

1.1 CABLE SELECTION GUIDE

Suitable Modicon qualified cables are outlined in this section. The R.I.O system operates on baseband frequencies (@ 1.544 MHz) which are not essentially compatible with cables and equipment used for cable T.V. Equivalents selected and recommended by distributors should not be used unless they have the same characteristics as those described herein. However, although these cables may have characteristics similar to those recommended, it must be noted that these cables have not been qualified by Modicon.

1.1.1 Recommended C.A.T.V. Cable (1/2 inch family)

Manufacturer:

Times Company  
(203) 265-8500

<u>Type/ Description</u>	<u>Minimum Bend Radium</u>	<u>Capacitance Per Foot</u>	<u>Loss @ 1.544 MHz Per 1000 Feet</u>
JT 4500 Plain	6.00"	15 pf.nom	0.8 dB
JT 4500J Jacketed	6.96"	15 pf.nom	0.8 dB
JT 4500JMS	6.96"	15 pf.nom	0.8 dB
JT 4500JMS Jacketed Messengered	6.96"	15 pf.nom	0.8 dB
JT 4500JB Jacketed for Burial	7.20"	15 pf.nom	0.8 dB
JT 4500JBA Jacketed for Burial-armored	8.40"	15 pf.nom	0.8 dB

## NOTES

1. For proper R.I.O. operation, maximum C.A.T.V. cable total length must not exceed 15,000 feet; this includes main runs and line drops.
2. Cable should not be mechanically drawn during installation. Refer to manufacturer's specifications for correct cable tension.

Manufacturer:

Comm Scope Company  
(617) 756-2333

<u>Type/ Description</u>	<u>Minimum Bend Radius</u>	<u>Capacitance Per Foot</u>	<u>Loss @ 1.544 MHz Per 1000 Feet</u>
P-3-75-500-CA Bare Cable Aluminum Sheath	8.0"	15.3 ± 1.0 pf	0.8 dB
P-3-75-500-JCA Polyethelene Jacket	8.0"	15.3 ± 1.0 pf	0.8 dB
P-3-75-500-JCASS Underground and/or Waterproof	8.0"	15.3 ± 1.0 pf	0.8 dB
P-3-75-500-JCAM109 with Messenger Wire	8.0"	15.3 ± 1.0 pf	0.8 dB
PO-3-75-500-JACASS Waterproof with Armor	8.0"	15.3 ± 1.0 pf	0.8 dB

## NOTES

1. For proper R.I.O. operation, maximum C.A.T.V. cable total length must not exceed 15,000 feet; this includes main runs and line drops.

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1.1.2 Recommended Coaxial Cable

1.1.2.1 RG-6/U Coaxial Type

Manufacturer:

Belden Corporation  
(317) 983-5200

<u>Type/ Description</u>	<u>Minimum Bend Radium</u>	<u>Capacitance Per Foot</u>	<u>Loss @ 1.544 MHz Per 1000 Feet</u>
9114 Solid Conductor	3.3"	17.3 pf.nom	7.0 dB
9283 Solid Conductor	3.3"	17.3 pf.nom	7.0 dB
9587 Solid Conductor Flooded Burial Cable	3.3"	17.3 pf.nom	7.0 dB

NOTES

1. For proper R.I.O. operation, maximum RG-6/U cable total length must not exceed 5,000 feet; this includes main runs and line drops.
2. Cable should not be mechanically drawn during installation. Refer to manufacturer's specifications for correct cable tension.

1.1.2.2 RG-11/U Coaxial Type

Manufacturer:

I.T.T. Surprenant  
(617) 365-6331

<u>Type/ Description</u>	<u>Minimum Bend Radium</u>	<u>Capacitance Per Foot</u>	<u>Loss @ 1.544 MHz Per 1000 Feet</u>
20107 Flame Retardent Foamed Coax	5.0"	17.3 pf.nom	2.0 dB
DBB-12M-A Flame Retardent Foamed Coaxial Cable with Mag. Shielding and Moisture Barrier	7.33"	17.3 pf.nom	2.0 dB

Manufacturer:

The Rockbestos Company  
(203) 265-6500

<u>Type/ Description</u>	<u>Minimum Bend Radium</u>	<u>Capacitance Per Foot</u>	<u>Loss @ 1.544 MHz Per 1000 Feet</u>
RSS-6-208E Flame Retardent Foamed Coax	5.0"	17.0 pf.nom	2.0 dB

NOTES

1. For proper R.I.O. operation, maximum RG-11/U cable total length must not exceed 8,000 feet; this includes main runs and line drops.
2. Cable should not be mechanically drawn during installation. Refer to manufacturer's specifications for correct cable tension.

1.2 CABLE CONNECTORS

For optimum system performance, it is strongly recommended that one brand of connectors be used throughout an R.I.O. system. Brand mixing and matching is highly undesirable and the results of such mixing and matching, in terms of system performance, are unpredictable.

1.2.1 Line Taps

Manufacturer:

Modicon, Inc.

