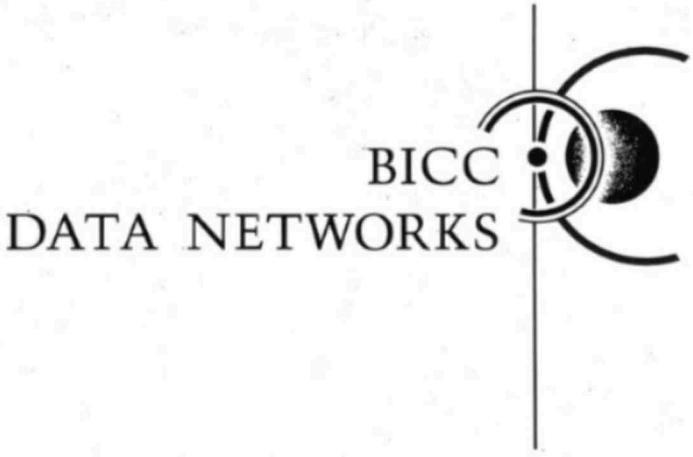
ISOLAN

How To Use

The ISOLAN Test Unit

Type 1105-0



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About This Manual

This manual describes the functions and use of the ISOLAN Test Unit, type 1105. It is assumed that you are familiar with local area network configurations using Ethernet.

The manual is divided into eight sections, these are:

1. About This Manual
2. Introduction
3. Operating the ISOLAN Test Unit
4. How to Test Transceivers
5. How to Generate Traffic on a Network
6. How to Measure Round Trip Delay
7. Using the ISOLAN Test Unit System Menu
8. First-Line Diagnostics

In addition there are four appendices and an index. The appendices are:

A. Characteristics of the ISOLAN Test Unit
B. Fault Codes
C. Transceiver Trouble Shooting Guide
D. Using the Hex Monitor

If you are new to the ISOLAN Test Unit, then it is recommended that you read the whole manual through once and subsequently re-read the sections that particularly concern the tasks you want to perform. Once you are familiar with the ISOLAN Test Unit the manual can be used as a quick reference source with the aid of the comprehensive index.

1 About This Manual

2
Introduction

What is the ISOLAN Test Unit?

The ISOLAN Test Unit is a portable unit which enables you to test transceivers either on or off a network. You can also use the unit to generate traffic or to measure the round trip delay time on a network.

To test transceivers off the network you will need access to a mains supply to power the ISOLAN Test Unit . To test on the network you will need access to a mains outlet and to an AUI cable. The other end of the AUI cable should be connected to a transceiver which is attached to your network.

The ISOLAN Test Unit has been designed to work in two separate ways depending on the tasks you wish to perform; for instance you can test a transceiver very quickly and get a pass or fail message, or you can perform individual tests on many of the transceiver's functions. Similarly, you can generate traffic on your network very easily using the default values of the unit or you can closely define the characteristics of the traffic.

Delivery Check List

When you unpack your ISOLAN Test Unit you will find the following items are included:

- The ISOLAN Test Unit
- Mains Cable (1.5 m)
- Blue AUI Cable (1.5m)
- Black Co-axial "Cheapernet" Cable (2m)
- BNC Adaptor (terminated at one end)
- Tapping Tool
- ISOLAN Test Unit User's Manual

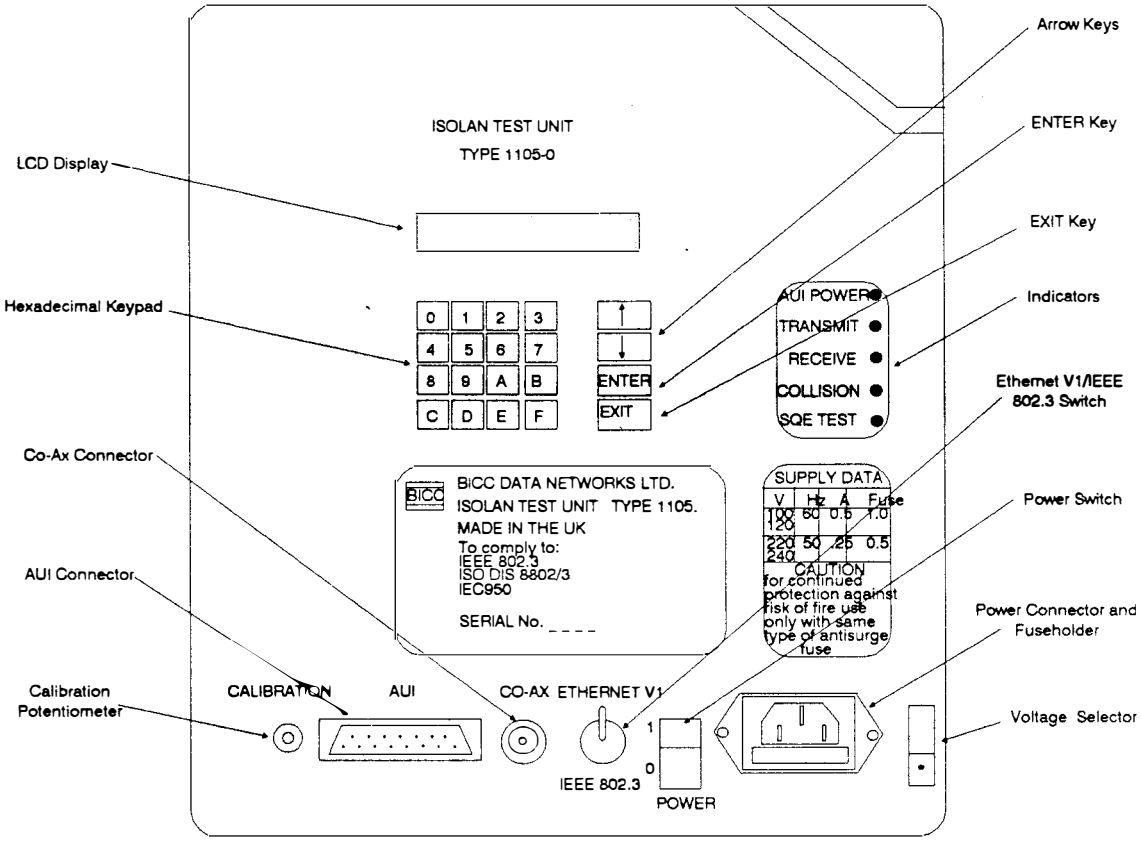
2 Introduction

3

Operating the ISOLAN Test Unit

Introduction

The ISOLAN Test Unit is a portable unit which is fitted into a "suitcase" type casing. All of the controls and indicators, including the main display, are on the front panel. The front panel is illustrated in figure 3-1



3-1 The front panel

Controls and Indicators

The functions of the unit are controlled from the keypad. This is a membrane keypad area below the display. There are sixteen keys on a numeric keypad and four control keys. The numeric keypad has hexadecimal numbering from 0 to F. The four control keys are, from top to bottom, UP ARROW, DOWN ARROW, ENTER and EXIT.

3 Operating the ISOLAN Test Unit

The main display is a two line Liquid Crystal Display (LCD), this displays the menus from which all functions are selected and the results of your tests. There are five indicator LED's which show; from top to bottom:

- AUI POWER
- TRANSMIT
- RECEIVE
- COLLISION
- SQE TEST

The LEDs give an indication of what signals are present on the AUI cable. The signals are those which are sent to and from the attached transceiver. The AUI POWER LED indicates that power is available to the transceiver from the ISOLAN Test Unit.

There are three switches on the front panel of the unit:

- ETHERNET V1/IEEE 802.3 switch
- POWER switch (0 = off, 1 = on)
- VOLTAGE SELECTOR - choose between 240V or 120V operation

At the bottom of the front panel are all the plugs and sockets for connecting the ISOLAN Test Unit to the mains and to the equipment under test. The following plugs and sockets are available:

- AUI socket - 15 way D type connector with screwlocks
- Co-ax socket - BNC style
- Power plug- IEC type plug for mains power lead

Finally there is a recessed twenty turn potentiometer marked CALIBRATION

Getting Started

Open the case by releasing the two fasteners on the front, raise the lid and familiarise yourself with the positions of the controls and indicators mentioned above. Note how the cables are packed so that you can repack them when you have finished testing. Before you start to use the unit check that the voltage selector is set to the correct voltage for your mains supply. The selector is correctly set when the voltage you require is visible on the switch when viewed from the front panel. When the ISOLAN Test Unit is shipped it is set for 240V operation and has a 500mA fuse fitted; if you change the voltage selector to 120V, remember also to change the fuse to one rated at 1A anti-surge. If you do need to change a fuse, refer to Section 8 of this manual. Next you connect the mains lead to the IEC socket on the right of the front panel; when you now switch the POWER switch to ON, three self diagnostic tests are carried out automatically. The tests are to ensure that the RAM and ROM are functioning correctly. The tests are carried out in the following order:

1 ROM Checksum	add and compare ROM contents
2 Odd RAM Test	read and write random sequence
3 Even RAM Test	read and write random sequence

While the tests are running you will see a "right arrow" appear on the top line of the display as each test is successfully completed. Once the tests are passed the LCD display will show the following:

```
BICC DATA NETWORKS
ISOLAN TEST UNIT
```

A few seconds later the display switches to the main menu. If the display does not appear, refer to the first-line diagnostics in section 8. Select either Ethernet V1 or IEEE 802.3 using the switch in the centre at the bottom of the front panel; your selection depends on the standard to which the transceiver you are using is designed. As a guide, use the selection table below:

If tranceiver designed to...	*then select:*
ESPEC1	Ethernet V1
DIX	Ethernet V1
Ethernet	Ethernet V1
ESPEC2	IEEE 802.3
IEEE802.3	IEEE 802.3

The Main Menu

When you have switched on and connected your ISOLAN Test Unit to a transceiver or to the network directly, press any key to display the main menu. The method of connecting to a network or transceiver is described in section 4. The display has only two lines and so scrolls continually to allow you to read all the options. The options available are:

1. Transceiver Tests
2. Packet Generation
3. Round Trip Delay
4. ITU System

You can select any of the options whenever the main menu is displayed, you don't have to wait for a particular number to be on the display before you can select it.

