Voltage Regulators
Catalog Data
CA225006EN

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New issue

COOPER POWER SERIES

CL-7 Multi-phase control application accessories

General

Eaton's Cooper Power™ series CL-7 multi-phase control is a highly versatility step voltage regulator control. With available accessories, the control can be applied to nearly any existing voltage regulator installation, regardless of the manufacturer.

Multi-phase control advantages

The CL-7 voltage regulator control multi-phase option is unique in the industry. It provides the first of its kind multi-phase voltage regulation: two or three regulators can be operated with the use of a single control. This provides a single point of contact for communications, true multi-phase metering and fewer controls to program and maintain. In addition, when power is lost from one regulator in a bank, the power from an adjacent regulator can be used to run the motor.

Easy installation

No matter the configuration or installation scenario, there is an interface option to meet the requirements. Interfacing with the multi-phase control requires a Cooper Power Series quick-connect control cable connection. This interface can be accomplished in one of three ways:

- The Eaton's Cooper Power Series voltage regulator is already factory equipped with a quick-connect cable connection which will connect to a multi-phase control.
- A quick connect interface (QCA) converts an existing control box from various manufacturers into a junction box capable of accepting the quick-connect control cable.
- A universal interface junction box adds a control cable quick-connection to any voltage regulator.

Powering Business Worldwide

Ordering information

Component selection tables are contained within this document with figures showing typical installations. For platform installations, see Table 3 and 4. For substation installation, see Tables 5 and 6.

For a list of available components to meet most installation requirements, see Table 1. For a list of applicable installation instruction manuals and the CL-7 control ordering guide, see Table 2.

Table 1. Multi-phase applications components list

Description	Part Number
Quick Connect Assembly (QCA)	
Cooper Power™ series	575044887B10
Siemens/Allis-Chalmers/Howard (12-conductor Connection)	575044887B01
GE (fork-type) (12-conductor Connection)	575044887B02
GE (pin-type) (12-conductor Connection)	575044887B03
Siemens/Allis-Chalmers/Howard (13-conductor Connection)	575044887B04
GE (fork-type) (13-conductor Connection)	575044887B05
GE (pin-type) (13-conductor Connection)	575044887B06
Siemens/Allis-Chalmers/Howard (14-conductor Connection)	575044887B07
GE (fork-type) (14-conductor Connection)	575044887B08
GE (pin-type) (14-conductor Connection)	575044887B09
Universal Interface Junction Box	
Universal Interface Junction Box (12-conductor)	57A61314400A
Universal Interface Junction Box (14-conductor)	57A61314400C
Control Cable Adapter	
Control Cable Internal Adapter (10- to 12-pin)	5044875B03
Control Cable External Adapter (10- to 12-pin)	5045394B1210
Cooper Power™ Series Quick-connect Style Control Cables*	
40 foot, 12-conductor	5041489B0480
6 foot, 12-conductor	5041489B0072
40 foot, 13-conductor	5041492B0480
6 foot, 13-conductor	5041492B0072
40 foot, 14-conductor	5041490B0072
6 foot, 14-conductor	5041490B0480

*Typical cable lengths are listed, other lengths are available

Table 2. Multi-phase applications documents

Description	Document Number
CL-7 voltage regulator control ordering guide	CA225003EN
Universal voltage regulator control cable interface junction box	MN225013EN
Quick connect assembly (QCA) universal kit (Eaton/Cooper)	MN225034EN
Quick connect assembly (QCA) 12-conductor retrofit kit	MN225002EN

Definitions

Eaton CL-7 multi-phase control replacement assembly (CRA) interface: The CL-7 multi-phase control will only interface with voltage regulators equipped with an Eaton quick-connect-style control cable connection. To interface the multi-phase control CRA to a voltage regulator not equipped with such a connection requires the addition of an adapter: Either the QCA, universal junction box, or control cable adapter.

Eaton quick-connect control cable: The control cable currently supplied by Eaton with all new voltage regulators. This cable comes with either 10, 12, 13 or 14 conductors, depending on the configuration originally supplied with the regulator. Typical cable uses are:

- 10-conductor – Used as a standard when the motor capacitor was located inside of the voltage regulator tank.
- 12-conductor – Currently used as a standard and contains 2 conductors for the motor capacitor.
- 13-conductor – Contains a shielding connection and motor capacitor leads.
- 14-conductor – Contains 2 auxiliary winding leads for fans or other equipment and 2 motor capacitor leads.

