ControlNet Standard and High-flex Coax Cable

Catalog Number 1786-RG6/A and 1786-RG6F/B

About This Document

This document contains application information you need to consider when you install standard RG-6 (1786-RG6/A) and high-flex RG-6 (1786-RG6F/A) coax cable in your ControlNet network.

Important User Information

Solid state equipment has operational characteristics differing from those of electromechanical equipment. *Safety Guidelines for the Application, Installation and Maintenance of Solid State Controls* (Publication SGI-1.1 available from your local Rockwell Automation sales office or online at http://www.ab.com/manuals/gi) describes some important differences between solid state equipment and hard-wired electromechanical devices. Because of this difference, and also because of the wide variety of uses for solid state equipment, all persons responsible for applying this equipment must satisfy themselves that each intended application of this equipment is acceptable.

In no event will Rockwell Automation, Inc. be responsible or liable for indirect or consequential damages resulting from the use or application of this equipment.

The examples and diagrams in this manual are included solely for illustrative purposes. Because of the many variables and requirements associated with any particular installation, Rockwell Automation, Inc. cannot assume responsibility or liability for actual use based on the examples and diagrams.

No patent liability is assumed by Rockwell Automation, Inc. with respect to use of information, circuits, equipment, or software described in this manual.

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Throughout this manual we use notes to make you aware of safety considerations.

WARNING ⚠	Identifies information about practices or circumstances that can cause an explosion in a hazardous environment, which may lead to personal injury or death, property damage, or economic loss.
IMPORTANT	Identifies information that is critical for successful application and understanding of the product.
ATTENTION ⚠	Identifies information about practices or circumstances that can lead to personal injury or death, property damage, or economic loss. Attentions help you: • identify a hazard • avoid a hazard • recognize the consequence
SHOCK HAZARD ⚡	Labels may be located on or inside the drive to alert people that dangerous voltage may be present.
BURN HAZARD ♨	Labels may be located on or inside the drive to alert people that surfaces may be dangerous temperatures.

Determining Trunk-cable Section Lengths

A ControlNet segment is comprised of one or more sections of trunk cable separated by taps and terminated at both ends. The total cable length of a segment is equal to the sum of all the trunk-cable sections.
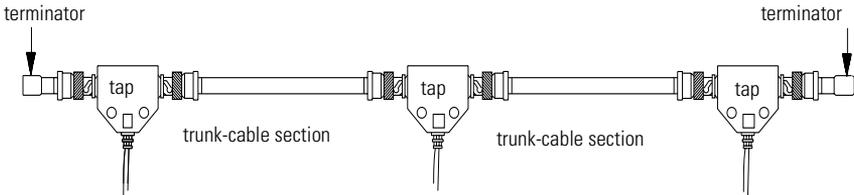
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IMPORTANT	When determining the cable length of trunk-cable sections, make sure you measure the actual cable path as it is routed in your network. Consider vertical dimensions as well as horizontal dimensions. You should always calculate the three-dimensional routing path distance when determining cable lengths.

TIP	Because high-flex RG-6 cable (1786-RG6F) has higher attenuation than standard RG-6 cable, a segment's total distance is reduced when you use high-flex RG-6F cable. Since the amount of high-flex RG-6F cable you can use in a system is less than the amount of standard RG-6 cable, you should keep high-flex cable use to a minimum. Use TNC or BNC bullet connectors to isolate areas that require high-flex RG-6F cable from areas that require standard RG-6 cable; this lets you replace the high-flex RG-6 section before flexure life is exceeded.

The following tables and examples are provided to help you determine the lengths of cable you can use in your system.

if you are using	The total allowable length of a segment depends on the
standard RG-6 cable (1786-RG6/A with attenuation of 5.99 dB)	number of taps in your segment (there is no minimum trunk-cable section length requirement). The maximum allowable total length of a segment is 1,000 m (3,280 ft) with two taps connected. Each additional tap decreases the maximum length of the segment by 16.3 m (53 ft). The maximum number of taps allowed on a segment is 48 with a maximum length of 250 m (820 ft). maximum allowable segment length = 1000 m (3280 ft) - [16.3 m (53.4 ft) x [number of taps - 2]]
any RG-6 or RG-6F cable (1786-RG6F/A)	number of taps in your segment and length of any RG-6 cable. maximum allowable segment length = $\dfrac{(20.29 \text{ dB} - \text{total taps in segment} \ X \ .32 \text{ dB})}{\text{cable attenuation[1] @ 10 MHz per 1000 ft (304 m)}} \ X \ 1000 \text{ ft (304 m)}$
a combination of RG-6 and RG-6F cable	number of taps in your segment and length of any RG-6 cable. (Attenuation 1786-R6F per 1000 ft @ 10 MHz/Attenuation 1786-RG6 per 1000 ft @ 10MHz) * length of 1786RG6F = equivalent length in 1786-RG6 cable.

[1] Cable attenuation is defined as the signal loss as measured at 10MHz per 1000 ft (304.8 m) of cable. See Table 1 for cable attenuation for RG-6 and RG-6F cables.

About Cable Attenuation

See Table 1 for attenuation for RG-6 and RG-6F cables.

Table 1 Attenuation for RG-6 and RG-6F cables

cable type	attenuation at 10 MHz per 1000 ft (304 m)
1786-RG6/A	5.99 dB
1786-RG6F/A	13.5 dB

You can increase the total trunk-cable length or number of taps by installing repeaters on the segment. This creates another segment. The following examples explain how you can calculate allowable lengths of segments for standard RG-6 (1786-RG6/A), and high flex RG-6 (1786-RG6F/A) cable, as well as for a system that combines the two types of cables.