You need to return to the main menu each time you want to carry out a different type of test, you cannot skip directly from say transceiver testing to packet generation without returning to the main menu. At any time you can stop what you are doing and return to the main menu by repeatedly pressing the EXIT button, this is useful if you get lost when you use a sub-menu. If you press EXIT while the main menu is displayed, you will return to the top of the main menu which reads:

```
** ITU MAIN MENU **
1.TRANSCEIVER TESTS
```

Should you ever press a wrong key when a menu is displayed the ISOLAN Installation Test Unit displays the acceptable range of keys for that particular part of the program.

3 Operating the ISOLAN Test Unit

Calibration

A twenty turn recessed potentiometer is mounted on the front panel to adjust the calibration of the unit. You will need a small electrical screwdriver or trimming tool to adjust this control. Do not adjust the potentiometer except as part of the calibration process described in Chapter 7 of this manual.

Switching Off

When you have finished testing disconnect the ISOLAN Test Unit from the network or transceiver and turn off the POWER switch. Disconnect the mains lead and pack it, along with the AUI cable and the co-ax cable, inside the case.

Safety

Do not, under any circumstances, try to remove the front panel of your ISOLAN Test Unit, there are no user serviceable parts inside.

4

How to Test Transceivers

Introduction

When you connect a DTE to an Ethernet segment, you use a transceiver which, apart from making a physical connection, performs the following functions:

- Transmit
- Receive
- Collision detection
- Jabber protection (if available)
- SQE Heartbeat test (if available and selected)

All of these functions can be tested using the ISOLAN Test Unit. You can perform all the tests with the transceiver disconnected from the network, perhaps for test before installation, or you can do most of the tests on a transceiver already connected to your network. On-network tests are particularly useful if the transceiver is installed in an inaccessible position and you only have access to the AUI cable connected to it.

Note that you cannot directly test an "on-board" transceiver, as included with the ISOLAN IBM PC Controller card for example, however you can test the correct operation of the transmit and receive paths using the Packet Generation Tests described in Section 5.

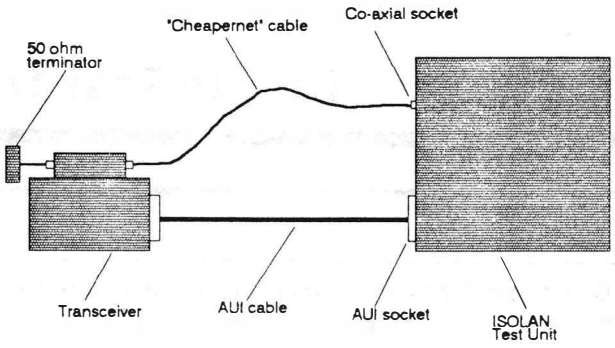
Connecting a Transceiver

Switch the ISOLAN Test Unit on and then connect the blue AUI cable to the unit. Plug the cable into the 15 way D-type socket and tighten the two locking screws to "finger tightness" only. All connections to transceivers or to a network are made via the cable supplied with the unit; The cable supplied with the unit is intended to be an easily replaceable item for maintenance purposes and increases the life of the fixed panel mounted connector, therefore it is not advisable to connect other AUI cables directly into the ISOLAN Test Unit.

To perform a test on a transceiver before installation you need to connect it to the ISOLAN Test Unit using the blue AUI cable, the BNC connector and the black co-axial ("Cheapernet") cable supplied. The configuration is shown schematically in Figure 4-1 (overleaf).

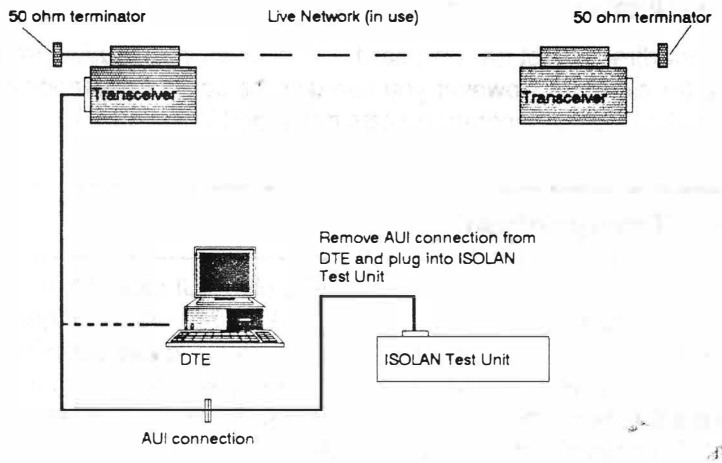
First connect the transceiver to the AUI cable and engage the slidelock to ensure a good connection. Remove the protective cover from the TAP, and fit the TAP to the transceiver. Remove the protective red cap from the unterminated socket on the BNC connector, and connect the black co-axial cable between the BNC connector on the TAP and the BNC type socket on the ISOLAN Test Unit marked CO-AX.

4 How to Test Transceivers



4-1 Off Network Testing

If you want to test a transceiver which is already installed you need access to the AUI cable connected to the transceiver you want to test, plug this AUI cable into the 1.5m blue AUI cable connected to your unit. The configuration is shown in Figure 4-2. In this way you can also gain access to the network to perform the packet generation tests described in Section 5. The ISOLAN Test Unit does not have an on-board transceiver so cannot be used to test a thin Ethernet (Cheapernet) segment unless you use a separate transceiver.



4-2 On Net Testing

Select Ethernet V1 or IEEE 802.3, using the switch on the front panel. The switch selects a different type of signal for the AUI interface to the transceiver, it also selects a different set of test parameters. For transceivers designed to Ethernet (also known as ESPEC1, Bluebook or DIX), switch to the Ethernet V1 position. For transceivers which conform to IEEE 802.3 or ESPEC2 , switch to the IEEE 802.3 position. If the selection switch is in the wrong position, the ISOLAN Test Unit will appear to function normally but the results of some tests might be wrong. Note that all ISOLAN transceivers should be tested with the switch in the IEEE 802.3 position. Other transceivers should have the standard to which they are designed printed on the transceiver body. If you are unsure of the standard, perhaps because the transceiver itself is inaccessible, do a bit loss test (see later in this section) with the switch in each of it's two positions. The setting which gives the *least* bit loss is probably the correct setting for your transceiver.

Starting to Test

Press 1 when the main menu is displayed to select transceiver testing. A "sub-menu" is displayed which scrolls in the same way as the main menu. The options are:

1. Full off net test
2. Full on net test
3. Bit loss
4. Off-net test
5. SQE test
6. Jabber protection
7. Loopback test
8. SQE Test on/off ?

If you have selected testing of IEEE 802.3 transceivers but the particular transceivers do not support SQE Test or SQE is not enabled, select option 8 on the menu and set SQE TEST to OFF. In this way transceivers which do not support SQE will not be recorded as failing the SQE test (unless of course SQE is detected when it should not be present). One of the following messages is displayed depending on the setting you select:

```
>>SQE TEST ON <<<
<<<SQE TEST OFF>>>
```

Then select the test you require by pressing the relevant key on the numeric keypad. At any time you can return to the ISOLAN Test Unit main menu by pressing the EXIT key, several times if necessary.

Error Messages

When a test cycle starts, several tests are automatically carried out to check that the transceiver is attached to a properly terminated segment and that dribble bits are not being transmitted or received. These tests may cause one of three error messages to appear. If you do *not* see one of these messages appear on the LCD display, then the unit will continue to test your transceiver. The messages are:

1. COLLISION ACTIVE CHECK TERMINATOR.

This means that 5 consecutive transmissions have occurred and on each transmission a collision occurred. It is quite likely that the cable is terminated with only one 50 ohm terminator instead of two, one at either end of the segment. Check the terminators before pressing a key. The test continues automatically after the next key depression.

2. COLLISION ERROR ATTEMPTING TO RESET.

This can occur when the transceiver is powered up with the cable connection open circuit, i.e. there is no tap fitted or both terminators are missing. The program assumes that the transceiver has jabber protected and will attempt to power cycle the transceiver in an effort to reset it. If after power cycling the transceiver is still generating collision then the following

report will appear: COLLISION ACTIVE FATAL ERROR. You will have to remove the faulty transceiver or clear the fault before continuing the test. If you remove the collision source, the test will continue automatically.

3. WARNING.....(T01) DRIBBLE BITS PRESENT.

This means that the the transceiver is adding bits to the packet, this can occur on transmit, receive or both and is usually an indication of a problem associated with the AUI interface. The ISOLAN Test Unit will only detect dribble bits on transmission. Press any key to continue with the test.

Simple Pass/Fail Testing

Often you will simply want to test a transceiver and know whether it passes all tests or fails. The ISOLAN Test Unit can do this job quickly and easily. From the main menu select numbers 1 or 2 depending on whether you want on-network or off-network testing. At other times you may want to perform only one specific test or get more details about the reasons for a failure, in this case select the individual tests you require. You can find some information on pinpointing specific transceiver faults in the Transceiver Trouble Shooting Guide in Appendix C.

Testing Off the Network

Select 1 for a full test of a transceiver which is not connected to a network. A full test sequence is carried out which includes an off-net test which will seriously disrupt network operation if the cable output (co-axial) from the ISOLAN Test Unit is connected to an on-line network. If a transceiver is attached to an on-line network but the co-axial cable is not connected, there is no danger of disrupting other users if you run an off-net test. If the selection switch is in the IEEE 802.3 position the following tests are carried out in sequence:

3 Bit loss

4 Off-net test

5 SQE test

6 Jabber protection test

7 Loopback test

If you select Ethernet V1 transceiver testing, the SQE test and Jabber protection test will not be carried out.

