



इ रि से ट
सूक्ष्मतरंग प्रयोगशाला

IRISET
MICROWAVE LABORATORY
EXPERIMENT NO.: D-MUX - 1

नाम

Name : _____

अनुक्रमांक

Roll No : _____

पाठ्यक्रम

Course : _____

दिनांक

Date : _____

प्राप्त अंक

Marks Awarded : _____

अनुदेशक का अध्याक्षर

Instructor Initial : _____

STUDY OF V MUX 30-A (V MUX-1)

The V MUX 30 A is an advanced versatile user configurable modular TDM Multiplexer system. The system can be used efficiently in any of the following network applications.

As a point to point multiplexer for voice and data transmission on primary rate E1 trunk.

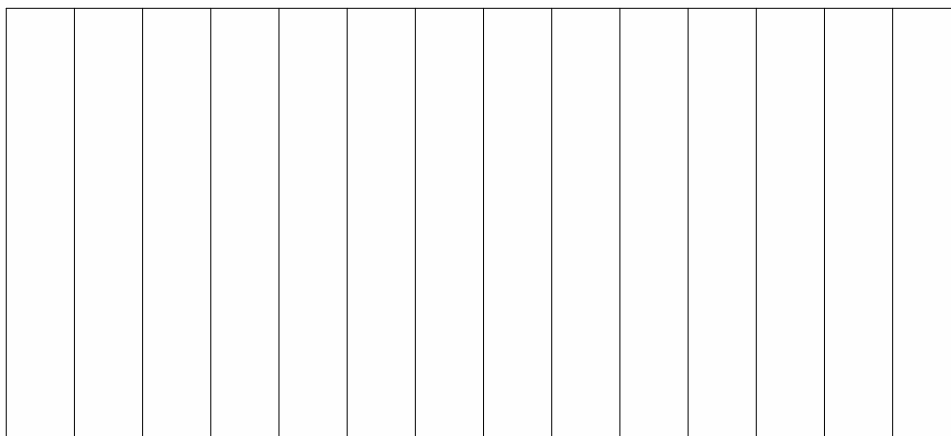
As a tail end MUX in digital transmission network.

As a drop insert MUX in a digital chain or ring network.

As a subscriber MUX for a 2.048 Mbps primary rate user.

V MUX supports two standard CCITT 2.048 Mbps (E1) PCM trunks. Both PCM trunk interfaces are however completely and independently programmable and can be configured if required to support two entirely independent PCM trunks going in different directions. Any time slot on PCM trunks can be mapped to any user port. Also any time slot of PCM-1 can be mapped to any time slot of PCM-2 to bypass channels in drop/insert configuration. In case of MUX failure in drop/insert configuration both the PCM trunks are connected to each other, thus bypassing the MUX.

The design of V MUX is based on multiple processors. At the heart is a 10 MHz Motorola 68000



processor on the GMAP card that looks after the overall operations of the MUX including scanning, alarm generation, programmability and the man-machine interface. Another 68000 processors on the SMX card look after the signalling of the MUX.

The system can be equipped with various types of cards that provide the required interfaces for the user data and voice channels. The system can be connected via 120 Ohms impedance or 75 Ohms impedance. The system works on - 48 V nominal (-40 V to -60 V) power supply. Typical power consumption is 75 W.

SYSTEM CONFIGURATION

There are 14 slots provided and counted from right to left. Slot Nos. 1 to 8 occupy user specified cards. They are slot independent and can be installed in any of the slots. Slot Nos. 10 to 14 occupies the common cards. These cards are slot dependent. Slot No. 9 is application specific like Supervisory and Conference. Now fill up the above diagram by observing the system.

Common Cards are

AUX card
SMX Card
PCM Card
GMAP Card
P/S Card

User interface cards are

E&M Card
EXCHANGE I/F Card
SUBSCRIBER I/F Card
DATA Card (G.703)

NODE MANAGEMENT TERMINAL (NMT)

The operation of the V MUX is configurable, can be monitored from a VT - 100 compatible Node Management Terminal. Through the NMT the user can interact with the V MUX over multilevel user-friendly screens to display the existing configuration and / or to enter new configuration. Once entered, the configuration information is stored in a non-volatile RAM (NVRAM). The NVRAM is factory programmed with a default configuration setting for all programmable parameters and has a battery life of several years. This default setting can be viewed and altered at site using NMT.

Q.1 Identify the Slot No. card and write briefly about the function of each.

Q.2 Identify the various indicators provided on each user card and write the significance of each indicator.

Q.3 Identify the various alarms provided and write the purpose of each.

Q.4 Identify the input and Output points of 2 Mb streams.

Signature of the Candidate



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PROGRAMMING ON V MUX OF PCL (V MUX-2)

Programming on V MUX is carried out in two ways.

1. Channel to PCM mapping. 2. PCM-1 to PCM-2 mapping.

Mapping is done through NMT or NMS. Here mapping is explained by using NMT.

Connect NMT to COM-1 port of GMAP card.

STEPS

1. Switch on the NMT.
2. Press ESC key or F 11 key on the keyboard.
3. Enter login selection: 1 (User Mode)
4. Main Menu is displayed. (Note the items)

5. Select item 1. After the selection of item No.1 note the observation.

To go back to the main menu press ESC key. Then select item No. 2. Note the observations.

Press ESC key to go back to the main menu. In a similar way select all the items one by one and note the observations in each case.

6. Come back to item No.1 (Status). In this there are 5 sub items. Select item Nos. 1, 2 and 3 one after the other and note the observations.

Press ESC key to go back to 'Status' (original).

7. Again select 2 (Trunk). There are 2 sub items.

8. Select sub item No.1 and note the observations. Choose sub item No.2 and note the observations.

9. What difference is observed in these two sub items? Comment.

10. Press ESC key.

11. Choose sub item No.3 (VF)

12. This has 32 selectable items which on choosing displays the configuration and the status of each channel.

Choose one E & M channel.

 one Sub. I/F channel

 one Exch. I/F channel

and note down the status. Each time when the channel number is keyed press Enter to see the display.

13. Press ESC key twice (Main menu id displayed).

14. Select item No.2 (Routing Tables)

15. There are 7 selectable items. Note them.

16. Choose item No. 3 (Display routing table). The system has 4 default routing tables.

17. Choose routing table No.1 by entering 1.

18. Display shown.

The five sub tables are

1. PCM 1 2. PCM 2 3. TDM 1 4. TDM 2 5. VF

PCM 1 : shows the mapping of the channels onto the PCM time slots in direction 1.

