

INSTRUCTIONS

For Installation

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INTRODUCTION

CAUTION

The equipment covered by this publication must be selected for a specific application and it must be installed, operated, and maintained by qualified persons who are thoroughly trained and who understand any hazards that may be involved. This publication is written only for such qualified persons and is not intended to be a substitute for adequate training and experience in safety procedures for this type of equipment.

General

The interconnecting-control-wiring base spacer is a 6-inch high base spacer which is used to house and isolate, all low-voltage wiring from the high-voltage compartments. The interconnecting-control-wiring base spacer can be connected to installed S&C Manual PMH Pad-Mounted Gear only under any one of the following conditions: (1) there is adequate installed cable length to compensate for the 6-inch increase in

height when the control-wiring base spacer is installed; (2) suitable cable splices are made to compensate for the 6-inch increase in height; (3) the installed gear includes an optional 6-inch base spacer (suffix “-K1,” “-K7,” “-K11,” or “-K17”) that is removed before installing the control-wiring base spacer; or (4) the installed gear includes an optional 12-inch or greater height base spacer (suffix “-K2” through “-K4,” “-K8” through “-K10,” “-K12” through “-K14,” or “-K18” through “-K20”), and the installed base spacer is removed and replaced by a base spacer 6 inches lower in height before installing the control-wiring base spacer.

If none of the above conditions are met, the interconnecting-control-wiring base spacer cannot be installed. Furthermore, the control-wiring base spacer must be installed immediately below the pad-mounted gear without any intervening base spacer between them because the control wiring and external wire ducts will not otherwise extend to the switch operators and low-voltage compartment.

INTRODUCTION — Continued

⚠ WARNING

Since S&C Interconnecting-Control-Wiring Base Spacers attach to pad-mounted gear containing high voltage, there are hazards inherently present such that the following precautions should be observed at all times. Failure to observe these precautions may result in serious injury or death.

1. Make certain that the pad-mounted gear is de-energized and properly grounded before proceeding with installation of the interconnecting-control-wiring base spacer.
2. Test for voltage using proper high-voltage test equipment before touching any device that is to be inspected, serviced, or repaired in the high-voltage compartments.
3. Install suitable grounding equipment before touching any device that is to be inspected, serviced, or repaired in the high-voltage compartments.
4. Always assume that both terminals of any switch or fuse are energized unless proved otherwise by test, by visual evidence of open circuit conditions on both terminals, or by observing that both terminals are grounded.
5. Make certain that fuses are disconnected from all power sources (including backfeed) before being inspected or replaced.
6. Always confirm the open/close positions of Mini-Rupter Switches by visually observing the positions of the switch blades.

7. Doors on the pad-mounted gear, switch operators, and low-voltage compartment must be securely closed and latched, with padlocks in place at all times unless work is being performed inside the enclosures.
8. Optional key interlocks, if furnished, must be in place. Check the operating sequence of key interlocks to verify proper sequencing. Destroy all duplicate keys or make them accessible only to authorized persons so that the key-interlock scheme will not be compromised. Key interlocks are not security locks and are not substitutes for padlocks.
9. Do not apply any undue force when attempting to open a door. The use of undue force may damage the door latching mechanism. If optional key interlocks are provided, make certain that the interlocks are in their correct positions to allow door opening.
10. Do not remove or obscure any of the "CAUTION," "DANGER," or other precautionary signs and labels.

These recommendations may differ from the user's operating and safety procedures. Where such discrepancy exists, users should follow their operating procedures.

INSTALLATION

Preparation

Step 1

Proceed as described in the "WARNING" above or follow the user's standard system operating procedures to de-energize the cables and the pad-mounted gear. Then disconnect all high-voltage cables, if they have not been removed already.

Step 2

Removing some of the internal barriers in the pad-mounted gear will make the following steps easier. Remove the hanging barriers in all compartments and the switch interphase barriers.

To remove a switch interphase barrier, loosen the wing-head stud, or ¼-inch hex-head bolt, that attaches the barrier to the barrier-support angle (see Figure 1) by turning the stud counterclockwise

¼ turn (turn hex-head bolts until the barrier is removable). Remove the stud from its retainer in the barrier-support angle (stud remains attached to barrier; bolts must be retained for reinstallation), and lift the barrier from the barrier guide which supports the barrier at the switch frame.

Step 3

The instructions that follow presume that the Type PM Switch Operators and low-voltage compartment are already installed on the pad-mounted gear. If these components have not been installed, do so at this time referring to S&C Instruction Sheet 669-500.

For pad-mounted gear that does not include a base spacer, continue with Step 4. For pad-mounted gear that includes an installed base spacer, proceed to Step 6.

Units Without Base Spacers

Step 4

If the unit does not include a base spacer, disconnect the pad-mounted gear from the concrete pad by removing the anchor-bolt nuts and brackets (see anchor-bolt detail on the catalog dimensional drawing). If the gear includes cable guides (suffix "-M2" or "-M3"), the cable-guide mounting angle must be detached from the pad-mounted gear, leaving the cable guides secured to the cables. Refer to the applicable S&C instruction sheet on installation of the pad-mounted gear for proper lifting procedures. Then lift the gear and set it aside.