When the tests are complete the display will indicate whether the transceiver has passed or failed. In case of failure the number or numbers of the failed tests are displayed. Press EXIT to return to the transceiver test menu. You can select the failed tests individually to find out more about the nature of the failure. For a description of the individual tests, see the rest of this section. You can find some more information on pinpointing specific transceiver faults in the Transceiver Trouble Shooting Guide in Appendix C.

Testing On the Network

Select 2 for a full on-net test sequence. This series of tests is exactly the same as for off-net testing except that the off-net test is omitted. The following tests are carried out:

3 Bit loss

5 SQE test

6 Jabber protection test

7 Loopback test

When the tests are complete the display will indicate whether the transceiver has passed or failed. In case of failure the number or numbers of the failed tests are displayed. Press EXIT to return to the transceiver test menu. You can select the failed tests individually to find out more about the nature of the failure. For a description of the individual tests see the rest of this section. You can find some more information on pinpointing specific transceiver faults in the Transceiver Trouble Shooting Guide in Appendix C.

Bit Loss

Press 3 to determine the number of bits lost on both the transmission and reception paths of the transceiver. Bit Loss occurs in a transceiver as a result of delays in allowing a packet to be re-transmitted; for example the transceiver needs to receive a few bits of a packet before it can recognise that a valid packet is present. To determine bit loss a packet of known length and edge characteristics is transmitted and edge detected on reception. The number of edges received is subtracted from the number of edges transmitted. The test is repeated ten times and the result displayed, providing it is within the specification, as the average number of bits lost. If the test is failed you will see a message explaining the nature of the fault. Press EXIT to return to the transceiver test menu.

Possible failure messages are:

T06 Loopback Failure Indicates a Tx or Rx path transceiver failure.

T07 Excessive Bit Loss Bit loss greater than 8 bits.

Off-Net Tests

Off-Net testing requires access to the co-axial port of the transceiver. To perform this test you must connect the short length of co-axial cable from the BNC tap into the co-ax socket on the front panel of the unit. This test must not be run with a transceiver connected to a network; the network may be corrupted and other users will be disrupted if you do. The test measures the following parameters:

- That the idle signal (during no packet transmission) from the transceiver produces less than 25 mV on the coaxial port.
- That, when the transceiver is transmitting, the average DC component of the signal falls within the allowable range on the co-axial port (between -900mV and -1.200V).
- That the collision oscillator is turned on when the required minimum DC voltage to generate a collision (-1.650V), is applied at the co-axial port.

- That the maximum allowable voltage which should not turn on the collision oscillator (-1.418V), can be applied without turning the oscillator on.
- That the frequency of the collision oscillator is within specification (8.50MHz to 11.50MHz), the resulting frequency value is displayed.

At the end of the test you will see a display like this:

```
Collision Detected
FREQ (MHz) = 10.083
```

Press any key and you will see the Pass or Fail message displayed, you can then press EXIT to return to the transceiver test menu.

Possible failure messages are:

T08 Collision Inactive	Collision Oscillator should be on and is off.
T09 Collision Active	Collision Oscillator should be off and is on.
T10 Idle Error	Transceiver ooutput stage on i.e. it is applying current to the co-ax during the idle period.
T11 Tx Output Low	TX output current too low on the co-ax.
T12 Tx Output High	TX output current too high on the co-ax.

SQE (Heartbeat) Test

SQE Test is a function performed by a transceiver which exercises the collision pair after a packet has been sent to check the integrity of the connections. This function is only implemented for transceivers designed to conform to IEEE 802.3 or ESPEC2: if the switch on the front panel is in the Ethernet V1 position the test will not be performed as part of the full test sequences; if you select the SQE test individually you get a message on the display stating 'Ethernet selected - invalid key entry'. So long as you have selected IEEE 802.3, press 5 for the SQE test; depending on how you have set the software switch (SQE on/off) the ISOLAN Test Unit tests for the presence or absence of SQE test. If SQE is detected when it should be present, the unit transmits 20 packets and measures the time between the end of the packet and the start of SQE, and also the time between the start of SQE and the end of SQE. One of the reasons for the failure of this test may be that SQE is not selected on the transceiver under test. If the test is passed the time values are displayed, otherwise a FAIL message appears. Press EXIT to return to the transceiver test menu.

Possible failure messages are:

T13 No SQE Test Activity	SQE TEST function is not being generated by the transceiver.
T21 Delay + Length Error	SQE TEST Delay + Length is too long.
T22 SQE Test Present	SQE is detected for a non-SQE transceiver

Jabber

This test is only performed for transceivers conforming to IEEE 802.3. The Jabber protection function inhibits a transceiver from sending excessively long packets and monopolising the network. This function is tested by transmitting an illegally long packet and monitoring the response. Press 6 to start the test. A timer starts at the beginning of the transmission and stops when collision activity, indicating the triggering of the jabber function, is received from the transceiver. The time is checked against the specification and displayed if the unit is within specification. The test also determines the collision frequency and whether the transceiver automatically resets itself or requires power cycling to do so. When the test is complete you will see a display like this:

```
Collision Detected
FREQ (MHz) = 10.019
```

Press any key and you will see a Pass or Fail message on the display along with a value for the Jabber Protection delay time; press any key to find out whether the transceiver resets itself automatically or requires power cycling. Press EXIT to return to the transceiver test menu.

Possible failure messages are:

T14 Collision Inactive	Transceiver will not Jabber Protect
T15 Jabber Delay >150mS	Jabber delay too long
T16 Jabber Delay <20mS	Jabber delay too short
T17 Collision Error	Collision oscillator is stuck on.
T18 Collision Low	Collision Frequency is too low
T19 Collision High	Collision Frequency is too high
T23 Remove Transceiver	Unable to power reset the transceiver

Loopback

Press 7 to perform a loopback test. The ISOLAN Test Unit transmits a special 32 byte packet to itself, on receiving this packet the CRC is checked along with the data framing of the packet. If any error occurs, a data match test is carried out on the packet contents; the result of the data matching test enables you to see if any corruption of the packet is only at the end of the packet or throughout. Press EXIT to return to the transceiver test menu.

Possible failure messages are:

T03 Data Mismatch Error	Packet received but data corrupted and CRC
T04 CRC Error	CRC Error on loopback packet.
T05 Alignment error	Framing error extra bits are present.

4 How to Test Transceivers

Testing Fibre Optic Transceivers

The ISOLAN Test Unit can successfully test ISOLAN fibre optic tranceivers (type 1180). However, for fibre optic transceivers (FOT's), there are two special points to note:

- The FOT *must* be connected to a fibre optic cable, which in turn must be connected to an ISOLAN fibre optic unit *which is powered*. Suitable ISOLAN fibre optic units include the repeater (type 1150), the hub (type 1160) or another FOT (type 1180).
- You *cannot* run OFF-NET tests on a FOT. Select the full ON-NET test (number 2 on the transceiver test menu) or individual tests other than the OFF-NET test.

5

How to Generate Traffic on a Network

Introduction

You can generate traffic on the network to which your ISOLAN Test Unit is connected in two ways: you can simply generate some traffic using the default values provided by the equipment or you can define the characteristics of the traffic in some detail.

To generate traffic, go to the main menu and select:

```
2 PACKET GENERATION
```

The Packet Generation menu will scroll on the display and you select the option you want using one of the number keys. The menu options are:

```
*PACKET GENERATION*
1.   Run Normal Test
2.   Run ISO Test
3.   Dest. Address?
4.   Packet Length?
5.   Packet Contents?
6.   Repetition Delay?
7.   View Counters
8.   Reset Counters
enter test number
EXIT = MAIN MENU
```

Normal Test or ISO Test?

You can use the ISOLAN Test Unit to generate network traffic in one of two specific modes. *Normal Test* uses the default packet characteristics, or those you have specified, to generate traffic on the network. You can load a network with up to 80% of it's designed capacity using a single ISOLAN Test Unit; in this way you can assess, for instance, how other network components will behave when the network is heavily used. An 80% loading will be achieved if no other devices are transmitting. If other devices transmit, then the Test Unit will follow the CSMA/CD protocol and not transmit while another device is transmitting on the network. The 80% maximum loading figure may be reduced if the ISOLAN Test Unit cannot transmit every time the software requests transmission.

Alternatively, if you select *ISO Test*, then special ISO test packets are generated which can be "bounced" off an ISOLAN Controller Card or any other equipment which supports the ISO test protocol. Using ISO test allows you to test the transmit and receive paths of an "on-board" transceiver such as that used by the ISOLAN PC Controller Card or other "Cheapernet" devices.

5 How To Generate Traffic on a Network

Traffic Generation

To use the default values, press key 1 for "Run Normal Test". Network traffic is generated with the following characteristics:

Destination address:	the unique address of your ISOLAN Test Unit
Packet length:	64 bytes
Packet contents:	random$_{10}$
Repetition delay:	250ms

Any or all of these parameters can be specifically defined if you want to control the characteristics of the traffic you generate.

When you generate traffic it is possible, but very unlikely, that you will see the following error message:

```
HELP!  HELP!  HELP!
  TOO MUCH TRAFFIC
```

This indicates that your ISOLAN Test Unit has attempted to transmit a packet 512 times but each time has encountered a collision. Check, first of all, that the tap is properly connected to the transceiver and that the network is properly terminated at both ends; an unterminated segment could cause constant collisions. If the terminations are both correct, the message indicates that the network is already saturated with traffic, probably in excess of 95%, and there is no room for you to generate more. Under normal circumstances you will never see this message.

