Schneider Automation
Modbus Plus Network
Installing Clustered Node Devices

31000939 00 Version 2.0

To Our Customer

Modbus Plus devices must be installed as specified in a network layout plan, showing each device's mounting location and cable connections. Improper installation can cause problems with the network operation. If you do not have a diagram showing the mounting locations and cabling information, you should obtain one from your network administrator before proceeding with the installation. The *Modbus Plus Network Planning and Installation Guide* (890USE10000) describes how to prepare a network layout plan.

Tools You Will Need

You will need these tools:

- ☐ Wire cutter to cut the cables, and a wire stripper or knife to remove the cable outer jacket.
- ☐ Wire crimper to connect the ground lug to the shield braid of the drop cable.
- ☐ Flat screwdriver for connecting the ground lug to the Tap.
- ☐ Insertion tool for pressing the wires into the wiring terminals. Use of the tool is required. The tool is available from Schneider Automation (part number 043509383), or from AMP Incorporated, P.O. Box 3608, Harrisburg, PA 17105–3608 USA (part number 552714-3). The correct tool's shank color is white, indicating that it is designed for installing 24 ... 28 AWG (0.08 ... 0.2 mm) wires.

Overview: Modbus Plus Single and Clustered Nodes

Modbus Plus devices can connect to the network in two ways: as single nodes, or as a group of nodes in a cluster. Schneider Automation provides connectors and cables for each configuration.

Each Modbus Plus network has a trunk cable with Taps located at device sites. A drop cable connects each Tap to a single node device, or to a cluster of node devices. Figure 1 shows a typical network configuration with single nodes and two types of clustered nodes. Note how the network is terminated at its two ends: at the last tap for a single node, and at the last clustered node.

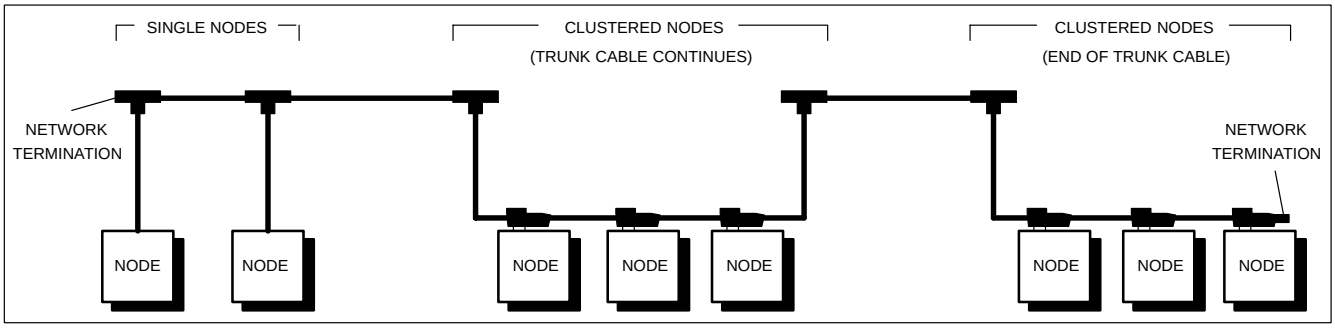

Figure 1 Overview: Network with Single Nodes and Clustered Nodes

Two Types of Cluster Configurations

The network may contain up to 8 clusters, with up to 8 nodes per cluster. Configuration details are on page 4. Two types of cluster configurations are allowed, depending upon how the trunk cable will be routed at the cluster.

☐ **A. Trunk Cable Continues:** If the trunk cable will continue from the cluster, refer to Figure 2.

☐ **B. Trunk Cable Ends:** If the trunk cable will end at the cluster, refer to Figure 3.

A. Trunk Cable Continues from Cluster: Figure 2 shows a pair of clusters with the trunk cable continuing from the cluster. In this configuration the last clustered node must return through a drop cable to the next Tap.