Step 5

Set the interconnecting-control-wiring base spacer in position over the anchor bolts on the pad. Make sure the control-wiring base spacer is oriented correctly with the wire-harness openings for the switch operators adjacent to the high-voltage cables of the switches that will be power operated. Secure the control-wiring base spacer to the pad using the anchor-bolt brackets and nuts previously removed. If cable splices are required to compensate for the 6-inch increase in height of the gear, make the necessary splices and then proceed to Step 10.

Units with Base Spacers

Step 6

If the installed unit already includes a base spacer, remove the bolts that connect the installed base spacer to the pad-mounted gear. Also, remove the ground bus that connects the ground pads of the pad-mounted gear and base spacer.

Refer to the applicable S&C instruction sheet on installation for proper lifting procedures for the pad-mounted gear. Then, while lifting the pad-mounted gear, separate it from the base spacer and set the gear aside. Gasketing between the pad-mounted gear and the base spacer may hold them together and, therefore, some effort may be required to separate the two assemblies.

For units with an installed 6-inch base spacer, continue with Step 7 below. For units with an installed 12-inch or greater height base spacer, proceed to Step 8.

Step 7

If the installed base spacer is 6 inches in height: Remove the installed base spacer from the concrete pad by removing the anchor-bolt nuts and brackets (see anchor-bolt detail on catalog dimensional drawing), and set the base spacer aside. Set the interconnecting-control-

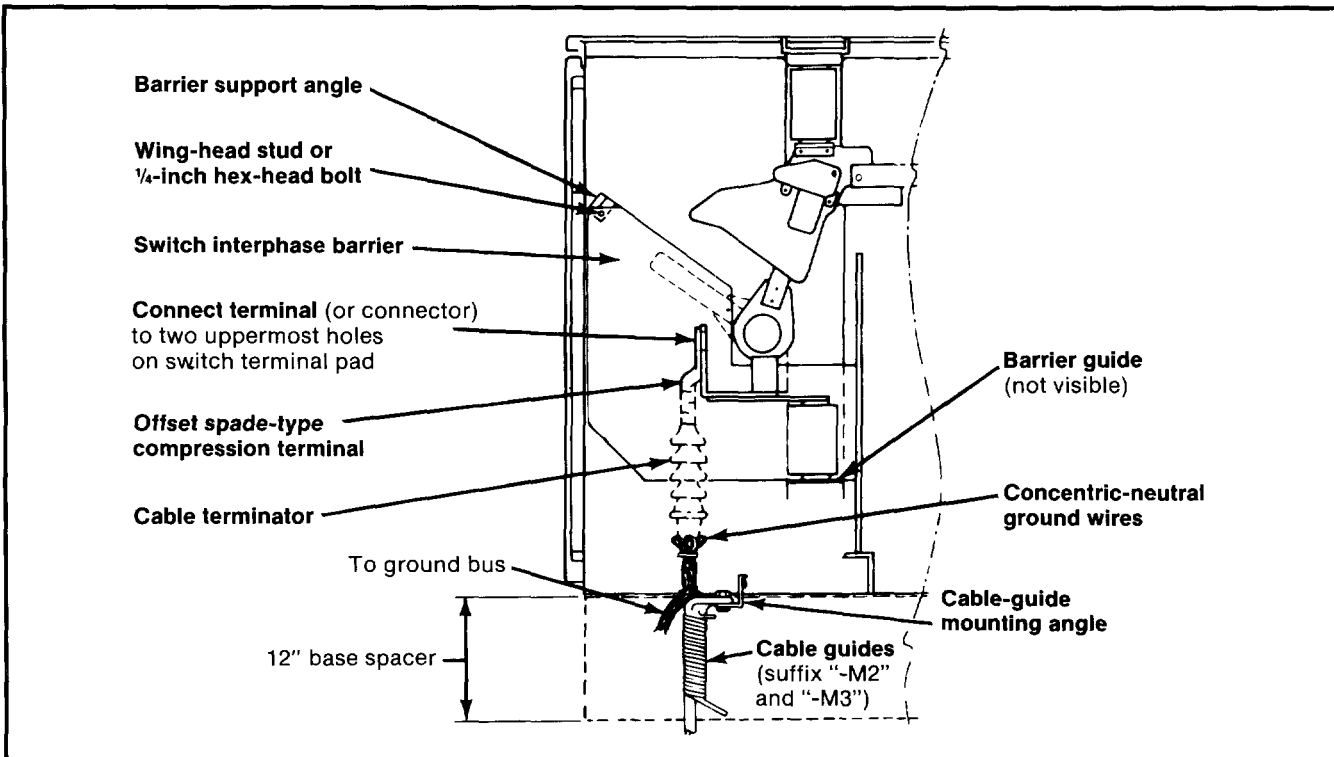


Figure 1. Side view of switch showing interphase barrier attachment points, terminal-pad connections, and optional cable supports. Illustrated above is an installed unit of pad-mounted gear with an existing 12-inch base spacer.

