WIRE-WRAP TOOLS
DESCRIPTION AND USE

1. GENERAL

1.01 This practice covers the description and use of electric, spring, and hand operated wire-wrap tools.

1.02 Wire-wrapped connections shall be made only on terminals designed for wire-wrapping.

2. WIRE-WRAPPING TOOLS

2.01 The wire-wrapping tools recommended for use are:

a. Electric Wire-Wrap Tool No. 14B1-A (wire gauge capacity 20 through 32).

b. Spring Operated Wire-Wrap Tool No. 14H-1C (wire gauge capacity 20 through 26).

c. Hand Operated Wire-Wrap Tool No. 20557-23 (wire gauge capacity 24 through 26).

d. Hand Operated Wire-Wrap Tool No. 20557-14 (wire gauge capacity 22).

e. Hand Unwrapping Tool No. A-31478-(LH) (wire gauge capacity 20 through 26).

f. Wrapping Bit No. 500131 (wire gauge capacity 22).

g. Wrapping Bit No. 17612-2 (wire gauge capacity 24).

h. Sleeve No. 18840 (wire gauge capacity 22).

i. Sleeve No. 17611-2 (wire gauge capacity 24).

3. DESCRIPTION

3.01 A wire-wrapping tool is basically a metal rod containing two longitudinal holes. The skinned portion of a wire is inserted into the smaller hole and the larger hole is placed over the terminal. See Figures 1 through 4.

3.02 The wire-wrap tools No. 14B1-A and No. 14H-1C are pistol shaped. The No. 14B1-A is electrically driven and the No. 14H-1C is hand driven and is equipped with a spring which restores the tool to normal.

3.03 Wrapping bits and sleeves are provided in different sizes to accommodate the various wire sizes. The bits and sleeves are inserted into the nose assemblies of the wire-wrapping tools. The wire sizes are shown in Part 2.

3.04 The wire-wrapping bit has an axial hole in one end which fits over the terminal on which a wrapped connection is to be made. In the same end near the outer edge is a smaller hole which is the wire feed slot. (See Figure 5.)

3.05 The sleeve has two wire anchoring notches located opposite each other for holding the insulated portion of the lead. This prevents the insulated portion of the wire from wrapping around the terminal. On the same end is a funnel-shaped flare which guides the skinned portion of the wire into the feed slot of the wrapping bit (Figure 5).

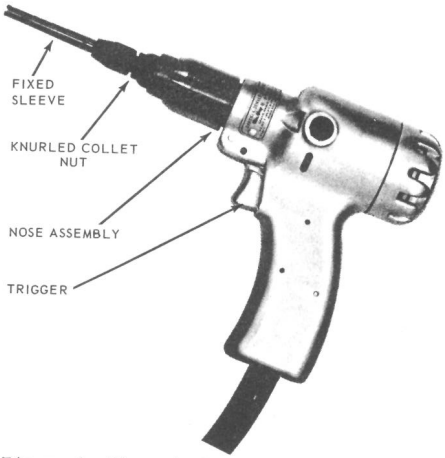


Figure 1. Electric Powered Wire-Wrap Tool

Figure 2. Hand Operated Wire-Wrap Tool

Figure 3. Hand Wrapping Tool.

Figure 4. Hand Unwrapping Tool.

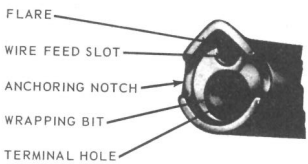


Figure 5. Wire Wrapping Tool Equipped with Associated Bit and Sleeve.

4. PREPARATION

4.01 The gauge of the wire-wrap tool, bit and sleeve shall match the gauge of the wire which is to be used.

4.02 To equip the tool for operation, unscrew the knurled collet nut (see Figure 1) and insert the bit and then the sleeve into the nose piece. Tighten the knurled collet nut by hand. Operate the trigger several times to verify that the wire feed slot stops in line with the flare. If the wire feed slot fails to stop in line with the flare, loosen the knurled collet nut and reposition the sleeve. Failure of the wire feed slot to line up with the flare after repositioning may indicate that the wrapping tool or bit is defective. In this case the wrapping tool and bit should be returned for inspection and repair.

4.03 To remove the sleeve, loosen knurled collet nut and pull sleeve straight out from the wrapping tool.

4.04 To remove the bit, pull it straight out from the wrapping tool until it stops and is free to rotate. Rotate the bit 180° and pull straight out.