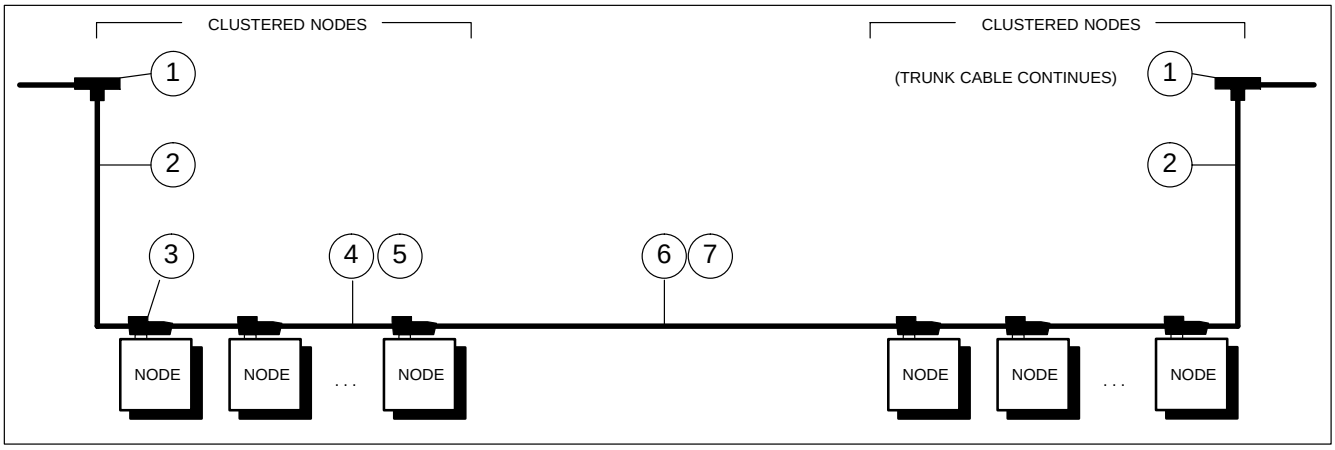

Figure 2 Cluster Configuration: Trunk Cable Continues

B. Trunk Cable Ends at Cluster: Figure 3 shows a pair of clusters with the trunk cable ending at a cluster. This configuration is used at either end of the trunk cable. In this configuration the last clustered node must have a terminator installed. Note that the terminator is installed at the node, and not in the Tap.

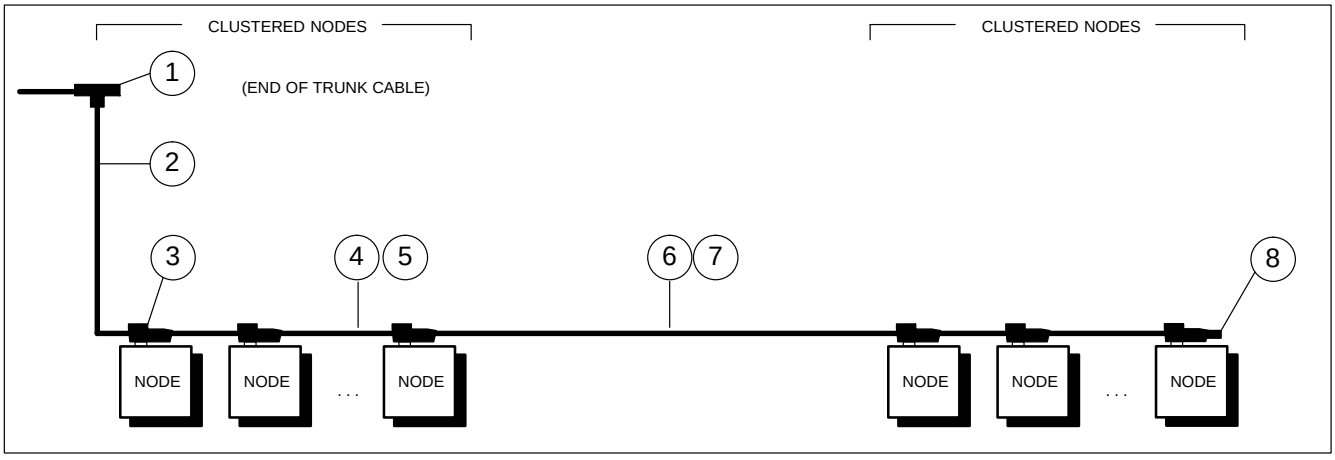

Figure 3 Cluster Configuration: End of Trunk Cable

Cluster Components

Figure 4 illustrates the components used in connecting Modbus Plus node devices in clusters. Refer to Figure 2 and Figure 3 for examples of how the components are used.

