COMMUNICATIONS SERVICE MONITORS

2945A, 2945B, 2946A, 2948, 2948B

for MPT1327

Operating Manual Supplement

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2945A, 2945B, 2946A, 2948 and 2948B

for MPT1327

About this Manual

This manual explains how to use the MPT1327 option of the Communications Service Monitors 2945A, 2945B, 2948 and 2948B and Avionics Communication Service Monitor 2946A. It applies to service monitors fitted with System software version 4.04 and greater.

Intended audience

People who need to test the performance of MPT1327 mobile radio telephones. It is assumed that the reader has either a working knowledge of the Service Monitor mentioned above or access to the appropriate Operating Manuals, and is familiar with MPT1327 telecommunication terms.

Structure

Chapter 1

Introduction, overview and performance data

Chapter 2

Operating instructions for the MPT1327 option

Appendix A

Autotest error codes with definitions

Document conventions

The following conventions apply throughout this manual:

Hard key titles are shown verbatim, using normal lettering in square brackets.	[Tx TEST]
Soft key titles are shown verbatim using italic lettering in square brackets.	*[Tx freq]*
Titles on the instrument panels are shown verbatim using capital letters.	RF IN/OUT
Text displayed on screen.	See below[†]

[†] References to text displayed on the screen of the Service Monitor are given verbatim, using a font that resembles the displayed text: e.g. GEN FREQ: , Ref Level: , Ref Level: .

Associated publications

Each service monitor is supplied at the time of delivery with the following:

- Operating manual: 46882/311 (2945A), 46882/682 (2945B), 46882/312 (2946A), 46882/341 (2948), 46882/692 (2948B).
- Programming manual: 46882/318 (2945A, 2946A, 2948), 46882/683 (2945B, 2948B).
- Operating manual supplements for all installed systems:

EDACS Repeater (46882/300)
AMPS Supplement (46882/313)
PMR Supplement (46882/315)
MPT1327 Supplement (46882/317)
EDACS Radio Supplement (46882/301)
TACS Supplement (46882/314)
NMT Supplement (46882/316)

Contents

Precautions

Refer to the relevant Operating Manual: see 'Associated publications' above.

Chapter 1
General Information

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Introduction

The Systems mode of the Communications Service Monitors 2945A, 2945B, 2948, 2948B and Avionics Communication Service Monitor 2946A enables you to automatically or manually test radio communication equipment such as cellular radio telephones and trunked system mobile radio telephones (abbreviated to the colloquial term *mobile* in the rest of this manual).

The Service Monitor simulates signaling transmitted by a base station, which is received by the mobile under test. Signaling transmitted by the mobile is received by the Service Monitor for measurement or analysis.

This manual refers to the use of the Service Monitor to test the performance of mobiles designed to operate on the MPT1327 system.

The Service Monitor and the mobile are connected using suitable RF cables for connecting to the antenna socket of the mobile. AF connections are made to the audio input and output circuits of the mobile for tests such as signal to noise, modulation distortion etc. Fig. 1-1 show how the MPT1327 system interfaces with the other operating modes of the Service Monitor.

Auto and manual testing

The AUTO mode allows you to run test programs that are resident within the Service Monitor and tests the operational performance of the mobile for use on a MPT1327 system. User defined programs can be loaded into the Service Monitor and run in the same way. The MANUAL mode offers manual control of the Service Monitor base station simulation. This is useful for fault finding or adjusting the mobile under test.

Auto

The AUTO mode provides a selection of four built-in test programs that are run on a selection of channels to test the performance of the mobile.

The four test programs vary in content so as to give you a wide choice of tests to suit your particular requirement. You set up a channel plan to determine which channels will be used for the tests.

The progress of tests and the results obtained from them are displayed on the screen and stored in memory within the Service Monitor for later analysis. Results can be printed on a suitable printer while the test program is running or at the end of the test program. The set-up menus allow many combinations of data presentation, storage, retrieval and printing. The use of the memory cards and remote control facilities extends this further.
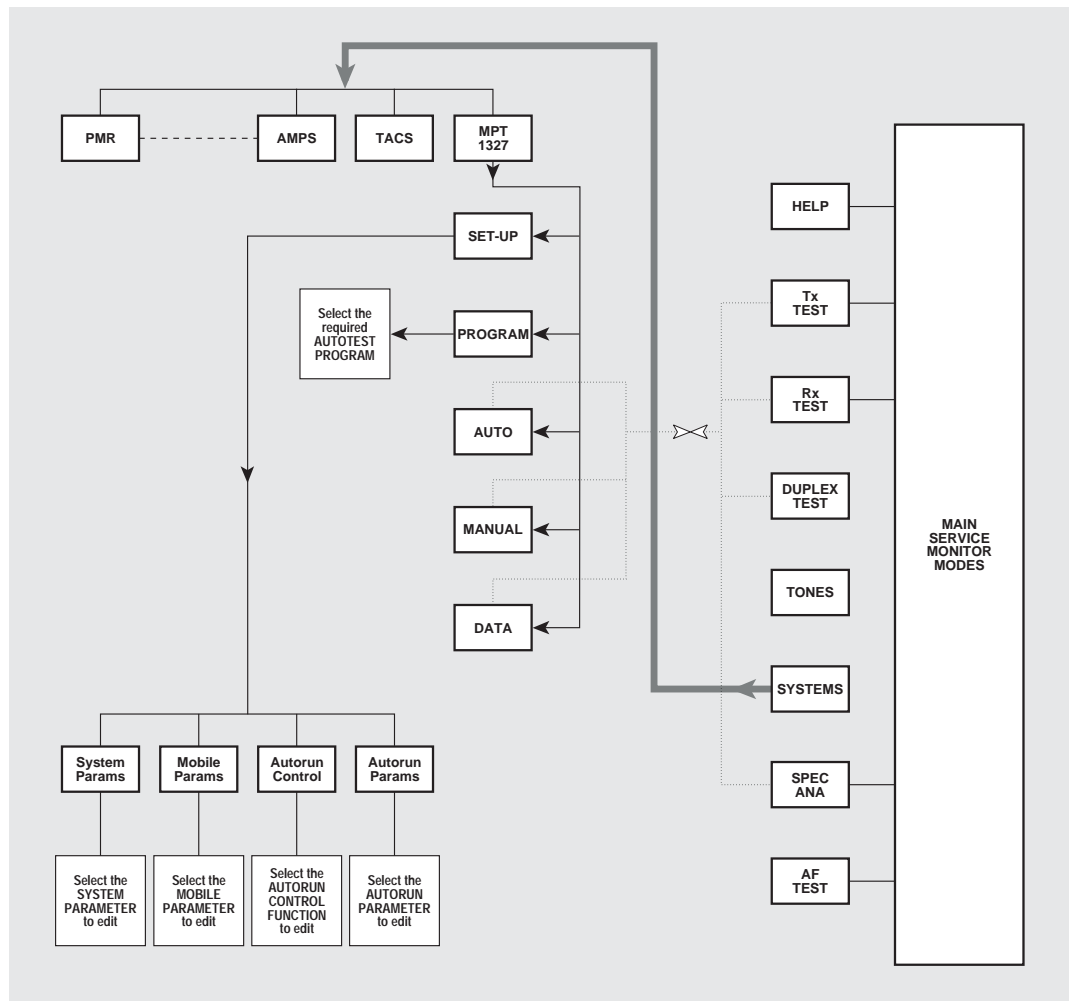
Fig. 1-1 MPT1327 system interface with main test modes of the Service Monitor

