*Table 1. Terminology*

| Term | Description |
|---|---|
| Trunk Cable | The main twisted pair cable between stations on the bus. Together the trunk and the tap cables forms the twisted pair bus cable. |
| Twisted Pair media | Twisted pair media comprises modem cables, modems and twisted pair bus cables |
| Twisted Pair modem | A twisted pair modem is a device that connects the communication interfaces to the twisted pair bus cable. The CI627, S800 I/O Station and the Advant Controller 70 have integrated twisted pair modems |
| Twisted Pair to Coaxial modem or vice versa | TC513 is media converter between twisted pair media to coaxial media. |

*Table 6. Advant Fieldbus 100 Equipment Items (Continued)*

| Equipment Item | Type Designation | Description | Remarks |
|---|---|---|---|
| Modems | TC516 | Twisted Pair. Provides a connection between CI520/CI522/CI526 and the Advant Fieldbus 100 twisted pair bus. Metal housing. | |
| | TC515V2 | Twisted Pair/Twisted Pair modem. Plastic housing. New power supply connector. | |
| | TC515V1 | Twisted Pair/Twisted Pair modem. Plastic housing. New compatible Twisted pair connectors. | Replaced by TC515V2 |
| | TC515 | Twisted Pair/Twisted Pair modem. Plastic housing. | Replaced by TC515V1 |
| | TC514V2 | Twisted Pair/Optical Fiber modem. Plastic housing. New switch for selection of 50% or 100% optical output. New power supply connector. | |
| | TC514V1 | Twisted Pair/Optical Fiber modem. Plastic housing. New compatible Twisted pair connector. | Replaced by TC514V2 |
| | TC514 | Twisted Pair/Optical Fiber modem. Plastic housing. | Replaced by TC514V1 |
| | TC513V1 | Twisted Pair/Coaxial modem. Metal housing. New compatible Twisted pair connector. | |
| | TC513 | Twisted Pair/Coaxial modem. Metal housing. | Replaced by TC513V1 |
| | TC512V1 | Twisted Pair. Provides a connection between CI520/CI522/CI526 and the Advant Fieldbus 100 twisted pair bus. Metal housing. New compatible Twisted pair connectors | |

Figure 6 shows a single twisted pair media configuration with conversion to coaxial media.

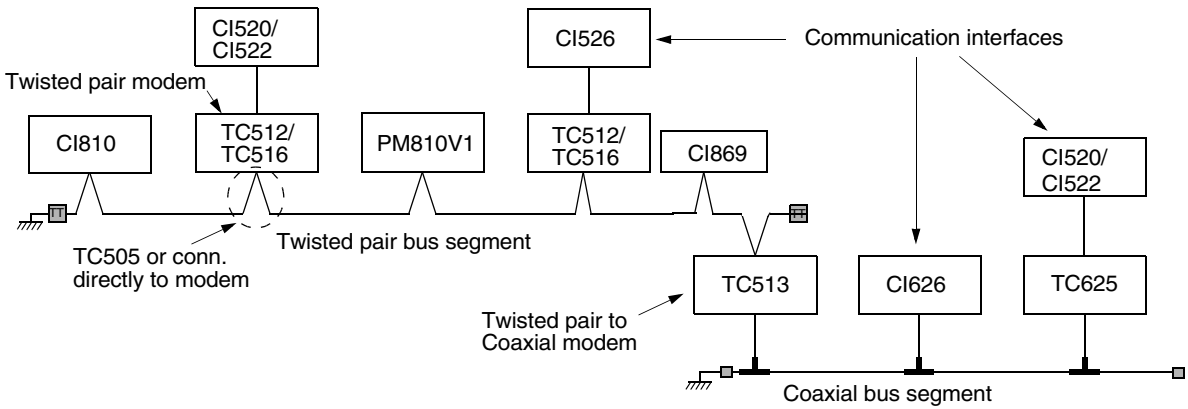



*Figure 6. Twisted Pair Media with conversion to Coaxial Media and Name Conventions*

Figure 7 shows a redundant twisted pair configuration with conversion to coaxial media.
The figure illustrates that the CI626, CI810, and PM810 has two twisted pair modems integrated and two external TC512/TC516 modems. TC513 modems are required to achieve media redundancy for the CI520/CI526 and for the media conversion.

# Advant Fieldbus 100 Cable Length

The Advant Fieldbus 100 bus consists of several segments. Two different segments are interconnected with a modem (TC513, TC514, TC515 or TC630).