(617) 475-4700

<u>Type/ Description</u>	<u>Insertion Loss</u>	<u>Return Loss</u>	<u>Tap Loss</u>	<u>Freq. Range</u>	<u>Impedance</u>
MA-0185-000 F-Type	-1 dB Max.	-18 dB Min.	-12 dB Nom.	0.1 to 100 MHz	75 ohms

Manufacturer:

Extronix/PECA Inc.

(215) 245-1550

<u>Type/ Description</u>	<u>Insertion Loss</u>	<u>Return Loss</u>	<u>Tap Loss</u>	<u>Freq. Range</u>	<u>Impedance</u>
DT-10 F-Type	-1 dB Max.	-18 dB Min.	-10 dB Nom.	0.1 to 5 MHz	75 ohms

NOTE

The Modicon line tap cannot mechanically accept two C.A.T.V. cable connections, but the Extronix tap can. The only exception is when an L.R.C. C.A.T.V. to male F connector type A1-500-FM-B3 is used.

1.2.2 Line Splitters

Manufacturer:

Modicon P.C.D.  
(617) 475-4700

<u>Type/ Description</u>	<u>Insertion Loss</u>	<u>Return Loss</u>	<u>Tap Loss</u>	<u>Freq. Range</u>	<u>Impedance</u>
MA-0186-000 F-Type	-3.5 dB Max.	-18 dB Min.	N/A	0.1 to 100 MHz	75 ohms

Manufacturer:

Extronix/PECA Inc.  
(215) 245-1550

<u>Type/ Description</u>	<u>Insertion Loss</u>	<u>Return Loss</u>	<u>Tap Loss</u>	<u>Freq. Range</u>	<u>Impedance</u>
DS-2H Hybrid Two Way Splitter	-3.5 dB Max.	-18 dB Min.	N/A	0.1 to 5 MHz	75 ohms

NOTES

1. The DS-2H Extronix splitter packing is identical to the DT-10 tap.
2. The Modicon line splitter cannot mechanically accept two C.A.T.V. cable connections, but the Extronix splitter can. The only exception is when an L.R.C. C.A.T.V. to male F connector type A1-500-FM-B3 is used.

## 1.2.3 C.A.T.V. Cable to Male F Connector

Manufacturer:

Gilbert Eng.  
(800) 528-5567

Type: GRS-500-AFM-DU03

## NOTE

Due to the width of this connector (1 1/4" dia.), it cannot be used with Modicon tap type MA-0185-000 and splitter type MA-0186-000. But, it can be used with the Extronix taps and splitters.

Manufacturer:

L.R.C. Electronics  
(607) 739-3844

Type: A1-500-FM-B3

## NOTE

This type is suitable for use with Modicon and Extronix taps and splitters.

## 1.2.4 Cable Terminator - 75 ohm

Manufacturer:

Jerrold/R F Systems  
(800) 847-0721

Type: TR-75F

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## NOTE

Any brand other than the above can be used providing the minimum power handling is 1/4 watt.

## 1.2.5 RG-6/U Male F Connector

Manufacturer:

Jerrold/R F Systems  
(800) 847-0721

Type: F56C

## NOTES

1. Any suitable brand F56C type connector can also be used.
2. With respect to parts listed in 1.2.4 and 1.2.5 above, Modicon taps and splitters (MA-0185-000 and MA-0186-000) are supplied with terminators and type F male connectors.

## 1.2.6 RG-11/U Male F Connector

Manufacturer:

Gilbert Engineering  
(800) 528-5567

Type: GF-11-AHP/450



2.1 CABLING REQUIREMENTS

A single coax or C.A.T.V. cable run is used to connect all I/O locations to the J200. This cable is configured as a multidrop connection; a main cable is installed and a splitter may be connected to the J200 to create a branch in the system. Taps are used to connect each I/O location to the main cable. The requirements for this cabling are:

1. Maximum length of any drop is 100 feet (30 meters) from the main cable.
2. Total cable length should not exceed 5,000 feet (1.5 km) for RG-6/U, 8,000 feet (2.4 km) for RG-11/U, or 15,000 feet (4.5 km) for C.A.T.V.
3. The maximum allowable dB loss between the J200 and any drop is 35 dB. The dB loss should be taken into consideration before configuring the system.
4. The dB loss for the cabling is:  

RG-6/U	=	7.0 dB/1000 ft. (305 M)
CATV	=	0.8 dB/1000 ft. (305 M)
RG-11/U	=	2.0 dB/1000 ft. (305 M)
5. The dB loss for the taps and splitters is:  

Tap	=	1 dB through; 10 or 12 dB down drop*
Splitter	=	3 dB from center to both sides

\*for both Extronics and Modicon brands
6. No more than one splitter per system should be utilized and every effort should be made to place this splitter an equal distance from both ends for the following reasons. First, TREE configurations are not recommended (see Appendix E), and second, unequal line lengths on either side of a splitter can cause high VSWR's (due to unbalanced capacitive reactance). This, in turn, can cause drop-outs.
7. Cable can be terminated in two ways; either at a channel of I/O or with a 75 ohm cable terminator.