INSTALLATION — Continued

wiring base spacer in position over the anchor bolts on the pad. Make sure the control-wiring base spacer is oriented with the wire-harness openings for the switch operators adjacent to the high-voltage cables of the switches that will be power operated. Secure the control-wiring base spacer to the pad using the anchor-bolt brackets and nuts previously removed. If cable splices are required to compensate for the 6-inch increase in height of the gear, make the necessary splices and then proceed to Step 10.

Step 8

If the installed base spacer is 12 inches or greater in height: Remove one 6-inch section from the installed base spacer by removing the bolts and ground bus that connect the sections. If there is no separate 6-inch section attached, remove the entire base spacer from the concrete pad by removing the anchor-bolt nuts and brackets (see anchor-bolt detail on catalog dimensional drawing). Then replace it with a combination of 6- and 12-inch sections, so that the combined height of the base spacer is 6 inches less than that of the original base spacer.

Be sure to remove any existing gasketing, and install new gasketing between any sections being joined and on the bottom of the section that will be in contact with the pad.

If the base spacer was removed from the pad, secure the bottom base-spacer section to the pad using the anchor-bolt brackets and nuts previously removed.

Step 9

Bolt the interconnecting-control-wiring base spacer to the top of the base spacer that is to remain with the pad-mounted gear, and install the ground bus between each base-spacer section. Be sure that: (1) the control-wiring base spacer is oriented correctly with the wire-harness openings for the switch operators adjacent to the high-voltage cables of the switches to be power operated; (2) the total height of the new base spacer (including the control-wiring base spacer) is the same height as the original base spacer; (3) the control-wiring base spacer is the top section of the new base spacer (i.e., will be positioned next to the pad-mounted gear); (4) all of the sections have gasketing between them,

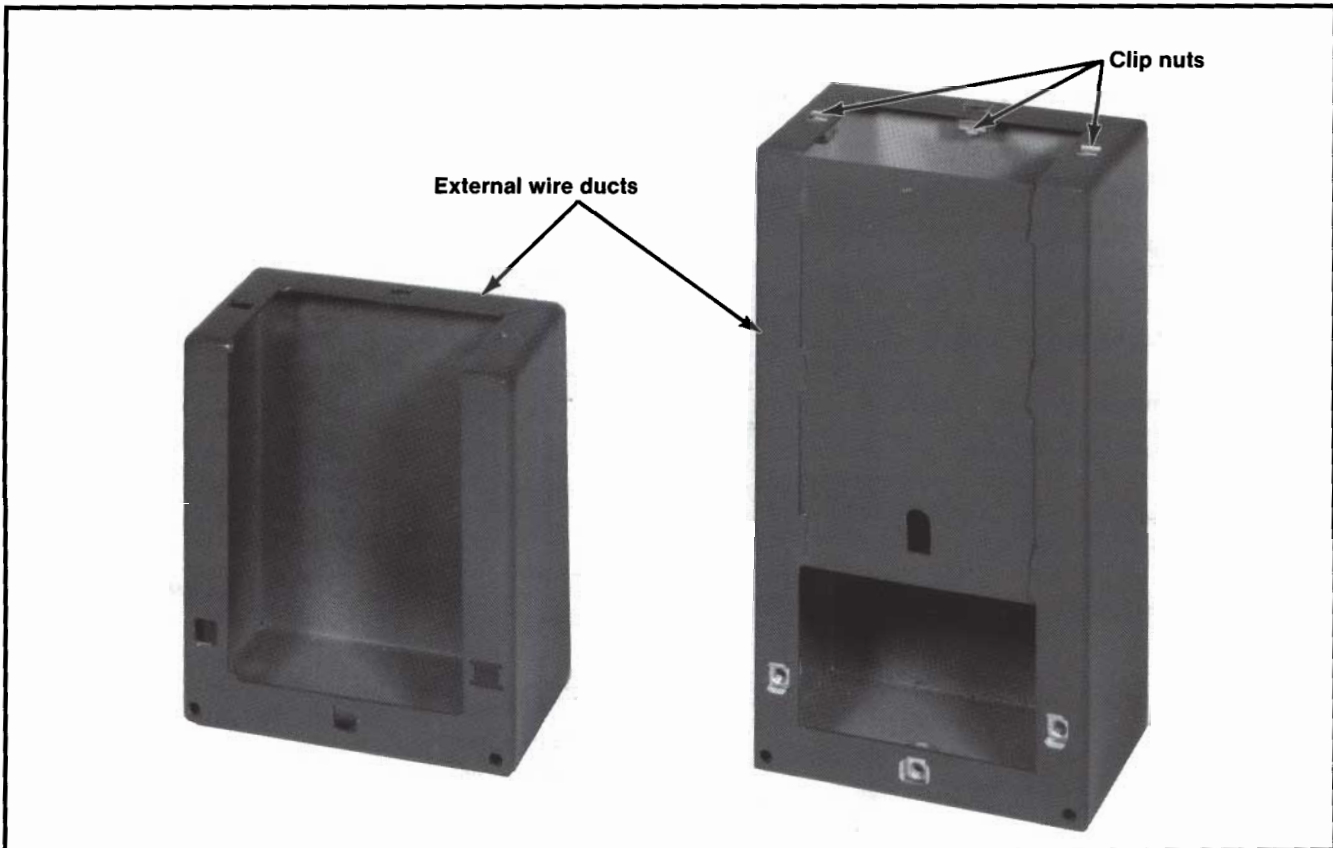


Figure 2. Shorter external wire duct is pictured (at left) without clip nuts installed and matches up with the low-voltage compartment. Taller external wire duct is pictured (at right) with clip nuts installed and matches up with a Type PM Switch Operator.