Defining the Characteristics of the Traffic

You can define the following characteristics of the traffic you generate:

- Destination address
- Packet length
- Packet contents
- Repetition delay

Destination address

The default value for destination address is the unique address, allocated at manufacture, of the ISOLAN Test Unit you are using. This is to avoid affecting the performance of any other equipment connected to the network. To change the address select:

```
3 DEST. ADDRESS
```

The display shows:

```
Edit DEST Address ?
 >08004Exxxxxx  <<
```

Where xxxxxx is the portion of the address that is unique to each unit. Press the ENTER key and the display changes to:

```
Edit DEST Address ?
 >???????????  <<
```

Now enter a new Ethernet address; as you press each key the question mark is replaced by the new character. When all twelve characters have been entered the display pauses for two seconds before returning to the Packet Generation menu.

If you start to enter an address and make a mistake, press the exit key and the current address remains active.

To see the address that is currently active, press 3 from the packet generation menu, the current destination address is displayed. Press EXIT to return to the Packet Generation menu. Note that if you use the default address, (i.e. that of the transmitting unit), the packets will *not* be received by the unit. The ISOLAN Test Unit can only transmit or receive - not both at the same time, except when running the loopback test which uses a special short packet..

Changing the Characteristics of the Packets

You can change the characteristics of the packets you generate, you can alter the packet length and the actual data contained within each packet. The packet length is the total length of the packet including the CRC bytes at the end of the packet.

To edit the packet length, press key 4 while the Packet Generation menu is displayed. The display changes to:

```
Edit Packet Length
    0064 Bytes
```

As with the destination address, you can choose to leave the value at the default by pressing EXIT or you may decide to change it by pressing ENTER. When you press ENTER the display looks like this:

```
Edit Packet Length
    ???? Bytes
```

Now enter the packet length you want by pressing four keys, you must enter a value between 0064 and 1518 bytes (note that all leading zeros must be entered). If you enter a value outside these limits the ISOLAN Test Unit will not accept the value and displays the error message:

```
PACKET LENGTH ERROR
max=1518      min=64
```

If you then decide that you do not want to change the value after all, press EXIT and the original value is used. At any time you can find out what value is current by pressing 4 when the Packet Generation menu is displayed, you see the current value on the display, to change it press ENTER and to retain it press EXIT.

Changing the Contents of the Packets

Change the contents of the packets by pressing 5 when the Packet Generation menu is displayed. The display looks like this:

```
Packet DATA Contents
1. Random Fixed
```

The default packet data contents are random fixed, this means the actual contents are random but remain the same throughout each test. If you press ENTER, the following menu is displayed, it scrolls slowly as usual:

```
Edit DATA Contents?
1. Random Fixed
2. DATA AA55 Hex
3. DATA 00FF Hex
4. DATA AAAA Hex
5. DATA 5A5A Hex
Enter Number or EXIT
```

Press a key between 1 and 5 to select the data pattern you want, to retain the current value press EXIT. Again to view the current value, press 5 while the Packet Generation menu is displayed, the current value is shown on the display, return to the menu by pressing EXIT.

Changing the Repetition Delay

You alter the delay between packets by altering the repeat delay. Press 6 when the Packet Generation menu is displayed. The display changes to:

```
Edit Repeat Delay?
  0250 mS (1=min)
```

The default value is a delay of 250 milliseconds, that is four packets per second. Press ENTER and you can enter a value in the range 0001 and 9999 milliseconds, this range represents rates of transmission from 1000 per second (delay 0001) to one every 10 seconds (delay 9999). Note that it is possible to enter a value of 0000, this is interpreted by the ISOLAN Test Unit as a delay of 0001 millisecond.

If you have specified a packet length above 1000 bytes, the repeat delay cannot realistically be 1ms; therefore if the packet length is greater than 1000 bytes and the repeat delay is set to 1mS, the ISOLAN Test Unit automatically resets the repeat delay to 2 mS.

Using the Counters

Options 7 and 8 on the Packet Generation menu allow you to view and reset the counters which monitor the input and output from your ISOLAN Test Unit. It is important to realise that the ISOLAN Test Unit *only* collects data from packets that originate from or are addressed to the unit itself; the unit does not collect statistics relating to the other users on your network. Press 7 to view the counters, the display looks like this:

```
SYSTEM  ERROR TABLE
ENTER NUMBER OR EXIT
```

You then enter a number between 1 and D, on the hexadecimal keypad, to view the counter you want. Note that on the hexadecimal keypad 10 is represented by A, 11 by B, 12 by C and 13 by D; so to enter 12, press C, not 1 followed by 2. Before you use the counters, it is a good idea to ensure that they are all reset to zero. To achieve this, press 8 when you have the Packet Generation menu displayed, this sets all the counters and the clock to zero. When you do this the display shows:

```
All Log Counters
Have Been Reset
```

When this message has been shown for three seconds the unit automatically switches back to the Packet Generation menu.

The counter options available are:

1 DEFERRED TX	This counter shows the number of times that the ISOLAN Test Unit has been requested to transmit a packet but has been unable to do so owing to the media being busy.
2 TX LATE COLLISION	Shows the number of late collisions detected by the ISOLAN Test Unit whilst attempting to transmit a packet. A late collision is defined as a collision which takes place outside the collision window; after this period has elapsed the unit will not attempt to back off or retry, it continues to transmit until the complete packet has been sent.
3 TX LOSS OF CARRIER	Displays the total number of occasions when the receive carrier detection signal goes false during transmission. This fault could be caused by a faulty AUI cable or transceiver.
4 COLLISIONS	Shows the total number of collisions which occurred while the ISOLAN Test Unit was attempting to transmit. If a collision occurs during packet generation the unit does not retry automatically; this function of the controller chip has been disabled to enable each individual collision to be counted. Note that the collision counter only counts collisions which take place while the ISOLAN Test Unit is attempting to transmit.

5 RX BUFFER ERROR	An RX Buffer error occurs each time a packet is received which is greater than 1024 bytes long and the next receive buffer is not available. This means that the controller chip is unable to store the complete incoming packet. This condition may occur under heavy network loading conditions, it indicates that you are approaching the performance limits of the ISOLAN Test Unit. Note that an RX OVERFLOW error may also be present. The receive buffers are held internally within the ISOLAN Test Unit, see Section 7, for more details.
6 RX FRAMING ERROR	Displays the number of packets received which do not contain an exact multiple of eight bits. This error suggests that somewhere on the network a device is adding bits to the end of a transmission or that the transmission is truncated.
7 RX OVERFLOW ERROR	Indicates that the controller chip has lost all or part of the incoming packet as it is unable to store the packet contents in memory. See also RX BUFFER ERROR.
8 CRC ERROR	Displays the number of packets addressed to the ISOLAN Test Unit which were corrupted at some point in the packet after the destination address.
9 BABL ERROR	A BABL error occurs when the ISOLAN Test Unit is asked to send an illegally long packet, one of more than 1518 bytes. As the unit is currently set up it is not possible to generate an illegally long packet during Packet Generation. However some BABL errors may have occurred if you have run the jabber protection test on a transceiver and have not reset the counters.
10 MISS ERROR	This counter displays the number of times that no receive buffers are available for an incoming packet. It suggests that all buffers are in use and have not been handed back to the controller chip, if this error occurs it is probably because you are sending too much traffic addressed to the ISOLAN Test Unit.
11 TRANSMISSIONS	Counts the number of transmissions completed since the start of a test. This counter handles up to 16 million transmissions.
12 RECEPTIONS	Counts the number of packets received since the start of a test. This counter also handles up to 16 million receptions.

13 ELAPSED TEST TIME	The time since the start of packet generation is displayed. Once you stop generating packets, the clock stops to show you how long you ran the test. The display will handle up to 99hrs 59 mins, after that time the display starts again from zero.

Each of the counters can show up to 65535 occurrences except for packets transmitted and received which can show up to 16 million. If any counter goes above these figures they simply restart from zero, no warning is given that this has happened.

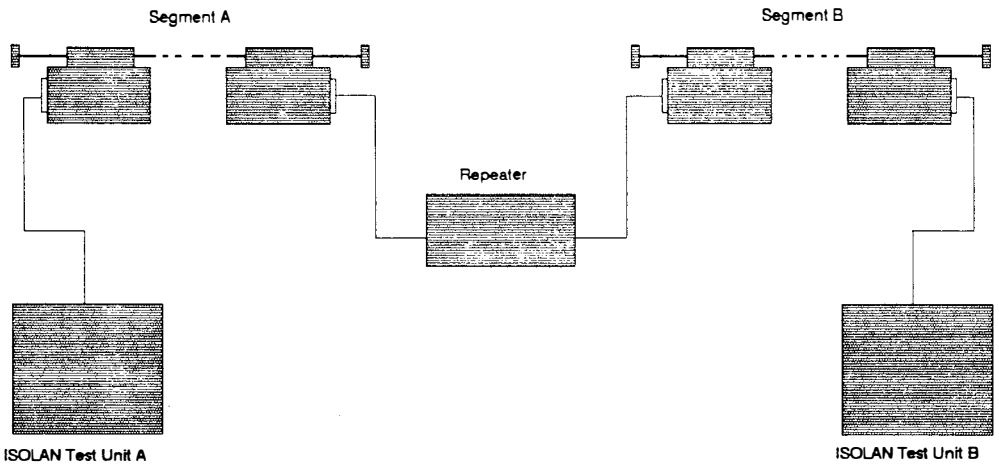
Testing Your Network Installation

When you have an installed network or segment with transceivers and taps fitted in several places, you may test the installation to prove that each transceiver and associated drop cable is capable of transmitting and receiving data. In addition you may wish to check that other components within the system such as a Two Port or Multi Port Repeater, Fanout, Fibre Optic Hub or Fibre optic transceiver can pass data successfully.