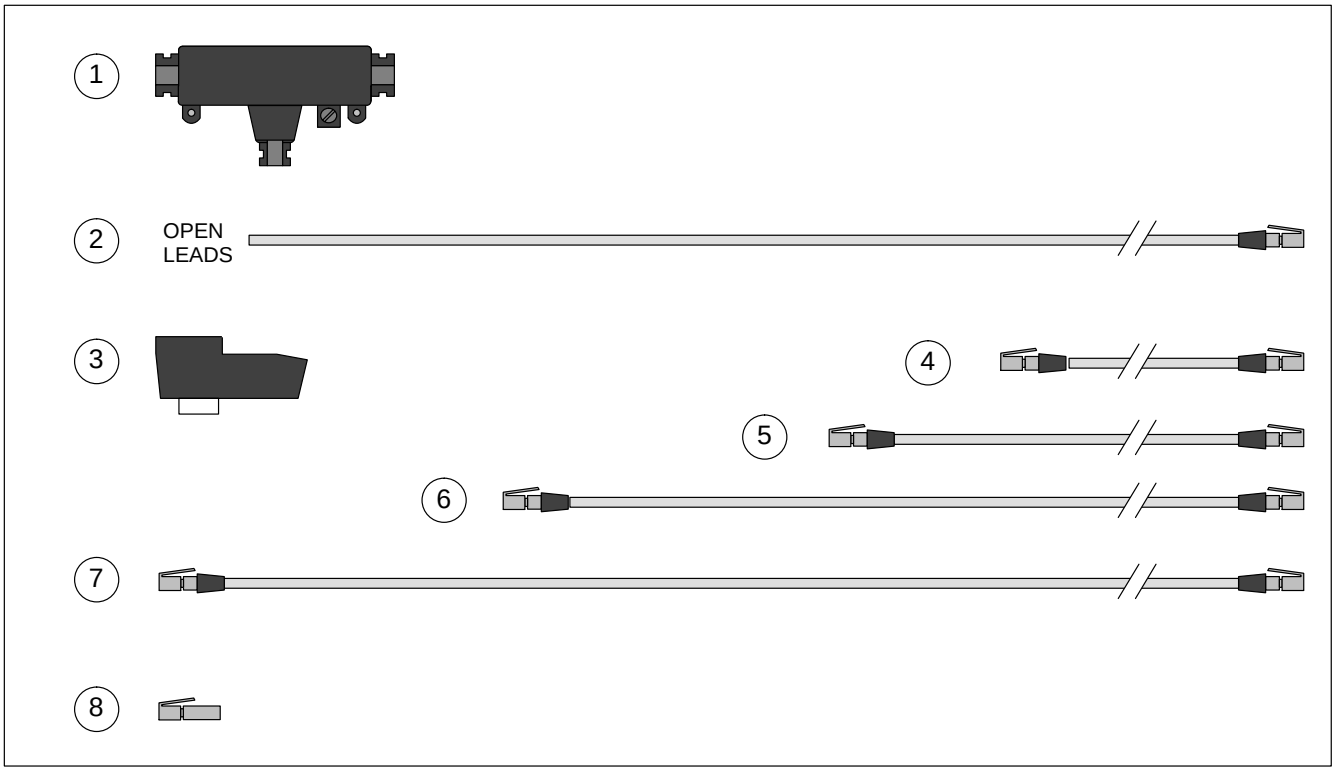

Figure 4 Modbus Plus Cluster Components

Reference	Part Number	Description	Note
1	990 NAD 230 00	Modbus Plus Tap	
2	170 MCI 021 20 or 170 MCI 020 80 (modified – see Note)	Drop Cable, RJ45 to Open Leads, 10 ... 30 ft (3 ... 10 m)	Fabricate this cable as required. Use RJ45/RJ45 cable item 6 or 7. Remove one RJ45 connector. Cut to required drop length, min. 10 ft (3 m), max. 30 ft (10 m).
3	170 XTS 020 00	T–Connector, RJ45/RJ45/D9	
4	170 MCI 020 10	Cable, RJ45–RJ45, 10 in (25 cm)	Connects nodes within a cluster.
5	170 MCI 020 36	Cable, RJ45–RJ45, 36 in (75 cm)	Connects nodes within a cluster.
6	170 MCI 021 80	Cable, RJ45–RJ45, 10 ft (3 m)	Connects between two clusters.
7	170 MCI 020 80	Cable, RJ45–RJ45, 30 ft (10 m)	Connects between two clusters.
8	170 XTS 021 00	Terminator, RJ45 (pack of 2)	Used if node is at network end.

Principles for Configuring Clustered Nodes

Designing the Network Layout

☐ If all nodes are Momentum products, up to 64 node devices may be installed over a total cable length of 1500 ft (450 m).

