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Find the *Pickering 20-791-711* at our website: ***Click HERE***

PROVISIONAL
USER MANUAL

Model No. **20-790**

8 Channel 2 to 155MBit/s Tributary Daisy Chain Switch Module

Designed & Manufactured by:-

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Issue 0.95 November 1998

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HELP!!!

If you need assistance with your Pickering Interfaces Switching System: *Switching problems, Programming or Integration within your Test System. – Please ring Pickering Interfaces and ask for "Technical Support".*

Alternatively you may fax, email or connect to our Internet Web Site.

A full set of operating manuals, application notes and software drivers is available on CD ROM.

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Section 1
20-790 Tributary Daisy Chain Switching Module

1.1 Features

- **Suitable For Testing SONET/SDH Transmission Multiplexers**
- **8 Tributaries Per Module**
- **Up To 64 Tributaries Per Mainframe**
- **Expandable To Any Size: 32, 64, 96, 128, 256,..**
- **75 Ohm Impedance With Choice of Connector Types SMZ/BT Type 43 & Siemens 1.0/2.3**
- **All Tributaries Can Be Daisy-Chained to One Signal**
- **Integrated Multiplexer Allows Selection of One Tributary For Analogue Testing**
- **For 2MBit/s Applications Look At Higher Density 16 Trib 20-792 Module (Section 8)**

1.2 Module Description

The 20-790 Tributary Daisy Chain Switching Card is suitable for Testing SDH/SONET Transmission Multiplexers.

There are 2 basic versions available, each with a choice of connector types:-

20-790	8 Tributary Daisy Chain Switching Card.
20-791	8 Tributary Daisy Chain Switching Card With Separate 8 Channel or 2 Channel Multiplexers.

Up to 64 tributaries can be accommodated in one System 20 Case. Large Tributary test switching systems may be constructed by interconnecting individual modules with multiple expansion cases.

Self-Test is performed both at power up and at any other time either manually or under program control. In the unlikely event of relay failure the front panel will indicate a fault. The diagnosis - including the position of the suspect relay - will be indicated using the DIAGNOSTIC? command.

1.3 Front Panel

The module front panels are illustrated in Section 6, they include:

Status Display, 5 LED Indicators:-

Power LED.	Connected to power system supply.
Active LED.	On whenever one or more matrix switches are closed. For a list of all active switches use the VIEW? command.
Warning LED.	Not used in this version.
Self-Test LED.	Active when self-test in progress.
Error LED.	Indicates that error found during self-test.

Serial (RS-232) Configuration/Test Port

The 20-790 has a built in RS-232 port (9600 baud software handshake), this is used to configure the module and may also used for self test and error diagnosis (this may also be done using the normal IEEE-488/RS-232 interface).

RF Connectors

All RF connections are via the front panel, there are from 20 to 30 connectors (depending upon version).

1.4 Width and Dimensions

All modules conform to the 6U height (262mm) Eurocard standard and are 160mm deep. Panel width is 1.8 Inches.

Product Order Codes

8 Tributary Daisy-Chain Switch

SMZ/Type 43 Version, 75Ohm	**20-790-711**
1.0/2.3 Version, 75Ohm	**20-790-741**

8 Tributary Switch + 8 Channel Multiplexer

SMZ/Type 43 Version, 75Ohm	**20-791-711**
1.0/2.3 Version, 75Ohm	**20-791-741**

8 Tributary Switch + 2 Channel Multiplexer

1.0/2.3 Version, 75Ohm	**20-791-741-S**

Options

Alternative connectors are available on many modules, e.g. 75Ohm mini SMB, etc. please consult factory. **– C**

Mating Connectors

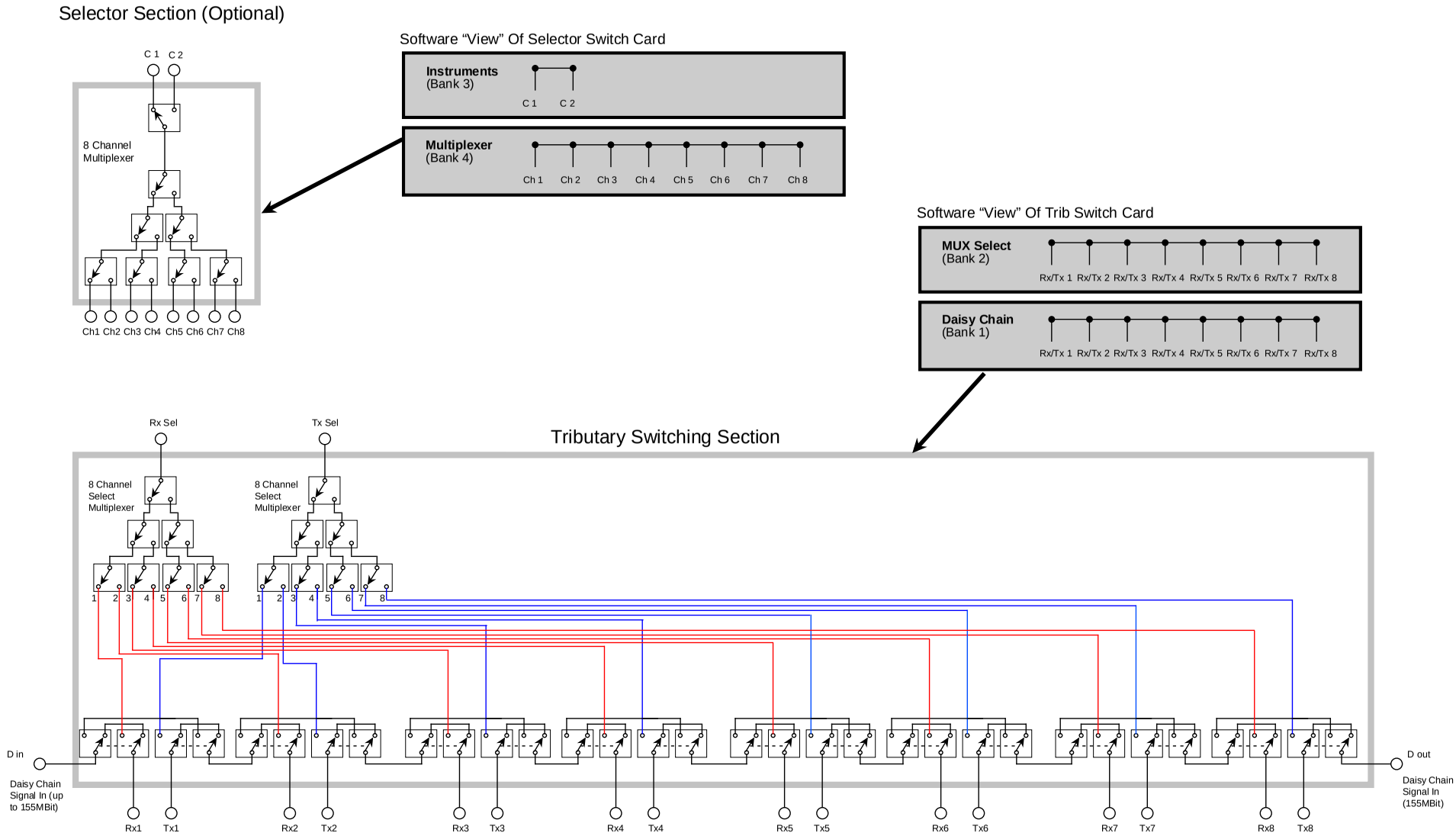
Please refer to Model List for a full breakdown of RF connector and cable types.