Quick Connect Assembly (QCA): This is a wire harness designed to convert an existing control box into a junction box with a quick-connect junction capable of accepting and Eaton quick-connect cable.

Universal Interface Junction Box: A junction box capable of accepting the existing control cable from any voltage regulator manufacturer into the top. The existing control cable is hard-wired into a terminal board inside the junction box. From the bottom of the junction box is an Eaton quick-connect control cable connector.

Control Cable Adapter: Adapts Eaton quick-connect cables with different numbers of conductors. The most common use for the adapter would be to adapt a new control box with a standard 12-conductor cable to an Eaton/Cooper voltage regulator with a 10-conductor control cable.

Multi-phase control application scenarios

When applying a multi-phase control to an existing voltage regulator installation, there are several factors to consider. For applications to both the distribution and substation voltage regulators, there are two typical categories of applications to consider, depending upon the location of the control with respect to the voltage regulators. The categories include cases where the control box is mounted on the voltage regulator tank, and cases where the control box is mounted remote from the voltage regulator tank. From there, the scenarios are further categorized by the number of control cable conductors and by manufacturer.

Distribution voltage regulators (Platform mounted)

Platform mounted Voltage regulators Case 1:
Control mounted on tank

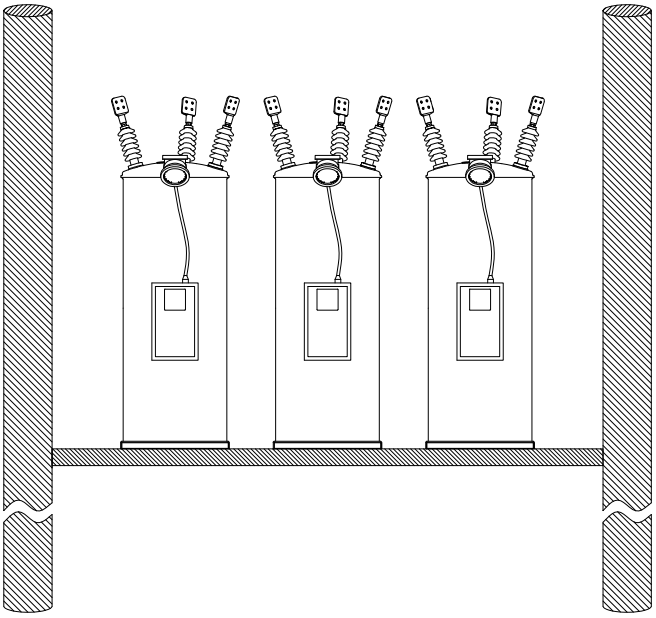

Figure 1. Example of existing platform-mounted voltage regulators with controls mounted on the tank

Table 3.
Platform-mounted Voltage Regulators
Existing Control Box Mounted on Tank
Multi-phase CRA Mounted on Pole

			Interface Options			
			Choose One			
Regulator Manufacturer	Existing Connection Information	Figure	QCA (Qty.3)	Universal Junction Box (Qty. 3)	Control Cable Adapter (External) (Qty. 3)	Control Cable (40 Foot**) (Qty. 3)
Cooper	Hard-wired	2	575044887B10*	57A61314400A	NA	5041489B0480
Cooper	10-conductor	3	NA	NA	5045394B1210	5041489B0480
Cooper	12-conductor	4	NA	NA	NA	5041489B0480
Cooper	13-conductor	4	NA	NA	NA	5041492B0480
Cooper	14-conductor	4	NA	NA	NA	041490B0072
Siemens	Jack Plug	2	575044887B01*	57A61314400A	NA	5041489B0480
Howard	Jack Plug	2	575044887B01*	57A61314400A	NA	5041489B0480
GE	Pin Terminal	2	575044887B03*	57A61314400A	NA	5041489B0480
GE	Fork Terminal	2	575044887B02*	57A61314400A	NA	5041489B0480

*This is the option shown in Figure 2.
**Other control cable lengths are available.

Solution 1: Applies to McGraw Edison, Cooper Power Systems, and Eaton's Cooper Power series voltage regulators with hardwired control cable and motor capacitor inside the tank. It also applies to Siemens, Howard, or GE voltage regulators.

