WIRE WRAPPED CONNECTIONS
CONNECTING AT SPECIFIC APPARATUS

CONTENTS

1. GENERAL

1.1 Scope of Section

1.11 This section covers the application of wire wrapped connections to terminals of specific apparatus where nonstandard methods or techniques are required to facilitate the connecting operations.

1.12 Each figure in this section illustrates respectively only the conditions to which reference is made in the text and is not to be considered as covering requirements for other conditions that may be involved.

1.2 Precautions

1.21 General precautions to be taken against personal injury, equipment damage and service interruptions are covered in Handbook 0 and are to be observed at all times, as they apply to the operations being performed. Specific precautions, when applicable, are included in this section with the associated method.

2. TERMINAL STRIPS

2.1 Distributing Frame

2.11 On distributing frame terminal strips arranged for wrapped connections, the shop may connect and solder straps at the base of terminals. Installer wrapped connection on these terminals should be solderless wrapped. (No solder required.)

2.12 When identifying skinned leads prior to connecting, be certain to use color code markings that are complete and not those that may have been mutiliated by the skinning operation.

Example: A lead skinned between two dots of the color code marking would have the same appearance, just above the skinning point, as a lead with a one dot color code marking.

2.13 On the horizontal side of the distributing frame, the terminal strips have to be tilted to prepare them for fanning and Solderless Wrap Connecting (SWC). Previous methods utilized either the R-3468, R-4256, or R-4497 to tilt the terminal strips. These fixtures have been cancelled and the associated usage methods removed from this section.

2.131 A simple method of tilting these terminal strips on the distributing frame in preparation for solderless wrap connecting has been adopted. This method uses expense items that are normally available on most job sites. The following steps describes these expense items and how they can be used:

A. Locate the positions on the distributing frame where the terminal strips are to be mounted. If the mounting location is between existing terminal strips, and less than 36 inches of space, cut a section of 1" Dia. PVC tubing (RM-552448) to fit into the space. If mounting location is more than 36 inches long, one or more pieces of the tubing may be required depending on the number of adjacent terminal strips to be mounted on a given shelf.

B. Secure the lengths of tubing at these mounting locations by wrapping a R-4265 Cable Tie around the tube and horizontal stiffening bar, one at each end, and pulling them up tight enough to hold the tube in place. If the frame does not utilize stiffening bars, wrap a tie around the tube and then run diagonally across the "ears" located on the ends of the transverse arms. (See Figures 1 and 2.)

NOTE: Rigid 1" fiber tubes used by the shops to protect local forms can also be used. If R-4265 Cable Ties are not available, R-2916 Twine can be used for securing.

C. Place the terminal strips into the correct locations and secure them temporarily in place. This can easily be accomplished by running a R-4265 Cable Tie through the top terminal strip mounting hole (one at each end of the block). Through the top mounting hole of the transverse arm end, or mounting bar, and then back over the top of the terminal strip and through the cable tie head. Pull the two cable ties up tight enough to give you the desired angle of tilt conducive to an efficient fanning and connecting operation. (See Figures 3 and 4.)

D. After the connecting operations have been completed and the terminals trips are ready for mounting, cut the cable ties holding the 1" tubing and remove the tubes from their temporary locations. This allows the terminal strips to drop down into position for final mounting due to the top two cable ties still being secured in place.