For a comprehensive test of your network you should use two ISOLAN Installation Test Units, although most functions can be successfully tested with a single unit and an installed ISOLAN PC Controller Card, ISOLAN Gateway or a product which supports ISO test.

Network testing with two ISOLAN Test Units

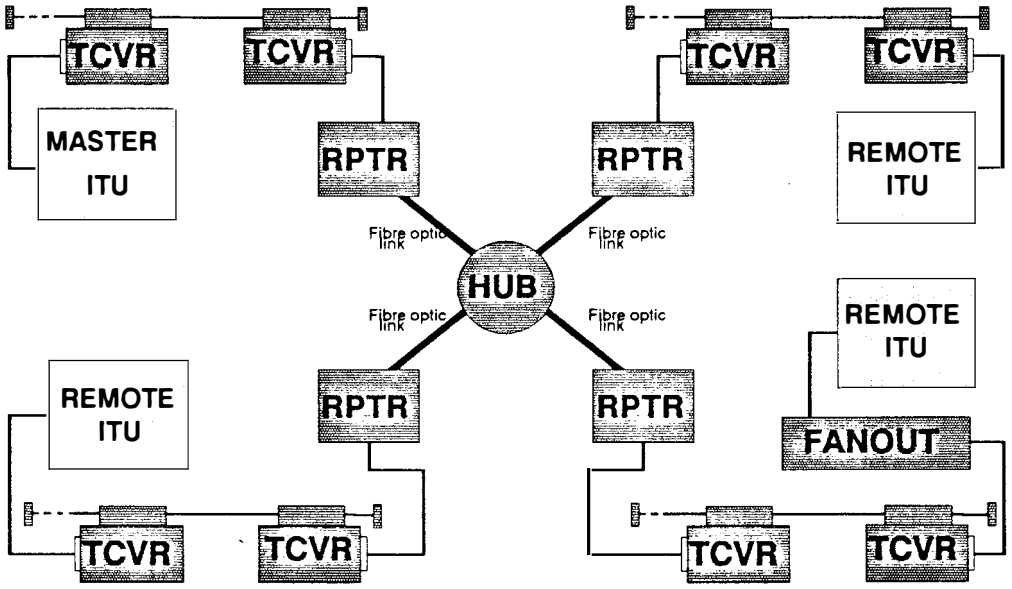
If you have two ISOLAN Test Units, you can set up a comprehensive test of your network. You can set up a test where one unit transmits to the other, monitoring transmissions at one end and receptions at the other, or you can set up the units such that while Unit A is transmitting to Unit B, Unit B is transmitting to Unit A. All the time when these tests are running you can monitor the traffic and any errors dynamically with the counters. For instance you could set up the configuration shown in Figure 5-1



5-1 Two segments with a repeater

5 How To Generate Traffic on a Network

You can easily test quite complex network topologies, for instance the network shown in Figure 5-2.



TCVR = Transceiver (eg Type 1170)

HUB = Fibre Optic Hub (Type 1160)

ITU = ISOLAN Test Unit (Type 1105)

RPTR = Fibre Optic Repeater (Type 1150)

FANOUT = Fanout Unit (Type 1130)

5-2 Complex network configuration

The simplest test is to set up one unit to transmit to the other: to do this, follow this procedure:

1 **Find out the Ethernet address of the destination unit. Do this by selecting the ITU System menu when the Main menu is displayed, and press 1, the Ethernet address is displayed. Take a note of the address and press EXIT to return to the Main menu.**

2 **At the destination (receiver) unit, select the Packet Generation Menu and reset the counters by pressing 8. Leave the unit with the Packet Generation menu displayed.**

3 **Go to the source (transmission) unit and select Packet Generation. Enter the address of the remote unit as the destination address. Enter the Repeat Delay, Packet length and Packet Contents if you want to modify them from the default. Reset the counters.**

4 **Start the test by selecting 1 for Run Normal Test at the source unit. When you want to stop transmission press EXIT. The counters can be viewed, in the normal way, during the test as well as afterwards on either or both of the ISOLAN Test Units.**

As an alternative you could follow the same procedure but select an ISO test. In this case the receiving unit exchanges the source and destination addresses, modifies the LLC header and sends each packet back to the transmitting unit. Using this method you generate two-way traffic.

Another way to generate two-way traffic is to set up a normal test as described above but in addition set up Unit B to transmit to Unit A at the same time as Unit A is transmitting to Unit B. Follow the procedure above except to set up the remote unit, in the same way as the first unit, to transmit normal test packets. Collisions may be produced fairly easily using this technique.

When you have finished testing, and noted any readings from the counters that you want, press EXIT several times on each ISOLAN Test Unit to return to the main menus.

Network testing with one ISOLAN Test Unit

If you have only one ISOLAN Test Unit it is possible to "bounce" ISO test packets off of an Isolan Controller Card, ISOLAN gateway or other equipment which supports the ISO test protocol. In this way you can test both transmit and receive paths. By choosing the Ethernet address of a unit on the "other side" of a repeater, fanout or fibre optic hub, you can check the integrity of the path through the device.

When bouncing packets off ISOLAN controller cards or gateways, it is recommended that you do not transmit more than 40 packets per second: that is a repeat delay of 25ms. Transmitting at this rate will have very little effect on the performance of the destination controller card or gateway.

Firstly find out the Ethernet address of the device which supports ISO testing and enter that address as the Destination Address for packet generation. If you are using an ISOLAN PC Controller Card the Ethernet address is:

```
08-00-4E-XX-XX-XX
```

where XX-XX-XX is the portion of the address that is unique to each unit. These three hexadecimal digits can be read off the card (label on EPROM: position IC11). Alternatively, when the PC is "booted" the Ethernet address is displayed on the screen as the card is initialised.

You should then alter the packet length, packet contents and repeat delay to the values you want (or do nothing to use the unit's default values). Make sure that the counters are reset and then press 2 when the Packet Generation menu is displayed to select Run ISO Test. The ISOLAN Test Unit generates packets, to your chosen specification, until you press EXIT to stop the test. Note that when you are "bouncing" packets off an ISOLAN card or ISOLAN gateway, it is recommended that you set a Repeat Delay of greater than 25mS.

Press EXIT several times to make sure you are back at the main menu.

6
How to Measure Round Trip Delay

Introduction

The ISOLAN Installation Test Unit enables you to measure the collision fragment round trip delay time on your network. Round Trip Delay is measured from one extreme end of a network configuration to the other: or in other words over the maximum possible distance of cable or fibre.

The delay time will help you to decide if a particular network configuration is workable and whether you have exceeded the maximum length network topology. A collision fragment should be detected by all DTE's within 511 bit times after the Start Frame Delimiter (the Start Frame Delimiter terminates the preamble pattern and signifies the start of the Destination Address field).

Test Method

Connect the test unit, via a transceiver, to the network at one extreme end of the path you wish to study. At the other end of the network you should remove the terminator from the network segment, note you should *only* remove a terminator when the network is not in use. Press 3 when the main menu is displayed to select Round Trip Delay. The Display shows the following rotating message:

```
ROUND TRIP DELAY: Press 1 for Instructions or 3 to run
                  test.........
```

On the second line it will say;

```
EXIT = Main Menu
```

If you press 3 the test will be carried out automatically with no further intervention from the test unit itself. If you press 1 two instructions are listed:

```
1.Ensure that there is no traffic on the
                  network.........
```

Press any key and the second instruction will appear on the display:

```
2.Remove a terminator from the remote end of the
                  network.........
```

If both of these things have been done you can press any key apart from exit and the ISOLAN TEST UNIT will send out a special test packet. The packet will propagate through the network and generate a collision on the unterminated segment. This collision will propagate back through the network to the transmitting ISOLAN Test Unit. The unit measures the time taken from when the transmission started to when collision activity was detected. The result is displayed in the following format:

```
ROUND TRIP DELAY =  nnn Bits
     Press EXIT to QUIT
```

6 How to Measure Round Trip Delay

The value nnn represents the time, measured in bits (1 bit = 100nS), from the start of transmission to when the collision, which occurs at the far end of the network, propagates back to the ISOLAN Test Unit. No test is made to check whether the value is within the specification or not. If you see an error message displayed like this:

```
Check Configuration
```

it indicates that the unit has not detected the collision expected from an unterminated network; it is likely that you have not removed the terminator from the other end of the network. If you press EXIT you will return to the main menu.

Theoretical Round Trip Delay

Network round trip delay is contributed to your network by the components which comprise the network; to determine what round trip delay time you should expect for your network configuration follow this procedure;

1 **Construct a diagram of your network or the section of your network that you wish to test. This diagram should show all the devices resident on the network and all cable lengths involved.**

2 **Trace the network from the ISOLAN Test Unit (including its transceiver and AUI cable) through all repeaters, transceivers etc. towards the unterminated segment end. Each time the trace goes through a device, note what type of port the trace enters and exits. Also note all lengths and types of cable in the trace.**

3 **Once you have itemised the trace, look in the round trip delay tables which follow to find a round trip delay time for each item in your list.**

4 **Add all the individual values together to give you a calculated total round trip delay time.**

The figure you calculate must be treated as a rough guide only to the sort of value you will obtain when a round trip delay test is performed using the ISOLAN Test Unit. The calculated and actual values should be within 10% of one another. Note that neither the calculated or measured round trip delay times should be used as evidence for deciding to extend your network, these data are for guidance only. If a network is to be extended, **maximum** round trip delay times **must** be used otherwise severe network operating difficulties could occur. Maximum round trip delay times are published in the IEEE 802.3 standard.

Round Trip Delay Tables

These tables give typical round trip delay data which relate only to ISOLAN network components, devices from other manufacturers may have significantly different round trip delay figures.