Latest Details

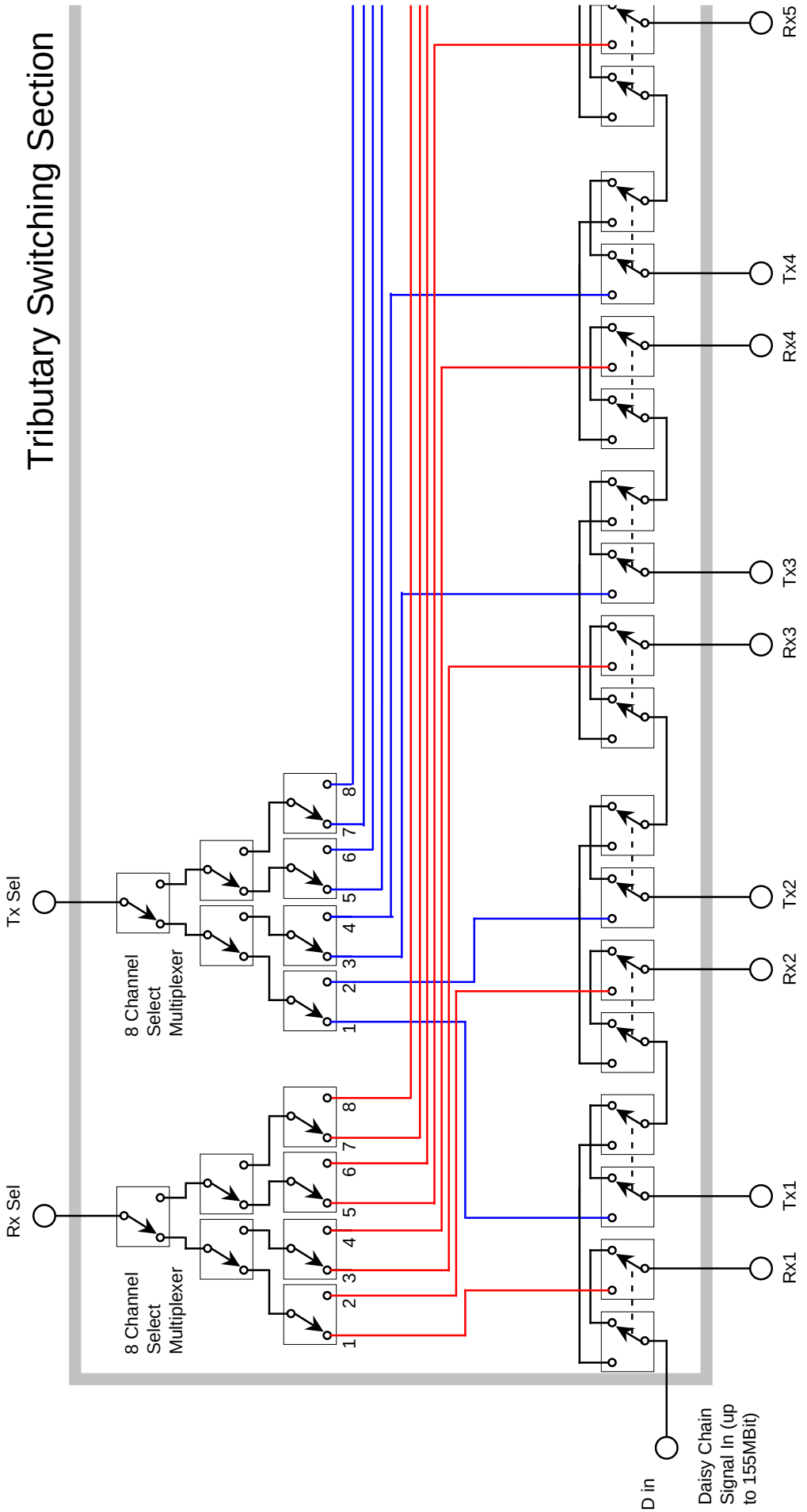
Please refer to our Web Site for Latest Product Details.

General Specification (All Versions)

Maximum Voltage	100V d.c./100Va.c.
Maximum Power	30W
Maximum Switch Current	1.0A
On Path Resistance	< 500 mOhm
Off Path Resistance	> 10^8Ohm
Expected Life (Low Power)	> $1x10^8$ ops
Expected Life (Max Power)	> $2x10^5$ ops
Total Switching Time	10mS
Relay Mechanical Settling Time	< 3mS

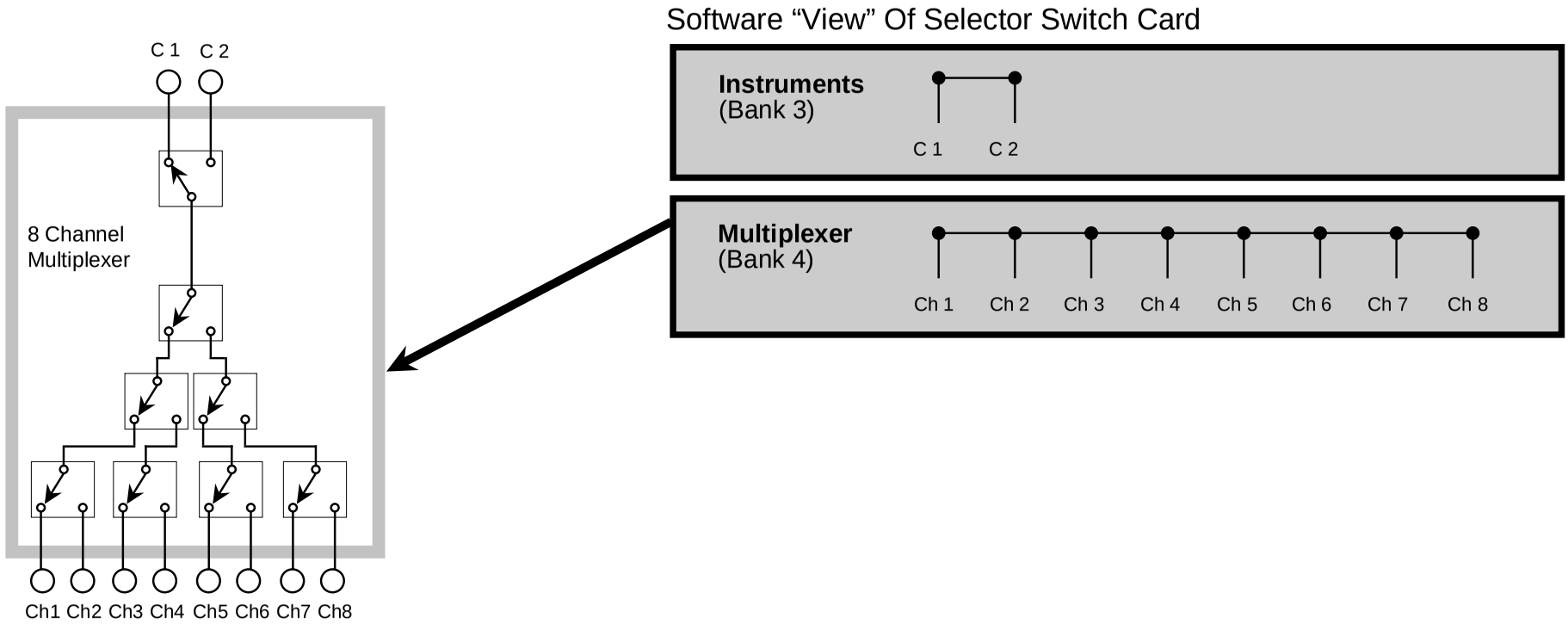


Block Diagram of 8 Channel Daisy Chain Switching Module

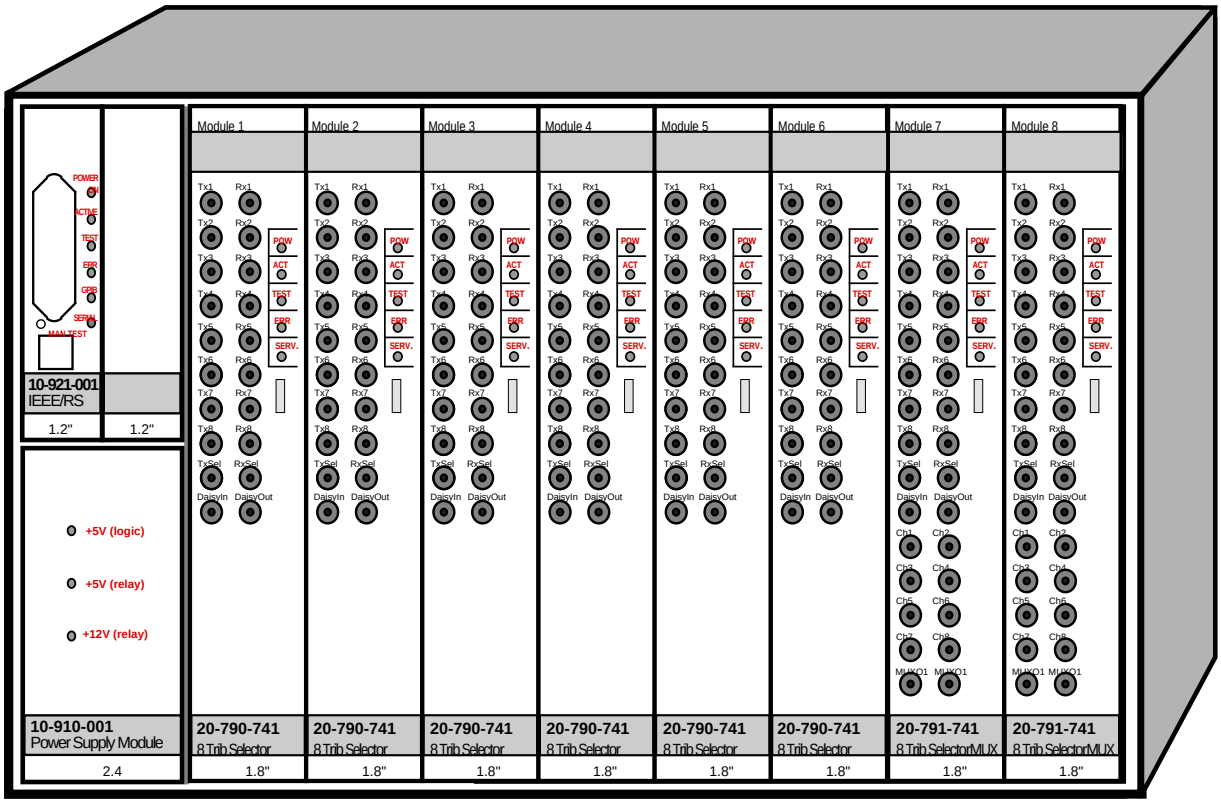


Close Up View of 8 Channel Daisy Chain Switching Module

Selector Section (Optional)