The advantages of using segments are:

- Reaching distances of up to 13300 meters between the outermost stations on the bus.
- Using different media for different parts of the bus.
- Restoring the bus signals after an electrical disturbance.
- Using more than 32 stations on a twisted pair bus.

## Segments - Max Length for Coaxial, Twisted Pair, and Optical Media

The maximum length of each segment on Advant Fieldbus 100 is based on the electrical attenuation of the media of the segment. This ensures that the attenuation does not reach a limit, where it may be impossible for the receiver to read the complete transmitted information because of the attenuation in the media.

The maximum length for:

- RG59 Coaxial cable is up to 300 m (1000 ft.) per segment
- RG11 Coaxial cable is up to 700 m (2300 ft.) per segment
- Twisted pair cable is up to 750 m (2500 ft.) per segment, Communication media according to IEC 1158-2 fieldbus standard.
- Optical fiber is up to 1700 m (5500 ft.) per segment.

### Configuration Rules for Twisted Pair media

- Max. cable length = (length of trunk cable) + 3*(total length of tap cables)=750m.(1)
- Length of Tap cable: 0 - 10m.(2)
- Max. number of nodes on a Twisted Pair Cable segment: 32.

Attenuation in a tap cable is 50% higher than in the trunk cable.
A tap cable is intended to be used within a cabinet.

### Segments - Minimum Length for Twisted Pair Media

For twisted pair media, the minimum cable length between two modems (for example, TC516 and TC513) or two communication interfaces with integrated modems (for example, CI527 and CI869) is 4 meters (13 ft). This is true also for redundant CI modules in a controller, for example, the cable between a redundant pair of CI869s in an AC 800M controller also needs to be 4 meters.

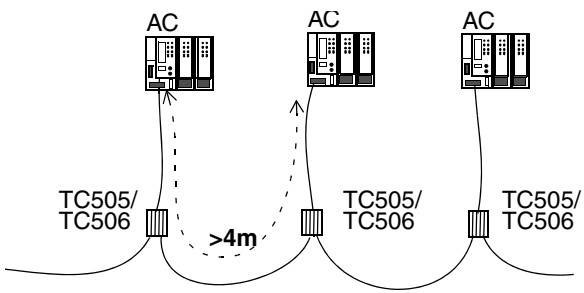



*Figure 29. Distribution of Advant Fieldbus 100 stations*

The distance between modems can be less than four meters if the total length of the bus segment is less than 10 meters.

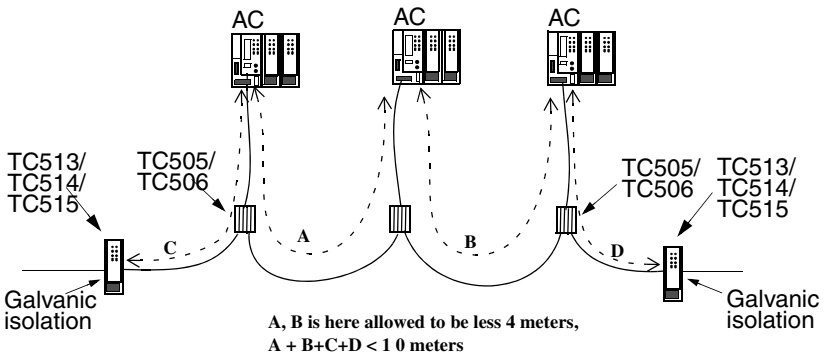



*Figure 30. Configuration example with less than 4 meters between stations*

### Configuration rules for Coaxial media

- Max. cable length:
  - 300 meter (1000 ft.) if coaxial cable type RG59 is used.
  - 700 meter (2300 ft.) if coaxial cable type RG11 is used.
- Max. length of Drop cable: 0.3 meter (1 ft.)
- Max. number of nodes: 80.

### Segments - Minimum Length for Coaxial Media

For coaxial media, the minimum cable length between two modems (for example, TC625 and TC513) or two communication interfaces with integrated modems (for example, CI626 and CI630) is 3 meters (10 ft).

For connection between two redundant communication interfaces within a redundant CI522 or CI630 pair, a minimum distance up to 0.1 meter is allowed, if the distance to the next communication interface is 3 meters or more.

There is no minimum required distance between nodes, if:

- Bus-cable is connected directly to the device (that is no drop-cable).
- Total cable length < 10 meter (30 ft.).
- There are only two nodes on the bus.

#### Segments - Minimum Length for Optical Media

There are no minimum limitations for Optical Media.