PCM 2 : shows the mapping of channels onto the PCM time slots in direction 2.

TDM 1 : shows local channel mapping on to either PCM 1 or PCM 2 without conferencing.

TDM 2 : Maps conference channels on to PCM 1 and or to PCM 2.

VF : Channel port mapping on to TDM bus structure. Study each.

19. Press ESC KEY.

20. Displays continue (Y/N) (Enter Y to see function).

21. Enter 2 and observe.

22. Press ESC key.

23. Press Yes.

24. Enter 3. Observe the display.

25. Press ESC KEY.

26. Press Yes.

27. Enter 4. Observe the display.

28. Press ESC key.

29. Again press ESC key.

30. Select 4. (Activate routing table).

Observe the display. Present active routing table is -----.

Enter routing table to activate.

Modify settings (Y/N). Press Y.

What does the screen display? Why?

31. Press enter.

NOTE: No changes can be made in user mode. Go to Supervisory mode.

32. Press ESC key.

33. Press ESC key again.

34. Choose 6.

35. Press ESC key.

36. Enter selection 2. (Supervisory Mode) and enter.

37. Enter pass word (123) and enter.

38. Main menu is displayed.

39. Select item No.2.

40. Select item No.1. This option allows the user to route a specific port or TS of any trunk to any port or TS of any trunk in a routing table.

41. Three options are displayed. Note them. Modify settings (Y/N). Select Y.

Example 1 : Channel to PCM Mapping.

Enter routing table to edit (1 - 4). Select 4 and press enter.

Enter source (1 - 3). Select 3 and press enter.

Here the local channel is mapped to either PCM 1 or PCM 2.

Enter Source TS (1-31) or port (1-32) : Select 30 and enter.

Enter destination (1-3) : Select 2 and enter (PCM 1 or PCM 2).

Enter destination TS (1-31) or Port (1-32) : 17

Save settings (Y/N): Select Y.

Routing is done.

To see the set routing press ESC.

Select 3.

Enter the routing table to display as 4 (The edited routing table No.).

Now observe.

Channel No. 30 is mapped to PCM 2 Time Slot No. 17.

Select 2 from sub table.

Source	Channel	Destination	Channel
PCM 2	17	TDM 1	29

You have typed channel 30, it displays 29. Why?

Example 2: PCM 1 to PCM 2 mapping.

Press ESC key.

Again press ESC key.

Select 1 (Modify connections).

Display is same as previous example.

Modify settings (Y/N). Select Y.

Press 4 and enter.

Press 1 (Trunk 1 or PCM 1) and enter.

Press 15 (Choose time slot of PCM 1) and enter.

Press (trunk 2 or PCM 2) and enter.

Press 12 (choose time slot of PCM 2) and enter.

Save settings (Y/N): Select Y.

Routing is done.

To see the set routing press ESC key.

Select 3.

Enter the routing table to display: 4

Now observe.

Source	Channel	Destination	Channel
PCM 1	15	PCM 2	12

Please note that user enters only the source and destination time slots on PCM 1, PCM 2 and not on TDM 1 and TDM 2, which are automatically routed by the system.

Press ESC key.

Press ESC key again.

Press ESC key again.

Select 6 (log off).

Signature of the Candidate



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Marks Awarded :

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Instructor Initial :

STUDY OF WEBFIL FLEXIMUX

OBJECTIVE:

To acquire familiarity with Webfil Flexi-MUX Hardwarw, Interface cards, Functionality and wiring.

The FlexiMUX is a programmable Add/Drop multiplexing equipment which combines a variety of voice and data traffic into a 2.048 Mbps stream. This equipment is manufactured and supplied by WEBFIL Limited. The Add/Drop feature of the FlexiMUX is realized through the use of a high performance time/space non-blocking cross-connect switch with four independently controlled serial time division multiplexed buses. Conferencing of voice is done through a separate digital signal processing circuit in digital format. A micro controller handles all the signaling information.

The system can be programmed for its channel assignments locally through a portable laptop computer or remotely from a Central Supervisory Terminal through a polled data channel derived through unused National bits or the overhead bit-stream of the transmission equipment. The same channel is also used for Network Monitoring and control operations. Polled mode of operation allows it to be used in tandem, loop or star to suit the network structure of the user. Various diagnostics features are built-in the system which eases the maintenance of the network.

Features

- Complaint with ITU-T Recommendations G.703, G.704, G.711, G. 712, G. 713, G. 714, G. 732, G. 735, G. 823.

- Dynamic branching through digital cross-connect.
- Terminal, Drop/Insert and Branching configurations in single unit.
- Wide range of voice and data interface units.
- Digital Conferencing for omnibus voice and data.
- Sub rate multiplexing of low speed data transmission for efficient timeslot utilization.
- Immediate reuse of branched timeslot for efficient system utilization.
- Integrated Interface for equipment configuration, network supervision and management.
- Built-in centralized monitoring of equipment alarms and external parameters.
- High reliability, robust and compact design.

Benefits

- Drop/Insert capability reduces equipment cost of low capacity multi-node network.
- Mixed service capability enables better utilization of transmission infrastructure.
- Flexible channel cross connect and reuse of timeslot maximizes bandwidth utilization.
- Dynamic Branching enables online reallocation of channels for alternate routing in case of link failure.
- Built-in supervisory system eliminates the necessity of external system thus reducing cost, space and power.
- Connector's wire-wrap back plane simplifies equipment installation and provides reliable extension of signals.
- Built-in surge suppression and input over voltage protection in the power supply module prevents the system from catastrophic failures.
- Universal shelf for 19" rack mounting fits most installations.
- Minimal variety of cards reduces spares inventory.

ARCHITECTURE:

The FlexiMUX is a compact unit based on the 19" mechanical construction. The Sub-rack is a common mechanical housing with a bussed back plane that accepts all the modules with vertical mounting making a modular equipment concept possible. LEDs on the front panel indicate the status of all the individual modules. The 2 Mbps streams are accessed from the rear side either through coaxial connectors for 75 Ohms interface or through wire wrap post for 120 Ohms balanced connection. All the voice, signaling and data information are accessed from wire wrap connectors mounted at the back. The NMS can be accessed through a 9-pin D-shell connector, mounted in the back plane or from RJ-11 jack mounted in the Network Interface Module.

The basic system consists of :

- a) The Network Interface Module.
- b) Tributary Module.
- c) Power supply Module.
- d) Sub-Rack with the back plane.