Manual testing

Manual testing allows you a means of testing any part of the mobile's operation. The required signaling is generated as for the AUTO mode, but tests are allowed to run manually under your control.

Test programs

The four built-in test programs are described as follows:

Call processing only

Tests the registration of the mobile, sets up a call from the mobile and then clears the call from the mobile. Places a call to the mobile, performs a number of handoffs and clears the call from the base station.

An RF connection is required between the N type RF connector on the Service Monitor and the antenna connector of the mobile.

Call and RF testing

Performs all the above tests and in addition, tests the RF power and frequency from the mobile.

An RF connection is required as for the Call Processing Only program.

Brief testing

Performs all of the above tests and in addition tests the AF distortion produced by the mobile receiver and by the mobile transmitter, the sensitivity of the mobile receiver and the modulation level limiting action of the mobile transmitter.

An RF connection is required as for both the previous programs. AF connections are required from the AF output connector of the Service Monitor to the audio input of the mobile and from the audio output of the mobile to the AF input of the Service Monitor.

Comprehensive testing

Performs all of the tests carried out in the Brief testing program, tests the AF expansion characteristics of the receiver and the AF compression and noise characteristics of the transmitter.

RF and AF connections are required as for the Brief Testing program.

User defined test

Allows you to determine what tests and measurements you wish to perform using the Service Monitor. This program is downloaded into the instrument via the GPIB or RS232 interface.

Pause facility

A feature of the AUTO mode is the pause facility. This allows you to select the conditions under which the test program will pause. The options are:

> After every individual test in the program.
>
> Following an individual test which fails.
>
> At the end of any test, following your request.

When in the paused condition, the current parameters and results are displayed. Conversation is maintained between the Service Monitor and the mobile if applicable.

You can select other operating modes of the Service Monitor in order to carry out detailed analysis of mobiles' performance.

The test program can be resumed at any time.

Data displays

The data that passes between the Service Monitor and the mobile in either direction can be decoded, displayed and examined for content or errors.

Connections

The connections required between the Service Monitor and the mobile are mentioned in each of the test program descriptions earlier in this chapter. A more detailed explanation of the requirements is given in Chapter 2.

Performance Data

General MPT1327 system information

System type	Base Tx frequency of minimum channel number (MHz)	Mobile Tx frequency of minimum channel number (MHz)	Minimum (physical) channel number	Maximum (physical) channel number	Channel spacing (kHz)	Duplex offset (Rx - Tx) (MHz)	Logical/ Physical channel offset (logical–physical)
BAND III	201.2125	193.2125	58	560	12.5	8.00	−57
JRC	139.51875	148.01875	22	99	12.5	−8.50	0
UK WATER	77.7250	77.7250	0	0	12.5	0.00	218
	85.2375	71.7375	1	5	12.5	13.50	18
	85.3125	71.8125	6	8	12.5	13.50	19
	85.3625	71.8625	9	11	12.5	13.50	20
	85.4125	71.9125	12	12	12.5	13.50	21
	85.0375	71.5375	13	13	12.5	13.50	−10
	85.1125	71.6125	14	14	12.5	13.50	−5
	85.4625	71.9625	15	15	12.5	13.50	22
	85.1000	71.6000	16	16	12.5	13.50	−8
	85.4375	71.9375	17	18	12.5	13.50	18
	85.2125	71.7125	19	19	12.5	13.50	−2
	85.5750	72.0750	20	20	12.5	13.50	26
	86.1625	72.6625	21	21	12.5	13.50	72
	86.7125	76.7125	22	24	12.5	10.00	115
	86.9375	76.9375	25	26	12.5	10.00	130
	87.0000	77.0000	27	30	12.5	10.00	133
HONG KONG	176.5250	191.5250	1	480	12.5	−15.00	0
AUTONET	446.5125	440.0125	1	200	12.5	6.50	0
MADEIRA	170.2750	164.3250	1	39	12.5	5.95	0
AMT	305.9375	341.9375	85	329	12.5	−36.00	0
NL TRAXYS	420.0125	410.0125	1	799	12.5	10.00	0
NZ MPT 1327	414.0125	406.0125	1	320	12.5	8.00	0
PH INDO	407.0000	417.0000	1	160	12.5	−10.00	0
REPART	460.0125	450.0125	1	55	12.5	10.00	0
CARRIS	462.5250	452.5250	325	326	12.5	10.00	0
	463.01250	453.01250	364	365	12.5	10.00	0
RADIO-MOVEL	460.7000	450.7000	56	108	12.5	10.00	0
USER MPT	201.2125	193.2125	1	503	12.5	8.00	0

The allocation of channels to a system does not necessarily start at 1. Therefore, the first channel in a system may be logically channel 1 in the signaling between a base station and a mobile and not the sub-band channel 1. In the case of BAND III, logical channel 1 corresponds to physical channel 58. The Service Monitor functions in physical channels but allows the offset to be defined.

FM voice deviation	±1.5 kHz nominal, ±2.5 kHz maximum.	
Data type	FFSK phase-continuous 1200 and 1800 Hz tones.	
Data rate	1200 bit/s ±1 bit/s (1200 Hz = 1 and 1800 Hz = 0).	
Data deviation	1.5 kHz ±250 Hz.	
Mobile transmit power	Declared power ±1.5 dB (Not specified, specific to individual manufacturers).	
Carrier frequency error	±1.5 kHz.	