5. WRAPPED CONNECTIONS

5.01 *Solderless Wrapped Connections:* The minimum number of turns around the terminal shall be six complete turns for 24 gauge wire, and five complete turns for 22 gauge wire. A skinned length of 1 5/8 inches should be sufficient for 22 and 24 gauge wire to permit the required number of turns around the terminal. More than the required number of turns is permissible (see Figure 6). In order to ascertain that satisfactory connections are being obtained, check them periodically.

5.02 *Soldered Wrapped Connections:* A minimum of three complete turns around the terminal shall be made for soldered wrapped connections. A skinned length of 3/4 inch should be sufficient to permit the required number of turns around the terminal. More than the required number of turns is permissible (see Figure 6).

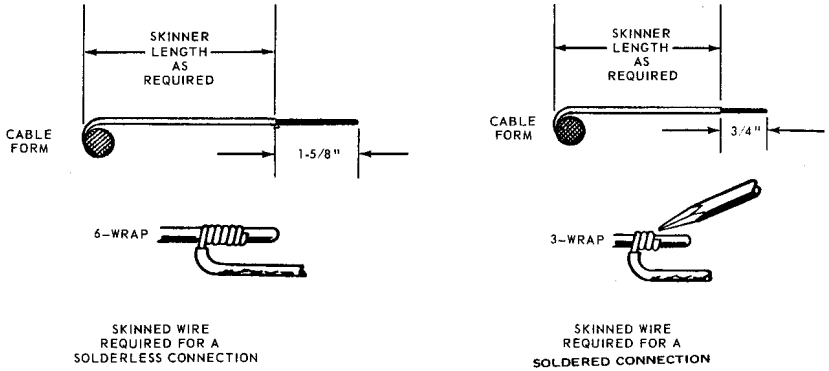


Figure 6. Skinned Lengths Required for Solderless and Soldered Wire Wraps.

5.03 *Skinning Leads:* Care should be used when skinning leads for wrapped connections as it is important that the leads not be nicked or flattened. The wires should not be bent as this makes it difficult to introduce the wire ends into the wire feed slot of the bit.

NOTE: *Before skinning cable conductors on the apparatus side of terminal strips, the wires shall be in their final position.*

5.04 *Wrapping Leads:* Wrap leads as follows:

a. Insert the skinned portion of the lead into the feed slot of the wrapping bit, care being taken to insure that no bare wire is showing. Bond the insulated portion of the lead into the anchoring notch as illustrated in Figure 7. Push the tool onto the terminal while holding the wire taut in the anchoring notch. Use of the left or right anchoring notch is determined by direction of approach, i.e., a lead dressed to the left of the terminal is placed in the left anchoring notch; if dressed to the right, it is placed in the right anchoring notch.

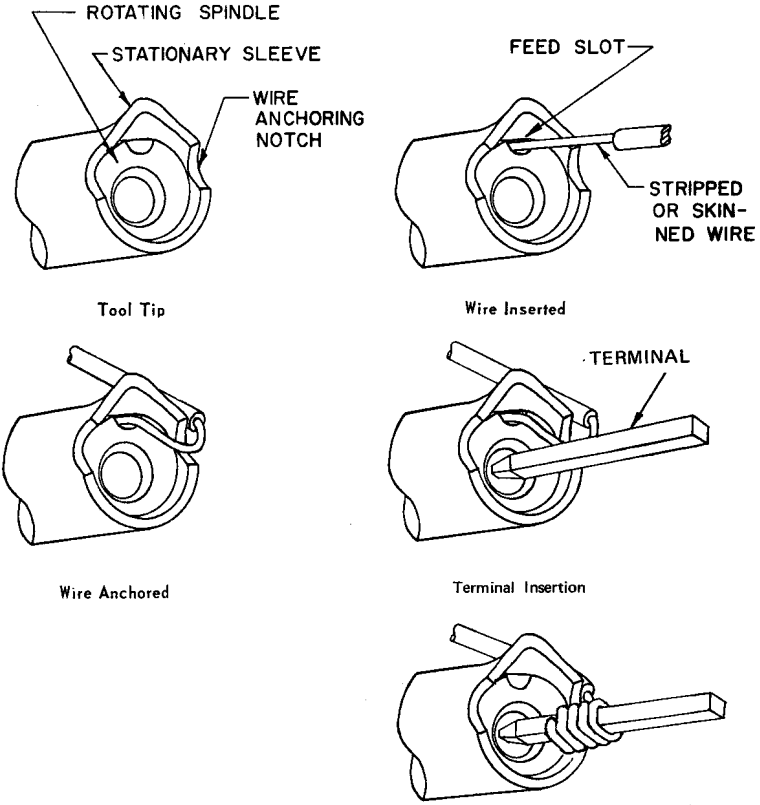


Figure 7. Solderless Wrapped Connection Process.