NETWORK MEDIA

MEDIUM	**VALUE (bits/25 metres)**
AUI	2.57
Cheapernet	2.74 (minimum 3bits)
Ethernet	2.33 (minimum 3bits)
Fibre	2.56

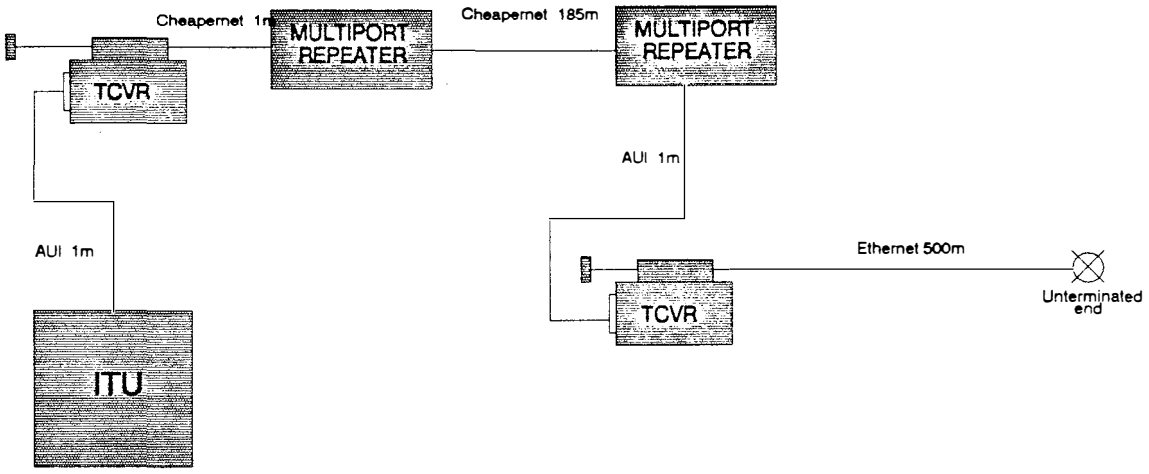
NETWORK DEVICES

DEVICE	IN	OUT	VALUE (bits)
Transceiver	AUI	network	6
	network	AUI	5
Types 1100/11, 1112/13, 1170/71			
Fibre Optic Transceiver	AUI	fibre	4
	fibre	AUI	5.5
Type 1180			
SST	AUI	network	6
	network	AUI	6.5
Type 1114			
Two port repeater	AUI	AUI	10.5
Type 1120			
Fibre optic two port repeater	fibre	AUI	16
	AUI	fibre	14.5
Type 1150			
Fibre optic hub	AUI	fibre	8.5
	fibre	AUI	9
	fibre	fibre	9
	AUI	AUI	6.5
Type 1160			
Cheapernet Multiport repeater	AUI	cheapernet	18
	cheapernet	AUI	14.3
	cheapernet	cheapernet	22.8
	AUI	AUI	10.5
Type 1125			
Fibre optic multiport repeater	AUI	fibre	12
	fibre	AUI	10.4
	fibre	fibre	12.7
	AUI	AUI	10.5
Type 1126			

6 How to measure Round Trip delay

Worked examples

Example 1

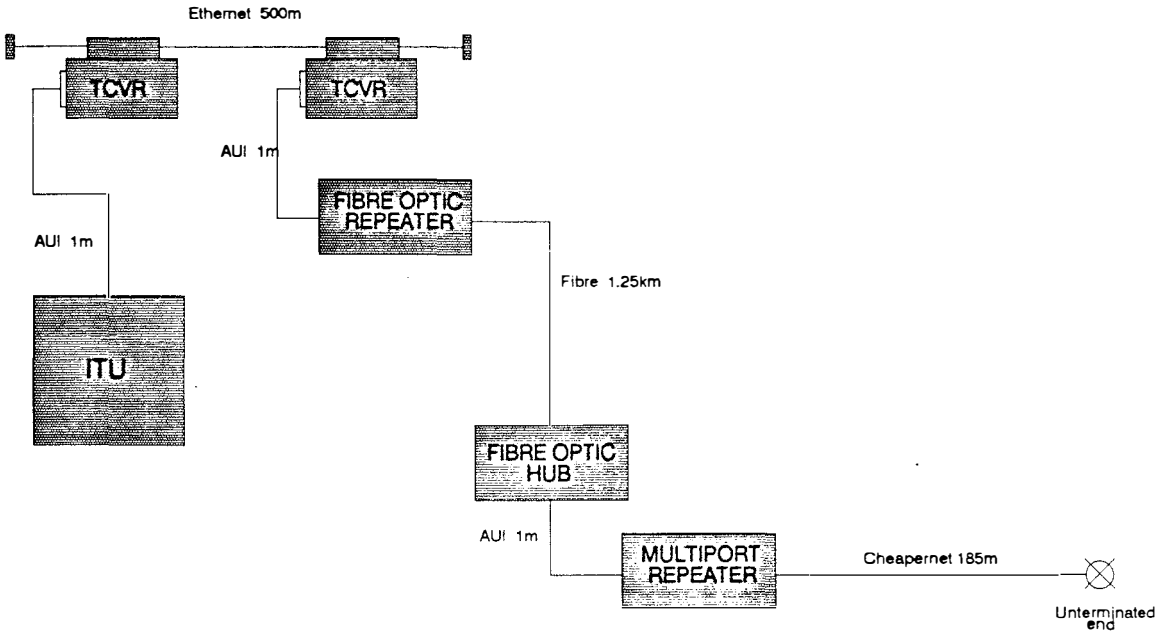


Itemised trace list

DEVICE	IN	OUT	VALUE (bits)
AUI - 1m	-	-	0.1
transceiver	AUI	network	6.0
cheapernet - 1m	-	-	3.0 (minimum value)
multiport repeater	network	network	22.8
cheapernet - 185m	-	-	20.3
multiport repeater	network	AUI	14.3
AUI - 1m	-	-	0.1
transceiver	AUI	network	6.0
ethernet - 500m	-	-	46.6
		TOTAL	**119**

This network has been set up and the round trip delay measured using an ISOLAN Test Unit. The measured value was 111 bits giving an error on the calculated figure of +6.7%

Example 2



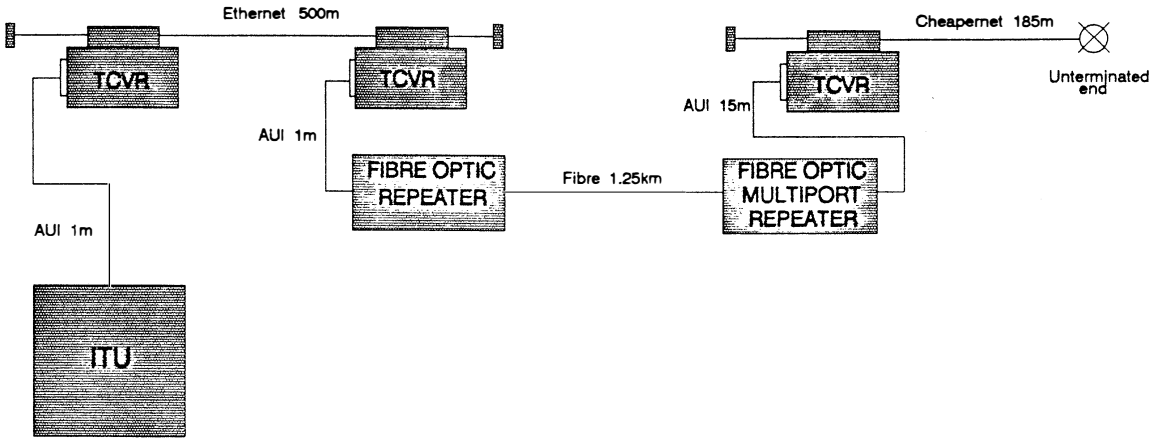
Itemised trace list

DEVICE	IN	OUT	VALUE (bits)
AUI - 1m	-	-	0.1
transceiver	AUI	network	6.0
ethernet - 500m	-	-	46.6
transceiver	network	AUI	5.0
AUI - 1m	-	-	0.1
fibre optic repeater	AUI	fibre	14.5
fibre - 1.25km	-	-	128.0
fibre optic hub	fibre	AUI	9.0
AUI - 1m	-	-	0.1
multiport repeater	AUI	network	18.0
cheapernet - 185m	-	-	20.3
		TOTAL	**247.7**

This network has been set up and the round trip delay measured using an ISOLAN Test Unit. The measured value was 230 bits giving an error on the calculated figure of +7.7%

6 How to measure Round Trip delay

Example 3



Itemised trace list

DEVICE	IN	OUT	VALUE (bits)
AUI - 1m	-	-	0.1
transceiver	AUI	network	6.0
ethernet - 500m	-	-	46.6
transceiver	network	AUI	5.0
AUI - 1m	-	-	0.1
Fibre optic repeater	AUI	fibre	14.5
fibre - 1.25km	-	-	128.0
fibre optic multiport repeater	fibre	AUI	10.4
AUI - 15m	-	-	1.5
transceiver	AUI	network	6.0
cheapernet - 185m	-	-	20.3
		TOTAL	**238.5**

The value of round trip delay found by measuring this network with an ISOLAN Test Unit was found to be 230 bits, thus giving an error on the calculated figure of +3.6%.

7

Using the ISOLAN Test Unit System Menu

Introduction

Press 4 when the main menu is displayed to select the ISOLAN Test Unit System Menu. The following is displayed:

```
*****ITU SYSTEM*****
1. Display Address
2. Hex Monitor.
3. Software Issue
4. Receive Buffers
5. Calibration
ENTER NUMBER OR EXIT
```

Display Address

Press 1 to see the Ethernet address of your unit on the display. You will need to know this address if you want to transmit packets from another ISOLAN Test Unit to this one in order to test your network; there are details of how to do this in Section 5 of this manual.