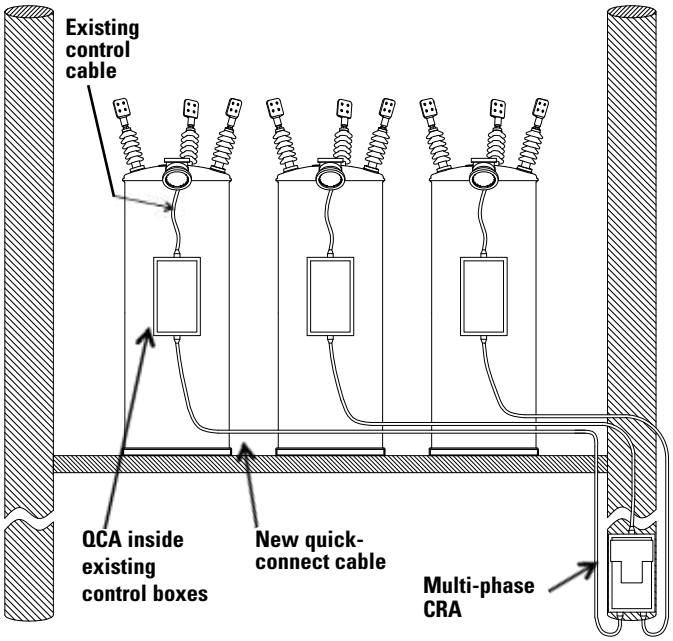

Figure 2. Existing control boxes converted to junction boxes using QCAs. New quick connect cables and a multi-phase CRA are added.

List of required components for this solution:

- Multi-phase CRA, qty. 1
- QCA assembly appropriate for unit manufacturer, qty. 3
- Quick-connect control cable, qty. 3

Other solutions:

Three universal junction boxes could be substituted for the three QCAs.

Solution 2: Applies to McGraw Edison and Cooper Power voltage regulators with quick-connect control cables that have the motor capacitor inside the voltage regulator tank.

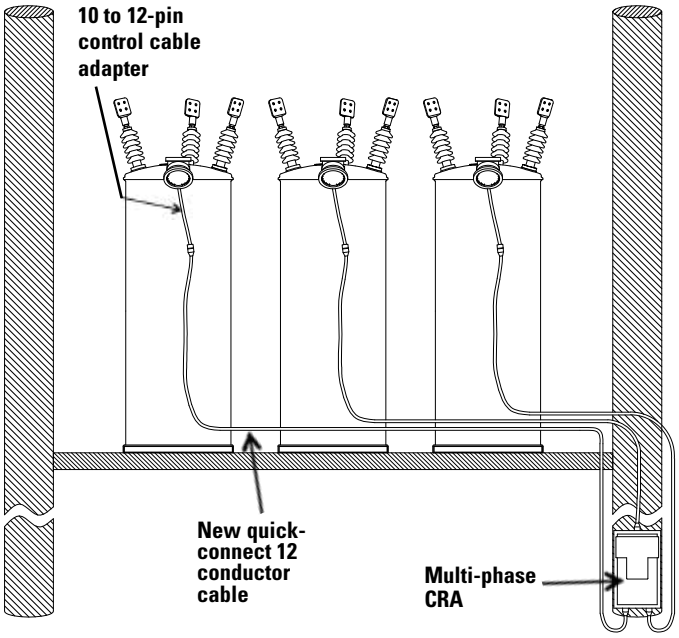

Figure 3. Existing control boxes are eliminated. New 12-conductor quick-connect cables are adapted to the existing 10-pin quick-connectors at the junction boxes. A new multi-phase CRA is added.

List of required components for this solution:

- Multi-phase CRA, qty. 1
- Control cable adapter, 10- to 12-pin external application, qty. 3
- Quick-connect control cable, qty. 3

Other solution:

The voltage regulators could be converted to move the motor capacitor into the control box; in that case the solution 3 below would be used.

Solution 3: McGraw Edison, Cooper Power Systems, or Eaton's Cooper Power series voltage regulators with quick-connect control cable and motor capacitor permanently installed in the control box.