Analog and digital services are realized with interface specific access units connected to an internal 2 Mbps bus.

Each of the access units accommodates one to four channels depending on the complexity of the interface. Each individual service channel consumes one time slot (voice and data up to 64 Kbps) and fractional time slots (low speed data up to 19.2 Kbps) of the 30 time slots available for use with the 2 Mbps stream.

For voice channels various interface options are available to suit the customer's requirement. The interface units are small adaptor cards that can be plugged into any one of the four adaptor sockets available on a voice access module. Flexibility of these plug-in modules allows free inter-mixing of interface units on a particular voice access module. The various interface options available at present are:

- a) 4 W/2 W E&M.
- b) Subscriber interface.
- c) Exchange interface.
- d) Hot line interface.

SUB-RACK:

The sub-rack has altogether 13 slots for housing the various modules. Out of these slot-1 and slot-2 are dedicated for PSU modules (in case of redundant power supply) and slot-3 and slot-4 are dedicated for the Network interface Module (NIM) and Tributary Module (TM) respectively. Slot-5 to slot-13 are meant for housing various access modules for both voice and data interface. Each of these slots supports access to 4 time slots of the 2 Mbps stream. Thus slot-5 to slot-11 supports altogether 28 time slots of the 2 Mbps bus. Slot-12 and slot-13 has equal and parallel access to time slots 30 and 31. This has been done for efficient utilization of the bit stream during sub-multiplexing of a time slot for low speed data. The structure of the sub-rack and time slot allocation is shown in figure below.

1 2 3 4 5 6 7 8 9 10 11
12 13

PSU	PSU	NIM	TM	ACCESS MODULE	TS-1 TO TS-4	ACCESS MODULE	TS-5 TO TS-8	ACCESS MODULE	TS-9 TO TS-12	ACCESS MODULE	TS-13 TO TS-15 TS-17	ACCESS MODULE	TS-18 TO TS-21	ACCESS MODULE	TS-22 TO TS-25	ACCESS MODULE	TS-26 TO TS-29	ACCESS MODULE	TS-30 TO TS-31	ACCESS MODULE	TS-30 TO TS-31
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Access to the 2 Mb ports is available from the back plane from the rear side. Separate connectors are available for 75 Ohms and 120 Ohms impedance matching. For 75 ohms, Spinner type threaded connector has been provided for firm contact. For 120 Ohms, three pin 1 mm square post has been provided for either wire wrap termination or termination through self lock header socket. A separate port is also available for driving the system using external clock.

POWER SUPPLY MODULE

The power supply unit operates from 48 V supply. The input power is fed through a surge protector and filter section to protect the system from high voltage spikes and lightening spikes coming along the power line. Each PSU has three separate switching power supply modules, one for +5 V, one for ± 10 V and another for + 80 V. They are also mutually isolated with each other. + 5 V is used to operate all the digital devices of the system. The ± 10 V is post regulated in different card to ± 5 V and is used to drive the analog devices. The card also has under-voltage and over-voltage alarm for both input and output.

NETWORK INTERFACE MODULE:

The Network Interface Module primarily takes care of the alarm acquisition function from various internal and external sources and responds to the queries and commands issued by the Network Manager through the “Super-Net” Network Management System. The module runs on a high performance Intel 80C196 microcontroller with associated communication and alarm interfaces for its operation. The Network Interface module is used for exchange of information among the Network Manager, the Tributary Module and the various access modules interconnected via the back plane. It has altogether four communication interfaces for information exchange.

TRIBUTARY MODULE

The Tributary Module is the heart of the system which interfaces to the 2 Mbps stream and realizes the add-drop function of the channel through digital cross-connect. Block diagram of the Tributary Module is shown in the figure below.

The function of the Tributary Module is to

- Extract the master clock (MCLK) of the Network from the incoming 2 Mbps streams. The node is made synchronized to the MCLK.
- Synchronize the phase of the incoming frame of the incoming 2 Mbps streams and also that of the internal 2 Mb bus for local access.
- Cross-connect 64 Kbps digital data along with signaling data.
- Perform PCM summing of conference channels along with logical summing of corresponding signaling data.
- Generate 2 Mbps internal TDM bus for channel units.
- Generate 2 Mbps HDB-3 encoded interface signals.
- Collect and analyze equipment and line faults and take necessary actions.
- Control jitter to a limit well below the limit.
- Report to Network Interface Module about the alarm status of the 2 Mb stream and the module.
- Support a communication channel through the use of National bits of TS0 for Network Monitoring and Control.

2 W/ 4 W E&M INTERFACE

For 4 W interface circuits, the voice is extended through a pair of balance line for both transmit and receive. Separate line transformers are used for this purpose. The impedance is matched for 600 ohms. Separate E and M leads provide Signalling . For 2 W interface of voice, both the Trans and receive voice is fed to outgoing transformer working in hybrid mode. Jumper settings are available in the module for configuring the circuit into a 2W mode or 4W mode.

Jumper settings:

Mode	Jumper	Pins
4W	E1, E2, E3, E4	2, 3
2W	E1, E2, E3, E4	1, 2

SUBSCRIBER INTERFACE:

This interface is normally used for extending a voice to the plain old telephone sets (POTS). In this interface both the signalling and voice is sent over one pair of wire. The unit provides talk current from the primary -48 V source for the operation of the telephone set. Hook condition and dial pulses are sent by interrupting the loop current in the handset. The interface also has built-in ringer to buzz the phone for incoming calls. The subscriber interface along with the exchange interface can be used for extending the subscribers of a local exchange to remote sites through the FlexiMUX.

EXCHANGE INTERFACE:

This interface is used for interfacing the exchange side of a subscriber line. Depending on the hook status of the subscriber, the exchange interface extends loop to the exchange. It basically emulates the function of the telephone to the exchange and reproduces the voice and signalling of the telephone set. It also senses the ring and loop reversal condition which is sent to the subscriber interface for reproduction.

HOTLINE INTERFACE:

This is basically subscriber to subscriber interface. Depending on the off-hook status at one end, the ringer is activated at the other end. The ringer is automatically deactivated as soon as the handset is lifted. After the conversation is over, both the user will have to comeback to the on-hook condition to enable the ring again. By changing two straps on the subscriber interface, the same module can be converted to hotline interface.