☐ If any node device is not a Momentum product, up to 32 node devices may be installed over a total cable length of 1500 ft (450 m).

☐ The cable length is the combined length of all cables added together, including the trunk cable, drop cables, and cables between nodes in clusters.

☐ Modbus Plus Repeater and Bridge products are available for extending the cable length and node count. Refer to the *Modbus Plus Planning and Installation Guide* (890 USE 100 00) for further information.

Installing the Network Terminations

☐ Each end of the network must be terminated.

☐ If the network ends at a Tap with a drop to a single node device (not a cluster), connect the Tap's internal jumpers to provide termination.

☐ If the network ends at a Tap with a drop to a cluster, do not install the Tap's jumpers. Instead, install an RJ45 terminator (170 XTS 021 00) at the T–connector on the last node in the cluster.

Observing Configuration Limits for Clusters

☐ The network may contain no more than 8 clusters, regardless of how many nodes are in each cluster.

☐ A single cluster may contain up to 8 node devices maximum. If more than 8 nodes are required, you must add another cluster with an interconnecting cable between the clusters.

☐ The interconnecting cable between clusters must be 10 ft (3 m) minimum length. You can install either the 10 ft (3 m) cable or the 30 ft (10 m) cable, part numbers 170 MCI 021 20 or 170 MCI 020 80.

☐ Nodes within a cluster are connected using either the 10 in (25 cm) cable or the 36 in (75 cm) cable, part numbers 170 MCI 020 10 or 170 MCI 020 36.

Fabricating Drop Cables

☐ The minimum allowable drop cable length is 10 ft (3 m). The maximum length is 30 ft (10 m).

☐ The drop cable is fabricated from either the 10 ft (3 m) cable or the 30 ft (10 m) cable, part numbers 170 MCI 021 20 or 170 MCI 020 80.

☐ To fabricate the drop cable, remove one RJ45 connector from the cable to expose the open leads. Connect the open leads to the Tap, following the wiring diagrams in these installation instructions.

Installing the Tap

Before mounting the Tap to a panel, install the supplied grounding screw and nut onto the Tap as shown in Figure 5.

Install the Tap at its planned location. Figure 5 shows the Tap's dimensions.

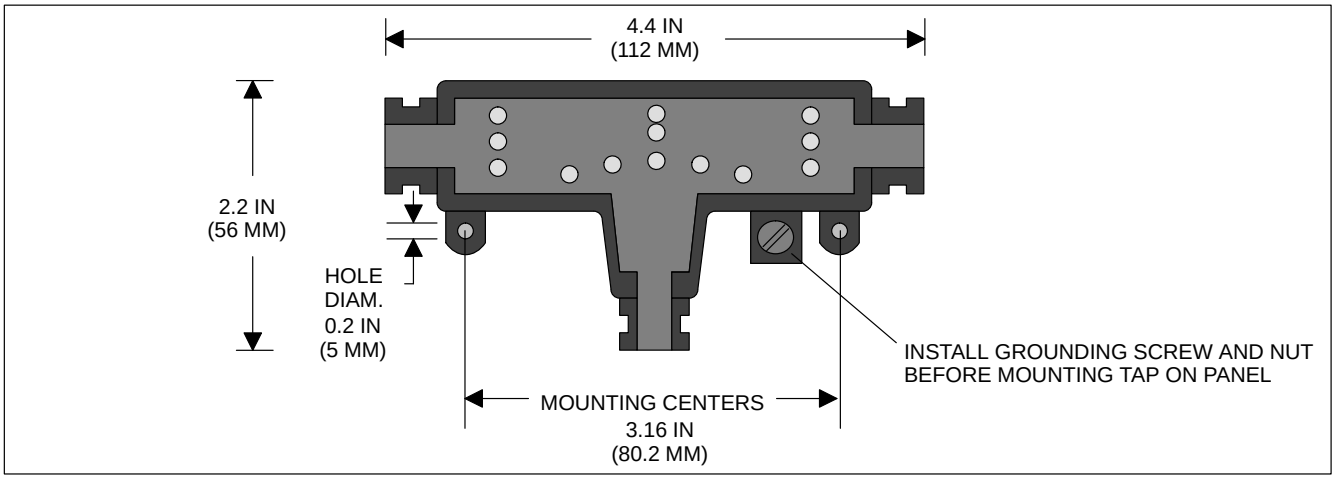

Figure 5 Tap Dimensions (Cover Open)

Connecting the Drop Cable to the Tap

Preparing the Cable

The minimum allowable drop cable length is 10 ft (3 m). The drop cable will have one RJ45 connector and one open end.