NOTE: *If the wire is not inserted up to the insulation, a "shiner" may result. A "shiner" shall not be longer than 1/8 inch. A longer length "shiner" is a potential trouble.*

b. The tool shall be inserted over the terminal as far as it will go without touching the terminal moulding.

c. The tool shall be in a direct line with the terminal before operation.

d. Operation of the trigger will wrap the wire on the terminal. The tool will automatically recede as the wire coils on the terminal, producing a finished connection.

e. Insufficient pressure on the tool when wrapping may cause separation between turns. Complete turns may be separated, provided the spaces between inside wraps are no more than .005 inch as gauged by eye. (Figure 8)

Figure 8. Separated Turns Resulting From Insufficient Pressure.

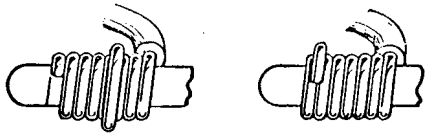


Figure 9. Overriding Turns Resulting From Excessive Pressure.

f. Excessive pressure on the tool when wrapping can cause overriding turns. (Figure 9) Overriding turns are not permissible.

g. It ~~is not~~ required that the wire end be flat against the terminal but a 1/64 inch clearance between the wire end and adjacent terminal must be maintained.

h. If the clearance between the wire end and the adjacent terminal is less than 1/64 inch, and solderless connections are involved, the wire end can be wrapped by placing the tool lightly against the connection and operating the tool.

5.05 *More than one wire per terminal:*

a. Where more than one connection per terminal is necessary, the method of wrapping the second or third connection is determined by the remaining terminal length after the first connection has been made. Each 6 turn connection takes approximately 1/4 inch of the terminal. In order to make a second or third connection, at least 1/4 inch or 1/2 inch of the terminal must be available. (Figure 10 A)

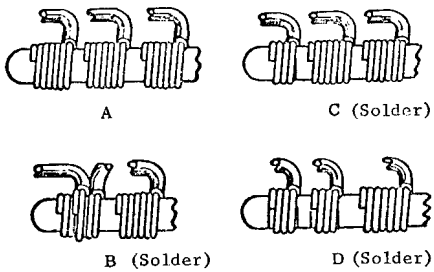


Figure 10. More than One Wire Per Terminal.

b. If there is not sufficient terminal length available for solderless connecting, 1 1/4 to 3 turn connection may be made but must be soldered. (Figure 10 C & D)

c. If there is not sufficient terminal length for a 1 1/4 inch turn connections, wrap the lead over the previous connection and solder. (Figure 10 B)

d. Where it is decided on an installation that it is not practical to apply solderless wire-wrapped connections on terminal strips, the soldering operation can be facilitated if the wrapping tool is not placed on the terminal as far as it will go. A depth guide as shown in Figure 11 and used as illustrated in Figure 12 will position the wrapping tool so as to leave sufficient space for three connections of three turns each. After the first horizontal row of connections has been made on a group of terminal strips, the remaining terminals can be gauged by eye rather than repositioning the guide on each succeeding row of terminals.

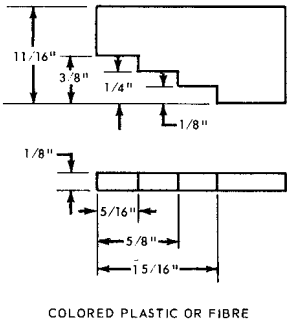


Figure 11. Depth Guide for Soldered Connections on Terminal Strips.

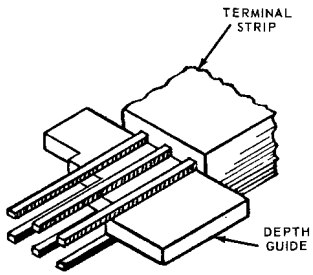


Figure 12. Method of Using Depth Guide for Soldered Connections on Terminal Strips.

5.06 *Soldering Wrapped Connections:*

a. When a terminal contains solder, either on an existing connection or resulting from a previously soldered connection, all connections added to this terminal shall be soldered.

b. When soldering a wrapped connection, a minimum of two adjacent turns of the connection shall be soldered.

c. Where a connection requiring solder is added to a terminal, all connections on that terminal shall be soldered.