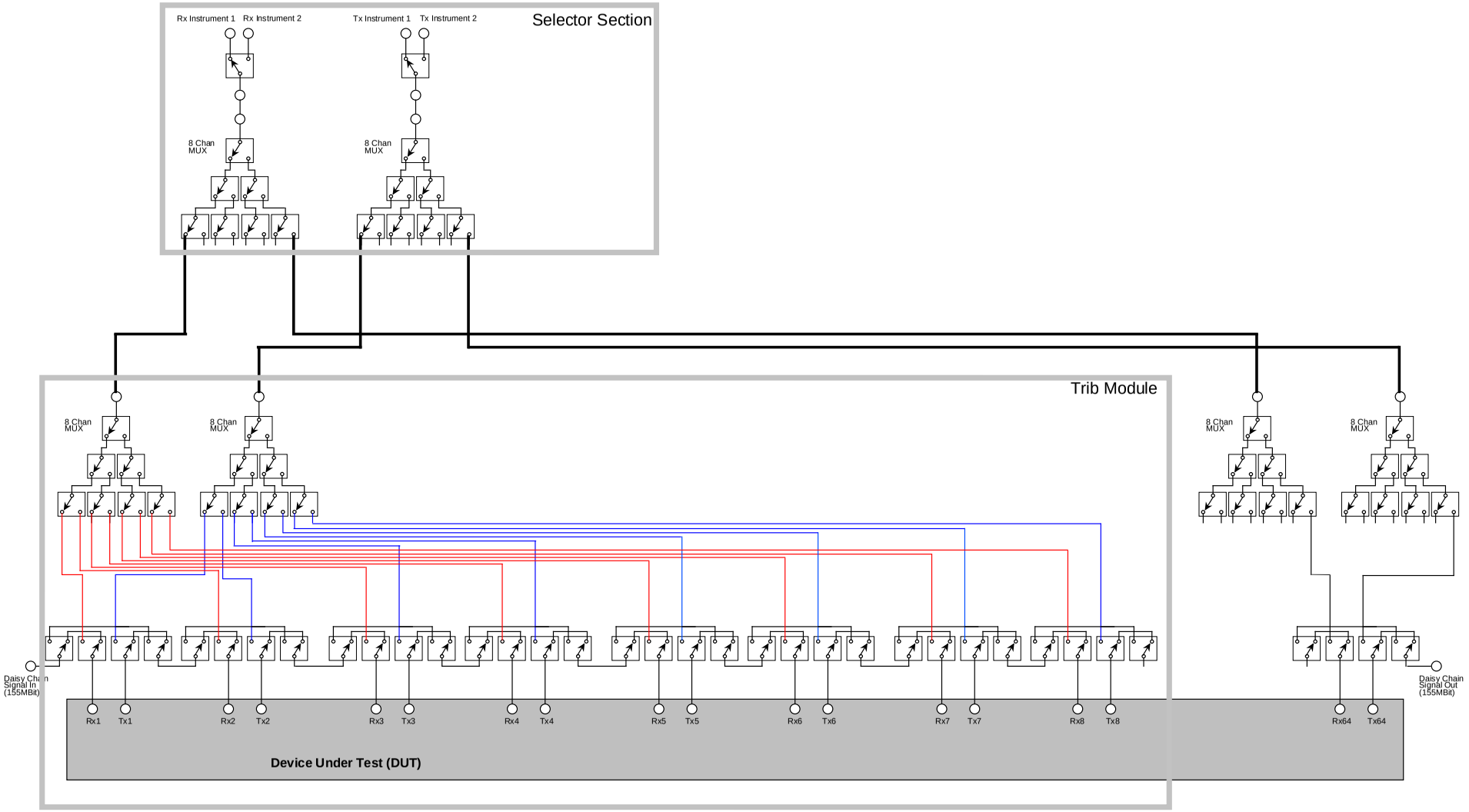


Close Up View of Selector Section (20-791 version only)



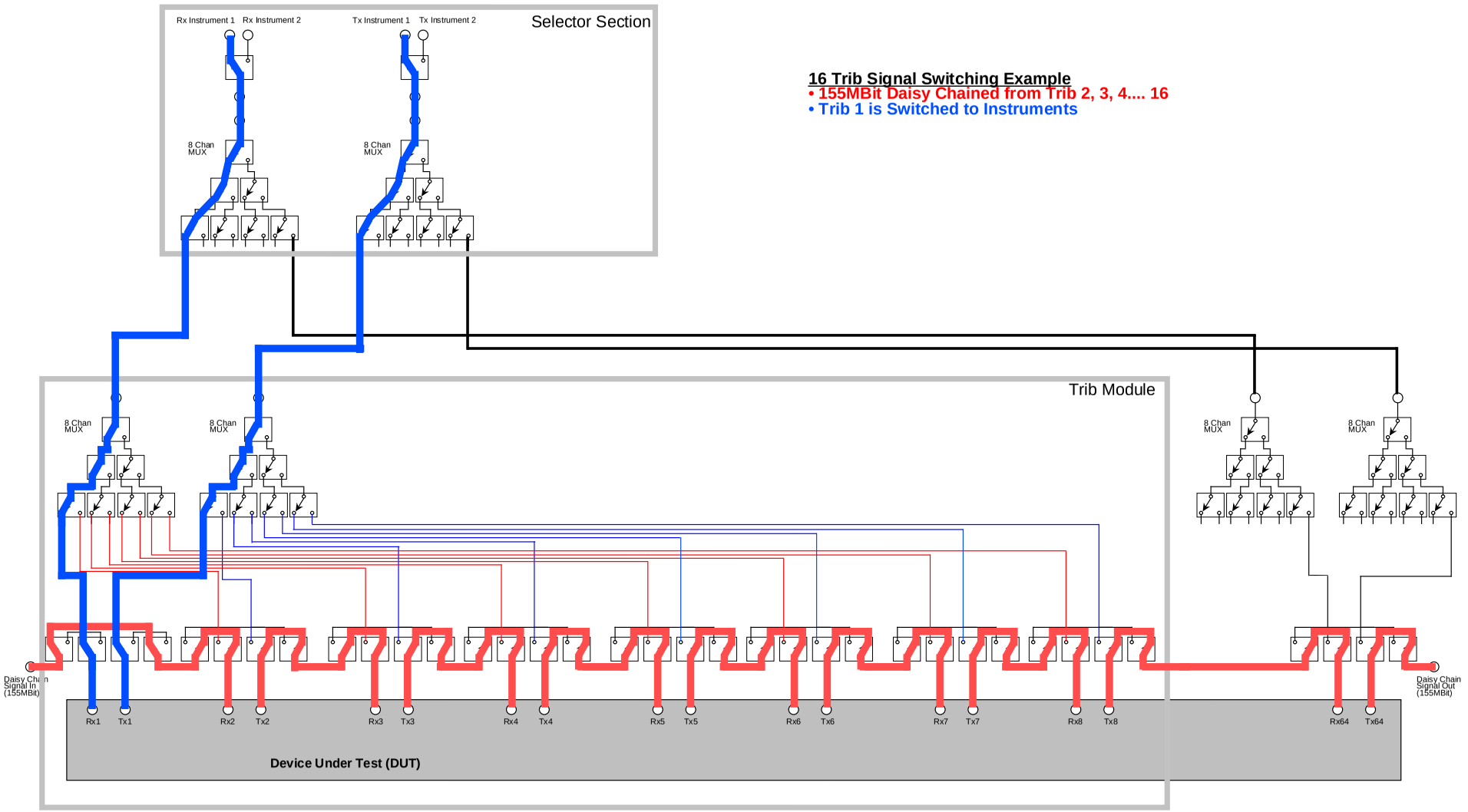
64 Tributary System In Fully Loaded System 20 Case.