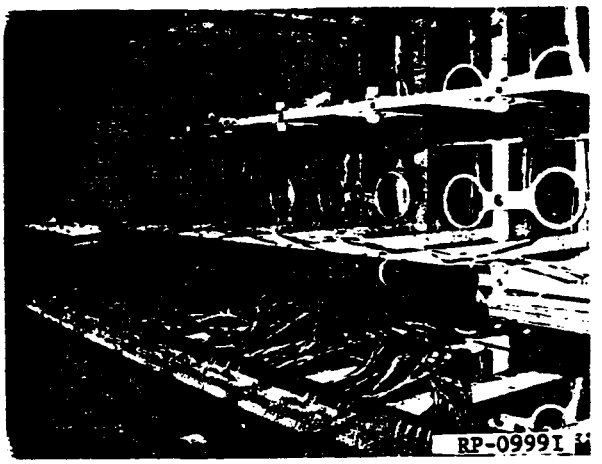

FIG. 1 (PAR 2.131B)
SECURING TUBE TO HORIZONTAL SIDE OF DISTRIBUTING FRAME

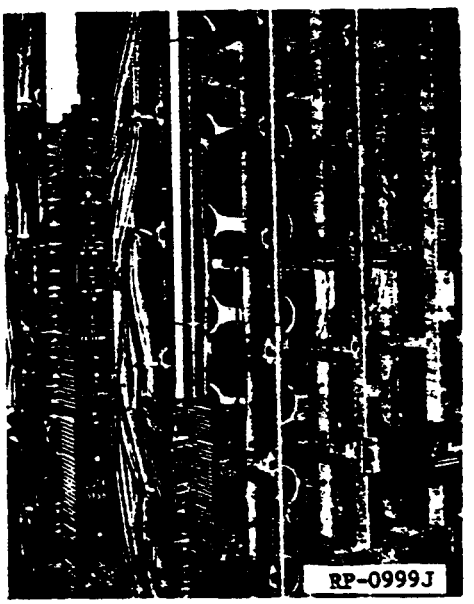

FIG. 2 (PAR 2.131B)
SECURING TUBE TO VERTICAL SIDE OF DISTRIBUTING FRAME

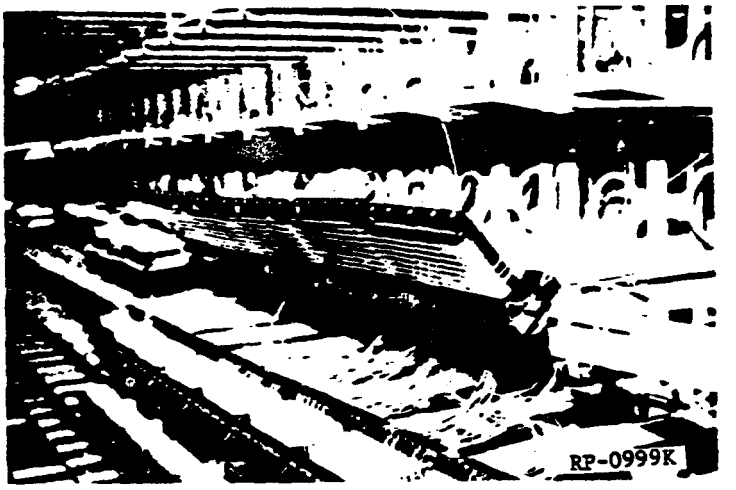

FIG. 3 (PAR 2.131C)
TERMINAL STRIPS TILTED ON HORIZONTAL SIDE OF DISTRIBUTING FRAME

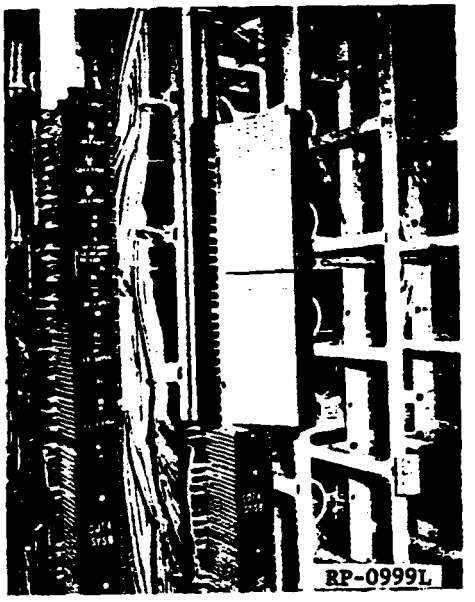

FIG. 4 (PAR. 2.131C)
TERMINAL STRIPS TILTED ON VERTICAL SIDE OF DISTRIBUTING FRAME

E. Align the bottom two holes of the block and start the mounting screws. If nuts and washers are required, place the washers over the screws and start the nuts up on the threads. Cut the top two cable ties holding the block and remove them.

F. Align the top two mounting holes and secure the block in place with screws and/or washers and nuts. Finish mounting by tightening the bottom two screws.

NOTE: This method can also be utilized on the vertical side of the distributing frame, however, a slight difference of cable tie application may be required depending on the type of vertical mounting bar used.

2.14 The tilting of terminal strips will always leave the cable leads forming into the terminal strips about 1"-1-1/2" longer than necessary. This excess slack shall be dressed back directly behind the terminal strips in a neat appearing manner being sure that it does not interfere with jumper running operations.