Jumper settings:

Mode	Jumper	Pins
SUB	E1, E2, E3, E5	2, 3
	E4	3, 4
Hotline	E1, E2, E3, E4, E5	1, 2

64 Kb/s DATA INTERFACE (G.703) MODULE

One 64 Kb/s data card caters for two 64 Kb/s co-directional data channel which conforms to G.703 requirement. Each channel consists of a general-purpose line interface chip. It contains both transmit and receive circuitry to interface TTL signal either from or to a twisted pair cable. Data signal coming from the DTE will face 1:1:1 isolation transformer for isolating line side interface and digital PCM interface.

LOW SPEED DIGITAL DATA MODULE

The Low Speed Data Module is primarily meant for extending asynchronous low speed RS 232 C data circuits through the FlexiMUX. The module works in bit transparent mode and acts as a data pipe irrespective of the data. It can also work in synchronous mode in which case the incoming and outgoing data will have to be synchronized to the clock signal provided by the module (contra-directional data). Each time slot of the 2 Mb frame provides a bit rate of 64 Kbps. Low speed data channels can very well be accommodate into such a high bit rate channel. However, for better utilization of the information bandwidth a V.110 sub-multiplexing format is used to support multiple low speed data on a single time slot. This module supports baud rate ranging from 600 baud to 19.2 K baud. The number of bits of a time slot required is given below.

Up to 4800 baud	1 bit
9600 baud	2 bit
19.2 K baud	4 bit

To exploit the network bandwidth efficiently for data communication, time slots TS30 and TS31 are extended to both the card slots 8 and 9 of the sub-rack. However, this does not limit the use of these slots for voice communication, if required. Each data access module supports four channels. The channels can be configured as either synchronous or asynchronous mode of operation. Each of the channels supports all the handshaking lines required for the V.24 protocol. The handshaking signals are status information of the DTE and DCE connected at two nodes of the network, which are just extended through the network

120 Ohms balanced 2 Mbps Port

O	O	O
SIG	SIG	GND

J1 for 2 Mb input (Port A)

J2 for 2 Mb output (Port A)

J5 for 2 Mb input (Port B)

J6 for 2 Mb output (Port B)

Pin details on wire wrap connector for voice and G 703 data interface

O	32	O	
	O	31	O
O	30	O	
	O	29	O
O	28	O	
	O	27	O
O	26	O	
	O	25	O
O	24	O	
	O	23	O
O	22	O	
	O	21	O
O	20	O	
	O	19	O
O	18	O	
	O	17	O
O	16	O	
	O	15	O
O	14	O	

Review Questions

1. Identify the various modules equipped in the equipment and draw a diagram showing the slots and cards present in the slots.

2. Identify the various alarm indicators provided on the modules and note them for each module.

3. Give the significance of the indicators on each module.

4. Draw a neat wiring diagram showing the connections between the Krone and the Wire Wrap connectors of the system for each channel.

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Experiment: PROGRAMMIN OF FLEXIMUX

OBJECTIVE: To gain hands-on practice in configuration, mapping and measurements on Webfil Flexi-MUX through NMS.

Webfil Supernet Management System is a window based network management system designed to configure and control FLEXIMUX equipment. It can process information, in real time mode, received from all FLEXIMUX equipments connected in a network. With the help of this one can also monitor health of a particular equipment and network.

Basic functions of Supernet Management System

- Real time monitoring of network.
- Execution of various Diagnostics and Telecommands.
- Configuration of Card type and parameters.
- Configuration of Timeslots.
- Status and alarm history logging.
- Viewing of logged data with specified query.
- Performance monitoring of equipment and network.

Connecting FLEXIMUX to PC

The communication between the supervisory computer and a remote equipment is done through RS 232c asynchronous serial I/O with baud rate 1.2 Kbps. The serial port COM1 or COM2 of the computer is connected to the serial port of any of the FLEXIMUX equipment (connector J15 on the mother board or NMS port in the front side of the equipment with the help of serial I/O cable supplied along with the system.

Important Terminology

SITE: Site is the name of location where equipment is installed. There are two names for a site. One is full name, which can be up to 15 characters and the other is a short name up to 4 characters long. For most of the operation site is referred by its short name. The short name is a unique identity of the site and thus should be unique for the entire network. The sites are represented by circle in the network diagram.

LINK: Link means the connection between sites to observe the network operation. The solid lines in the network diagram represent the links.

EQUIPMENT: Equipment refers to the FLEXIMUX installed in a site. All equipment has unique identity called Address by which it is accessed.

ACTIVATION: The term activated or De-Activated is related to the equipment only. If the state of the equipment is marked as activated, NMS will display status of that equipment during scanning operation. If an equipment is 'De-activated' that will not be polled at the time of scanning.

SCAN: The status of Scan may be kept in On or Off state. NMS can receive real time alarm status from the activated equipment, only when the scan is in ON mode.

DEDICATED SCAN: It is a special type of scanning used mainly for maintenance purpose. This option, when enabled, scans only a selected equipment and response time is fast enough to get immediate feedback from the equipment.

DATA LOGGING: The data logging can be switched On or Off. If it is OFF, the status data received from the equipment will not be saved into the database for future reference.

RUNNING WEBFIL SUPERNET MANAGEMENT SYSTEM: The Supernet Management System is password protected. Two types of user access are allowed namely 'Administrator' and 'Operator'. 'Administrator' has full control over the software but 'Operator' can access only limited operations and are not allowed to configure or save changes. After installation, a default username and password will be available:

User name: ADMIN
Password : user

Remember that password is case sensitive and default password 'user' is accepted only in small letters. 'Administrator' type user can change name and password of other users but the 'operator' can only change his own password. Maximum five different login IDs can be created.

Steps to be followed for programming the Mux

Switch on the laptop computer.
Select the Shortcut to NMS Icon.
Display will show the following.
Supernet Management System.
Click on Login button.

The system will ask for the user name and password.
Enter valid user name and password and then click OK. The NMS default screen will appear.

WEBFIL SUPERNET MANAGEMENT

SCANNING STATUS

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1. Selection of **SETUP** option will display the following

Change password

User Account

Network

2. Selection of **Equipment** option will display the following

List

Activate/De-activate

Legend Setup

Cross connect

Card parameter

3. Selection of **Monitor** option will display the following

Network

Single Equipment

All Equipment

4. Selection of Control option will display the following

Auto

Bypass
Digital Bypass
TRIB-A Loop back
TRIB-B Loop back
Channel Loop back
mW Signal
Tributary-A Remote Loop back
Tributary-B Remote Loop back
Activate
Deactivate
G 821 Reset

5. Selection of **History** option will display the following

Equipment
Local

History means the information, which are loaded either in equipment or in hard disk of the computer on which NMS is running.