System parameter settings

System type	As selected	Default BAND III
System identity	Hexadecimal: 4 digits	Default 0001
	Decimal: 5 digits	Default 00001
Control channel	58 to 560 (system dependent)	Default 58.
First traffic channel	58 to 560 (system dependent)	Default 58.
Last traffic channel	58 to 560 (system dependent)	Default 560.
Channel increment	0 to 560 (system dependent)	Default 251
Aloha number	1 to 15	Default 5
Full off-air	Enabled Disabled	Default ENABLED.
Traffic confirmation	Disabled Pressel Ahoy.	Default AHOY

Mobile parameter settings

Mobile Prefix/identity	Format xxx/xxxx	Default 000/0001
Group Prefix/identity	Format xxx/xxxx	Default 000/0001
Calling unit identity	Format xxx/xxxx	Default 000/0001
Called disconnect count		Default 3
Calling disconnect count		Default 5.
Mobile power type	High Low	Default HIGH

Display format settings

Display format	SUMMARY FULL	Default SUMMARY.
Pause mode	ALWAYS MANUAL ONLY ON FAILURE	Default MANUAL ONLY
Print	ON OFF	Default OFF
Number format	STANDARD DECIMAL HEXADECIMAL	Default STANDARD

Program settings

Test programs	CALL PROCESSING ONLY		Default CALL PROCESSING ONLY
	CALL & RF TESTING		
	BRIEF TESTING		
	COMPREHENSIVE TESTING		
	USER DEFINED TEST		

Autorun parameter settings

These are the default parameters for all of the available auto tests for MPT1327. These parameters are used by the tests (called from BASIC), or they can be accessed directly by BASIC. The list on the right hand side of the page shows the equivalent BASIC commands for the parameters. If you modify these parameters, these defaults can be restored by using the appropriate command in the HELP/SETUP menu.

Note that deviations returned in automatic tests are **peak** measurements only. Manual measurements can return peak or RMS results.

Registration		**TEST REGISTER**	
Status	ON	STATUS	{ON/OFF}
RF generator level	-80 dBm	RFGENLEVEL	<expr> [<units>]

Place call		**TEST PLACECALL**	
RF generator level	-80 dBm	RFGENLEVEL	<expr> [<units>]
Timeout	30s	TIMEOUT	<expr> [<units>]
Use accessory port	ON	USEACCPORT	{ON/OFF}
Set accessory port logic	1	ACCPORT	{LOGIC0/1/2/3}

Clear from mobile		**TEST MOBILECLEAR**	
RF generator level	-80 dBm	RFGENLEVEL	<expr> [<units>]
Timeout	20s	TIMEOUT	<expr> [<units>]
Use accessory port	ON	USEACCPORT	{ON/OFF}
Set accessory port logic	2	ACCPORT	{LOGIC0/1/2/3}

Page mobile		**TEST PAGEMOBILE**	
RF generator level	-80 dBm	RFGENLEVEL	<expr> [<units>]
Timeout	30s	TIMEOUT	<expr> [<units>]
Use accessory port	ON	USEACCPORT	{ON/OFF}
Set accessory port logic	3	ACCPORT	{LOGIC0/1/2/3}

Handoff		**TEST HANDOFF**	
RF generator level	-80 dBm	RFGENLEVEL	<expr> [<units>]
Timeout	20s	TIMEOUT	<expr> [<units>]

Clear from land		**TEST LANDCLEAR**	
RF generator level	-80 dBm	RFGENLEVEL	<expr> [<units>]

PTT ON		**TEST PTTON**	
Timeout	20s	TIMEOUT	<expr> [<units>]
Use Pressels	OFF	USEPRESSEL	{ON/OFF}
Use accessory port	ON	USEACCPORT	{ON/OFF}
Set accessory port logic	0	ACCPORT	{LOGIC0/1/2/3}

PTT OFF		**TEST PTTOFF**	
Timeout	20s	TIMEOUT	<expr> [<units>]
Use Pressels	OFF	USEPRESSEL	{ON/OFF}

Transmitter RF power		**TEST TXLEVEL**	
Status	ON	STATUS	{ON/OFF}
Averages	5	AVERAGES	<expr>
Upper limit	35.3W	UPPER	<expr> [<units>]
Lower limit	5W	LOWER	<expr> [<units>]

Tx frequency		**TEST TXFREQ**	
Status	ON	STATUS	{ON/OFF}
Error tolerance	1.5 kHz	ERROR	<expr> [<units>]

Tx SINAD		**TEST TXSINAD**	
Status	OFF	STATUS	{ON/OFF}
Averages	5	AVERAGES	<expr>
Modulation level	1.5 kHz	MODLEVEL	<expr> [<units>]
Tx filter	0.3-3.4 kHz BP	TXFILTER	{NONE/LP15KHZ/LP5KHZ/ LP300HZ/STDBP/CCITT/ CMESS}
Lower limit	20dB	LOWER	<expr> [<units>]

Tx distortion		**TEST TXDISTN**	
Status	ON	STATUS	{ON/OFF}
Averages	5	AVERAGES	<expr>
Modulation level	1.5 kHz	MODLEVEL	<expr> [<units>]
Tx filter	0.3-3.4 kHz BP	TXFILTER	{NONE/LP15KHZ/LP5KHZ/ LP300HZ/STDBP/CCITT/ CMESS}
Upper limit	10%	UPPER	<expr> [<units>]

Tx S/N		**TEST TXSN**	
Status	OFF	STATUS	{ON/OFF}
Averages	5	AVERAGES	<expr>
Modulation level	1.5 kHz	MODLEVEL	<expr> [<units>]
Tx filter	0.3-3.4 kHz BP	TXFILTER	{NONE/LP15KHZ/LP5KHZ/ LP300HZ/STDBP/CCITT/ CMESS}
Lower limit	20dB	LOWER	<expr> [<units>]

Tx noise		**TEST TXNOISE**	
Status	ON	STATUS	{ON/OFF}
Averages	5	AVERAGES	<expr>
Tx Filter	300 Hz LP	TXFILTER	{NONE/LP15KHZ/LP5KHZ/ LP300HZ/STDBP/CCITT/ CMESS}
Upper limit	300 Hz	UPPER	<expr> [<units>]