Hex Monitor

The Hex Monitor allows you to examine the contents of the memory of your ISOLAN Test Unit. Some details of how you could use this facility are given in Appendix D of this manual.

Software Issue

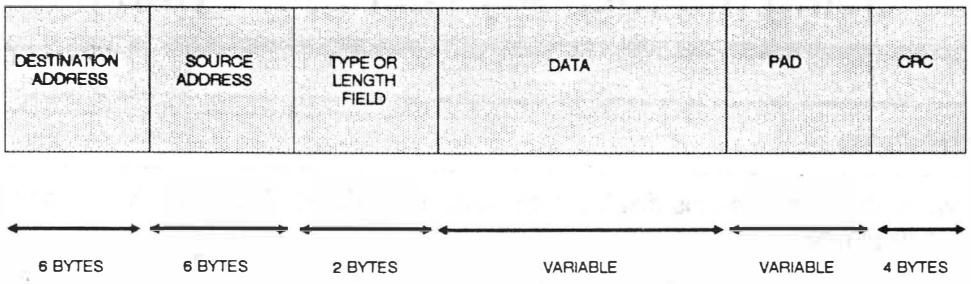
Press 3 to see the version number of the software installed in your ISOLAN Test Unit. You may need to quote the software version number if you have a problem with your unit and need to contact Technical Support personnel or your supplier.

Receive Buffers

Your ISOLAN Test Unit has eight Receive Buffers, these store incoming packets allowing you to view the contents of the Unit's memory. Press 4 to view the Receive Buffers. You will be prompted to enter a number between one and eight to choose which Receive Buffer you want to inspect. For instance to see the contents of buffer 1, press 1. The display shows the contents of the buffer. Scroll the display, to look at adjacent lines, using the arrow keys.

7 Using the ISOLAN Test Unit System Menu

In order to interpret the contents of a Receive Buffer, see figure 7-1 which shows the structure of a MAC level frame.



7-1 Structure of MAC Level Frame

From Figure 7-1 you can see that the first six bytes stored in the Receive buffer are the destination address, this of course will be the address of your ISOLAN Test Unit. The next six bytes are the source address, allowing you to identify the source of the packet. The rest of the memory contains the data from the packet plus the PAD and CRC.

The PAD field is required if it is necessary to "pad" out the packet to the minimum frame size. The LENGTH field is valid if the frame is an IEEE802.3 frame, recognised by the length field showing less than the maximum frame size; a figure in the length field greater than the maximum frame size is interpreted as a TYPE field as used in "Bluebook MAC" frame definition.

As an example of the use of this facility, you could try the following experiment. Power up the ISOLAN Test Unit and check the receive buffers, they will all be empty. Now do a loopback test on a transceiver (see Section 4 in this manual), that is, send a packet to the transceiver which is immediately returned to the unit. When you now look in receive buffer 1, you will see the following (note that you need to use the down arrow key to scroll the display):

```
4150 08004E0101
4155 A008004E01
415A 01A0000EAA
415F AAAAAAAAAA
4164 AAAAAAAAAA
4169 AAAAAAFA4E
416E 6A63000000
4173 0000000000
4178 0000000000
```

The four digit number at the left of the display represents the memory location. You can see that the first six bytes, starting from memory location 4150, are the Ethernet address of your ISOLAN Test Unit (08 00 4E 01 01 A0), this is followed immediately by the source address, in this case because you have done a loopback test, the address is the same as the destination address. The next two bytes (00 0E) represent the packet length field. This is followed by the packet contents, in this case, all A's. Finally there are the four bytes of the CRC sequence with the rest of the buffer empty.

Calibration

To recalibrate your unit you will need a $3^1/_2$ digit DVM accurate to 1% and a small screwdriver or potentiometer adjuster.

To calibrate your unit press 5 from the System menu, you see the following display:

```
Refer To The Manual
Adjust for -1.650V
```

Then follow this procedure:

1 **Connect the BNC cable to the coaxial socket on the ISOLAN Test Unit**

2 **Connect the TAP to the far end of the BNC cable and fit a 50ohm terminator to the other end of the TAP**

3 **Select the 2.000V range on your Digital Voltmeter (DVM) then connect the negative lead to one of the outer pins on the TAP and the positive lead to the inner conductor of the TAP.**

4 **Adjust the CALIBRATION potentiometer on the front panel of your ISOLAN Test Unit using a small scewdriver or potentiometer adjuster. Adjust until the DVM reads -1.650V**

5 **Press any key on the test unit and you see the following display:**

```
Refer To The Manual
 Check for -1.418V
```

Make sure that the voltage displayed on the DVM is 1.418V plus or minus 8mV

6 **Press EXIT to return to the ISOLAN Test Unit menu**

If you are unable to set the voltage at -1.650V or if the -1.418V reading is outside the tolerance, then return the ISOLAN Test Unit to your distributor for repair.

7 Using the ISOLAN Test Unit System Menu

8
Diagnostics and Configuration

Introduction

Refer to this section if you suspect that something is wrong with your ISOLAN Test Unit, or you want to check the calibration. If, after following the advice given here, your problems remain, then contact the authorised service agent. There are also instructions for changing the fuse in your unit.

First Line Diagnostics

Unit Does Not Power Up

When you power up the unit, the self diagnostic tests should be carried out (you see three "right arrows" appear on the display, one for each successful test) and the LCD display should show the following message for a few seconds before switching to the main menu:

```
BICC DATA NETWORKS
 ISOLAN TEST UNIT
```

If this does not happen check the following:

1 **The mains power lead is plugged in and turned on.**

2 **Mains power ia available at the socket.**

3 **The fuse in your ISOLAN Test Unit is intact.**

4 **The unit is switched on (0 = off, 1 = on)**

5 **The voltage selector is in the correct position for your mains supply.**

6 **The fuse in the mains plug is intact.**

7 **The blue AUI cable and the black co-axial cable are not attached when you attempt to turn on the power.**

If the problem remains after checking all of these, refer to the authorised service agent. Do not attempt to remove the front panel of the unit; there are no user serviceable parts inside.

Changing the Fuse

The fuse is contained in a fuseholder which is part of the IEC type mains lead connector assembly. To remove the fuseholder, firstly disconnect the power lead from the power connector assembly and withdraw the fuseholder. You may need to gently lever the fuseholder from the assembly using a small screwdriver. Push the fuse out of the fuseholder and replace it with a new one and then refit the fuseholder to the power connector assembly.

8 Diagnostics and Configuration

Checking the Calibration

You can check the calibration of your unit and recalibrate if necessary. Press 4 from the main menu to display the ITU System menu and then press 5 to start the calibration procedure. Full details are given in Chapter 7 of this manual

Appendix A

Characteristics of the ISOLAN Test Unit.

Standards

The ISOLAN Test Unit is designed to comply with the following standards:

- IEEE 802.3
- ISO DIS 8802/3
- ECMA 97
- IEC 950
- BS 2011

Electrical

Power inlet:	IEC 320
Fuse protection:	500 mA anti-surge
	(1A anti-surge for 120V operation)
Mains operation:	240V or 120V nominal

Mechanical

Dimensions

- Height:304mm
- Width:164mm
- Length:412mm
- Weight:7.1Kg

Environmental Requirements

The ISOLAN Test Unit is designed to operate within the following ranges of environmental conditions:

- Temperature:0^{o} to 40^{o} C
- Humidity: 10% to 95% rh non-condensing

Appendix B
Fault codes.

When you test a transceiver and the equipment fails a test you may see a fault code which is a "shorthand" way of telling you exactly what the problem is. By relating the fault code to the list below you can determine in more detail what is wrong with a failed transceiver. There is more information on pinpointing faults in your transceivers in the next section (Appendix C).

CODE	PROBLEM
T01 Dribble Bits Present	Can occur before each test.
T02 Packet not received	Loopback failure of transceiver.
T03 Data Mismatch Error	Packet received but data corrupted and CRC
T04 CRC Error	CRC Error on loopback packet.
T05 Alignment error	Framing error extra bits are present.
T06 Loopback Failure	Bit loss, no RX activity.
T07 Excessive Bit Loss	Bit loss greater than 8 bits.
T08 Collision Inactive	Collision Oscillator should be on.(OFFNET TEST)
T09 Collision Active	Collision Oscillator should be off.(OFFNET TEST)
T10 Idle Error	Transceiver output stage on.(OFFNET TEST)
T11 Tx Output Low	TX output current too low (OFFNET TEST)
T12 Tx Output High	TX output current too high (OFFNET TEST)
T13 No SQE Test Activity	SQE Test is not being generated.
T14 Collision Inactive	Transceiver will not Jabber Protect
T15 Jabber Delay > 150mS	Jabber delay too long
T16 Jabber Delay < 20mS	Jabber delay too short
T17 Collision Error	Collision oscillator is stuck on.
T18 Collision Low	Collision Frequency is too low
T19 Collision High	Collision Frequency is too high
T20 Jabber reset early	Jabber protect reset too early
T21 Delay + Length Error	SQE TEST Delay + Length is too long.
T22 SQE Test present	SQE is detected for a non-SQE transceiver
T23 Remove Transceiver	Transceiver has jabber protected and will not reset

B Fault Codes

Appendix C
Transceiver Trouble Shooting Guide.

This section gives recommendations for the interpretation of the results of your transceiver tests and suggestions for additional tests which may pinpoint faults in your transceiver.

If you get ... *Then...*

T01 Dribble bits present

This message appears when the transceiver is adding extra bits to the packet on transmission. This is a fault but does not necessarily obstruct packet transmission. This can be due to excessive "undershoot" or noise on the Tx pair of the AUI cable at the transceiver input, or by testing an Ethernet transceiver on the IEEE 802.3 setting.

Action

1 To confirm that dribble bits are the problem, view the end of packet coaxial waveform on an oscilloscope. Do this by setting up the ISOLAN Test Unit in packet generation mode with a fast repetition rate.