INSTALLATION — Continued

and there is gasketing between the bottom section and the pad; and (5) that all installed hardware is tight. If cable splices are required to compensate for the 6-inch increase in height of the gear, make the necessary splices and then proceed to Step 10.

External Ducts

Step 10

Attach six clip nuts to each of the external wire ducts, three on the top and three on the back. Arrange the nuts so that they are inside the external ducts. See Figure 2.

Step 11

Cut sections of gasketing and apply them on the top and back flanges of the external wire ducts, placing the adhesive side against the external duct. See Figure 3. This gasketing seals between the bottom of the switch operator or low-voltage compartment and the top of the external wire duct, and between the control-wiring base spacer/pad-mounted gear enclosure and the back of the external wire duct. Puncture the gasketing at each clip nut to facilitate installation of the bolts later.

Note: The taller external wiring ducts fit below the switch operators, and the shorter external wiring duct fits below the low-voltage compartment.

Step 12

At one of the openings in the sides of the control-wiring base spacer, pull the wire harnesses out of the opening and feed them into an appropriate external wire duct. *Do not pull the harness with the rectangular connector through the base spacer.* It is for the current sensors and plugs into an internal wire duct that will be installed later.

Insert one half of the plastic grommet (furnished) into the hole in the base spacer. Then carefully insert the other half, making sure that the wiring fits into the smaller guide hole.

Step 13

Bolt the external wire duct to the control-wiring base spacer. The bolts start from inside the base spacer and extend into the clips on the external duct. *Do not tighten the bolts at this time, leave them as loose as possible while keeping the external duct attached.*

Repeat Steps 12 and 13 for each external wire duct.

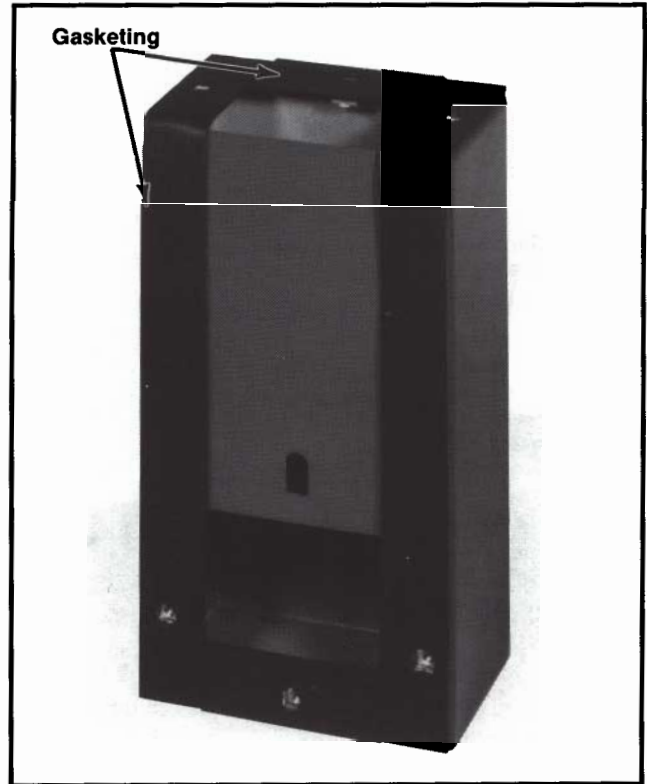


Figure 3. External wire duct showing placement of gasketing and holes required for the bolts.



INSTALLATION — Continued

Internal Ducts

Step 14

On the rear divider in each appropriate compartment of the interconnecting-control-wiring base spacer, attach the long flap of a galvanized-steel internal wire duct assembly using two $\frac{1}{4}$ "—20 \times $\frac{3}{4}$ " self-tapping fasteners. At each switch operator location, pull the wiring with the rectangular connector through the

opening on the rear divider and into the internal wire duct. Then bend the internal duct at the flap crease so that access to the bolts securing the external wire duct is still maintained (i.e., do not install the nuts at the short-flap end of the internal duct). See Figure 4. Repeat this step for each internal duct. See Figure 5 for an overall view of the assembled base spacer.