Out of the above options of the Main menu bar only those options/sub options are described here, which are required generally in day-to-day working.

Configuring the card parameter

From the Main menu bar of the default screen select **Equipment** and then Click **Card Parameter**.

- On the screen Click Start button and then select Address, click OK button of the address selection Popup screen. For the first time as you select an Address, all the slots will be shown blank and you will be notified, 'New entry! No previous data found.'
- Click Right Mouse Button on a slot twice. The popup menu for card type selection will appear as shown below.

Blank slot
Voice module
LSD module
G703 HSD module
V35 HSD Module
N X 64 Interface
E1 Branching

IDSL

From the Popup screen, select desired card type and then click Left Mouse Button again on that slot Depending upon selected card type the related sub-module configuration screen will appear. Follow on screen menu and message to configure sub-modules for a selected card. The screen for a particular type of card is shown below as an example.

Channel Configuration [Slot 1]

CLOSE

Sub-Module Configuration for Voice Card

Yes

Card Present 2 Wire – 4 Wire ▼

Adapter Type 0 ▼ Default

Incoming Gain -2 ▼ SAVE

Outgoing Gain

In various card configuration screens you can find **SAVE** buttons. These save buttons are used to saving sub-modules only. At the end of all module and sub-module configuration, you must have to save the entire configuration by clicking **SAVE** button of the card parameter main screen otherwise, all the changes you have made will be lost.

Uploading Card Parameter from the equipment

Click **Upload** button of the card parameter screen to upload card parameter from the selected equipment, follow on screen message there after.

Uploading Present Card from the equipment

Click **Present Card** button of the card parameter screen to view actual card present in the selected equipment. The card actually present in various slots will be displayed and if there is any error or mismatch in the card configuration the same will be displayed with red colour. For Voice card, Channel level error will be displayed as 'Chnl. Err'. Click '**Chnl.Err.**' to view more details.

Saving Card Parameter Configuration for other addresses

Clicking **Save As** Button of the card parameter screen will allow you to select other address. If you select other address, the present configuration will be popped up for new address. You have to click **Save** button now, to save the same for newly selected address.

Click **Close** or **Done** to quit from the screen and return to NMS default screen.

Configuring Cross-Connect Tables

- From the menu bar of the default screen Click **Equipment, Cross-Connect**. The following screen appears.

TABLE type

Equipment

Normal Faulty A Faulty B Address New

Open table Equipment

Remote A Remote B Bypasss

Cross-Connect type Allow

Linear Semi-conference Conference Edit

Timeslots from 1 to 31

Timeslots from 1 to 31

Save Table

Download

Upload Exit

- Select equipment address from drop down list, click **Open Table** and then click on one of the Table Type Buttons. They are:

Normal

Faulty-A

Faulty-B

Remote-A

Remote-B

Bypass

If the table has not been created before, all the boxes for Tributary A, Tributary B and Tributary C will be shown as blank. Now to start assigning channels for cross-connect, you have to select an appropriate cross-connect type. Click either on **Linear**, or **Semi-conference** or **Conference** button.

- **Assigning LINEAR channels**

If you select **LINEAR**, you have to choose an option from the list of buttons, displayed just below the Linear button. Depending upon the selection, TRIB-A, TRIB-B or TRIB-C frames will be activated. You will be allowed two different clicks on boxes marked by channel numbers (Timeslots). After completion of two different clicks on boxes, the boxes will change their colour to red. Now click **OK** to assign channels or click **Cancel** to cancel the operation. The linear channels will be shown on yellow background. Repeat the process to assign other channels. Linear channels means connectivity between two points only.

- **Assigning SEMI-CONFERENCE channels**

If you select **Semi-Conference**, You have to choose an option from the list of buttons, displayed just below the semi-conference button, that is "**From A**", "**From B**" or "**From C**". This selection informs the software that, your bi-directional channel for semi-conference will start either from Tributary A or Tributary B or Tributary C. Now you have to click one of the buttons, from the list of buttons displayed below the lastly selected button, that is from buttons marked as **To A & A**, **To A & B**, **To A & C** etc. Depending upon the selection, TRIB-A, TRIB-B or TRIB-C frames will be activated. As you have selected semi-conference, you will be allowed three different clicks on boxes marked by channel numbers (Timeslots). Remember that your first click will be accepted as bi-directional channel and it should match your selection of button **From A**, **From B** or **From C**. After completion of three clicks, the boxes you have clicked will change their colour to red. Click **OK** to assign channels or click **Cancel** to cancel the operation. The semi-conference channels will be shown on Cyan background. Repeat the process to assign other semi-conference channels.

- **Assigning CONFERENCE channels**

If you select **Conference**, you have to choose an option from the list of buttons, displayed just below the conference button. **A-B-C**, **A-A-A**, **A-A-B** etc. Depending upon selection, TRIB-A, TRIB-B or TRIB-C frames will be activated. As you have selected conference, you will be allowed three different clicks on boxes marked by channel numbers (Timeslots). After completion of three clicks, the boxes you have clicked will change their colour to red. Click **OK** to assign channels or click **Cancel** to cancel the operation. The conference channels will be shown on green background. Repeat the process to assign other conference channels.

Finally click **Save Table** button and then on alert window click **Yes**.

All other tables can be configured for the same address following the same procedure as described above

- **Down loading Cross-connect Table To an Equipment**

Once you open a table, the same will be downloaded to the selected equipment when you clicked **Download Table** button. The download is possible only after saving the table. You will receive an acknowledgement from the equipment if download is successful.

- **Uploading Cross-connect Table from an Equipment**

Click **Upload** button to upload selected cross-connect table from the selected equipment. If upload is successful the Table screen will appear. You can now use the uploaded data or discard it by clicking **Use Upload Data** or **Discard Uploaded Data** button. If you use uploaded data you must have to save it by clicking **Save Table** button otherwise the same will not be available once you exit from the current screen.

- **Editing Cross-connect Table**

Click **Allow Edit** button to get permission for editing. Click on the boxes where channels are assigned. As you click on a box where cross-connect is assigned, the background colour of all related boxes will change red. The red mark indicates that, these channels may be deleted. You can now click **Delete Channel** button to delete or click **Cancel Edit** button to cancel present editing operation. Remember to save the current table after editing.