8. Try not to mix types of cables. (All C.A.T.V. cable, one type; all coaxial cable, one type.) Mixing cable types will increase the VSWR due to reflections occurring as signals move from one medium to the other.
9. Ensure all F connectors are properly crimped and tightened.
10. Adjacent high-energy cables must not be closer than 12 to 14 inches per kilovolt. If they must cross, make sure they cross at right angles.

## 2.2 TOPOLOGY DRAWING

At this point, it is advantageous to draw a topology of your intended R.I.O. system (an example is shown in Appendix E), and calculate the theoretical losses to check its feasibility before proceeding on to installation.

It is also recommended that you keep an accurate record (footages of tap and splitter locations and drops, etc.) of your installed topology for future reference.

## 2.3 NATIONAL ELECTRICAL CODE (N.E.C.)

Although adherence to N.E.C. guidelines is not a requirement, Modicon strongly recommends that you adhere to article 820 (refer to Appendix B).

## 2.4 INSTALLATION

### 2.4.1 Tools

Coring Tool - to remove polyethylene dielectric: Jerrold CPT-500 or Ripley Co. Cablematic CCT 2500 or Ben Hughes Communications Products DCT-500.

Flexible Coax Cable Stripper - Ripley Co. UT-5900; and the aluminum shield on the semirigid coaxial cable can be cut with an ordinary copper pipe cutting tool.

Kit for C.A.T.V. Cable:

Ripley	SFT-500A	Cable preparation
	JFT-500	Jacket stripper
	CCT-3500	Coring tool

Hex Crimp Tool - Ripley CR596Q, Jerrold PL-602, or Gilbert 8-CRT-804 for RG-6/U; G-CRT-211 for RG-11/U.

All other installation tools are standard electricians' tools.

2.4.2 Construction

Standard C.A.T.V. construction practices are generally acceptable for 584 R.I.O. media installations. In addition, particular care should be exercised to insure there is adequate strain relief (service loop) of the trunk cable at all taps, splitters, and splices and at all tap-to-drop cable connections. This allows for expansion and contraction of cable over long runs. Generally, there will be a .05% change in cable length per degree centigrade in temperature. For example, for a length of 500 meters at a 20°C change, the length of cable will vary by 0.5 meters.

Utilizing the proper cable handling tools, not exceeding the minimum cable bending radius, and avoiding kinks and dents in the cable are important. Kinks and dents in the trunk cable can cause reflections in the transmission path that could jeopardize the dynamic range capability of the system. Exceeding the bending radius of the drop cable can cause rupture of the outer conductor and lead to EMI problems.

2.4.3 Connections

2.4.3.1 F Coax

An F connector must fit the cable properly to be effective. When the correct connector is determined for the bonded foil cable being used, it must also be installed properly. The following procedure explains the recommended cable preparation.

1. Using a sharp knife, score the cable jacket at the length required, then strip off the jacket to expose the braid. Do not cut through the braid. Fold the braid back against the jacket.
2. Score through the bonded foil and dielectric at the length required and remove. Do not nick the center conductor.
3. Start the connector over the bonded foil (reversed as shown in Figure 2-1) and bottom against the braid. This will help shape the dielectric and assist in normal connector installation.



Figure 2-1. Shaping the Cable with the Connector

4. Remove connector and insert the connector post over the foil and bottom, see Figure 2-2). Crimp the connector using the appropriate tool.



Figure 2-2. Inserting Cable Into the Connector

NOTES

1. For connectors that have a separate crimp ring, install the crimp ring after step 3. Install the connector as explained in step 4 making sure that the connector is bottomed, then slide the crimp ring flush against the connector and crimp.
2. It is imperative once the coax F connector is attached to the J200, P451's, or P453's, that these connections are not abused, e.g., shaken, or excessive stress repeatedly applied. When a communications error occurs, in order to test the cable, use the appropriate status word. The F connector can be installed hand-tight.

2.4.3.2 F to C.A.T.V.

1. Core the cable (with the tool specified in section 2.3.1) 7/8" leaving a stinger of 15/16" as shown in Figure 2-3.

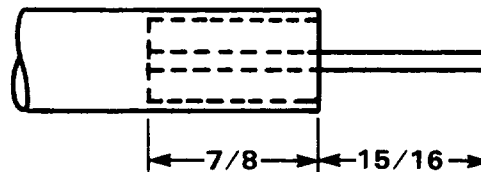


Figure 2-3. Cored Cable Measurements

2. Refer to Figure 2-4. Insert and connect (in order) C HEX, B HEX, and A HEX onto the cable prepared in step 1.

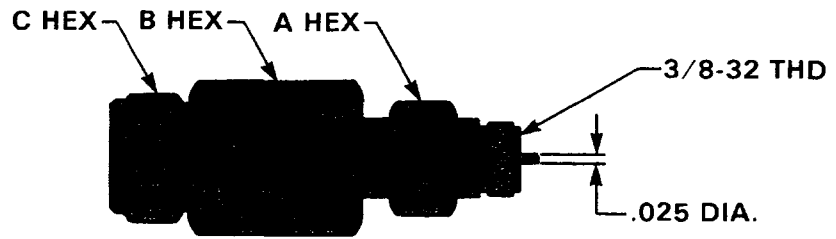


Figure 2-4. Insertion of Connectors onto Cored Cable