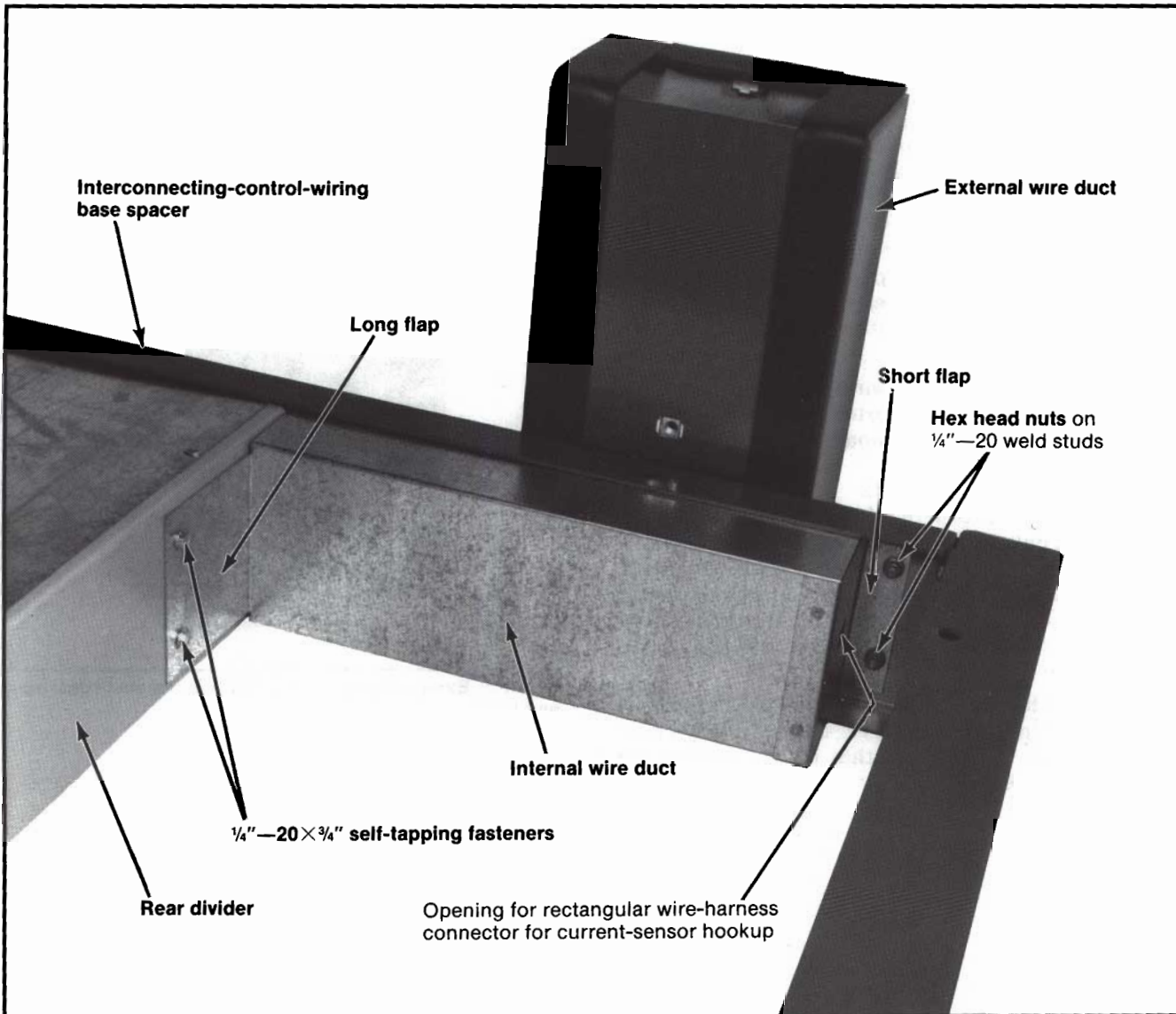


Figure 4. Internal wire duct showing placement of the self-tapping fasteners and the hex head nuts. Hex head nuts on short flap of internal duct are not to be installed until after the control-wiring base spacer is attached to the gear.



INSTALLATION — Continued

Step 15

Cut appropriate lengths of gasketing and install them on the top flanges of the interconnecting-control-wiring base spacer.

Step 16

Remove the conduit-entrance plates from the bottom of each switch operator and low-voltage compartment on the pad-mounted gear.

Step 17

Lift the pad-mounted gear and while lowering it onto the control-wiring base spacer, make sure it is oriented correctly and feed the wiring harnesses from the external ducts through the openings in the bottoms of the switch operators and the low-voltage compartment. Bolt the pad-mounted gear to the control-wiring base spacer. Install the ground bus between the ground pads of the gear and those of the control-wiring base spacer. Make sure the ground pad in each base-spacer section and the gear are connected.