Monitoring Network Status

- **To monitor alarm status of all sites at a glance**

Click Monitor, Network. A screen with all sites will appear. We can monitor status of all sites in a single window. In this window, if scan is on, sites are shown in network diagram with different colour depending upon the occurrence of alarms in the equipment. If all the equipment of a particular site has no alarm then, that site will be displayed with green colour. If any one of the equipment has major alarm, the colour of the site will be red and for the case of minor alarm, the same will be yellow. If both the major and minor alarms occur in a site, the colour of that site will be red. If all the equipment of a site are not accessible through NMS, the site will be shown in gray colour.

- **Monitoring All Equipment**

Click Monitor, All Equipment. A Screen will appear. The screen has number of column with heading SITE, ADR, V and T. The Short name of a site is shown in column 'SITE'. The column 'ADR' is used to show Equipment Address, column 'V' and 'T' are used to display the analog parameter Voltage and Temperature of equipment respectively. Colour of Text shown in various columns depends upon the condition described in the table below.

Column 'V' (Voltage)	Text colour	Column 'T' (Temperature)	Text colour
Voltage > 60 OR Voltage < 40	RED	Temp. < 5 ⁰ C OR Temp. > 40 ⁰ C	RED
Voltage between 40 and 60	GREEN	Temperature between 5 ⁰ and 40 ⁰ C	GREEN

Column 'SITE'	Text Colour
Equipment has Major Alarm	RED
Equipment has Minor Alarm	YELLOW
Equipment has No Alarm	GREEN
Equipment has both Major & Minor Alarm	RED

Red colour of column 'ADR' represents 'Equipment Not responding'.

- **Monitoring status of a single equipment**

Click Monitor, Single Equipment, Equipment Status. A screen will appear containing Full site name, Short site name, Address, System, Problem Trib, Trib-A, Trib-B etc. Colour of various labels that are shown in this screen will change, depending upon the actual alarm occurs in the equipment. In all the cases, red colour indicates Major Alarm, Yellow indicates Minor Alarm and green indicates OK condition. The change of colour to show actual status of equipment will take place only if Scan or Dedicated Scan is ON.

- **Dedicated Scanning**

It is a special type of scanning used mainly for maintenance purpose. This can be activated by clicking **Enable Dedicated Scan** button only when normal Scan is OFF. This option, when enabled scans only the selected equipment and response time is fast enough to get immediate feedback from the equipment. Dedicated Scan can be switched OFF by clicking **Disable Dedicated Scan** button.

- **Monitoring G.821 Status**

Click Monitor, Single Equipment, G.821 status.

The G 821 Status screen will appear which will contain Address, Site name, duration and give the result in a tabular format.

	<u>TRIB A</u>	<u>TRIB B</u>
Available time % %
Unavailable time % %
Error Seconds % %
Severe Error Seconds % %
Degraded Minute % %
Equipment down time % %

- **Giving CONTROL command to the Equipment**

Click Control in the Main Menu. The following screen appears.

Auto

Bypass

Digital Bypass

Trib A Local Loop back

Trib B Local Loop back

Channel Loop back

mW signal

Trib A Remote Loop back

Trib B Remote Loop back

Activate

Deactivate

G 821 Reset

- First select Equipment Address from the dropdown list.
- Click one of the Control Command options and follow on screen message if any.
- Click **OK** and **Yes** to conform.

LIST OF CONTROL COMMANDS FOR FLEXIMUX EQUIPMENT

- **AUTO**

This command will withdraw any control command, which is being executed by the selected equipment.

- **BYPASS**

This command can set the equipment to bypass the 2 Mb signal in physical connectivity level i.e Tributary A and Tributary B will be patched to each other. This can be set to be permanent or for a specified duration.

- **DIGITAL BYPASS**

This command sets the equipment to work as per cross connect table 'Bypass' assigned in the equipment. This is also can be set permanent or for specified duration.

- **TRIB-A LOOPBACK**

This command can set Tributary A in loop back mode for specified duration.

- **TRIB-B LOOPBACK**

This command can set Tributary B in loop back mode for specified duration.

- **CHANNEL LOOPBACK**

With the help of this command the user can give Loop back command for any channel of any tributary.

- **mW SIGNAL**

This command can inject test signal to any channel.

- **TRIBUTARY-A REMOTE LOOPBACK**

This command can set Tributary A in loop back mode in remote side for specified duration.

- **TRIBUTARY-B REMOTE LOOPBACK**

This command can set Tributary B in loop back mode in remote side for specified duration.

- **ACTIVATE**

This can give activation command to any of the output relays.

- **DEACTIVATE**

This can give deactivation command to any of the output relays.

- **G821 RESET**

This command reset the performance data.

REVIEW QUESTIONS

1. What is dedicated scanning?
2. What is the need of Upload and Download buttons in a menu?
3. What difference do you observe between Semi-conference and Conference channel?
4. What do you understand by the term Linear Table with reference to Cross connect Table?



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सूक्ष्मतरंग प्रयोगशाला

IRISET
MICROWAVE LABORATORY
EXPERIMENT NO.: DMUX - 5

नाम

Name : _____

अनुक्रमांक

Roll No : _____

पाठ्यक्रम

Course : _____

दिनांक

Date : _____

प्राप्त अंक

Marks Awarded : _____

अनुदेशक का अध्याक्षर

Instructor Initial : _____

STUDY OF 2/34 Mbps SKIP MUX (M/S ITI)

This multiplexer on the transmit side multiplexes 16 Plesiochronous 2 Mb/s bit stream in to one 34 Mb/s stream. On the receive side demultiplexes one 34 Mb/s stream into 16 streams of 2 Mb/s. The multiplexing principle is cyclic bit interleaving in the tributary and positive justification is employed. The alarms and consequent action, the input and out put specifications are as per relevant CCITT Specifications.

The equipment is configured in 5 PC boards apart from power supply. The 2/34 MUX and DEMUX functions are carried out in two stages. On the transmit side, first the incoming 16 numbers of 2 Mb/s digital tributaries, after equalization/clock extraction, HDB-3 decoding and synchronization (positive justification) are multiplexed to obtain 4 tributaries of 8 Mb/s. The necessary frame alignment word and service bits are added. In the second stage these four 8 Mb/s digital streams are again multiplexed in a similar way as that of 2/8 Mb/s to obtain 34 Mb/s HDB-3 Output.