2.2 "D" Type Terminal Strips

2.21 At "D" type terminal strips where a designation strip is provided, it must be removed in order that the wire wrapping tool may be placed on the terminals.

2.22 On "D" type terminal strips of the PRT Selection and Connector Units on No. 5 Crossbar Originating Register Frames (wire spring type), it will be necessary to bend the top row of terminals slightly to permit the wrapping tool to be inserted in line with the terminal. This can best be accomplished by using a wrapping bit that has failed to pass the verification test. Bend the terminal downward as close to the base as possible, make the wrapped connection and bend the terminal back with a pair of pliers only so much as is required to meet the clearance requirements of 1/64" between connections.

3. CROSSBAR SWITCHES

3.1 General

3.11 Switch terminals should be checked before applying solderless wrapped connections. Approved crosspoint terminals (Refer to Section 314S) on 324, 325 and similar type switches can be identified by the small hump or shoulder at the wrapping base or by the extra width of the terminal extending from the wrapping portion back to the pile-up. Old type terminals not approved for solderless wrapping have a recognizable solder coating.

CAUTION: SWITCH TERMINALS ARE EXTREMELY THIN AND HAVE SHARP EDGES AND CORNERS. AVOID UNNECESSARY CONTACT WITH FINGERS WHEN CONNECTING OR DRESSING WIRES.

3.2 Connection .009 Terminals

3.21 Solderless Wrapped Connections

3.211 Use the R-3863, 24 gauge bit for solderless wrapping approved .009 crosspoint and vertical, multiple terminals.

3.212 A shiner length of 1-1/16" on shop skinned wires will result in connections of 7-1/2 to 8 turns. Crosspoint and vertical multiple terminals will accommodate this number of turns; however, to avoid insufficient turns on following connections, apply the first connection as close as practicable to the terminal shoulder, shiner length of 1-1/2" (obtained by using R-4473 Adjustable Skinning Pliers) on Installer skinned wires will result in connections of 6 turns.

3.213 Do not disturb any twist in a .009 terminal after a connection has been wrapped. When the twist exceeds 180°, solder the connection in accordance with Handbook 9, Section 310.

3.2131 Terminal twisting can be minimized by keeping the wrapping tool parallel to the terminal during the wrapping cycle.

3.214 Any connection being made on .009" terminals that have been previously wrapped on, or repair shall be soldered.

3.215 When two cable leads are to be connected to the same bifurcated vertical, multiple terminal and both lugs of the terminal are vacant, solderless wrap one lead on each lug to avoid soldering connections.

3.216 Cross-connections should not be removed and rerun if a faulty connection is made on a .009 crossbar switch terminal. Solder the connection.

3.22 Soldered Connections

3.221 When wrapping 22 gauge wire (2-3 turns) for soldered connections on minimum (.009 inch) terminals of crossbar switches, use an R-4495 and KS-20963 L-1 20-22 Gauge Bit and Sleeve with the R-3777 Wrapping Tool. This will help to prevent or minimize the twisting of terminals when makeing the 22 gauge connections.

3.222 When connecting to the old, solder terminals, use care to avoid contact between the wrapping bit and the terminal shoulder.

3.2221 For Nos. 22 and 24 gauge wire, use a shiner length of approximately 3/8". This will provide a two-turn connection which in this case will be satisfactory for a soldered wrapped connection.

3.223 For No. 20 or larger gauge wire (where the use of 20 gauge or larger wire cannot be avoided), use a simple hook connection made with the long nose or short nose pliers. Place the open end of the hook on the right-hand side of the terminal. Right-hand soldering is required for this type of connection, but solder will generally cover both sides when applied to the top of the connection.

3.3 Repairing Broken Vertical Multiple Terminals - 324, 325, and Similar Type Switches

3.31 To repair broken terminals, use the P-12F824 Terminal which can be ordered on an Installer Requisition (sourced from Columbus). Clip off any remaining stubs of the original wire wrap terminals as shown in Figure 5. Tin approximately 3/8 inch of the clipped spring stub end.