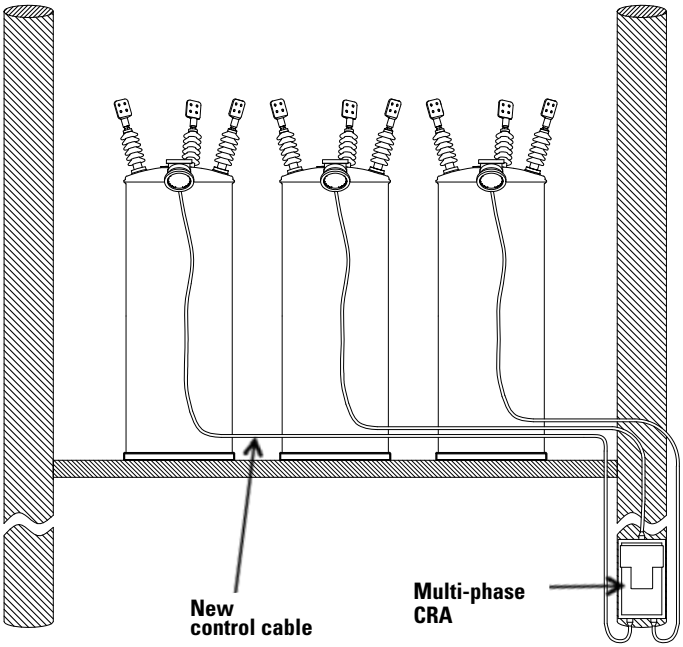

Figure 4. Existing control boxes are eliminated. The existing quick-connect cables are used to connect between the regulators and a new multi-phase CRA.

Platform mounted voltage regulators

Platform mounted voltage regulators Case 2:
Controls mounted remote of tank

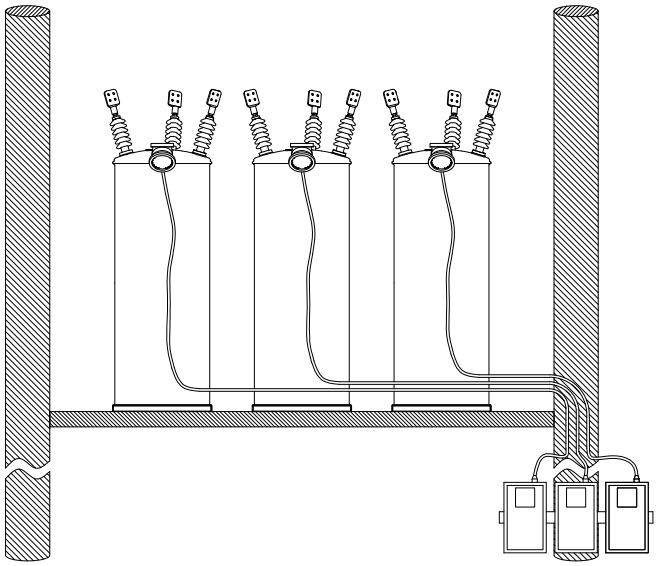

Figure 5. Example of platform-mounted voltage regulators with controls mounted on the pole

Table 4.
Platform-mounted Voltage Regulators
Existing Control Box Mounted on Pole
Multi-phase CRA Mounted on Pole

			Interface Options			
			Choose One			
Regulator Manufacturer	Existing Connection Information	Figure	QCA (Qty.3)	Universal Junction Box (Qty. 3)	Control Cable Adapter (External) (Qty. 3)	Control Cable (40 Foot**) (Qty. 3)
Cooper	Hard-wired	6	575044887B10	57A61314400A*	NA	5041489B0072
Cooper	10-conductor	7	NA	NA	5044875B03	NA
Cooper	12-conductor	7	NA	NA	NA	NA
Cooper	13-conductor	7	NA	NA	NA	NA
Cooper	14-conductor	7	NA	NA	NA	NA
Siemens	Jack Plug	6	575044887B01	57A61314400A*	NA	5041489B0072
Howard	Jack Plug	6	575044887B01	57A61314400A*	NA	5041489B0072
GE	Pin Terminal	6	575044887B03	57A61314400A*	NA	5041489B0072
GE	Fork Terminal	6	575044887B02	57A61314400A*	NA	5041489B0072

*This is the option shown in Figure 6.
**Other control cable lengths are available.

Solution 1:

Applies to McGraw Edison and Cooper Power Systems voltage regulators with hardwired control cables. It also applies to Siemens, Howard, or GE voltage regulators.