Tx limiting		**TEST TXLIMIT**	
Status	ON	STATUS	{ON/OFF}
Averages	5	AVERAGES	<expr>
Modulation level	1.5 kHz	MODLEVEL	<expr> [<units>]
Tx filter	15 kHz LP	TXFILTER	{NONE/LP15KHZ/LP5KHZ/ LP300HZ/STDBP/CCITT/ CMESS}
Overload factor	20dB	OVERLOAD	<expr> [<units>]
Upper limit	2.5 kHz	UPPER	<expr> [<units>]

Tx compression **(not normally used in MPT1327)**		**TEST COMPRESS**	
Status	OFF	STATUS	{ON/OFF}
Averages	5	AVERAGES	<expr>
Modulation level	1.5 kHz	MODLEVEL	<expr> [<units>]
Tx filter	0.3-3.4 kHz BP	TXFILTER	{NONE/LP15KHZ/LP5KHZ/ LP300HZ/STDBP/CCITT/ CMESS}
Reference	2	REF	<expr>
Error tolerance	10%	ERROR	<expr> [<units>]

Rx SINAD		**TEST RXSINAD**	
Status	OFF	STATUS	{ON/OFF}
Averages	5	AVERAGES	<expr>
RF level	-80 dBm	RFGENLEVEL	<expr> [<units>]
Modulation level	1.5 kHz	MODLEVEL	<expr> [<units>]
Rx filter	0.3-3.4 kHz BP	RXFILTER	{NONE/LP15KHZ/LP300HZ/ STDBP/CCITT/CMESS}
Lower limit	20dB	LOWER	<expr> [<units>]

Rx distortion		**TEST RXDISTN**	
Status	ON	STATUS	{ON/OFF}
Averages	5	AVERAGES	<expr>
RF level	-80 dBm	RFGENLEVEL	<expr> [<units>]
Modulation level	1.5 kHz	MODLEVEL	<expr> [<units>]
Rx filter	0.3-3.4 kHz BP	RXFILTER	{NONE/LP15KHZ/LP300HZ/ STDBP/CCITT/CMESS}
Upper limit	10%	UPPER	<expr> [<units>]

Rx S/N		**TEST RXSN**	
Status	OFF	STATUS	{ON/OFF}
Averages	5	AVERAGES	<expr>
RF level	-80 dBm	RFGENLEVEL	<expr> [<units>]
Modulation level	1.5 kHz	MODLEVEL	<expr> [<units>]
Rx filter	0.3-3.4 kHz BP	RXFILTER	{NONE/LP15KHZ/LP300HZ/ STDBP/CCITT/CMESS}
Lower limit	20dB	LOWER	<expr> [<units>]

Rx sensitivity		**TEST RXSENS**	
Status	ON	STATUS	{ON/OFF}
Averages	5	AVERAGES	<expr>
Modulation level	1.5 kHz	MODLEVEL	<expr> [<units>]
Rx filter	CCITT	RXFILTER	{NONE/LP15KHZ/LP300HZ/ STDBP/CCITT/CMESS}
RF upper limit	-107 dBm	UPPER	<expr> [<units>]
Reference SINAD	20dB	REFSINAD	<expr>

Rx expansion
 (not normally used in MPT1327)

TEST RXEXPAND

Status	OFF	STATUS	{ON/OFF}
Averages	5	AVERAGES	<expr>
Modulation level	1.5 kHz	MODLEVEL	<expr> [<units>]
Rx filter	0.3-3.4 kHz BP	RXFILTER	{NONE/LP15KHZ/LP300HZ/ STDBP/CCITT/CMESS}
Reference	2	REF	<expr>
Error tolerance	10%	ERROR	<expr> [<units>]

Rx expansion
 (not normally used in MPT1327)

TEST RXEXPAND

BASIC autorun test programs

This section defines what tests are run in each of the built-in test programs.

Note

In the following program descriptions, a start brace, {, and a finish brace, }, indicate the start and finish of tests that are run as a *group*. Each group of tests is repeated in accordance with the condition (e.g. while channels to test) preceding the group.

Call processing only

```
TEST PLACECALL
if passed TEST MOBILECLEAR
if enabled TEST REGISTER
TEST PAGEMOBILE

While more channels to test
{
      TEST HANDOFF        Jump to exit if failed or error
}

Exit:
TEST LANDCLEAR
```

Call and RF testing

```
TEST PLACECALL
if passed TEST MOBILECLEAR
if enabled TEST REGISTER
TEST PAGEMOBILE

While more channels to test
{
      TEST HANDOFF      Jump to exit if failed or error
      TEST PTTON        Jump to next_channel if failed
      If enabled TEST TXLEVEL
      If enabled TEST TXFREQ
      TEST PTTOFF       Jump to next_channel if failed
      next_channel:
}

Exit:
TEST LANDCLEAR
```

Brief Testing

```
TEST PLACECALL
if passed TEST MOBILECLEAR
if enabled TEST REGISTER
TEST PAGEMOBILE

For 3 channels (first traffic channel,
first traffic channel + handoff increment,
first traffic channel + handoff_increment ´2)
{
        TEST HANDOFF        Jump to exit if failed or error
        TEST PTTON          Jump to rxtests if failed
        if enabled TEST TXLEVEL
        if enabled TEST TXFREQ
        if enabled TEST TXDISTN
        if enabled TEST TXLIMIT
        TEST PTTOFF         Jump to next_channel if failed

        rxtests:
        if enabled TEST RXDISTN
            if enabled TEST RXSINAD
            if enabled TEST RXSENS
            next_channel:
}

exit:
TEST LANDCLEAR
```

Comprehensive Testing

```
TEST PLACECALL
if passed TEST MOBILECLEAR
if enabled TEST REGISTER
TEST PAGEMOBILE

While more channels to test
{
        TEST PTTON          Jump to rxtests if failed
        if enabled TEST TXLEVEL
        if enabled DC power
        if enabled TEST TXFREQ
        if enabled TEST TXSINAD
        if enabled TEST TXSN
        if enabled TEST TXDISTN
        if enabled TEST TXNOISE
        if enabled TEST TXLIMIT
        TEST PTTOFF         Jump to next_channel if failed

        rxtests:
        if enabled TEST RXSINAD
        if enabled TEST RXSN
        if enabled TEST RXDISTN
        if enabled TEST RXSENS
        TEST HANDOFF        Jump to exit if failed or error
        next_channel:
}
exit:
TEST LANDCLEAR
```

User Defined test

The user-defined test program facility allows you to run your own test program. This is written on a PC or other programming equipment using the *MI-BASIC language*, then loaded into the Service Monitor.