Construction of a 64 Trib Switching System



Block Diagram of 64 Tributary Switching System

Construction of a 64 Trib Switching System



16 Trib Signal Switching Example

- **155MBit Daisy Chained from Trib 2, 3, 4.... 16**
- **Trib 1 is Switched to Instruments**

Block Diagram of 64 Tributary Switching System. Showing Typical Signal Routing.

Tributaries 2 through to 64 are in the Daisy Chain. Test Instruments are connected to Trib 1

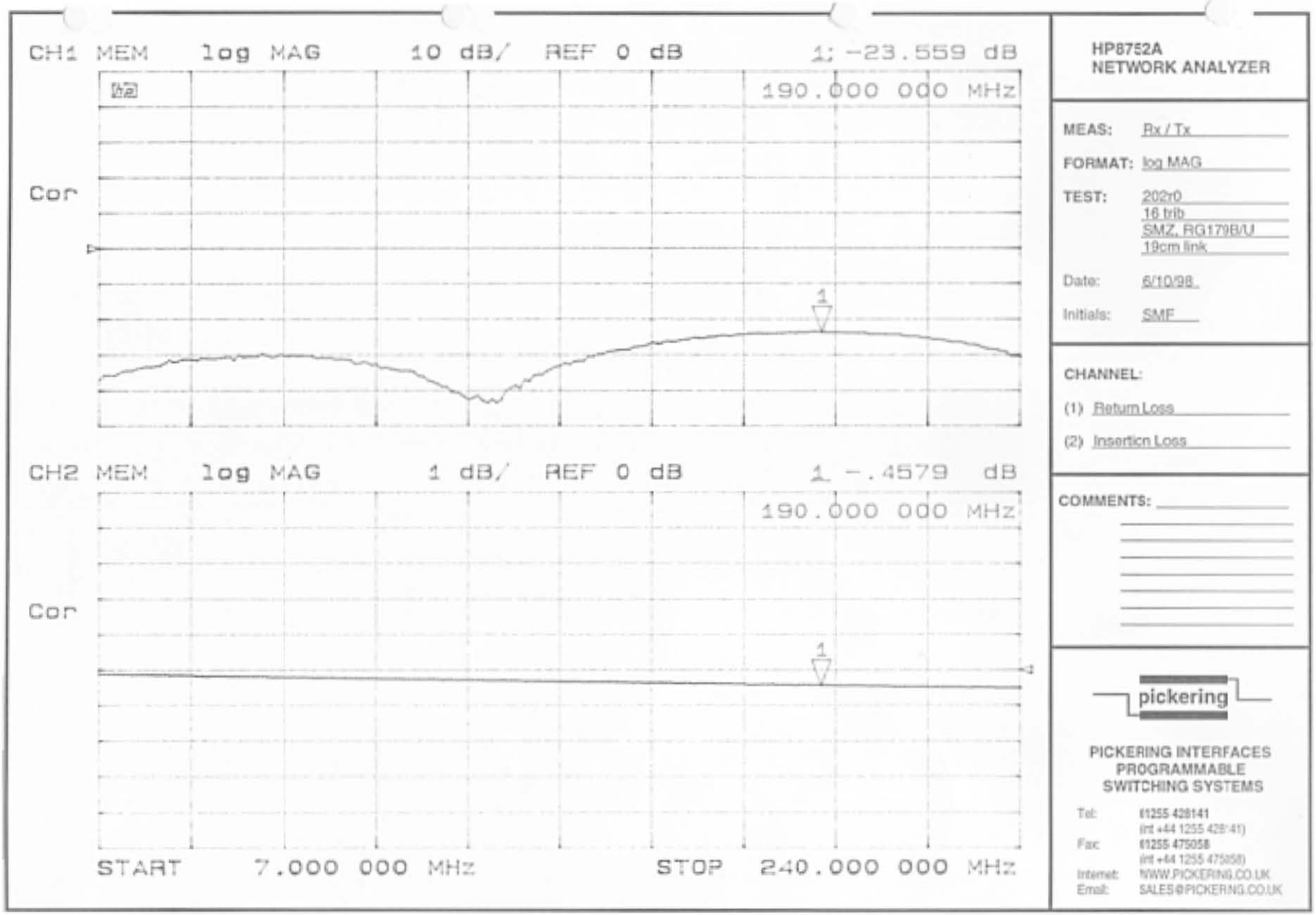
Section 2
20-790 Typical Performance Plots