T02 Packet not received

This indicates a Loopback failure of the transceiver

Action

1 Check the AUI lead is plugged properly into the ISOLAN Test Unit and the transceiver.

2 Check that when the test is attempted the following AUI activity indicators are ON: TRANSMIT, RECEIVE and AUI POWER. Check that the COLLISION indicator is OFF (see indicators).

3 Check that the co-axial cable is not shorted

4 Replace the AUI cable

5 Replace the transceiver

T03 Data mismatch Error

If this occurs during a loopback test, something is causing corruption of the packet between the source address and the start of CRC.

Action

1 Attempt test with a different transceiver

2 Attempt test with a different AUI cable

C Transceiver Trouble Shooting Guide

If you get ...	*Then...*
T04 CRC Error	
	A CRC error exists within the packet. This will probably occur along with T03 or T05. *Action* 1 Attempt test with a different transceiver 2 Attempt test with a different AUI cable
T05 Alignment Error	This registers that the incoming packet has more bits than the transmitted packet. This is nearly always caused by dribble bits (see T01). *Action* 1 Attempt test with a different transceiver 2 Attempt test with a different AUI cable
T06 Loopback Failure	
	This can occur during a bit loss test. *Action* 1 Check the AUI lead is plugged properly into the ITU and the transceiver. 2 Check that when the test is attempted the following AUI activity indicators are ON: TRANSMIT, RECEIVE and AUI POWER. Check that COLLISION is OFF (see indicators). 3 Attempt a LOOPBACK test to confirm AUI integrity 4 Attempt test with a different AUI cable 5 Attempt test with a different transceiver
T07 Excessive bit loss	
	This indicates a bit loss of more than 8 bits *Action* 1 Check that the Ethernet V1/802.3 switch is in the correct position 2 Attempt a LOOPBACK test to confirm AUI integrity 3 Check the coaxial cable is correctly terminated with 50 ohms at each end 4 Check that when the test is attempted the following AUI activity indicators are ON: TRANSMIT, RECEIVE and AUI POWER. Check that COLLISION is OFF (see indicators). 5 Attempt test with a different AUI cable 6 Attempt test with a different transceiver

If you get ... *Then...*

T08 Collision Inactive

This indicates that the transceiver should be generating collision and is not. The fault may be in the transceiver or the AUI cable

Action

1 Check that the AUI connection is made between the ISOLAN Test Unit and the transceiver

2 Check that the BNC cable is attached to the tap and the ISOLAN Test Unit

3 Check that the tap is firmly in the transceiver

4 Attempt to run a LOOPBACK test, if this is passed then try a JABBER protection test. If this passes then the collision threshold of the transceiver is out of tolerance

5 Attempt test with a different AUI cable

6 Attempt test with a different transceiver

T09 Collision active

This indicates that the collision threshold of the transceiver is too low.

Action

1 Check that the tap is firmly in the transceiver

2 Check the tap is correctly terminated with 50 ohms and that the co-axial cable is attached to the Test Unit

3 Check that the BNC cable is attached to the tap

4 Attempt test with a different transceiver

T10 Idle Error

This indicates that the transceiver is sinking too much current in the idle condition. This implies that the transceiver output stage is switched on in the transceiver.

Action

1 Attempt test with a different transceiver

T11 Tx output Low

This indicates that the transceiver output current is too low.

Action

1 Check the AUI lead is plugged properly into the ISOLAN Test Unit and the transceiver.

2 Check the coaxial cable is correctly terminated with 50 ohms at each end

3 Attempt test with a different transceiver

4 Try the test a number of times before concluding that the transceiver is faulty

5 If large numbers of transceivers fail then your ISOLAN Test Unit may need recalibration

If you get ... *Then...*

T12 Tx output high

This indicates that the transceiver output current is too high.

Action

1 Check the coaxial cable is correctly terminated with 50 ohms at each end

2 Try the test a number of times before concluding that the transceiver is faulty

3 If large numbers of transceivers fail then your ISOLAN Test Unit may need recalibration

T13 No SQE activity

This indicates that no SQE Test is generated when it was expected. Make sure that the transceiver has SQE TEST enabled or is described as "with SQE TEST".

Action

1 Check the AUI lead is plugged properly into the ISOLAN Test Unit and the transceiver.

2 Check that the ITU is configured to test for SQE activity (SQE on/off software switch).

4 Check that when the test is attempted the SQE test LED is lit (see indicators).

5 Attempt LOOPBACK and JABBER Protection tests to confirm AUI integrity

6 Attempt test with a different AUI cable

7 Attempt test with a different transceiver

T14 Collision inactive

This indicates that the transceiver will not jabber protect

Action

1 Check the AUI lead is plugged properly into the ISOLAN Test Unit and the transceiver.

2 Check that the Ethernet V1/802.3 switch is in the correct position

3 If the collision LED remains off, the transceiver's jabber protection function has malfunctioned

4 Run an Off-Net test to check that the collision oscillator is working. If the test is passed it is likely that the fault is in the jabber protection circuit.

T15 Jabber Delay > 150mS

This error shows the jabber protection is not terminating the transmissions of a jabbering DTE soon enough.

Action

1 Attempt test with a different transceiver

If you get ... *Then...*

T16 Jabber Delay < 20mS

This error shows the jabber protection is terminating the transmissions of a jabbering DTE too soon.

Action

1 Attempt test with a different transceiver

T17 Collision Error

The collision oscillator is on and should be off. This condition is tested for before attempting a Jabber Protection test.

Action

1 Check the coaxial cable is correctly terminated with 50 ohms at each end

2 Check that the BNC cable is attached to the tap

3 Check that the tap is firmly in the transceiver

4 Attempt test with a different transceiver

T18 Collision Low

The collision frequency is lower than the IEEE 802.3 specification permits and the transceiver is consequently out of spec. (.5MHz)

Action

1 Run a Jabber Protection test to see if the same problem occurs, if so attempt the test with a different transceiver.

2 Check that the COLLISION LED comes on during the test

3 Attempt test with a different transceiver

T19 Collision High

The collision frequency is higher than the IEEE 802.3 specification permits and the transceiver is consequently out of spec. (11.5MHz).

Action

1 Run a Jabber Protection test to see if the same problem occurs, if so attempt the test with a different transceiver.

2 Check that the COLLISION LED comes on during the test

3 Attempt test with a different transceiver

T20 Jabber reset early

The jabber protection may be of the auto-resetting variety, in which case the time taken to reset was too short. This error indicates possible intermittent collision activity, as opposed to a change of state from collision off to collision on being transmitted from the transceiver when the device has jabber protected. Intermittent collision activity will occur as a direct result of repeaters in the system breaking up the transmission because it is greater than 5ms

Action

1 Reattempt the test to establish whether the fault exists

2 Attempt test with a different transceiver

If you get ... *Then...*

T21 Delay + Length error

This error shows the SQE test parameters to be out of spec.

Action

1 Attempt test with a different transceiver

T22 SQE TEST present

This indicates SQE burst when testing a non-SQE transceiver

Action

1 Check that the ITU is configured to test the correct type of transceiver.

2 If the transceiver is configureable (SQE enabled/disabled), check that it is configured as you wish

3 Attempt test with a different transceiver

T23 Remove Transceiver

Indicates that as a result of a test carried out, the transceiver has probably jabber protected. The ISOLAN Test Unit has attempted to reset the device but has been unable to do so.

Action

1 If you are testing a device such as a Fanout unit with an external transceiver attached, the Test Unit will not be able to reset the the transceiver if it requires power cycling to reset: test the transceiver separately

2 Attempt test with a different transceiver

Collision error check terminator

This test is automatically carried out before the selected test is run by the unit and checks that the cables are terminated correctly.

Action

1 Check the coaxial cable is correctly terminated with 50 ohms at each end

2 Check that the BNC cable is attached to the tap

3 Attempt test with a different transceiver

Collision active attempting to reset

Indicates that the Transceiver co-axial port is open circuit or that the transceiver has jabber protected.

Action

1 Check that the BNC cable is attached to the tap

2 Check that the tap is firmly in the transceiver

3 Check the coaxial cable is correctly terminated with 50 ohms at each end

4 If a "bee-sting" type tap is being used, ensure that the centre conductor is connected to the centre pin.

5 Attempt test with a different transceiver

If you get ... *Then...*

Fatal error

This indicates that the transceiver has tried to reset itself but has failed, the transceiver co-axial port is open circuit.

Action

1 Check that the BNC cable is attached to the tap

2 Check that the tap is firmly in the transceiver

3 Check the coaxial cable is correctly terminated with 50 ohms at each end

4 If a "bee-sting" type tap is being used, ensure that the centre conductor is connected to the centre pin.

5 Attempt test with a different transceiver

6 Remove the transceiver and test it locally if attached to the network, otherwise the transceiver is faulty.

Warning Short CCT > > Remove MAU < <

This indicates that a sensing circuit has detected a current in excess of 750mA at the AUI port of the ISOLAN Test Unit. If this surge continues for more than 16mS, the unit automatically switches the power off.

Action

1 Attempt test with a different AUI cable

2 Attempt test with a different transceiver

If transceivers consistently fail the off net tests on more than one parameter and the transceivers pass a loopback test it is possible that the test unit requires recalibration.

Appendix D
Using the Hex Monitor.

Enter into the display 4000. The display will now change showing the four digit address in memory which you are currently looking at followed by five bytes of data expressed as hex digits, this is repeated with the next five memory locations on line two. If you press any of the keys in the range 0...F you will see some memory locations change. These are the decoded and ascii codes representing the keys you have pressed. Also there is a 16 bit memory location which is being incremented by an interrupt service routine which is constantly running in the background. You may be required to use this facility if you require customer support for some reason.

Press EXIT to get back to the sub menu.

D Using the Hex Monitor

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