Broadcast messages

The MPT1327 test system in the Service Monitor has provision for up to four broadcast messages to be included in the continuous overhead data.

Chapter 2
OPERATION

Contents

List of figures

Introduction

This chapter explains how to use the Service Monitor to carry out tests to mobile radio telephones operating on the MPT1327 trunking system. These are referred to as *mobiles* throughout this manual. The instructions given assume that you are familiar with the operation of the Service Monitor in its various modes and that the instrument has been prepared for use as described in the main operating manual supplied with it.

If you are unfamiliar with using the Service Monitor for MPT1327 system testing, it is suggested that a short time is spent exploring the various menus and displays before connecting to a mobile.

The operating details required by users of the Service Monitor when in the MPT1327 System mode fall into two areas:

(a) Set-up procedures, where you customize the test system for making tests on the particular mobile by changing the system parameters.

(b) Testing of individual mobiles. You decide on the procedures required for the particular unit or batch of units, connect a mobile to the Service Monitor, and carry out automatic or manual tests.

The set-up menus of the SYSTEM mode give you control of the test system parameters. Once set to your requirements, the instrument retains the settings for both immediate and future use.

SYSTEM mode selection

The MPT1327 system is one of several system options available with the Service Monitor. The [SYSTEM] key displays the menu of system available for the instrument. See Fig. 2-1.

Note

The [SYSTEM] key on the Avionics Communication Service Monitor 2946A gives access to the Avionics System test facility as well as to the Cellular and Trunked radio communications system test facility. If a Cellular or Trunked system *is not* selected currently, pressing the [SYSTEM] key displays the untitled screen shown in Fig. 2-2. Pressing the *[cell]* key displays the SYSTEM SELECTION MENU. **If a Cellular or Trunked system *is* selected currently, pressing the [SYSTEM] key displays the** SYSTEM SELECTION MENU **directly.**
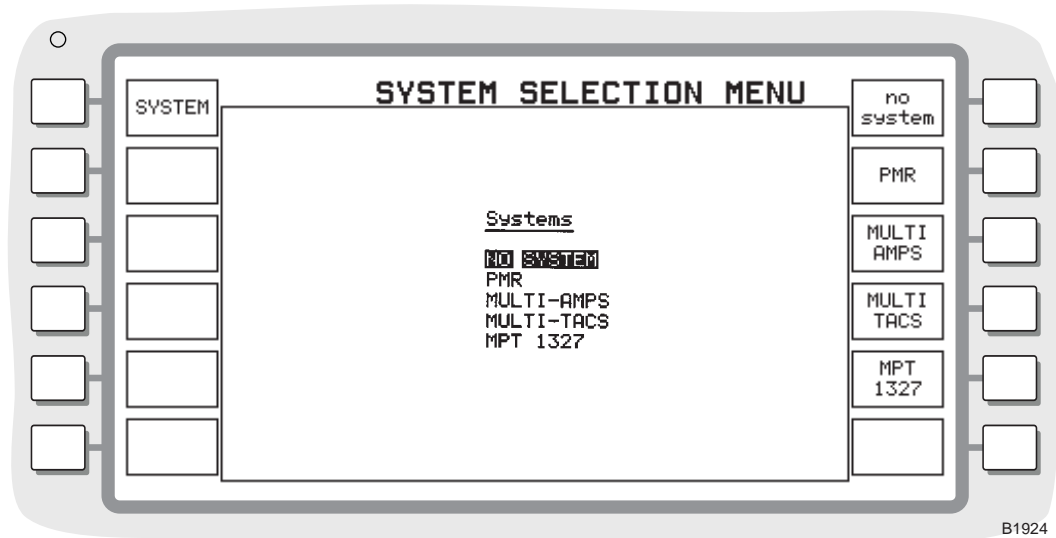
Fig. 2-1 System selection menu

Fig. 2-2 Avionics or Cellular/Trunked system selection screen

Selecting the MPT1327 system

The SYSTEM SELECTION MENU lists all of the test system that are installed in the instrument and designates one soft key to each. To select the MPT1327 system press the *[MPT1327]* key. Variants of the system (BAND III, NZ MPT1327, etc.) are selected from the SYSTEM PARAMETERS menu, using the key sequence, [SYSTEM], *[MPT 1327], [SET-UP]*.

With MPT1327 selected, the six soft keys at the left of the screen are allocated to explicit functions or user operations. They are available for you to use immediately, whenever the cellular system mode is active. The six keys and the functions that they access are shown below:

[SYSTEM]	SYSTEM SELECTION MENU
[SET-UP]	SYSTEM SET-UP MENU
[PROGRAM]	PROGRAM MENU
[AUTO]	AUTORUN test mode
[MANUAL]	MANUAL test mode
[DATA]	FORWARD/REVERSE DATA display mode

A description of the use of each menu or screen follows. The headings reflect the menu structure to assist in locating a particular key or function.

Operating modes

[SYSTEM]

The *[SYSTEM]* key brings up the SYSTEM SELECTION MENU, allowing you access to all of the test systems that are installed in the instrument, and an option *[no system]* to disable the active system prior to leaving the SYSTEM mode.