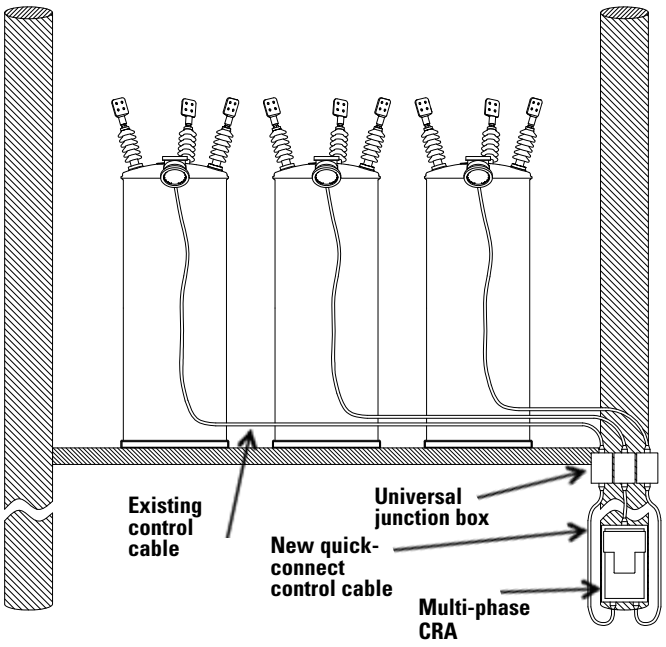

Figure 6. Existing control boxes are eliminated. The existing control cables are used to connect to the universal junction boxes and new quick-connect cables connect between the junction boxes and the new multi-phase CRA box.

List of required components for this solution:

- Multi-phase CRA, qty. 1
- Universal junction box, qty. 3
- Quick-connect control cable, qty. 3

Other solutions:

Three QCAs could be used in place of the universal junction boxes. The existing control boxes could remain on the poll or be moved to be mounted on the tanks.

Solution 2:

Applies to McGraw Edison, Cooper Power Systems, or Eaton's Cooper Power series voltage regulators with quick-connect control cables.

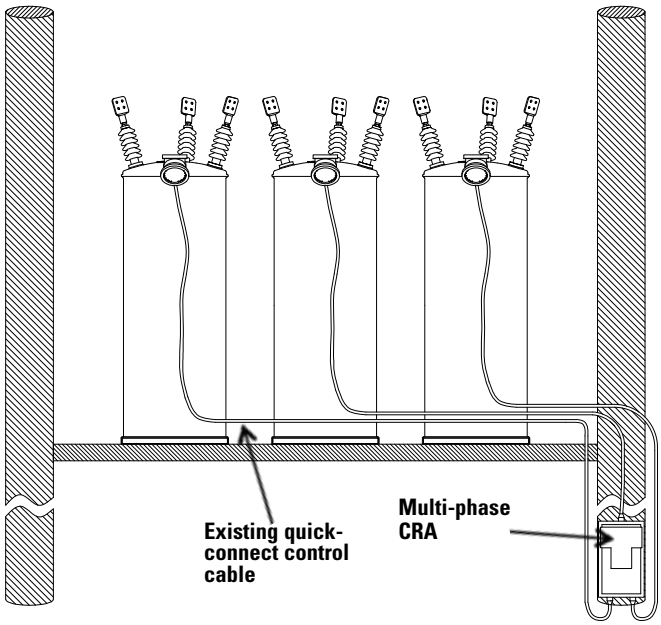

Figure 7. Existing control boxes are eliminated. The existing quick-connect control cables connect between the voltage regulators and the new multi-phase CRA box. An internal control cable adapter is used to adapt control cables with different numbers of conductors.

List of required components for this solution:

- Multi-phase control CRA, qty. 1
- Internal control cable adapter when control cables have different numbers of conductor, qty. 3

Substation voltage regulators

Substation voltage regulators Case 1:
Controls mounted on the tank

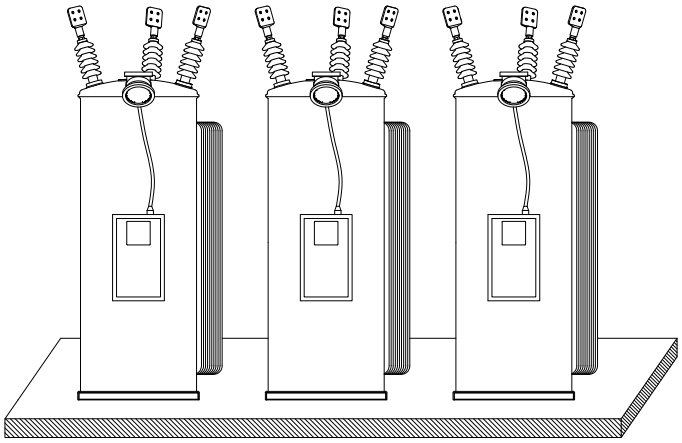

Figure 8. Example of existing substation voltage regulators with controls mounted on the tank

Table 5.