## Time Delay on Advant Fieldbus 100

Each of the following items causes a time delay equal to 150 meters of AF 100 bus media:

| | | |
|---|---|---|
| • TC630 | modem | Coaxial/Optical Fiber modem |
| • TC513 | modem | Coaxial/Twisted Pair modem |
| • TC514 | modem | Twisted Pair/Optical Fiber modem |
| • TC515 | modem | Twisted Pair/Twisted Pair modem. |

## Calculation of Maximum Bus Length for the Advant Fieldbus 100

Since there could be time consuming devices such as repeaters on the bus, the maximum physical distance depends on the actual configuration and it is always less than or equal to the logical length.

The formula for calculating the maximum allowed bus length is:

*Maximal cable length = 2000 - (Total Number of TCXXX) x 150 (m)*
*Maximal cable length = 6500 - (Total Number of TCXXX) x 500 (ft)*

*or*

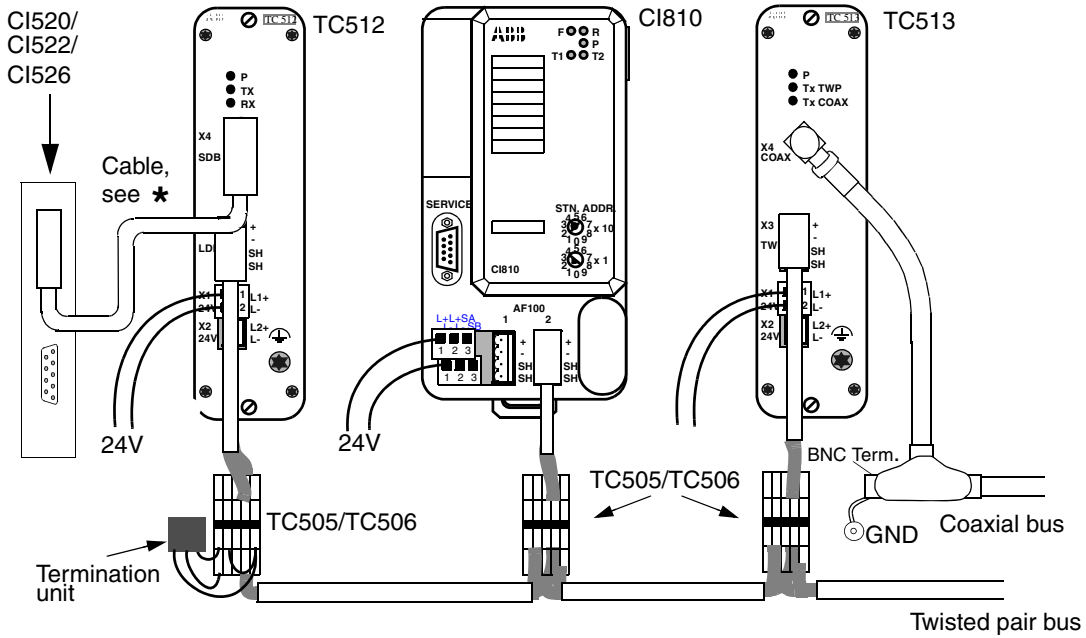
*Maximal cable length = 8500 - (Total Number of TCXXX) x 150 (m)*
*Maximal cable length = 27500 - (Total Number of TCXXX) x 500 (ft)*

*or*

*Maximal cable length = 15000 - (Total Number of TCXXX) x 150 (m)*
*Maximal cable length = 47000 - (Total Number of TCXXX) x 500 (ft)*

where *TCXXX* stands for a unit of TC513, TC514, TC515 or TC630.

Figure 75 illustrates a twisted pair media installation with conversion to coaxial media.




* For CI520 - Use cable TK515 (AC 450/AC 460) or TK593 (AC 410)
For CI526 - Use cable TK515
For CI522 - Use cable TK803V018 (AC 450/AC 460) or TK803V036 (AC 410)

*Figure 75. Single Twisted Pair Configuration with Media conversion*

| | | |
|---|---|---|
| TC513 | X1, X2 | 2-pol Jack Screw-connector |
| TC513 | X3 | 4-pol Jack Screw-connector |
| TC513 | X4 | DIN 9-pol connector. |

## Twisted Pair/Coaxial Modem TC513[1]

The TC513 is a modem to change media between twisted pair and coaxial media. For the function of the bus TC513 is totally transparent. The coaxial and Twisted pair media are electrically isolated from each others in the modem. One TC513 is equivalent to 150 meter (500 ft.) cable which must be noticed when calculating total bus length. If redundant cables shall be installed, it requires two TC513.

1. See Table 6 for information about TC513 variants