When you have selected a system, the SYSTEM TYPE currently selected is shown at the top left of the display. This is present on all system mode screens.
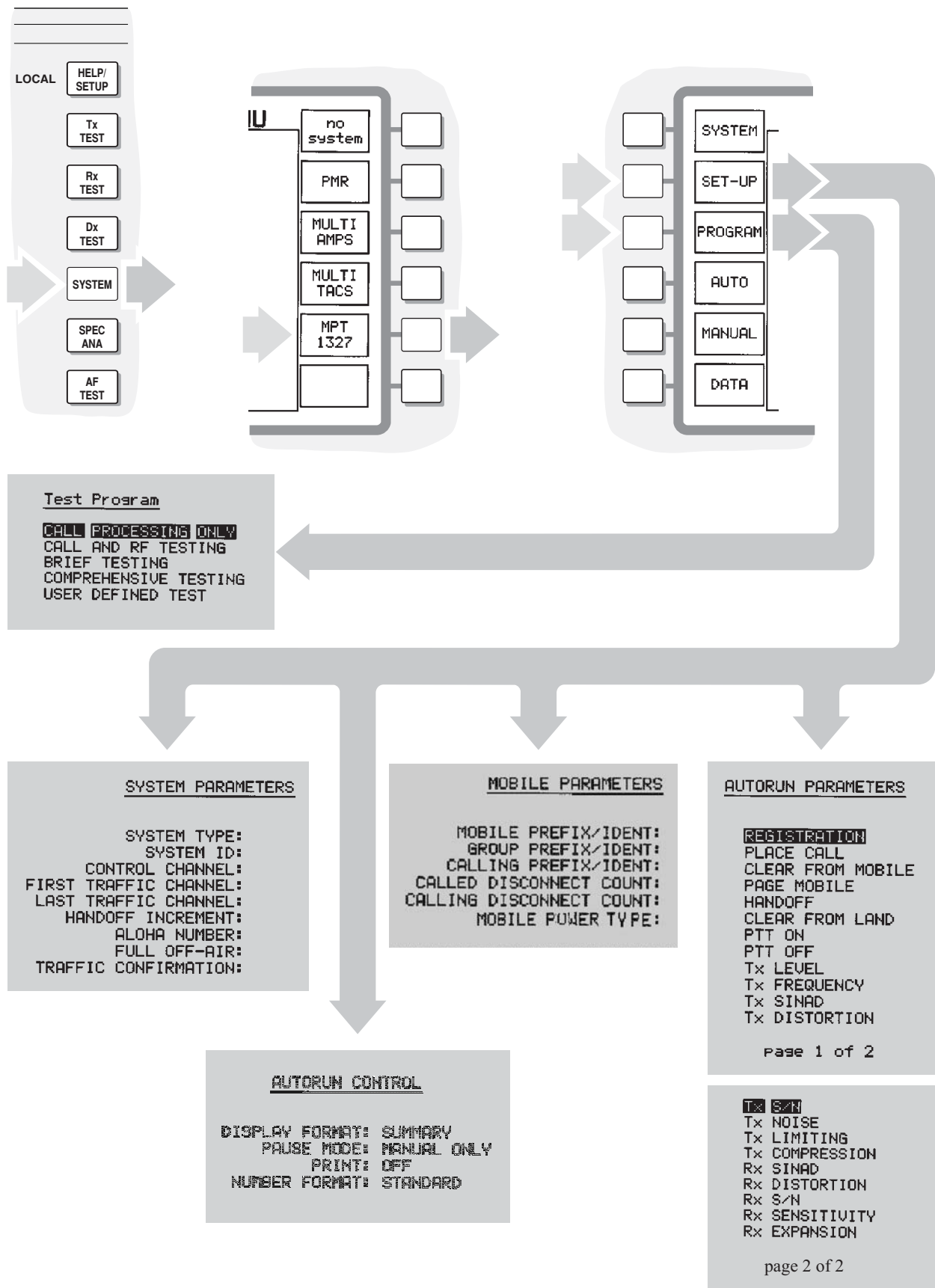
[SET-UP]

The *[SET-UP]* key allows access to all of the set-up menus for the MPT1327 system. There are four menus, each dealing with a different aspect of the system. Pressing *[SET-UP]* repeatedly toggles through all four menus.

The four menus are:

SYSTEM PARAMETERS	Allows adjustments to control channel number, first and last traffic channel number etc.
MOBILE PARAMETERS	Allows you to change or enter the mobile identity number sent to the mobile under test and enter the group and individual calling identity numbers associated with the mobile.
AUTORUN CONTROL	Allows you to select the format of the test results displayed, the conditions that cause the test program to halt for your attention, and to switch the print mode on or off.
AUTORUN PARAMETERS	Allows you to edit the parameters of each of the tests available in the test programs.

A detailed explanation of each menu and the parameters in it follows. A diagram of the menu structure from [SYSTEM] mode selection, through *[MPT1327]* and *[SET-UP]* to the set-up menus and through *[PROGRAM]* to the program menu is given in Fig. 2-3.

Fig. 2-3 Set-up menu and program selection menu access

System parameters

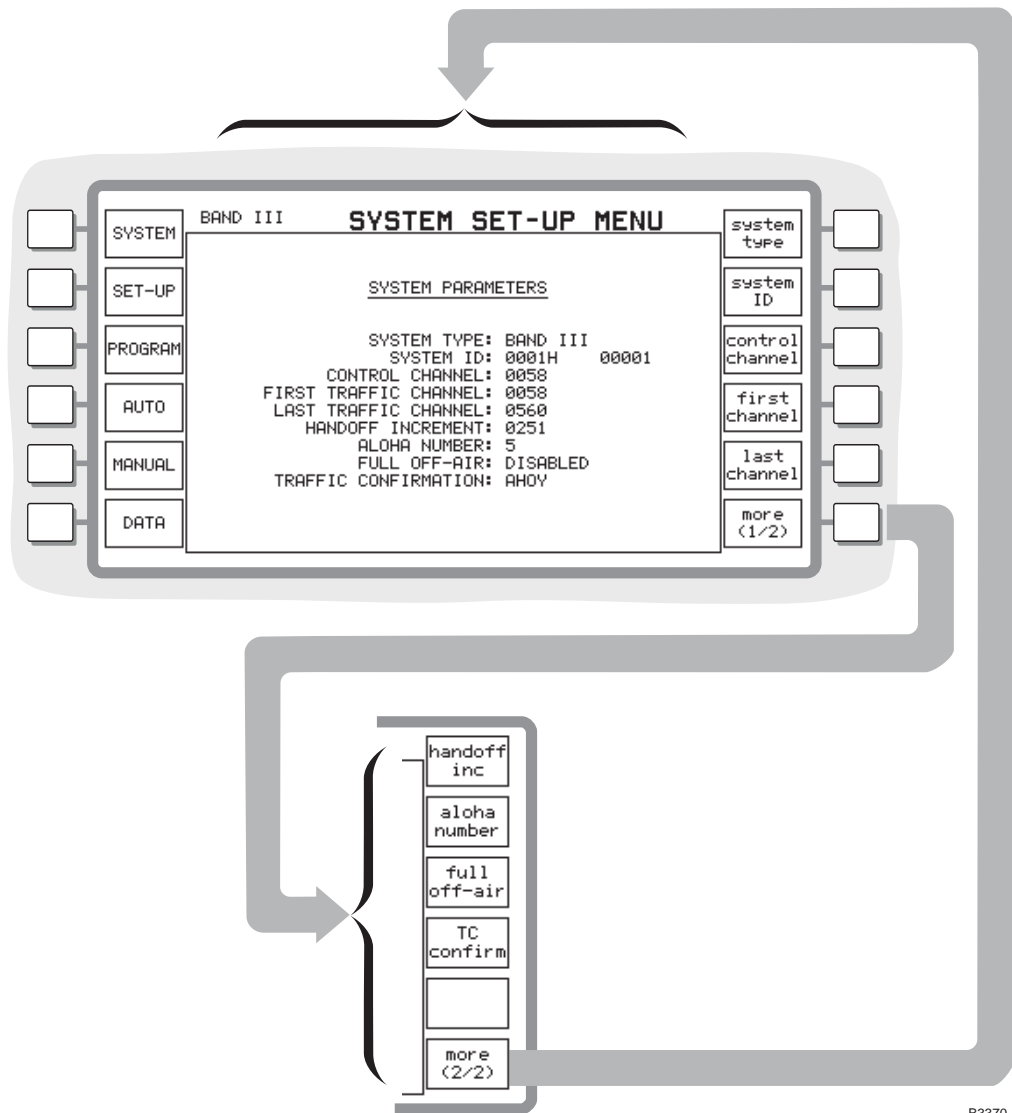The SYSTEM PARAMETERS menu lists the parameters of the MPT1327 system.