On the receive side the incoming 34 Mb/s stream after station cable equalization/clock extraction, regeneration, HDB-3 decoding and framing are demultiplexed to realize 4 tributaries of 8 Mb/s streams. In the subsequent stage these four tributaries are again demultiplexed to obtain 16 tributaries of 2 Mb/s streams.

The equipment is modular in construction and works on -48 V DC. The equipment uses Spinner connectors for interfacing the 34 Mb/s stream to the digital radio equipment or to OLTE of optic fiber system.

Q. 1 Identify various cards and briefly explain the function of each.

Q. 2 Draw the functional block diagram of trans and receive paths clearly indicating the function of each block.

Q. 3 What is the input voltage and its limits?

Q 4 What are the different alarms provided on the system? Briefly explain.

Signature of the Candidate



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IRISET
MICROWAVE LABORATORY
EXPERIMENT NO.: DMUX - 6

नाम

Name : _____

अनुक्रमांक

Roll No : _____

पाठ्यक्रम

Course : _____

दिनांक

Date : _____

प्राप्त अंक

Marks Awarded : _____

अनुदेशक का अध्याक्षर

Instructor Initial : _____

EXPERIMENT: Analyzing of 2Mbt/s digital signal generated by the 30channel Primary MUX.

OBJECTIVE: To gain hands-on practice on 30-Ch PCM Analyzer for G.821 statistics on individual Time slots of E' frame.

MEASURING INSTRUMENT: - PCM30 Analyzer.

THEORY OF OPERATION: - The 30 channels primary Mux generates 2Mbt/s digital signals. Thirty Analog VF channels are converted to thirty digital channels. Two-time slots for signaling and frame alignment word and alarm. Thus thirty-two time slots are generated for framing. Each Analog channel can be checked by feeding analog tone either 800Hz or 1Khz at Analog termination point and it can be analyzed in the digital format at 2Mbt/s termination point. Transmission media from A to B stations can be checked by generating 2Mbt/s Signal at one station and checking it to the other station by analyzer. The print out can be taken from the port connecting a printer.

PCM30 Analyzer has several options for menu selection. But in our present experiment we will select either 2M monitor or Drop – Insert modes.

2M MONITORS

In this mode the PCM30 Analyzer is active only for Receive section to receive digital signal. Receiver extracts key sequences from the signal and presents them on the display. Analyzing can be performed on unframed pseudo random bit sequence (PRBS) test-patterns or on PRBS in telephone channels of framed PCM signals.

The PCM30 Analyzer monitors: -

- 1) Error in frame alignment signal (FAS).
- 2) Violation against HDB –3 coding law.
- 3) CRC-4 errors and CRC-4 errors at the remote end are displayed as counts and as ratios.
- 4) The positive and negative peak values of a selectable telephone channel are displayed as well as difference in dBo. This channel is monitored through built in speaker and frequency of its signal is displayed.
- 5) Received bit pattern of frame alignment signal, Service word (NFAS), Multi frame alignment signal (MFAS) and Channel associated signaling (CAS)
- 6) Alarms are indicated on the display on LED and Audibly.

DROP-INSERT

In this mode the PCM30 Analyzer is active in both for Transmitter and Receiver sections. In the transmitter section, the transmitter generates HDB3 coded 2 Mbit/s digital signals. The signals may be of PCM30 or PCM31 format or PRBS bit stream. The generator transmits a PRBS test pattern in framed format or in unframed format. The framed signal is either generated internally or regenerated from the received signal and a PRBS is inserted in the selectable time slot. **Errors are injected in the PRBS either manually or in a selectable ratio.** AIS can be generated.

The receiver does the same analysis as in 2M Monitor modes, except peak and frequency.

PCM30 ANALYZER has 120 Ω and 75 Ω terminations for connectivity of 2Mbt/s signals of Tx and Rx. **V.24 Port is provided for printer connection.**

The important keys on the face of the meter are push button type and are operated by pressing them.

The keys are described here to know its functions.

1.  Power on/off

2. Press to enter the selected menu and more

SHIFT

function is available when it is pressed for SHIFT and pushes to speak.

MENU

3.

Press to select menu.

START

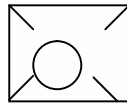
4.

Press to start measurement for result



5.

Cursor key. Press up, down, right and left for selection of menu and sub menu.



6.

Toggles LCD displays back ground light On/Of

C

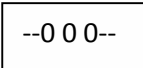
7.

Press to clear latch alarms. Alarm is active when measurement is running. Latch alarm is selected on set- up display by giving command "Yes".

F₁ – F₃

8.

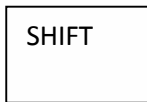
Press the key to select the function displayed "Boxes" bellow these keys.

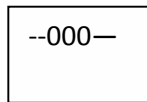
9 

AIS (Alarm indication signal) are transmitted from K4304

while key is pressed. This key is active in measurement modes, drop insert, drop repeat and unframed.

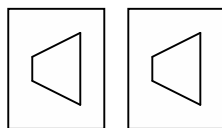
10.





All "0" is transmitted from analyzer while key is depressed. This key is active in measurement modes, drop insert, drop repeat and unframed.

11.



Internal speaker volume control.

If a key is depressed for more than about 0.4 seconds, it starts to auto repeat with a rate of about 5 keys per second.

PROCEDURE FOR OPERATING THE ANALYZER

1. Press the key – ON/OFF

Window displays –

- a) 2M Monitor
- b) Drop- Insert
- c) Drop- Insert Repeat
- d) Unframed
- e) Instrument set-up
- f) Memory
- g) Remote

Selection of 2M Monitors

1. High light 2M Monitors with the Cursor key Arrow signed
2. Press Key ENTER to select 2M Monitor.

Window displays –

2M Monitor Set-ups (Receiver receives digital signals from 30 channels PCM MUX)

1. Frame – PCM30 (If PCM30 is selected, timeslot 16 is monitored as CAS. If PCM31 is selected, time slot 16 is monitored as telephone channel- 31. If input signal contains CRC-4, select CRC to monitor and display CRC4 errors, remote CRC4 errors and CRC4 alarms)
2. Channel 1 – 31 Telephone channel that is monitored in speaker and whose peak and CAS is displayed.
3. Interval – Select with Cursor key arrow marking (1m or 10m)
4. Save in memory - ON/OFF - Operate cursor key left and right
5. On line print – Off
6. Latched alarms – On/Off (If “on” is selected, an alarm indication is retained on the screen even after the corresponding alarm has gone inactive. The indication is cleared when Key C is pressed)
7. Measure time – Manual/ Auto (Press F1 Key)