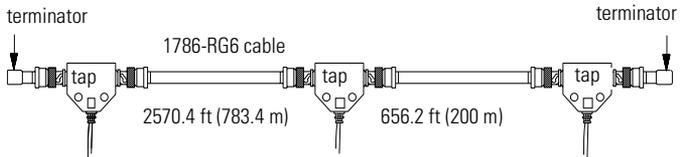**EXAMPLE**   **Example 1: Using only standard RG-6 cable in your system**

In this example, the segment:

- has 3 nodes (requires 3 taps)
- uses standard 1786-RG6 cable

To calculate the allowable cable length of standard 1786-RG6/A cable:

3280 ft - (53.4 ft * [3 - 2]) = maximum length
3280 ft - 53.4 ft = 3226.6 ft (983.4 m)

terminator   1786-RG6 cable   terminator

tap   tap   tap

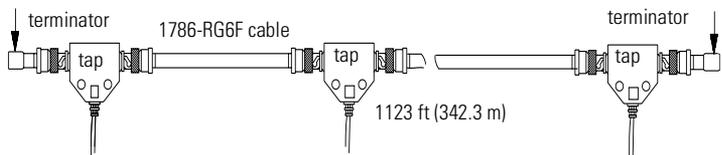2570.4 ft (783.4 m)   656.2 ft (200 m)

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EXAMPLE   **Example 2: Using only RG-6F cable in your system**

In this example, the segment:

- has 16 nodes (requires 16 taps)
- uses high-flex 1786-RG6F cable

To calculate the maximum allowable cable length of high-flex RG-6 cable (1786-RG6F):

([20.29 dB - 16 *.32 dB] / 13.5 dB) * 1000 = 1123 ft (342.3 m)

terminator   1786-RG6F cable   terminator

tap   tap   tap

1123 ft (342.3 m)

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| EXAMPLE | **Example 3: Determining the maximum allowable length of standard cable when mixing standard RG-6 and high-flex RG-6F cable in the same system** |

In this example, the segment:

- has 7 nodes (requires 7 taps)
- requires 656.2 ft (200 m) high-flex 1786-RG6F cable

1. Calculate the amount of standard 1786-RG6 cable that is equivalent to 656.2 ft (200 m) of 1786-RG6F cable by multiplying the ratio between the two attenuations by the length of RG-6F cable.

   (13.5 db / 5.99 db) * 656.2 ft (200 m)= equivalent length of standard RG-6

   Equivalent length of standard 1786-RG6 = 1478.9 ft (450.8 m)

2. Calculate the remaining allowable maximum length of standard 1786-RG6 cable.

   3280 ft (1000m) - 1478.9 ft (450.8 m) = 1801.1 ft (549.2 m)

3. Calculate the remaining allowable length on a segment with 7 taps.

   1801.1 ft - (53.4 ft * [7 - 2]) = 1534.1 ft (467.6 m)

terminator   1786-RG6 cable   1786-RG6F cable   terminator

tap   tap   tap

1534.1 ft (467.6 m)   656.2 ft (200 m)
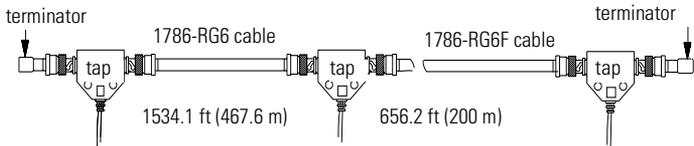
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Installing ControlNet Cable

Use these components to help you install your ControlNet cable.

component:	publication or catalog number:
ControlNet Cable System Planning and Installation Manual	CNET-IN002
ControlNet Coax Toolkit	1786-CTK

Cable Specifications

cable life (1786-RG6F only)	3-in. radius = 1.5M flextures (calculated using a rolling "C" track test with a 3-in. radius)
operating temperature	0 - 60 °C (32 - 140 °F)
storage temperature	-40 - 85 °C (-40 - 185 °F)
relative humidity	5 - 95% non-condensing

Rockwell Automation Support

Rockwell Automation provides technical information on the web to assist you in using our products. At http://support.rockwellautomation.com, you can find technical manuals, a knowledge base of FAQs, technical and application notes, sample code and links to software service packs, and a MySupport feature that you can customize to make the best use of these tools.

For an additional level of technical phone support for installation, configuration and troubleshooting, we offer TechConnect Support programs. For more information, contact your local distributor or Rockwell Automation representative, or visit http://support.rockwellautomation.com.

Installation Assistance

If you experience a problem with a hardware module within the first 24 hours of installation, please review the information that's contained in this manual. You can also contact a special Customer Support number for initial help in getting your module up and running:

United States	1.440.646.3223 Monday – Friday, 8am – 5pm EST
Outside United States	Please contact your local Rockwell Automation representative for any technical support issues.

New Product Satisfaction Return

Rockwell tests all of our products to ensure that they are fully operational when shipped from the manufacturing facility. However, if your product is not functioning and needs to be returned:

United States	Contact your distributor. You must provide a Customer Support case number (see phone number above to obtain one) to your distributor in order to complete the return process.
Outside United States	Please contact your local Rockwell Automation representative for return procedure.