5.07 *Removing Wrapped Connections:*

a. The spiral may be unwound with an unwrapping tool or pliers (Figure 13) or, if there is sufficient slack, by hand.

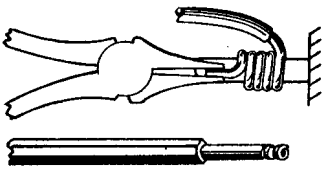


Figure 13. Removing Wrapped Connection.

b. Where a connection has been soldered, a soldering iron should be applied to the connection and the spiral unwound with pliers or by hand. *Do not use the unwrapping tool.*

c. No attempt shall be made to pull the wrap from the terminal by pulling on the lead. This may break the wire and make the wrap difficult to remove.

d. If, for any reason, a wrap must be removed and then reconnected, proceed as follows:

(1) When there is sufficient slack in the lead to obtain the proper skinned length, cut the previously connected lead back, skin and reconnect. Do not rewrap a previously wrapped skinned length as the strength of the wire is reduced by the first connection.

(2) Where there is insufficient slack to make a normal connection, skin 1/4 inch of insulation from the lead and wrap at least 1 1/4 turn of wire, using the wrapping tool or pliers. This wrap shall be soldered.

NOTE: *This does not apply to jumpers. If there is not enough slack, replace the jumper.*

(3) Rewrapped connections made on a terminal that was not previously soldered do not require soldering.

6. PRECAUTIONS

6.01 The bit of the wire-wrapping tool rotates in a thin walled sleeve and, *due to the close tolerance between the two parts, bumping or dropping the tool may result in the bit failing to turn or the wire feed slot failing to line up with the flare on sleeve.*

6.02 When the wrapping tool is not in use, it should be placed in a secure, out-of-the-way location.

6.03 When working on ladders, normal safety practices, such as securing the tool to the ladder with a cord, should be followed to protect both equipment and personnel.

6.04 Since the case of the 14B1-A tool is grounded, care should be taken when connecting terminals associated with working equipment. The appropriate supervisor shall be contacted to have working equipment released if possible. If equipment cannot be released, the connections shall be hand wrapped, using the hand operated wire-wrap tools to complete the connections.

6.05 When it is necessary to connect 20 gauge wire and the 20 gauge wrapping bit and sleeve are not available, the lead should not be wrapped with pliers. The lead should be wrapped around a square or rectangular test terminal, removed, placed on the equipment terminal and soldered. A nail or other object of suitable diameter could be substituted for a test terminal. The described method of wrapping on a test terminal or nail can also be used for 14 gauge wire. All connections made with 20 through 14 gauge wire must be soldered.

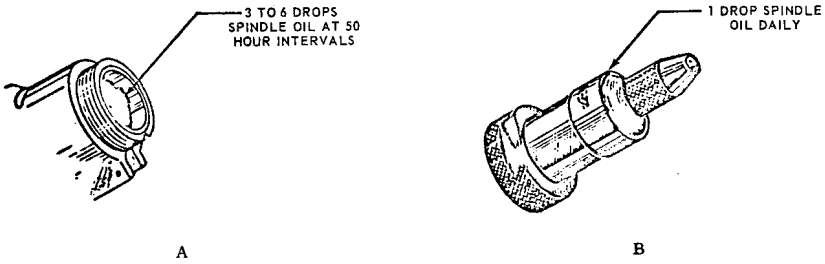
6.06 When solderless connections have been applied, care shall be taken that no testing fixture (either push-on or spring clip type) comes in contact with the connection.

7. LUBRICATION

7.01 The wire wrap tool is assembled at the factory with a light coating of oil on all moving parts. This provides initial lubrication for approximately 50 hours running time. Beyond this, additional lubrication is necessary to maintain top performance.

7.02 At 50 hour intervals, remove the nose assembly and add 3 to 6 drops of spindle oil to the upper clutch block and spindle, as illustrated in Figure 14 A. Replace the nose assembly and run the tool for one or two minutes before starting production.

7.03 The STOP PAWL located under the sleeve on the nose assembly must be lubricated DAILY. Apply 1 drop of spindle oil between the sleeve and guide sleeve assembly (Figure 14 B).



A B

Figure 14. Lubrication Points of Wire Wrap Tool.

8. ORDERING INFORMATION

8.01 The Wire-Wrap tools listed in Paragraph 2.01 are manufactured by the Gardner-Denver Company, Quincy, Illinois.