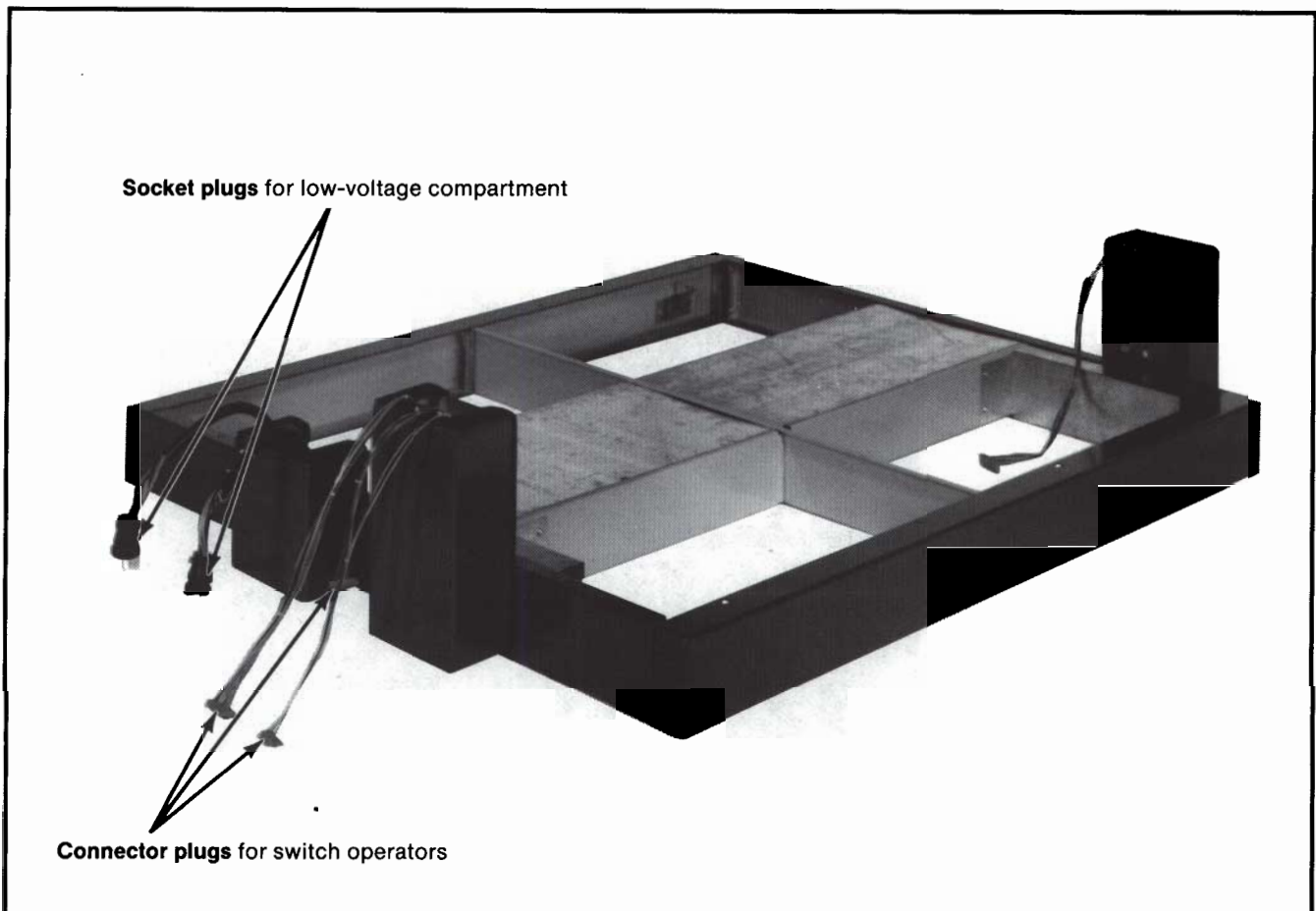


Figure 5. Fully assembled interconnecting-control-wiring base spacer prior to installation gasketing and mounting of the pad-mounted gear, except short flaps of internal ducts are not loose.



INSTALLATION — Continued

Step 18

Secure the wiring harnesses to the appropriate places in the Type PM Switch Operators and to the equipment that may be installed in the low-voltage compartment. Refer to the interconnection wiring diagram for your unit and Figure 6 for correct placement of the various connectors.

Step 19

Bolt each Type PM Switch Operator and the low-voltage compartment to the top of the associated external wire duct.

Step 20

Plug the rectangular wire-harness connector into the rectangular opening in the side of the internal wire duct. See Figure 4, on page 6. If the switch operator

includes an optional ZSD relay, drill a second hole in the internal ducts for the ZSD current sensor wiring. Tape cut edges on the duct to protect wiring.

Step 21

Inside the pad-mounted gear, fully tighten all bolts that secure the external ducts to the control-wiring base spacer.

Step 22

Position the unsecured end (short flap) of each internal wire duct over the $\frac{1}{4}$ "—20 weld studs on the control-wiring base spacer, and secure the duct using the $\frac{1}{4}$ "—20 hex head nuts. See Figure 4 on page 6 for the location of the studs.