Set-Up Sub display

- a) **Measure time** – Press Function key F_1 and select time
- b) **2M Input** – Press function key F_2 to select 120 Ω /75 Ω
- c) **Alarm signal** - Press function key F_3 to set –up the alarms
 1. Signal – Beep + LED
 2. No signal - On (No input signal)
 3. AIS – On
 4. No synchronization – On (No frame alignment signal)
 5. No M synchronization – On (No multiframe alignment signal)
 6. RAI – Off (Remote alarm indication)
 7. MRAI – Off (Distance loss of multiframe alignment)
 8. No CRC4 Sync. – Off
 9. No PRBS Sync. – Off
 10. FAS error- On
 11. CRC4 Error – On
 12. PRBS Error – On

d) Press Key SHIFT/ENTER (F_1)

Display Sub menu G 821 Threshold

1. LEVELS – HRX
2. ES% - 8.000
3. SES% - 0.200
4. DM% - 10.000

2M Monitor Run (Result)

Press Key – Start/Stop

The analyzer Runs to processes the incoming received digital signal.

For FAS Error Press the Key F_1

The Window displays

<u>Example</u>	<u>Observed Reading</u>
1. Elapse – d 00 h 00 m 00 Error count total (Error ratio)	Error count Total (Error ratio)
2. FAS – 1.23E – 04	----- (Error in bit 2 – 8 of the frame alignment signal)
3. Code – 2.3423E – 05	----- (Violation of HDB3 coding)
4. CRC4 – 3.4523E – 06	----- (Error in CRC4 check sum)
5. Remote CRC4 – 4.5623E – 07	----- (Error in CRC4 check sum at the remote end)
6. FAS- 10011011	-----
7. MFAS – 01111111	-----

Feed 800 Hz tone to the 2wire termination point of Analog channel. Connect PCM 30 analyzer to the termination point of 2Mbps of PCM MUX

For channel data press F₂

Window displays

<u>Example</u>	<u>Observed reading</u>
1. Elaps	-----
2. Channel (select particular channel number where you feed tone of 800Hz) Peak Code	
+ Code -12	-----
– Code -32	-----

dBm0 -16 -----

- For CAS press function Key F₁**

1111 -----

G821 0n FAS total count

	Total	%		Total	%
2. US –	100.	00.00	-----	-----	
3. ES –	Pass	00.00	-----	-----	
4. SES –	Pass	00.00		-----	-----
5. DM –	Pass	00.00	-----		-----

6. **Save in memory** - ON/OFF - Operate cursor key left and right

7. **On line print** – Off

8. **Latched alarms** – On/Off (If “on” is selected, an alarm indication is retained on the screen even after the corresponding alarm has gone inactive. The indication is cleared when Key C is pressed)

9. **Measure time** – Manual/ Auto

Set-Up Sub display

a) **Measure time** – Press Function key F_1 and select time

b) **2M Input** – Press function key F_3 to select $120\Omega/75\Omega$

c) **PRBS set-up**- Press F_2 –

1. Press F_1 – Select time slot. Use cursor key marked arrow

2. Press F_2 - Deselect time slot

3. Press F_3 to select all time slots

4. **PRBS pattern** – $2^{15} - 1$ Use cursor key marked arrow

6. **Error Inject** – Off

Press Shift / Enter Key.

d) **Alarm Signal** - Press F_1 –Window displays

a. Signal – Beep + LED

b. No signal - On (No input signal)

c. AIS – On

d. No synchronization – On (No frame alignment signal)

e. No M synchronization – On (No multiframe alignment signal)

f. RAI – Off (Remote alarm indication)

g. MRAI – Off (Distance loss of multiframe alignment)

h. No CRC4 Sync. – Off

i. No PRBS Sync. – Off

j. FAS error- On

k. Code Error-On

l. CRC4 Error – On

m. PRBS Error – On

e) **G821** – Press F_2

Display Sub menu G 821 Threshold

1.LEVELS – HRX

2.ES% - 8.000

3.SES% - 0.200

4.DM% - 10.000

DROP – INSERT RUN (RESULT)

Press start/Stop button, on the keypad

For FAS Error Press the Key F_1

The Window displays

<u>Example</u>	<u>Observed Reading</u>
1. Elaps – d 00 h 00 m 00 Error count total (Error ratio)	Error count total (Error ratio)
2. FAS – $1.23E^{-04}$	----- (Error in bit 2 – 8 of the frame alignment signal)
3. Code – $2.3423E^{-05}$	----- (Violation of HDB3 coding)
4. CRC4 – $3.4523E^{-06}$	----- (Error in CRC4 check sum)
5. Remote CRC4 – $4.5623E^{-07}$	----- (Error in CRC4 check sum at the remote end)
6. FAS- 10011011	-----
7. MFAS – 01111111	-----

PRBS Channel Press F_2

Window displays	Example	Observed reading		
1. Elaps -----				
2. Number of PRBS Time slot 1		-----		
		Error	Count	total
3. PRBS 12345678		-----	-----	-----
4. Ratio $1.23E^{-04}$		-----	-----	-----
5. Delay μs 123		-----	-----	-----
6. CAS 0001		-----	-----	-----
7. MFAS bit (5 – 8)1011		-----	-----	-----

Push to talk - ENTER

For G.821 PRBS Press function key F₃

<u>Example</u>			<u>Observed reading</u>	
1.Elaps			-----	
G821 0n PRBS				
	Total	%	Total	%
2.US –	100.	00.00	-----	-----
3.ES –	Pass	00.00	-----	-----
4.SES –	Pass	00.00	-----	-----
5. DM –	Pass	00.00	-----	-----

Push to talk - ENTER

For G.821 FAS Press function key F₁

	<u>Example</u>		<u>Observed reading</u>	
1.Elaps			-----	
G821 0n FAS				
	Total	%	Total	%
2.US –	100.	00.00	-----	-----
3.ES –	Pass	00.00	-----	-----
4.SES –	Pass	00.00	-----	-----
5.DM –	Pass	00.00	-----	-----

Push to talk - ENTER

Review Question

1. What is the difference between PCM30 and PCM31
2. Can you generate the PRBS test pattern in framed format or in unframed format?
What is the difference between framed and unframed format of PRBS pattern?
3. In 2M-monitor mode can you measure analog signal? If not then why?
4. Draw a connection diagram of Drop- Insert mode showing the analyzer and Transmission Media.
5. What precaution do you like to take during measurement?

Equipment set-up diagram for channel testing