Substation Voltage Regulators
Existing Control Box Mounted on Tank
Multi-phase CRA Mounted on Center Tank

			Interface Options					
			Outside Phases --- Choose One Option (Qty 2 Req'd)		Center Phase (Qty 1 Req'd)	Internal Control Cable Adapter (Qty 1)	External Control Cable Adapter (Qty. 2)	Control Cable (20 Foot**) (Qty. 2)
Regulator Manufacturer	Existing Connection Information	Figure	QCA	Universal Junction Box	External Control Cable Adapter			
Cooper	Hard-wired	9	575044887B10	57A61314400A*	57A61314400A	NA	NA	5041489B0240
Cooper	10-conductor	10	NA	NA	NA	5044875B03	5045394B1210	5041489B0240
Cooper	12-conductor	11	NA	NA	NA	NA	NA	5041489B0240
Cooper	13-conductor	11	NA	NA	NA	NA	NA	5041492B0240
Cooper	14-conductor	11	NA	NA	NA	NA	NA	5041490B0240
Siemens	Jack Plug	9	575044887B01	57A61314400A*	NA	NA	NA	5041489B0240
Howard	Jack Plug	9	575044887B01	57A61314400A*	NA	NA	NA	5041489B0240
GE	Pin Terminal	9	575044887B03	57A61314400A*	NA	NA	NA	5041489B0240
GE	Fork Terminal	9	575044887B02	57A61314400A*	NA	NA	NA	5041489B0240

*This is the option shown in Figure 9.
**Other control cable lengths are available.

Solution 1:

Applies to McGraw Edison and Cooper Power Systems voltage regulators with hardwired control cable and motor capacitor inside the tank. It also applies to Siemens, Howard, or GE voltage regulators.

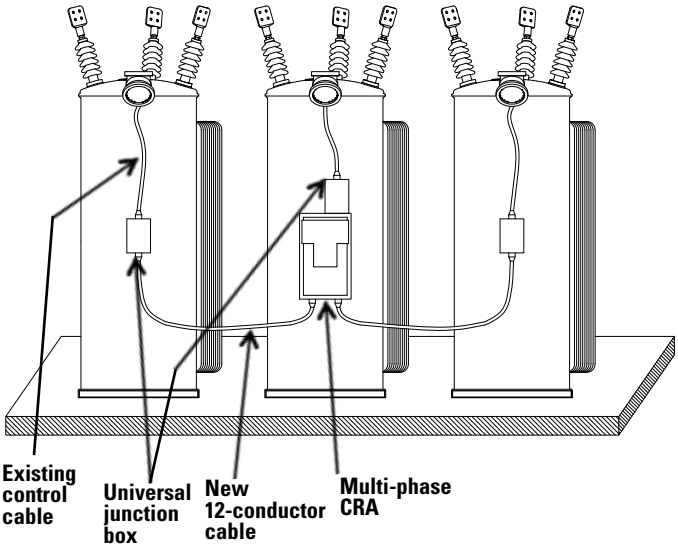

Figure 9. Existing control boxes are eliminated. Universal junction boxes are used to create a junction between the existing control cables and new quick-connect cables for the outside regulators. A universal junction box mounts to the top of the multi-phase CRA box to accept the existing control cable from the center voltage regulator.

List of required components for this solution:

- Multi-phase CRA, qty. 1
- Universal junction box, qty. 3
- Quick-connect control cable, qty. 2

Other solutions:

Two QCAs installed inside the existing control boxes could be used in place of the universal junction boxes for the outside regulators.

Solution 2: McGraw Edison and Cooper Power Systems voltage regulators with quick-connect control cable and motor capacitor inside the tank.

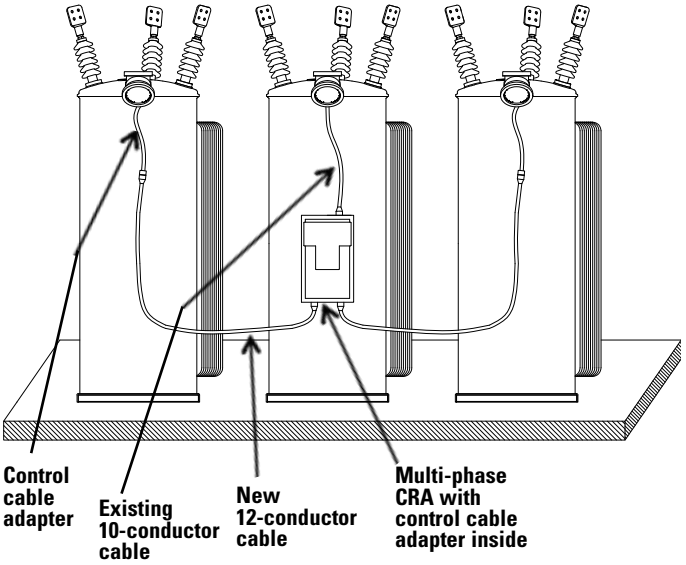

Figure 10. Existing control boxes are eliminated. Control cable adapters are used to adapt existing control cable connections to new 12-conductor quick-connect cables for the outside regulators. A control cable adapter is used inside the new multi-phase CRA box to adapt the existing 10 conductor control cable on the center regulator.