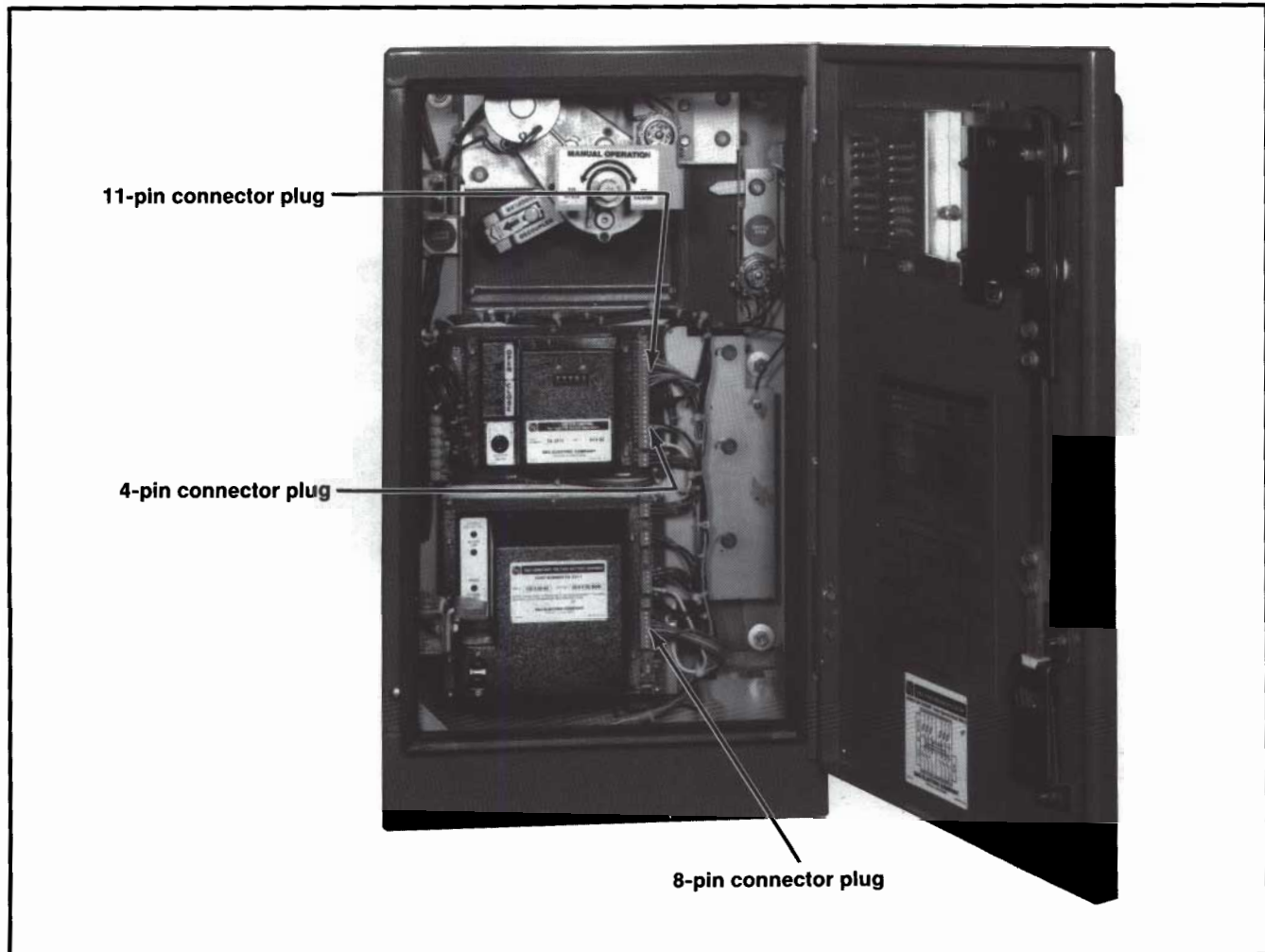


Figure 6. Switch operator containing battery charger showing final locations of the wiring-harness connectors.

Terminating Cables

Step 23

Resecure any cable-guide mounting angles that were removed to the pad-mounted gear.

Before reconnecting the cable terminators to the aluminum switch and fuse terminal pads, thoroughly wire-brush *aluminum* contact surfaces to remove any dirt or foreign materials as well as natural surface oxides. Immediately coat both contact surfaces to one-half inch beyond the joint with a uniform layer of Penetrox® A (available from Burndy Corporation).

Switch terminal pads are furnished with three mounting holes. In general, cable terminators may be connected to the two lower holes in the terminal pads. However, if the pad-mounted gear includes optional cable guides for switch terminals (Catalog Number Suffix "M2"), cable terminators *must* be connected to the two uppermost holes in the switch terminal pads. See Figure 1 on page 3.

Replace any switch interphase barriers that were removed.

When making connections, avoid placing any intentional strain upon any switch or fuse terminal. It is important that each cable-terminator connector be flat against the corresponding switch or fuse terminal pad, with the bolt holes in alignment. *Do not use the connecting bolts to pull the cables into alignment.*

Bolt all fuse-side and switch-side cable terminations to the appropriate terminals, making certain the following minimum clearances are maintained:

From energized parts to electrical ground: 6 inches at 14.4 kv; 7½ inches at 25 kv.

From energized parts to fiberglass-reinforced polyester barriers: 1 inch at 14.4 kv; 2¼ inches at 25 kv.

