY. THE CONTROL IS SUBJECT TO A FIVE MINUTE RECLOSEING DELAY.

2. OPEN/CLOSE SWITCH WORK IN THE MANUAL MODE.

3. MANUAL MODE LED (BLUE) - LIT STEADILY WHEN THE CONTROL IS IN THE MANUAL MODE. IT WILL BLINK FOR FIVE MINUTES AFTER A MANUAL OPEN OPERATION IS INITIATED IN THE MANUAL MODE.

4. AUTOMATIC MODE LED (YELLOW) - LIT STEADILY WHEN IN THE AUTOMATIC MODE.

5. CLOSE LED (RED) - LIT CONTINUOUSLY WHEN THE CONTROL BELIEVES THE BANK IS CLOSED AND DURING THE 15 SECONDS WHEN A MANUAL CLOSE OPERATION IS IN PROGRESS. IT WILL BLINK FOR 30 SECONDS BEFORE THE 15 SECONDS AFTER A MANUAL CLOSE OPERATION IS INITIATED.

6. OPEN LED (GREEN) - LIT CONTINUOUSLY WHEN THE CONTROL BELIEVES THE BANK IS OPEN AND DURING THE 15 SECONDS WHEN A MANUAL OPEN OPERATION IS IN PROGRESS. IT WILL BLINK FOR 30 SECONDS BEFORE AND 15 SECONDS AFTER A MANUAL OPEN OPERATION IS INITIATED.

7. INFRARED COMMUNICATION PORT USED BY ENGINEERING TO SETUP AND OPERATE CONTROL USING BECKWITH'S BLINCIR SOFTWARE AND A COMPUTER WITH THE APPROPRIATE INFRARED PORT.

APPROPRIATE SETTINGS FOR THIS CAPACITOR CONTROL ARE DETERMINED BY ENGINEERING. FOLLOW ALL GUIDELINES IN THIS SECTION FOR PROPER INSTALLATION. INFORM ENGINEERING WHEN A NEW CONTROL IS READY FOR SETTINGS TO BE INSTALLED. LEAVE A NEW CONTROL IN MANUAL UNLESS INSTRUCTED BY ENGINEERING. REFER TO ENGINEERING FOR ANY QUESTIONS RELATIVE TO THE SETTINGS OF THIS TYPE OF CAPACITOR CONTROL.
1. SEE DWG. 07.20-12B FOR NOTES AND BILL OF MATERIALS.

2. FOR THREE-PHASE REGULATOR INSTALLATIONS, A THREE REGULATOR PLATFORM IS PREFERRED OVER SINGLE-PLATFORM INSTALLATION.
NOTES:

1. SEE DWG. 07.20-12C FOR NOTES AND BILL OF MATERIALS.

2. INCREASE QUANTITY OF BOM ITEM 1 TO BE (3) IF ADDITIONAL SUPPORT FOR LEADS IS REQUIRED.

3. FOR THREE-PHASE REGULATOR INSTALLATIONS, A THREE REGULATOR PLATFORM IS PREFERRED OVER SINGLE-PLATFORM INSTALLATION.
## BILL OF MATERIALS

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<thead>
<tr>
<th>MACRO UNIT</th>
<th>ITEM NO.</th>
<th>COMPATIBLE UNIT</th>
<th>QTY</th>
<th>QTY PER CU</th>
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### NOTES:

1. **SINGLE PLATFORM TO BE USED FOR REPLACEMENT OF EXISTING SINGLE REGULATOR ONLY. TO MAKE READY FOR FUTURE DSDR PROGRAM, NEW BANKS OR WHEN REPLACING MORE THAN ONE REGULATOR SHOULD BE DONE ON A THREE-PHASE PLATFORM AS SHOWN ON DWG. 07.20-30A.**

2. **THIS INSTALLATION IS FOR USE WHEN A POLE MOUNTED 250 KVA OR LARGER REGULATOR MUST BE REPLACED AND THE NEW REGULATOR DOES NOT HAVE POLE MOUNTING BRACKETS. A NEW INSTALLATION OF THREE REGULATORS SHOULD BE DONE ON A PLATFORM.**

3. **REGULATOR SHOULD HAVE ARRESTERS PRE-INSTALLED ON THE REGULATOR.**

4. **ONE 10 FOOT SECTION OF 2-1/4" U-GUARD (CU CRIS1LUGPVC225WF) SHALL BE INSTALLED TO COMPLETELY COVER CONTROL CABLE AT CONTROL CABINET UNLESS CONTROL CABLE IS ALREADY IN FLEXIBLE CONDUIT. USE GALVANIZED CONDUIT STRAP (CN 30637805) TO ATTACH FLEX CONDUIT TO POLE EVERY 3 FEET.**

5. **JUMPERS SHALL BE SIZED TO BE EQUIVALENT TO PHASE CONDUCTORS.**

6. **GROUND CONTROL BOX AND PLATFORM WITH #6 SD BC. REGULATOR GROUND TO CONSIST OF #2 SD BC RUN FROM SL BUSHING TO REGULATOR TANK GROUND, THEN TO NEUTRAL LOOP.**


8. **SEE DWG. 07.20-12A FOR DESIGN SPECIFICATIONS.**

9. **MOUNT PLATFORM WITH 5/8" BOLTS (2 PER SIDE - TOTAL OF 4).**

10. **SOURCE BUSHING ON REGULATOR SHOULD ALWAYS BE CONNECTED TO PRIMARY SOURCE. BYPASS SOURCE AND LOAD LEADS MAY BE CROSSED, MAINTAIN MINIMUM 12" CLEARANCE BETWEEN LEADS.**

11. **CLEARANCE TO BOTTOM OF PLATFORM CAN BE 11' ONLY IF THE AREA UNDER THE PLATFORM IS SUBJECT TO PEDESTRIANS OR RESTRICTED TRAFFIC. IF AREA UNDER PLATFORM IS SUBJECT TO RIDERS ON HORSEBACK OR OTHER LARGE ANIMALS, VEHICLES OR OTHER MOBILE UNITS EXCEEDING 8' IN HEIGHT, THE DIMENSION TO THE BOTTOM OF PLATFORM SHALL BE 15' MINIMUM.**

12. **WHEN RIGHT-OF-WAY IS AN ISSUE, PLATFORM MAY BE SET IN LINE WITH THE PRIMARY WIRES.**
1. Connect SL bushings to neutral and pole grounds with #2 copper.
2. Arrester leads and pole grounds are #6 copper.
### BILL OF MATERIALS

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### NOTES:

1. ISSUE REGULATORS AND GROUND SEPARATELY.
2. SEE DWG. 07.20-15A FOR DESIGN SPECIFICATIONS.
3. SEE DWG. 08.01-01 FOR CUTOUTS AND ARRESTERS.
4. SEE DWG. 03.06-04 FOR INSULATORS.
5. SEE DWG. 08.10-10 FOR BYPASS SWITCH DETAILS.

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**REGULATOR ASSEMBLY, HORIZONTAL CONSTRUCTION, POLE MOUNTED (FMO)**