List of required components for this solution:

- Multi-phase CRA, qty. 1
- Control cable adapter, 10- to 12-pin external application, qty. 2
- Control cable adapter, 10- to 12-pin internal application, qty. 1
- Longer quick-connect control cable, qty. 2

Other solutions:

Two universal junction boxes or 2 QCAs could be substituted for the control cable adapters on the outside regulators. Also, the voltage regulators could be converted to move the motor capacitor into the control box; in that case the solution 3 below would be used.

Solution 3: McGraw Edison, Cooper Power Systems, and Eaton's Cooper Power series voltage regulators with quick-connect control cable and motor capacitor permanently installed in the control cabinet

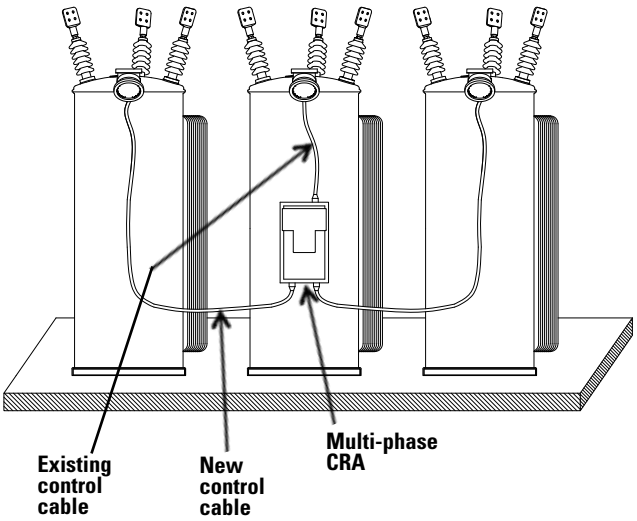

Figure 11. Existing control boxes are eliminated. New longer control cables are used to connect to the new multi-phase CRA box for the outside voltage regulators. The existing control cable connects the center regulators to the new multi-phase control box.

List of required components for this solution:

- Multi-phase CRA, qty. 1
- Longer quick-connect control cables, qty. 2

Substation voltage regulators

Substation voltage regulators Case 2:
Controls mounted remote from the tank

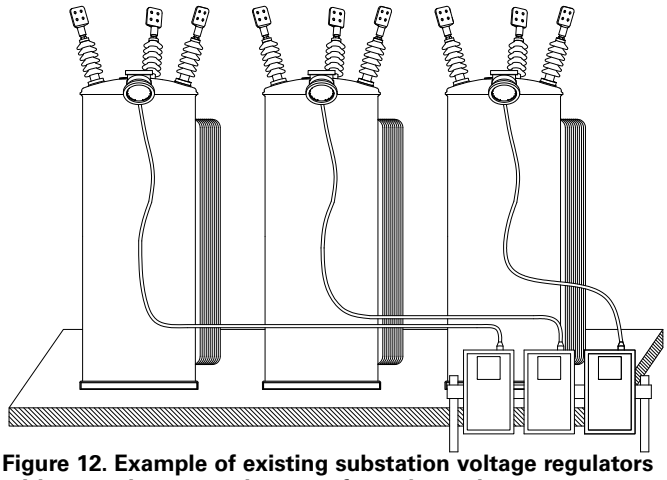

Figure 12. Example of existing substation voltage regulators with controls mounted remote from the tank.

Table 6.

Substation Voltage Regulators
Existing Control Boxes Mounted Remotely
Multi-phase CRA Mounted Remotely

Interface Options

Regulator Manufacturer	Existing Connection Information	Figure	Choose One		Internal Control Cable Adapter (Qty 3)	Control Cable (20 Foot**) (Qty. 3)
			QCA (Qty.3)	Universal Junction Box (Qty. 3)		
Cooper	Hard-wired	13	575044887B10*	57A61314400A	NA	5041489B0240
Cooper	10-conductor	14	NA	NA	5044875B03	NA
Cooper	12-conductor	14	NA	NA	NA	NA
Cooper	13-conductor	14	NA	NA	NA	NA
Cooper	14-conductor	14	NA	NA	NA	NA
Siemens	Jack Plug	13	575044887B01*	57A61314400A	NA	5041489B0240
Howard	Jack Plug	13	575044887B01*	57A61314400A	NA	5041489B0240
GE	Pin Terminal	13	575044887B03*	57A61314400A	NA	5041489B0240
GE	Fork Terminal	13	575044887B02*	57A61314400A	NA	5041489B0240

*This is the option shown in Figure 13.
**Other control cable lengths are available.