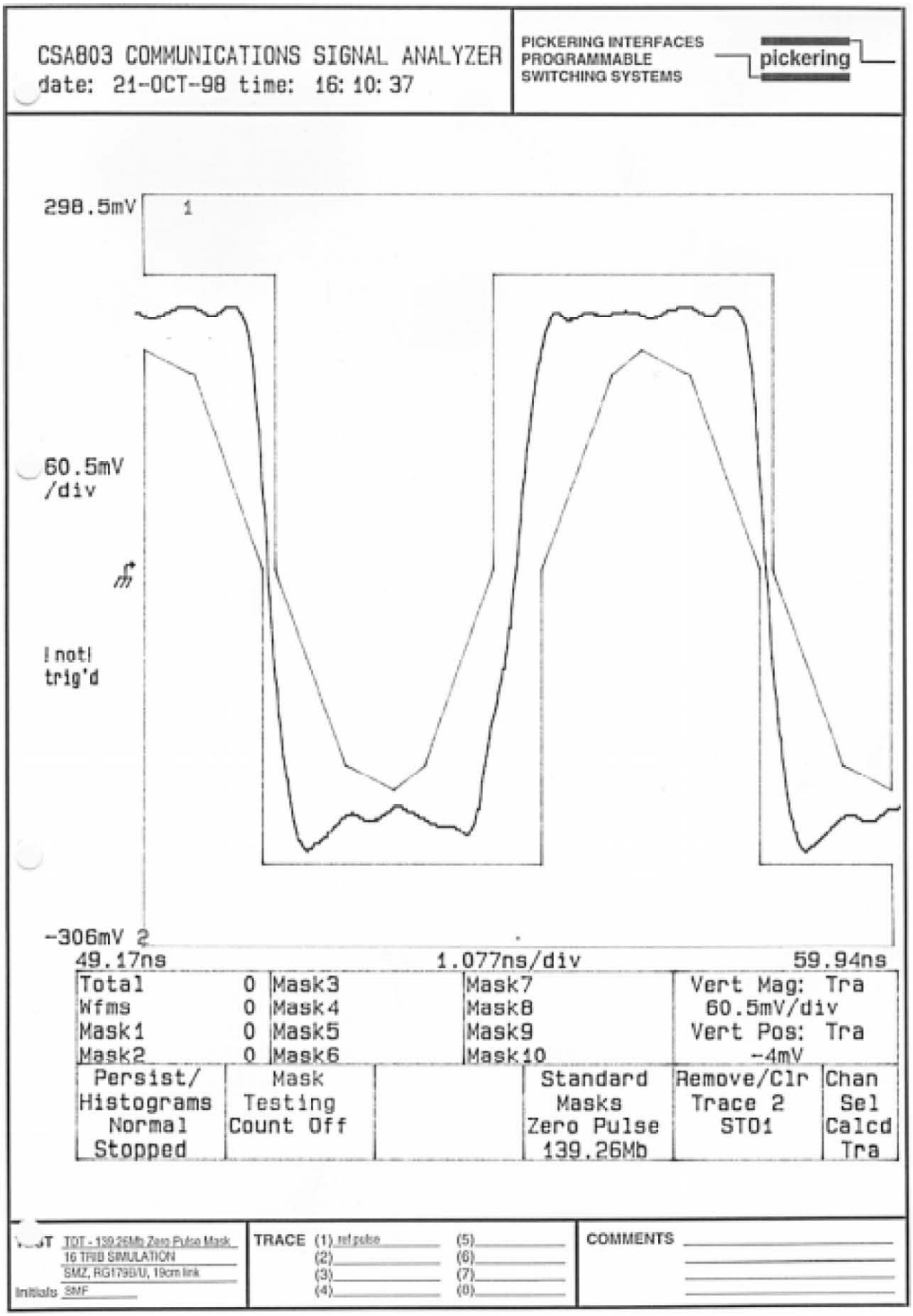
The following plots are included:-

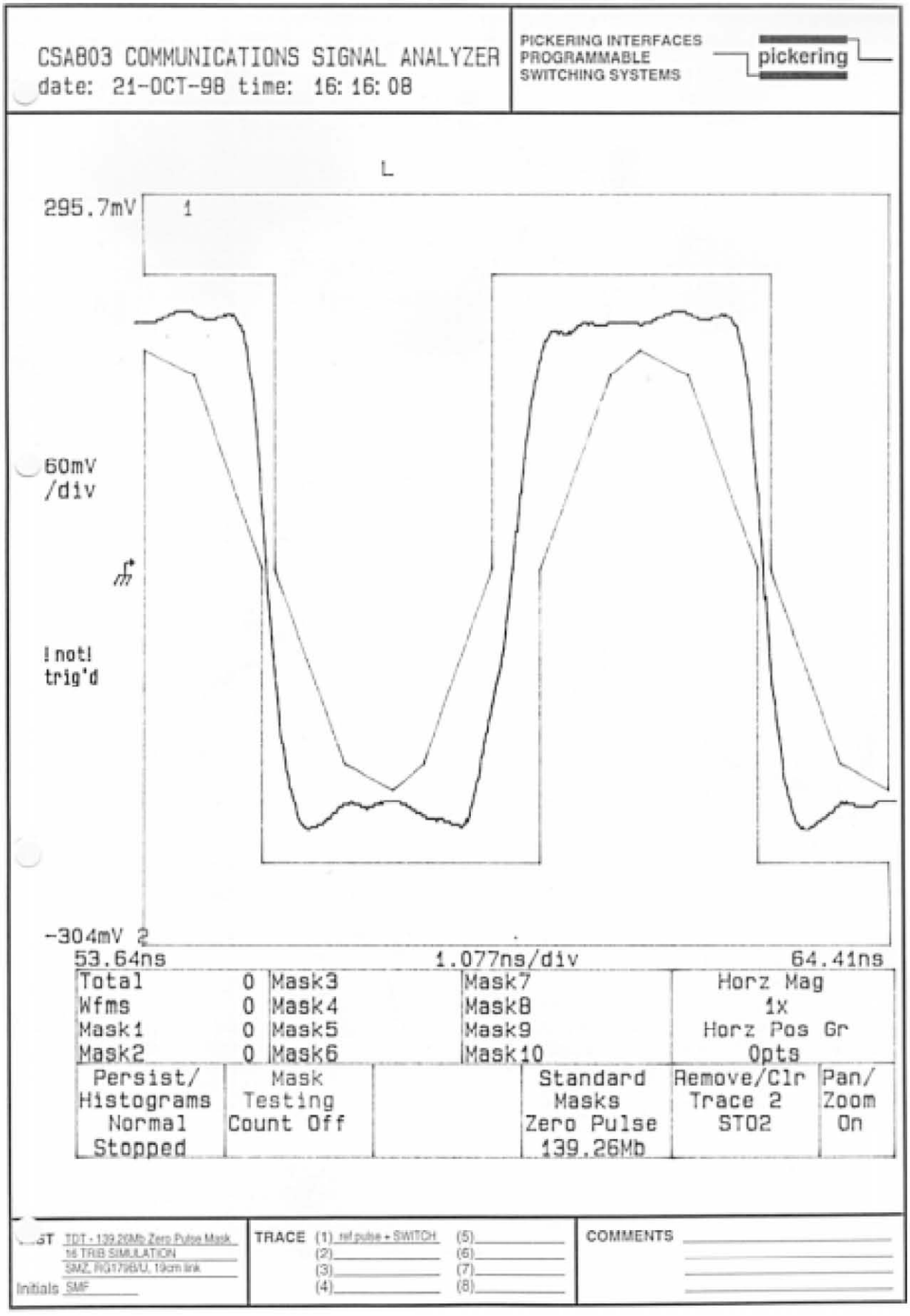
- Return Loss (0 to 240MHz).
  For a 16 Tributary System, measured from Instrument to Tributary.

- Insertion Loss (0 to 240MHz)
  For a 16 Tributary System, measured from Instrument to Tributary.

- Pulse Shape Distortion
  For a 16 Tributary System, measured from Instrument to Tributary.
  The Pulse before and after routing through the switching system are shown.


CH1 MEM log MAG 10 dB/ REF 0 dB 1: -23.559 dB
190.000 000 MHz
Cor
1
CH2 MEM log MAG 1 dB/ REF 0 dB 1 -.4579 dB
190.000 000 MHz
Cor
1
START 7.000 000 MHz
STOP 240.000 000 MHz
HP8752A
NETWORK ANALYZER
MEAS: Rx / Tx
FORMAT: log MAG
TEST: 202r0
16 trib
SMZ, RG179B/U
19cm link
Date: 6/10/98
Initials: SMF
CHANNEL:
(1) Return Loss
(2) Insertion Loss
COMMENTS:
pickering
PICKERING INTERFACES
PROGRAMMABLE
SWITCHING SYSTEMS
Tel: 01255 428141
(int +44 1255 428141)
Fax: 01255 475058
(int +44 1255 475058)
Internet: WWW.PICKERING.CO.UK
Email: SALES@PICKERING.CO.UK


CSA803 COMMUNICATIONS SIGNAL ANALYZER
date: 21-OCT-98 time: 16:10:37
PICKERING INTERFACES
PROGRAMMABLE
SWITCHING SYSTEMS
pickering
298.5mV
1
60.5mV
/div
!not!
trig'd
-306mV 2
49.17ns
1.077ns/div
59.94ns
Total 0
Wfms 0
Mask1 0
Mask2 0
Mask3
Mask4
Mask5
Mask6
Mask7
Mask8
Mask9
Mask10
Vert Mag: Tra
60.5mV/div
Vert Pos: Tra
-4mV
Persist/
Histograms
Normal
Stopped
Mask
Testing
Count Off
Standard
Masks
Zero Pulse
139.26Mb
Remove/Clr
Trace 2
STO1
Chan
Sel
Calcd
Tra
TDT - 139.26Mb Zero Pulse Mask
16 TRIB SIMULATION
SMZ, RG179B/U, 19cm link
Initials SMF
TRACE (1) ref pulse
COMMENTS


CSA803 COMMUNICATIONS SIGNAL ANALYZER
date: 21-OCT-98 time: 16:16:08
PICKERING INTERFACES
PROGRAMMABLE
SWITCHING SYSTEMS
pickering
295.7mV
60mV
/div
!not!
trig'd
-304mV
53.64ns
1.077ns/div
64.41ns
Total 0
Wfms 0
Mask1 0
Mask2 0
Mask3
Mask4
Mask5
Mask6
Mask7
Mask8
Mask9
Mask10
Horz Mag
1x
Horz Pos Gr
0pts
Persist/
Histograms
Normal
Stopped
Mask
Testing
Count Off
Standard
Masks
Zero Pulse
139.26Mb
Remove/Clr
Trace 2
ST02
Pan/
Zoom
On
TRACE (1) ref pulse + SWITCH
COMMENTS
Initials SMF

Section 3
20-790 Programming

3.1 Overview of the 20-790 Tributary Switching Module

The 20-790 is divided into 2 sections (refer to block diagram in Section 1), sections 3 and 4 are only fitted to the 20-791 version:-

Bank 1 Daisy Chain Select. These are used to feed signals into and out of the DUT (device under test), any selection of tributaries may be routed (e.g. all even, all odd, etc.).

Bank 2 Breakout Multiplexer Select. This is used to test a specific tributary.

Bank 3 Instrument Select Select 1 of 2 Instruments.

Bank 4 Channel Select. This is used to with bank 3 to connected a selected Tributary Switching Card to an Instrument.

3.2 General Programming Commands

`ARESET a`	Open all channels/crosspoints on device a.
`Diagnostic?`	Return complete diagnostic report for complete switching system.
`DELAY t`	Force a minimum delay of t milliseconds between two instructions.
`RESET`	Open all switches on all modules.
`VIEW? a`	View status of device a.
`CHAN a,b,c`	Select channel c on bank b of multiplexer a. Only one channel at a time is permitted to be on, automatic break-before-make is always enforced. b is in the range 1 to 4.

To operate more than one channel at any time an extra enable/disable argument, s, must be added to the CHAN command. The command will allow any combination of channels to be selected:

`CHAN a,b,c,s`	Select channel `c,` if `s` = 1 (i.e. s <> 0) on bank b of multiplexer `a.` Deselect channel `c,` if s = 0, on multiplexer `a.`

This command may only be used on Bank 1 (Daisy Chain Switch Section). Please make **particular note** that when the multi-channel form of the `CHAN` command is used the automatic break-before-make operation of the multiplexer is disabled, it can only be enabled again by issuing a standard `CHAN a,b,c` command (this will first clear all selected channels on that multiplexer bank).