The right-hand soft keys select parameters for customizing. The *[more]* key allows access to other parameters. See Fig. 2-4.

To change the parameter value, press the soft key assigned to the parameter. The selected parameter becomes highlighted. The required value is entered using the data input keys and then pressing the [ENTER] data key or the soft key for the selected parameter.

An exception to this is for selecting the system variant, which is done with secondary soft keys as explained below.

Selecting the System Type or Variant

To select the required SYSTEM TYPE (or variant) of the MPT1327 system, first press the *[system type]* key. The first five right-hand soft keys are then each designated to a system type.. Pressing the appropriate soft key selects the required SYSTEM TYPE and returns the keys to their previous function. If a key for the required SYSTEM TYPE is not displayed, pressing the *[more]* key gives access to others.

Fig. 2-4 System parameters menu

You can set up parameters for your own variant, which is available through the *[USER MPT]* key. The *[edit USER]* key allows access to the <u>EDIT USER</u> menu, from where the parameters of the USER SYSTEM are entered.

SYSTEM ID

The SYSTEM ID (*System identity*) is an allocated number unique to each operator/base station on the system and is programmed into each mobile on the system. It is transmitted to the mobile as necessary.

The SYSTEM ID parameter accepts a four-digit hex number within the range 0000 to 7FFF or a decimal number within the range 0000 to 32767. The Hex number is shown next to the SYSTEM ID legend on the display and the decimal equivalent is shown to the right of the hex number. Repeated presses of the *[system ID]* key toggle through the following three actions:

- Highlight the **SYSTEM** **ID** legend and allow a hex number to be entered.

- Highlight the **SYSTEM** **ID** legend and allow a decimal number to be entered.

- Accept a valid number as the system ID.

    If the SYSTEM ID number is entered as a hex number, the decimal number is updated to the equivalent number and vice versa. If the number entered exceeds the acceptable range, the number is not accepted. The invalid number must be deleted using the [DELETE] key, and a valid number entered.

Note

If the correct SYSTEM ID and the correct control channel number for the mobile are NOT entered the mobile MAY NOT GO INTO SERVICE.

CONTROL CHANNEL

Before any testing can be carried out on a MPT1327 mobile the CONTROL CHANNEL in the <u>SYSTEM PARAMETERS</u> menu must be set to a value that the mobile can recognize and use. When a new SYSTEM TYPE is selected the control channel defaults to the FIRST TRAFFIC CHANNEL value. The required channel number is entered using the data keys.

FIRST TRAFFIC CHANNEL
LAST TRAFFIC CHANNEL
HANDOFF INCREMENT

The channels that can be allocated as traffic channels by the Service Monitor are shown as FIRST TRAFFIC CHANNEL and LAST TRAFFIC CHANNEL. The values of these parameters are changed in the same way as the CONTROL CHANNEL value.

When running a handoff test within an AUTORUN program, the test uses FIRST TRAFFIC CHANNEL , LAST TRAFFIC CHANNEL and HANDOFF INCREMENT to determine the next traffic channel to hand off to.

ALOHA NUMBER

The number of the ALOHA slots within each frame generated on the control channel by the Service Monitor. The acceptable range is 1 to 15.

FULL OFF-AIR

When FULL OFF-AIR is enabled, the Service Monitor checks that during a page mobile test, the mobile is ready for communication by sending an AHY message. If the mobile is not ready it responds with an ACKI message and then becomes alert. When the mobile is ready for communication it sends an ACK message and the test continues.

TC CONFIRMATION (Traffic Channel CONFIRMATION)

There are three options for checking that the mobile is on the required traffic channel after the mobile has moved to a traffic channel:

- DISABLED *[disable]* The mobile is assumed to be on the traffic channel.

- PRESSEL *[pressel]* The mobile is requested to send a PRESSEL message on the new traffic channel.
  To do this you are asked to **** PRESS PTT **** and then **** RELEASE PTT ****.

- AHOY *[ahoy]* The Service Monitor sends an AHY message on the new traffic channel. If the mobile is on the new traffic channel it should respond with an ACK message.

Mobile parameters

MOBILE PREFIX/IDENT

The MOBILE PREFIX/IDENT (mobile prefix and identity) number is a unique number allocated to the mobile and programmed into it. It is transmitted from the mobile on request during the place call procedure. The MOBILE PREFIX/IDENT parameter allows you to change the number.

GROUP PREFIX/IDENT

The GROUP PREFIX/IDENT (group prefix and identity) number is a unique number allocated to a group of mobiles. It is programmed into the mobile in a similar manner to the mobile prefix and identity number. It is used to page all the mobiles having the same number.

The Service Monitor has a facility for calling the mobile under test, using its GROUP PREFIX/IDENT within the manual test mode.

CALLING PREFIX/IDENT

The CALLING PREFIX/IDENT parameter allows you to enter any prefix/identity from the usable range. This allows the Service Monitor to simulate any mobile or base station that might work with the mobile under test.

CALLED DISCONNECT COUNT

Different systems require differing numbers of disconnect messages to be sent from the called mobile to terminate a call. This parameter must be set to the system standard.