Fabricate the drop cable from either of the two cluster interconnection cables. Use either the 10 ft (3 m) or 30 ft (10 m) cable, part numbers 170 MCI 021 20 or 170 MCI 020 80.

To fabricate the drop cable, cut one RJ45 connector from the cable. Prepare the open end as shown in Figure 6.

- ☐ Strip the cable jacket to a length of 3 inches (75mm) as shown in Figure 6.
- ☐ Make the shield braid into a separate conductor, by separating it away from the wires (see Figure 6). Cut the shield braid to a length of 3 in (75 mm). Install a grounding lug on the end of the shield braid.
- ☐ Locate the Yellow/Grey pair and Red/Grey pair. Cut both of these pairs to a length of 1 in (25 mm). Do not strip these wires. (Note: Do not mix the two Grey wires. Keep them with their correct pair.)
- ☐ Cut the other wires back. Only the Yellow/Grey pair, Red/Grey pair, and shield braid will be used.

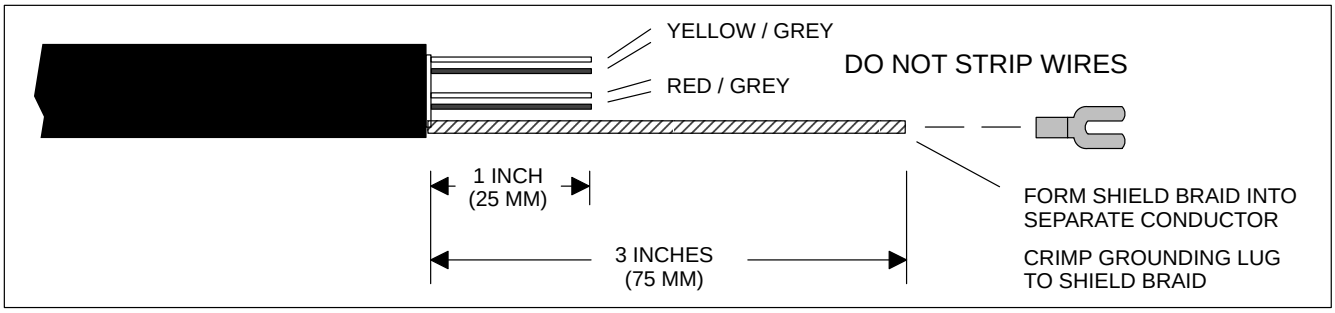

Figure 6 Preparing the Drop Cable

Connecting the Wires to the Tap Terminals

Figure 7 and Figure 8 show how to connect the drop cable wires to the Tap terminals.

- ☐ Refer to Figure 7 to see how to press each wire into its terminal.
- ☐ Refer to Figure 8 to see how to connect each wire to its correct terminal. Connect the wires as shown in Figure 8. Disregard the wire color information that is printed inside the Tap.

Figure 7 shows how to insert each wire into its terminal. (A) Do not strip the wire. Place the wire into the terminal slot so that the end of the wire is flush with the inside of the terminal (see the Top View in Figure 7). (B) Using the insertion tool, press the wire fully into the terminal. (C) Plastic caps are supplied with the Tap. Press a plastic cap down fully into the terminal.

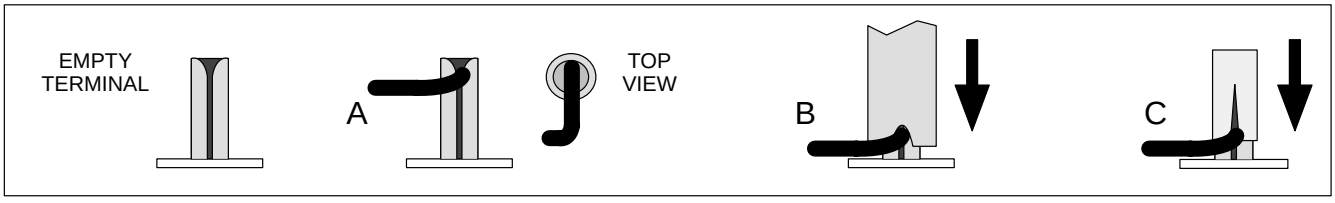

Figure 7 Wire Terminal Connection (Detail)

Use of the insertion tool is required. Ordering information for the tool is on the first page of these instructions.