3.3 Module Addressing

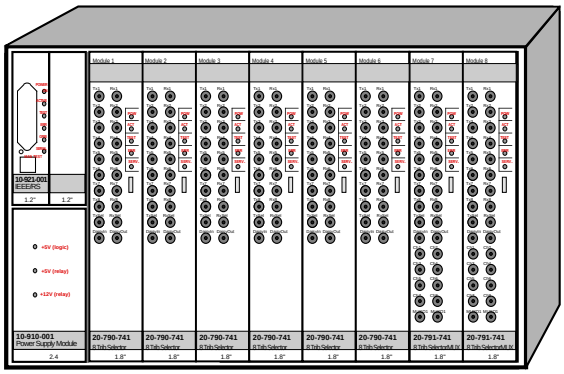
Each Trib Switching Module has it's own address within the Switching System mainframe. This is setup at the factory, the default setting is:-

Address 1 = 1st module from left.

Address 2 = 2nd module from left.

.....

Address 8 = 8th module from left (for the system shown below)



The module addressing (and other parameters) can be changed using the RS-232 port on the front of the module. Please contact factory for further details.

3.3 Configuration Specific Programming Commands

As shown in Section 1, each module contains either 2 or 4 banks, referred to as banks 1, 2, 3 and 4.

3.3.1 Bank 1 – Daisy Chain Tributary Switching Section

All tributaries are selected by default, i.e. the signal (D in) will be routed to Rx1, etc... To bypass a Tributary simply select that Tributary number as follows:-

`CHAN a,1,c,1` Select channel c on bank 1 of multiplexer a.

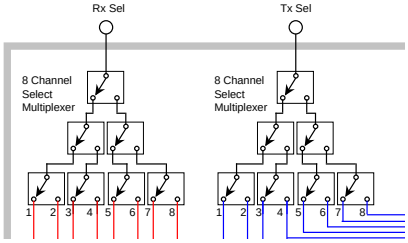
Any number of tributaries may be bypassed.

e.g. `CHAN 2,1,3,1` will bypass tributary 3 on module with address 2.

e.g. `CHAN 2,1,4,0` will include tributary 4 on module with address 2.

3.3.2 Bank 2 – Daisy Chain Tributary Switch Multiplexer Section

Each module contains two 8 channel tributary selection multiplexers, referred to as bank 2. These 2 multiplexers are programmed with the same instruction. They are used to route a bypassed Tributary to the RxSel and Tx Sel port. See diagram below:

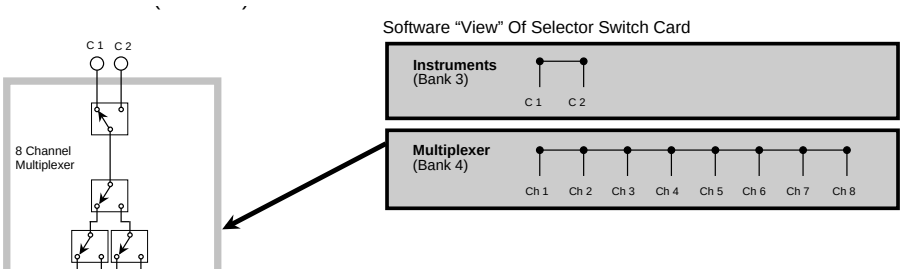


`CHAN a,2,c` Select channel c on bank 2 of multiplexer a. Only one channel at a time is permitted to be on, automatic break-before-make is always enforced.

e.g. `CHAN 5,2,1` will operate the module with address 5 selecting tributary 1.

3.3.3 Bank 3 and 4 – 8 Channel Selector Multiplexer and 2 Channel Instrument Section

20-791 Modules contain two additional multiplexer banks. These are used to connect test instruments to a selected Tributary, for example to make a pulse shape measurement. See diagram below:



8 Channel Multiplexer Operation: `CHAN a,4,c` Select channel c of multiplexer a. Only one channel at a time is permitted to be on, automatic break-before-make is always enforced.

e.g. `CHAN 5,4,4` will operate the module with address 5 selecting channel 4.

2 Channel Instrument Multiplexer Operation: `CHAN a,3,c` Select channel c of multiplexer a. Only one channel at a time is permitted to be on, automatic break-before-make is always enforced. c is in range 1 to 2.

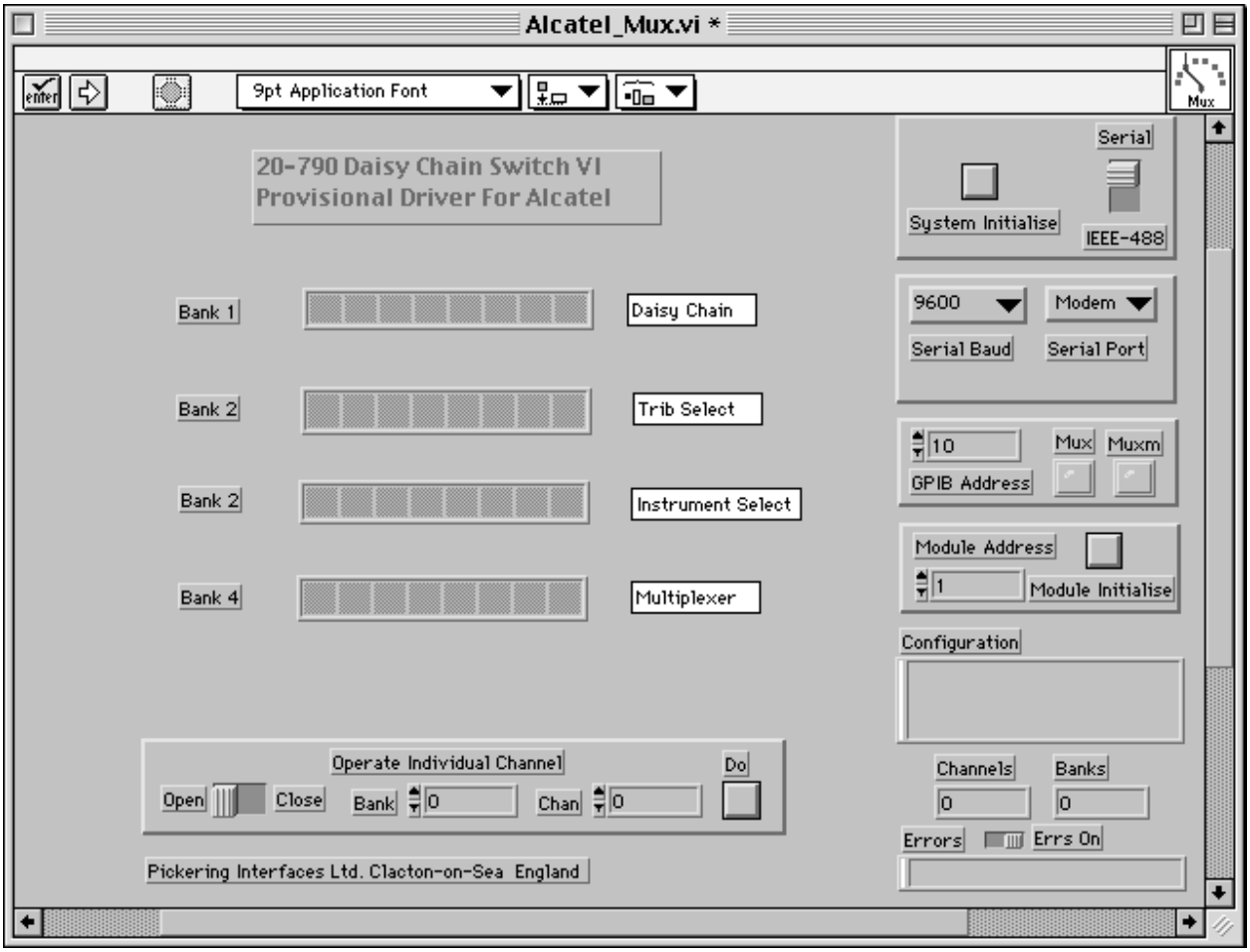
e.g. `CHAN 5,3,2` will operate the module with address 5 selecting channel 2.

Section 4
Provisional LabView Driver

4.1 20-790 LabView VI

This is a provisional driver, it allows any of the 4 banks on the 20-790 module to be easily operated. It will run in LabView version 4 or 5.

A more sophisticated version is in preparation and will be provided later.



Provisional LabView 4 VI For Controlling A Single 20-790 Module

Section 5
Self Test

5.1 Self-Test Function

Self-Test is invoked at power on and may also be operated under software (*TST?). Self-Test pass is indicated on a front panel LED with a full pass/fail description available using the DIAGNOSTIC? command.

Self-Test comprises 2 levels, see diagram below:-

1. **Logic Test**: Checks all logic including on-board microprocessor, relay drivers etc.
2. **Relay Coil Test**: All reed relay coils are checked for continuity.