Solution 1: Applies to McGraw Edison and Cooper Power Systems voltage regulators with hardwired control cable and motor capacitor inside the tank. It also applies to Siemens, Howard, or GE voltage regulators.

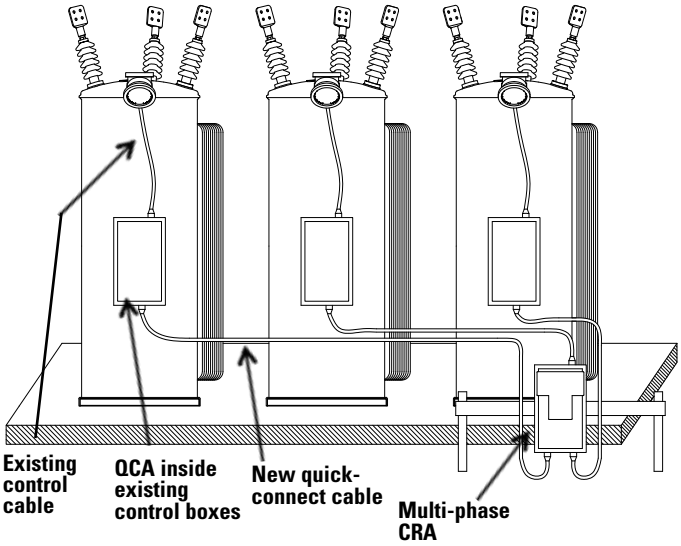

Figure 13. Existing control boxes are converted to junction boxes using QCAs. New quick connect cables and multi-phase CRA are added.

List of required components for this solution:

- Multi-phase CRA, qty. 1
- QCA assembly appropriate for unit manufacturer, qty. 3
- Quick-connect control cable, qty. 3

Other solutions:

Three universal junction boxes could be substituted for the three QCAs.

Solution 2: McGraw Edison, Cooper Power Systems, and Eaton's Cooper Power series voltage regulators with quick-connect control cable.

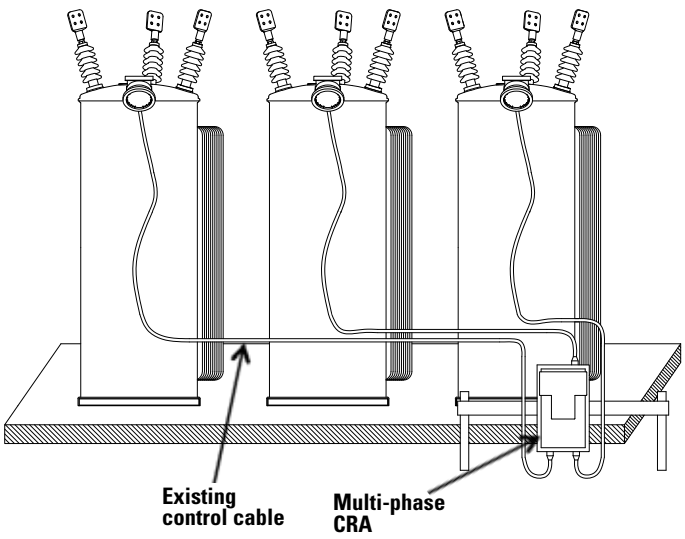

Figure 14. Existing control boxes eliminated. The existing control cables are used to connect between the voltage regulator the new multi-phase CRA. An internal control cable adapter is used to adapt control cables with different numbers of conductors.

List of required components for this solution:

- Multi-phase CRA, qty. 1
- An internal control cable adapter is used to adapt control cables with different numbers of conductors, qty. 3

For Eaton's Cooper Power series product information call
1-877-277-4636 or visit:
www.eaton.com/cooperpowerseries

Eaton
1000 Eaton Boulevard
Cleveland, OH 44122
United States
Eaton.com

Eaton's Power Systems Division
2300 Badger Drive
Waukesha, WI 53188
Eaton.com/cooperpowerseries

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