From terminator skirts to fiberglass-reinforced polyester barriers: ½ inch at 14.4 kv; 1¼ inches at 25 kv.

Current Sensors

Step 24

Connect the current sensors to the wiring harness as described in the instructions furnished with the current sensors. Then, install the current sensors on the cables

as described in the applicable S&C instruction sheet for installation of Type PM Switch Operators. Wiring for current sensors used with the Type ZSD Overcurrent Relay must be routed through the opening previously cut in the internal ducts.

Completing Installation

Step 25

Verify that all doors open and latch closed without binding. The gasket on the base-spacer bottom flange seals the enclosure to the foundation to help prevent entry of rodents, insects, or weeds into termination compartments and to discourage tampering by the curious. In the event that the gasket cannot completely compensate for an uneven foundation, apply grout at the bottom of the base spacer as necessary. Any grout applied should be recessed enough to permit caulking. To complete the installation, caulk around the bottom of the base spacer with a weatherproof compound applied with a standard caulking gun. A room-temperature vulcanizing (RTV) silicone-rubber compound is recommended. Apply a suitable compound to fill the spaces between the cable and any conduit, and around wiring openings in the internal ducts to prevent the entry of rodents.

Placing in Service

Step 26

Place the pad-mounted gear in service as follows:

1. Check the interiors of the pad-mounted gear, switch operators, and low-voltage compartment. Remove all foreign materials and tools that may have been mislaid, and clean the interiors of any debris.
2. If cleaning is required, wipe barriers, insulators, switches, fuses, and terminators clean with a mineral-spirits solvent and dry with a clean cloth.
3. Remove grounding equipment and install all hanging barriers.
4. Close and padlock all doors.
5. Follow user's standard system operating procedures to place the gear in service.

SPECIFICATIONS

INTERCONNECTING-CONTROL-WIRING BASE SPACERS^①

Item	Material	No. of Switch Operators to be Mounted on Pad-Mounted Gear	Applicable to Pad-Mounted Gear Models	Color	For Pad-Mounted Gear Shipped Prior to April 1992	
					14.4-Kv Models	25-Kv Models
					Catalog Number	Catalog Number
Interconnecting-Control-Wiring Base Spacers—for mounting directly under pad-mounted gear—wiring harnesses in base spacer permit connection of each switch operator to a low-voltage compartment appropriately mounted on the pad-mounted gear ^{②③}	Mild steel	1	PMH-3	Olive green	CPA-1120-1	CPA-1123-1
				Light gray	CPA-1120-2	CPA-1123-2
			PMH-5	Olive green	CPA-1121-1	CPA-1124-1
				Light gray	CPA-1121-2	CPA-1124-2
			PMH-6, -9, -10, -11	Olive green	CPA-1122-1	CPA-1125-1
				Light gray	CPA-1122-2	CPA-1125-2
		2	PMH-6, -9, -10, -11	Olive green	CPA-1122-3	CPA-1125-3
				Light gray	CPA-1122-4	CPA-1125-4
		3	PMH-10, -11	Olive green	CPA-1122-5	CPA-1125-5
				Light gray	CPA-1122-6	CPA-1125-6
		4	PMH-10	Olive green	CPA-1122-7	CPA-1125-7
				Light gray	CPA-1122-8	CPA-1125-8
	Stainless steel	1	PMH-3	Olive green	CPA-1126-1	CPA-1129-1
				Light gray	CPA-1126-2	CPA-1129-2
			PMH-5	Olive green	CPA-1127-1	CPA-1144-1
				Light gray	CPA-1127-2	CPA-1144-2
			PMH-6, -9, -10, -11	Olive green	CPA-1128-1	CPA-1145-1
				Light gray	CPA-1128-2	CPA-1145-2
		2	PMH-6, -9, -10, -11	Olive green	CPA-1128-3	CPA-1145-3
				Light gray	CPA-1128-4	CPA-1145-4
		3	PMH-10, -11	Olive green	CPA-1128-5	CPA-1145-5
				Light gray	CPA-1128-6	CPA-1145-6
		4	PMH-10	Olive green	CPA-1128-7	CPA-1145-7
				Light gray	CPA-1128-8	CPA-1145-8

① Not for PMS or PME models.

② To use these interconnecting-control-wiring base spacers, the Type PM Switch Operator that is equipped to supply power to all other switch operators on the pad-mounted gear must be mounted adjacent to Compartment 1 on PMH-3 and PMH-5 Models, or on Compartment 2 of all other PMH models. Furthermore, the RTU must be in an S&C Low-Voltage Compartment (or a suitable user-supplied equivalent) and that enclosure must be mounted on the right side of Compartment 1 of PMH-3

and PMH-5 Models, or on Compartment 3 of all other PMH models except PMH-10 Models where all four switches are to be power operated.

③ These interconnecting-control-wiring base spacers increase the height of the pad-mounted gear by 6 inches. As a result, installation of interconnecting-control-wiring base spacers requires disassembly of pad-mounted gear from any existing base spacer and may require splicing of installed cable. Refer to "General" on page 1