Note: **Spare relays** are mounted onto the relay circuit board for fast repair, additional relays are available from Pickering Interfaces.

5.2 Self-Test Operation

If self test is run under software control it will firstly **clear the whole module**.

When the selftest has finished the multiplexer will be returned to an all clear state (i.e. the previous state will not be remembered!).

5.3 Detailed Self Test Reporting using the DIAGNOSTIC? Query

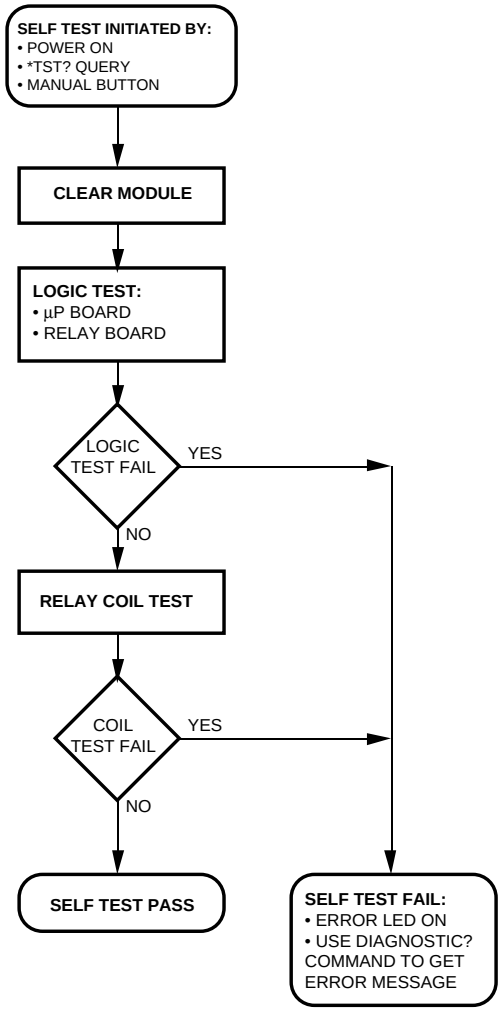
The DIAGNOSTIC? query will give an ASCII string detailing any self test failures. These will include:-

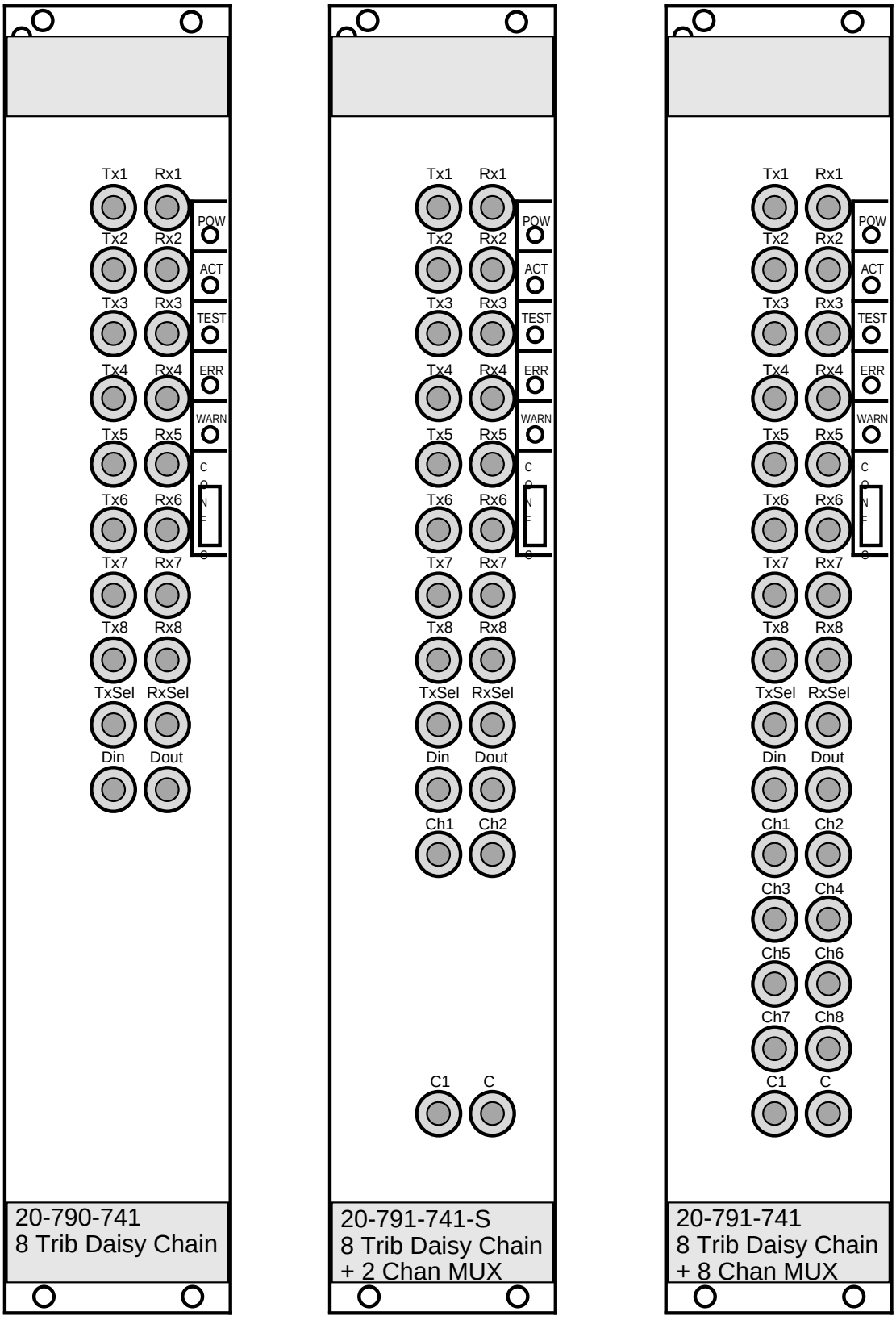
Logic: µP, RAM, EPROM, Relay Drivers, Invalid Link Settings etc.

Relay Coils: Open Circuit Coil.

This string is not intended to be processed by the user's software, it is suitable for copying directly onto the screen of your control computer. This information will then indicate the maintenance required (please contact Pickering for further help).

Self-Test: Basic Flow Diagram





20-790 Series Front Panel Layouts

Environmental

Operating Temperature 0°C to 50°C.
Storage Temperature -20°C to 75°C.
Humidity 95% non condensing.

Weight Dimensions and Power Requirements

Approx. Weight/g		1100
Dimensions/mm †		
Front Panel Width		45.3
Height		268
Overall Length		189
Power /Current Consumption		
Maximum /mA	5V	250
	12V	400
Minimum	5V	150
	12V	0

† Approx. dimensions. Standard 160mm, 6U, Eurocard, as specified in DIN 41494.

Voltage Supplies

Logic Supply 5Vdc ±5%.
Relay Supply 12Vdc ±10%

Section 8
Other Tributary Switching Solutions From Pickering Interfaces

Pickering Interfaces have a very wide range of RF switching modules, many of which may be used in tributary switching applications, please refer to Model List for further details or visit our Web Site.

A datasheet for a low cost 2MBit/s Tributary Daisy Chain Switching Card is included overleaf.