If you remove a wire after you have connected it, do not try to reconnect the wire at the same point on the wire. Cut the wire back by 1/8 inch (3 mm), then connect it at a new point on the wire.

Connecting the Cable Shield to the Tap Ground

You should have already crimped the grounding lug onto the shield braid (see Figure 6). Connect the lug to the Tap's grounding screw as shown in Figure 5.

Securing the Cable to the Tap

The Tap package includes cable ties. Install the tie as shown in Figure 8 to secure the drop cable to the Tap.

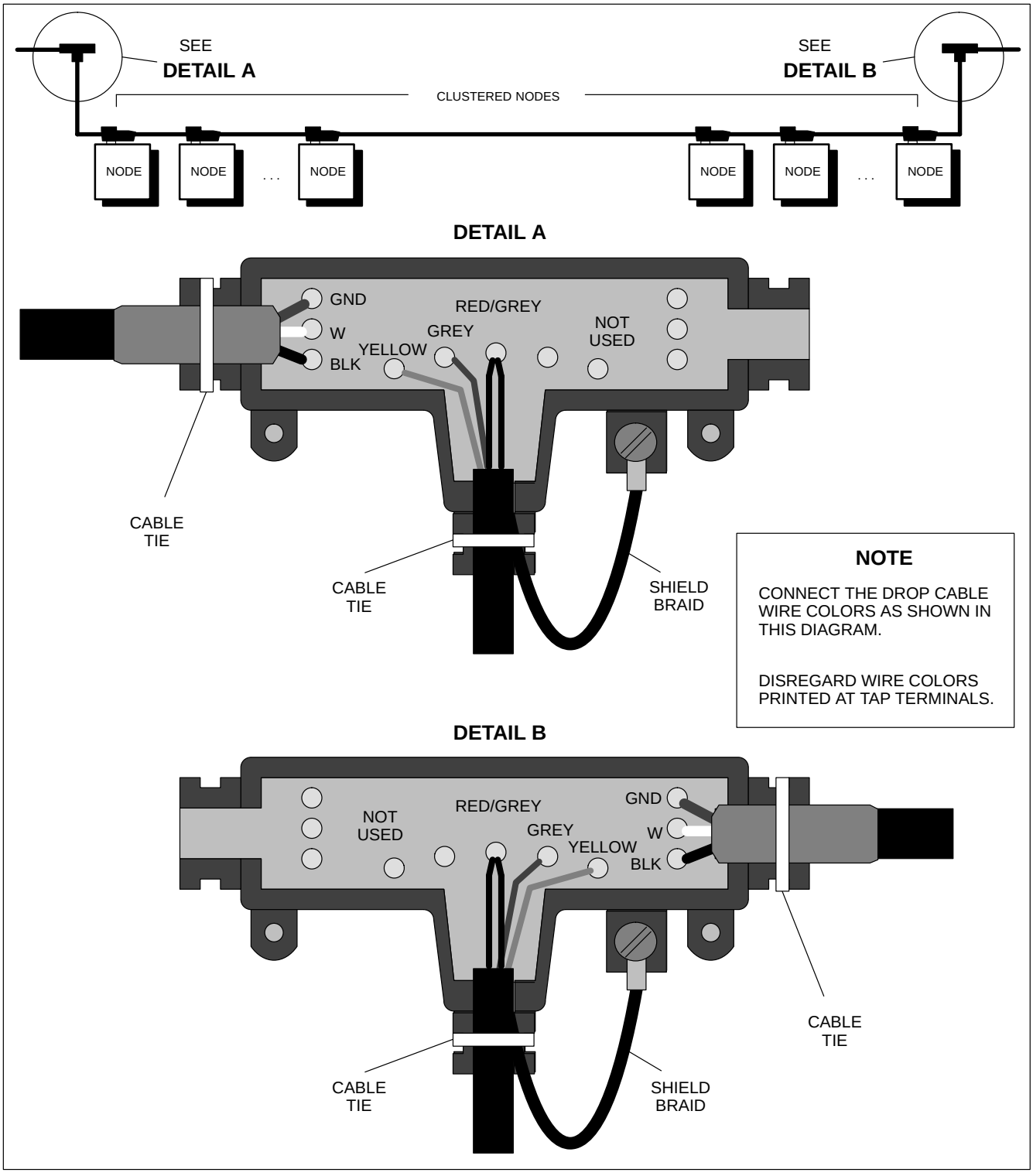

Figure 8 Connecting the Drop Cable to the Tap

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