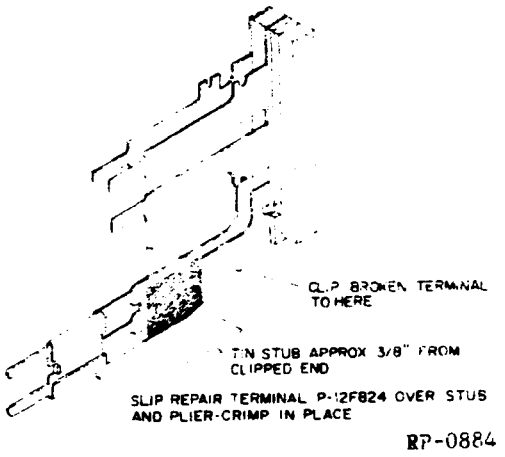

FIG. 5 RPEAIR PROCEDURES (PAR. 3.31)

3.32 Slip the P-12F824 Terminal over the slipped spring end. Crimp the wrap around terminal tabs with R-2291 Pliers. Sweat the two pieces together using an R-2733 Soldering Copper.

3.321 If no additional solder is applied during the sweating operation, the wire wrap portion of the new terminal will remain in satisfactory condition for solderless wrapping.

4. RELAYS

4.1 221 and Similar Types

4.11 Embossed terminals on 221 and similar type relays have a tendency to twist when connections are wrapped with 22 gauge wire, especially when a second connection is placed on the terminal. To minimize twisting of terminals when connecting 22 gauge wire, follow the procedures for crossbar switches outlined in Paragraph 3.221.

4.2 286F, M, 288A, C - Stationary Contact Terminals

PRECAUTION: PRIOR TO CONNECTING THE VERTICAL LOCAL CABLE FORMS FOR THE MARKER MULTIPLE, TEMPORARILY PROTECT THE SKINNED WIRE ENDS IN THE FORM WITH APPROPRIATE LENGTHS OF RM-552452 PLASTIC TUBING. THE TUBING SHOULD BE MOVED DOWN ON THE FORM EXPOSING THE SKINNED WIRE ENDS.

4.21 Be extremely careful when connecting wire to the stationary contacts of these relays. The serrated portion of this terminal is only about 9/16" long and does not have a tool stop; therefore, it is possible to place approximately three wraps on the round portion of the terminal and thereby, create a connection with insufficient turns which is considered unapproved and requires soldering.

4.22 When an unqualified connection has been made or when an unapproved gauge of wire has been connected to these terminals, the use of the R-3007 Midget Soldering Copper or the R-4121 L-2 Soldering Station is recommended to minimize possible PVC insulation damage, solder shorts and crosses.

4.23 Dress wires according to the information in Section 650 and make sure that a minimum of 1/32" separation is maintained between these terminals and also between these terminals and other terminals at left or right.

5. BIFURCATED TERMINALS

5.1 Wrapped Connections

5.11 On bifurcated terminals approved for solderless wrapped connections the individual segments of the terminal shall be considered as separate terminals. Solderless wrapped connections should, where possible, be applied to one terminal when soldered connections have been applied to the other terminal.

6. CONNECTORS

6.1 302, 303, 305, Type

6.11 Due to the design of this apparatus and the apparent difficulties encountered during the mounting and wiring operations, these connector terminals are particularly susceptible to damage; therefore, extreme caution shall be exercised during these operations. Should a damaged connector be received on the job prior to installation, the damage should be reported and replaced with a quality product. However, should the connector terminals be obviously damaged during the installation interval, the damaged terminals of the connector shall be corrected or replaced. This correction or replacement procedure shall be followed due to the bent terminals being a potential source of service interruption at some future date. Refer to the Statistical Quality Control Handbook 35, Section 1, for Basic Quality Concepts.

6.2 307 Type

6.21 The 307 type connector is quite different in physical appearance and design than the 302, 303, and 305 connectors and is utilized only on the "COSMIC II" distributing frame. This connector is used on the back side of the "COSMIC II" outside plant modules and features four 710 connectors locally wired to the rear side. These four 710SD connectors mate with four 710BD connectors placed on the end of the outside plant ABAM type cable.

6.22 Methods associated with the "COSMIC II" distributing frame installation are currently available under "Provisional" status. However, after trial installations, this "Provisional" section will be finalized as Section 191 of this handbook. Therefore, any information required on the 307 connector should be referenced to Section 191.