16 Channel Daisy Chain Switching Module Fitted with SMZ/BT Type 43 Connectors. Type 20-792-711

2MBit/s Daisy-Chain Tributary Switching Module Type 20-792

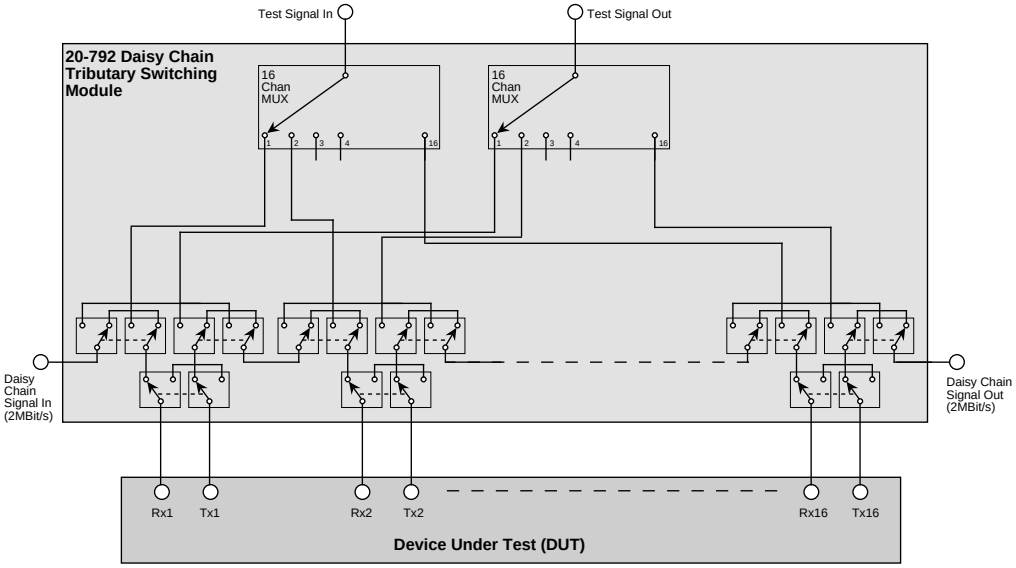
- **Suitable For Testing SONET/SDH Transmission Multiplexers**
- **16 Tributaries Per Module**
- **Up To 112 Tributaries Per Mainframe**
- **Expandable To Any Size: 32, 64, 96, 128, 256,..**
- **75 Ohm Impedance With Choice of Connector Types SMZ/BT Type 43, 1.0/2.3 & BNC**
- **All Tributaries Can Be Daisy-Chained to One Signal**
- **Integrated Multiplexer Allows Selection of One Tributary For Analogue Testing**
- **Use with 20-745/770 Multiplexer Module To Form Complete System**



16 Channel Daisy Chain Switching Module fitted with SMZ/BT Type 43 Connectors

The 20-792 Daisy Chain Switching Module is designed for telecom test applications. It allows production or verification testing of SONET/SDH transmission multiplexers. Traffic is sequentially Daisy-Chained through all tributaries (or any selection of tributaries), modules can be cascaded to test any number of tributaries. A built in breakout multiplexer allows separate testing of individual ports. Refer to graphic below.

Block Diagram of 16 Channel Daisy Chain Switching Module



Pickering Interfaces have a range of solutions for SDH/SONET Tributary Test Applications:

20-537 2MBit/s Daisy Chain Matrix Card, 40 Tributaries Per Module (320 per mainframe), Suitable For Bit Error Rate Testing (BERT).
20-792 2MBit/s Daisy Chain Matrix Card, 16 Tributaries Per Module (112 per mainframe), Suitable For Return Loss, Pulse Shape and BERT.
20-528 34MBit/s Daisy Chain Matrix Card, 12 Tributaries Per Module (96 per mainframe), Suitable For Return Loss, Pulse Shape and BERT.
20-790 155MBit/s Daisy Chain Matrix Card, 8 Tributaries Per Module (56 per mainframe), Suitable For Return Loss, Pulse Shape and BERT.

20-745 Quad 8 Channel Multiplexer, Suitable For Switching from 2Mbit/s up to 155MBit/s.
20-770 Hex 4 Channel Multiplexer, Suitable For Switching from 2Mbit/s up to 155MBit/s.
For further information please refer to our latest product list or web site.

General Specification (All Versions)

Maximum Voltage	100V d.c./100Va.c.
Maximum Power	30W
Maximum Switch Current	1.0A
On Path Resistance	< 200 mOhm
Off Path Resistance	> 10^8Ohm
Differential Thermal Offset	< 20µV
Expected Life (Low Power)	> $1x10^8$ ops
Expected Life (Max Power)	> $2x10^5$ ops
Total Switching Time	10mS
Relay Mechanical Settling Time	< 3mS

RF Specification (Multiplexer)

Characteristic Impedance	75Ω
Maximum Frequency	100MHz
Rise Time	< 1nS
Insertion Loss (< 10MHz)	< 0.3dB
Return Loss (< 10MHz)	> 21dB
VSWR (< 10MHz)	< 1:1.15
Isolation (< 10MHz)	> 50dB

Programming Information

The 20-792 comprises 2 sections-

1. Daisy-Chain switches. These are used to feed 2M signals into and out of the DUT (device under test), any selection of tributaries may be routed (e.g. all even, all odd, etc).

2. Breakout multiplexer. This is used to test a specific tributary.

The 20-792 is programmed as a 4x16 matrix (see diagram):-

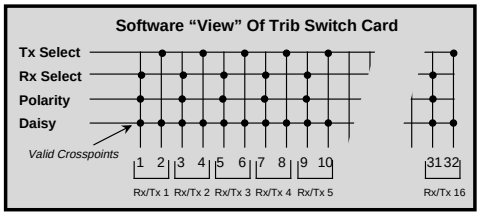
1st row is used to route the Daisy-Chain switches. The default setting is for all tributaries to be selected.

2nd row is used to switch polarity.

3rd row is used to select the receive multiplexer to a specific tributary.

4th row is used to select the transmit multiplexer to a specific tributary.

Multiple modules are still programmed as Xx4, making expansion easy. For example a 96 tributary system would be programmed as a 96x4 matrix (see diagram below). Software drivers for LabWindows/CVI, HP VEE and LabView are available.



Product Order Codes

Daisy-Chain Tributary Switch

BNC Version, 75Ohm	**20-792-701**
SMZ/Type 43 Version, 75Ohm	**20-792-711**
1.0/2.3 Version, 75Ohm	**20-792-741**

Options

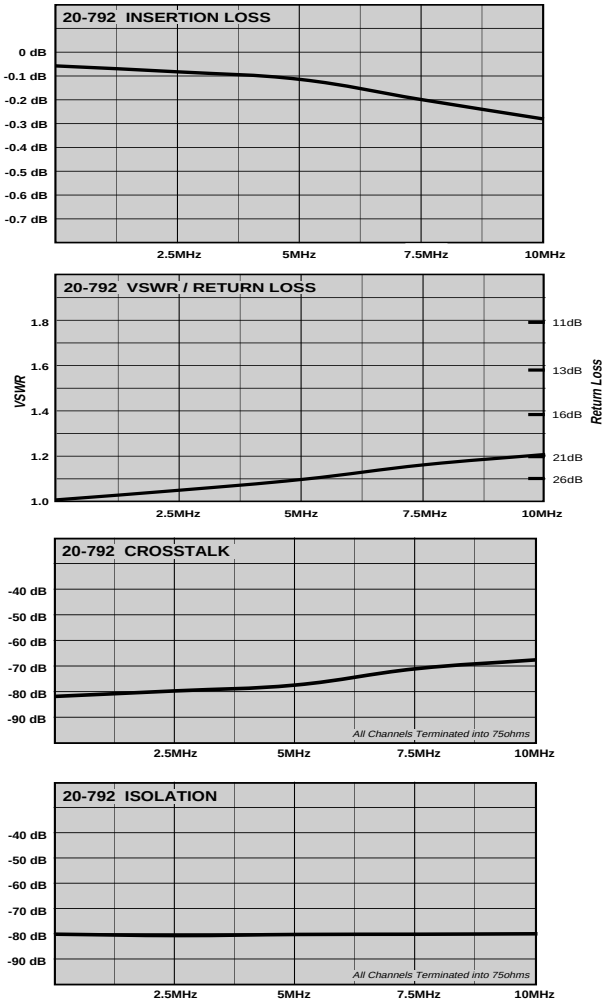
Alternative connectors are available on many modules, e.g. 75Ohm mini SMB, etc please consult factory. **– C**

Mating Connectors

Please refer to Model List for a full breakdown of RF connector and cable types.

Latest Details

Please refer to our Web Site for Latest Product Details.

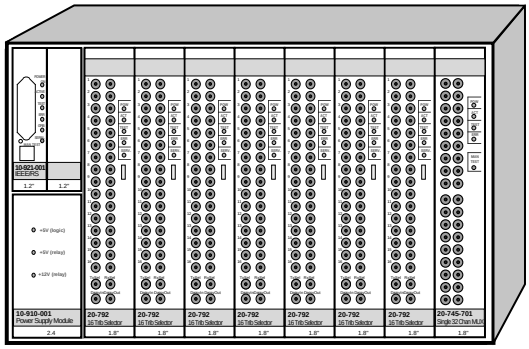


Typical RF Performance Plots for 20-792-711

(1 Tributary Switched To The Test Multiplexer)

Width and Dimensions

All modules conform to the 6U height (128mm) Eurocard standard and are 160mm deep. Panel width for 711/741 version is 1.8 Inches (701 is 3.6 Inches), up to 8 modules per mainframe.



One Mainframe Has The Capacity for 112 x 2MBit/s Tributaries.

(Multiple cases can support: 224, 336, 448, etc...)

SDH/SONET Tributary Testing is a specialised area, please contact Pickering Interfaces for additional application information and to discuss your exact

Pickering Interfaces maintains a commitment to continuous product development, consequently we reserve the right to vary from the description given in this data sheet.

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