6.3 308 Type

6.31 The 308 Type Connector is a recent design and mounts only on the new ED-97898-31 Single Sided Modular Protector Frame. This new protector frame has been designed to permit high density mounting of the 308 Type Connectors and consequently has caused some congestion on the wiring side of the frame. The vertical uprights on the rear of the frame has the outside plant "ABAM" cable secured to one side and the tie cables (Installer run) to the opposite side of it. This arrangement is not only conducive to damaging the connectors during mounting operations, but it limits access to the terminals for the solderless wrapping of the cable leads.

6.32 When connecting the 26 gauge tie cable leads on these connector terminals, you should use the R-3786 (Bit) and R-3710 (Sleeve) 5 inch long extension bit and sleeve combination to make it easier to reach the ends of the terminals.

> CAUTION: WHEN OUTSIDE PLANT SECURES THE CABLE STUBS TO THE VERTICAL UPRIGHTS, THEY USE THE HEAVY BLACK CABLE TIES AND SELDOM CUT OFF THE ENDS FLUSH WITH THE TIE HEADS. THESE ENDS ARE VERY SHARP AND YOU MAY CUT THE BACK OF YOUR HAND OR ARM. BE VERY CAREFULL! IT MAY BE EXPEDIENT TO CUT-OFF THESE TIE ENDS FLUSH WITH THE TIE HEADS PRIOR TO THE WIRING OPERATION.

6.33 After the above caution note has been reviewed and rectified where necessary, start fanning and connecting the cable leads. Measure the leads down to the fanning strip and over to the farthest terminal, allow enough slack for the leads to enter the fanning strip and skin all these leads to the same length. Using the 5 inch extension bit, terminate all these leads and dress them back into the fanning strip. Dispose of the slack by dressing it back and down behind the fanning strip. Continue this method until the wiring of the connector has been completed.

6.4 Replacing 302, 303, 305, and 308 Connector Terminals

6.41 Precaution should be taken to prevent interference to working circuits of adjacent terminals when replacing any broken terminals. If there is a plastic cover over the connector, it will be necessary to remove this cover prior to the terminal replacement operation.

6.42 The following procedure should be followed when removing and replacing the P-46D861 and 840212476 Terminals (Refer to Figures 6 and 7):

A. From the wiring side, tag and remove the leads from the broken terminals to be replaced.

B. Using a new terminal or a sharp instrument such as a test probe, push the broken terminal through the connector about 1/8 inch.

C. From the front side of the connector, grasp the terminal head with the R-2120 Long Nose Pliers and pull the terminal from the block.

D. From the front side of the connector, insert the new terminal into the same hole from which the old terminal was removed. Using the fingers, push the terminal into the slot as far as possible.

E. Replace the protector unit to hold the terminal in place.

F. From the wiring side, grasp the terminal with the long nose pliers and pull the terminal forward into its proper position. To determine that the terminal is in the correct position by observing the position of the adjacent terminals.

G. Using the long nose pliers, apply a steady pressure and spread open the tangs of the terminal.

H. Reconnect the tagged leads to the proper replaced terminals. The portion of wire previously used should be cut off and a new "shinner" provided for the wire wrapped connection. However, if insufficient lead length is not available, then apply 1-1/2-3 turns and solder using the temperature controlled R-4121 L2 Soldering Iron, RM-728226 High Tin Content Solder and a R-3367 Heat Sink to dissipate excessive heat. In cross connection field new wire shall be rerun to provide sufficient lead length for a new solderless wrapped connection. Exercise extreme caution to eliminate possible wire insulation damage.

6.43 The following procedure should be followed when removing and replacing the R-46D862 Terminals (Refer to Figures 6 and 7):

A. From the wiring side of the connector, using a soldering iron, remove all the solder from the terminal to be replaced then using the long nose pliers, grasp the terminal and remove it.

B. Follow procedures 6.42B through 6.42H.

6.44 The following procedure should be followed when removing and replacing the P-47L969 Terminal (Refer to Figure 6 and 7);

A. Follow procedures 6.42A through 6.42D.

B. Using an orange stick or spudger, push the terminal into its proper position on the connector.

C. Follow procedure 6.42H.

6.45 This procedure should be followed when removing and replacing the P-21E489 Terminal (Refer to Figures 6 and 7):

A. Tag and remove the leads from the front and rear sides of the terminal.

B. Pull the terminal out of the block with the long nose pliers.

C. From the front side, insert the new terminal into the same hole from which the broken terminal was removed using the long nose pliers.

D. Follow procedure 6.42H.

6.46 Replacement terminals shown in Figures 6 and 7 can be ordered on an Installer Requisition sourced from Baltimore.

7. NETWORK PANELS

7.1 "C" Type

7.11 At 42A apparatus mountings, the sleeve cable leads should be connected as solderless wrapped connections when the resistor pigtail lead is connected at the base of the terminal. However, when the wrapping area of the terminal contains solder or the pigtail connection is located less than 0.9 inch (gauge by eye) from the starting point of the wrapped sleeve connection, the sleeve lead connection should be soldered.

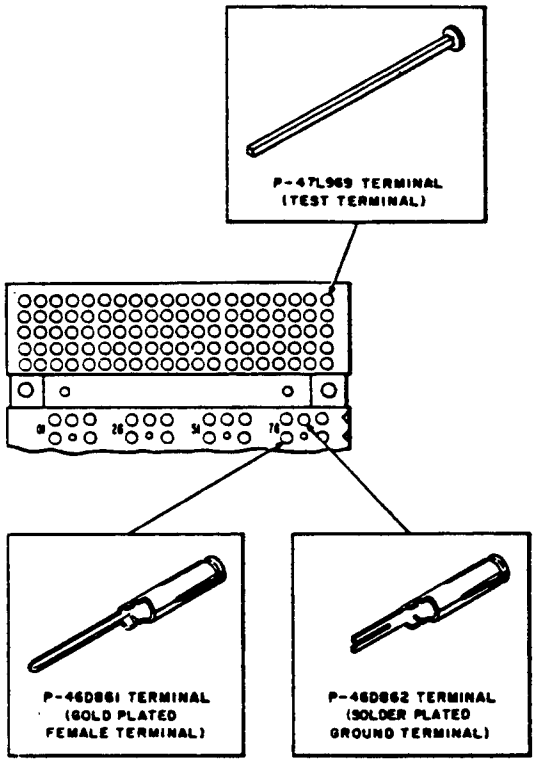

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FIG. 6 302-TYPE CONNECTOR - FRONT SIDE
(PARS. 6.42, 6.43, 6.44, 6.45, 6.46)

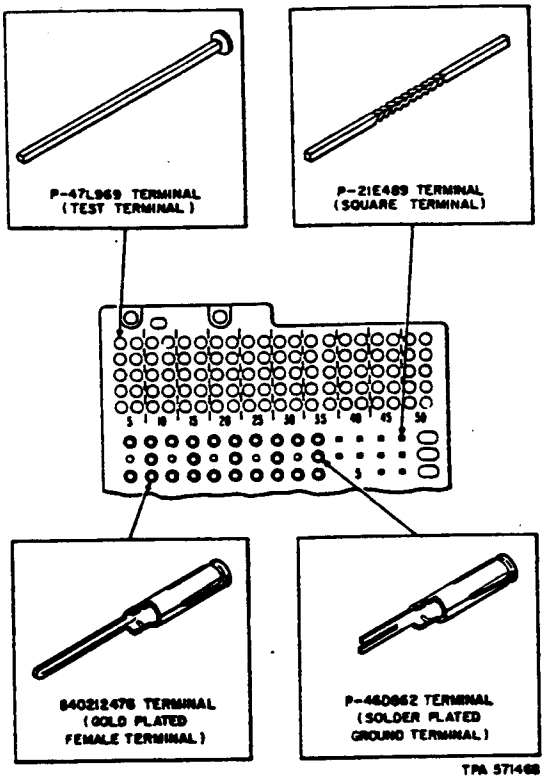

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FIG. 7 303-TYPE CONNECTOR - FRONT SIDE
(PARS. 6.42, 6.43, 6.44, 6.45, 6.46)

Indicates New or Changed Information

Engineering Planning Manager
(Installation)

REASON FOR REISSUE:
To remove R-3468, R-4256, R-4497 Tilting fixtures and associated methods.
Remove reference to 608 Switchboard Jack and Lamp Panels.
Add Paragraphs 2.131A through 2.131F on new method of tilting.
Information on 305, 307, and 308 Type Connectors.