CALLING DISCONNECT COUNT

Different systems require differing numbers of disconnect messages to be sent from the calling mobile to terminate a call. This parameter must be set to the system standard.

MOBILE POWER TYPE

The majority of mobiles operating on the ***MPT1327 System*** have power outputs in excess of 5 W (+37 dBm). The HIGH Mobile Power Type setting should be used for these mobiles as this sets the Test Set RF reference level to a suitable value.

The LOW Mobile Power Type setting should be used for testing mobiles with a power output of less than 5 W (+37 dBm). The Test Set RF reference level is set to be more sensitive than for the HIGH selection.

Autorun control

The AUTORUN CONTROL menu allows you to select the way that the AUTORUN program responds to the results of tests.

DISPLAY FORMAT

This gives you control over the data displayed on completion of each test in the program. With FULL selected, the results of each test are printed in detail, with the results of each measured parameter listed. With SUMMARY selected, one line is displayed or printed for each test, containing the test title, then PASS or *FAIL*, with a brief summary of the test.

PAUSE MODE

You can select the criteria that cause the test program to pause and wait for intervention.

Three options are available, displayed on a soft key menu after pressing the *[pause mode]* key. They are:

- *[manual only]*. The AUTORUN program runs through all tests. If the *[pause]* key is pressed during a test the program pauses at the end of the current test.

- *[on failure]*. The AUTORUN program pauses at the end of any test that fails.

- *[always]* The AUTORUN program pauses at the end of every test.

Once the program has paused there are two available options. The program can be continued by pressing the *[cont]* key, or the operation of the mobile can be examined by selecting one of the other modes of the Service Monitor. The mobile remains active if the [Dx TEST] or [Rx TEST] modes are selected, and all the settings of the basic instrument modes relate to the ongoing SYSTEM test. By this means, the current state of the mobile can be examined for fault diagnosis or adjustment.

You can return to the test program at any time, by pressing the [SYSTEM] key. The AUTORUN screen is displayed. Pressing the *[cont]* key continues the program from the point where it paused.

PRINT

When print is set ON, all AUTORUN results are printed as they appear in the results screen. The *[print]* key allows access to the *[on]* and *[off]* keys.

NUMBER FORMAT

The format of the displayed Equipment Serial Number (ESN) is selected from this menu. The options available are:

[decimal]

[hex]

[standard]

Autorun parameters

The AUTORUN PARAMETERS menu allows you access to the parameters of each of the tests that are available within the MPT1327 system. The parameters of each test are listed in the following description in the same order as they appear on the display.
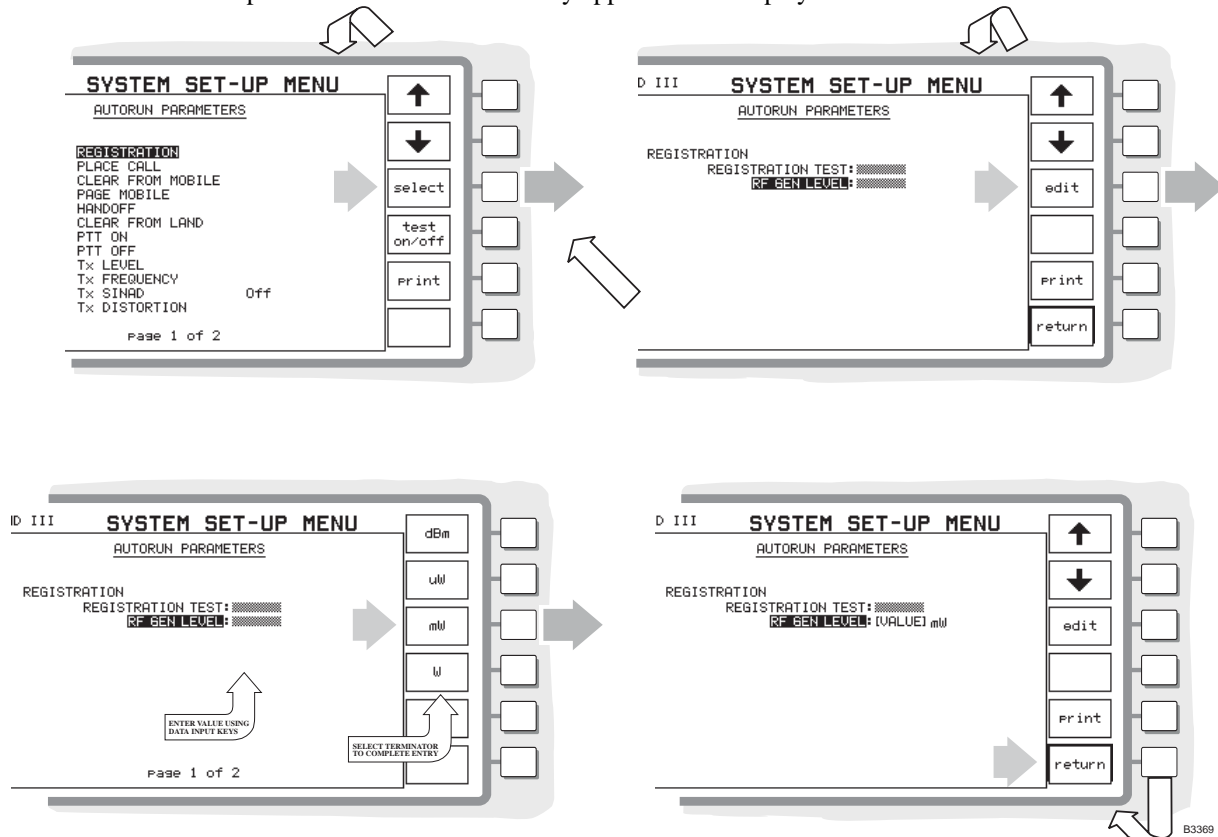

Fig. 2-5 Editing AUTORUN PARAMETERS

Many of the tests can be disabled so that the program does not run them. This gives you flexibility to meet specific requirements. Where this is an option it is shown in the parameter list, the test title is followed by ON or OFF.

To gain access to the individual parameters follow the procedure shown in the flow diagram in Fig. 2-5.

USER MPT

There are a number of different system type (*or variant*) set-ups programmed into the MPT1327 test system of the Service Monitor. Selecting the required system type is explained earlier under *System parameters menu; selecting the system type or variant.*

The frequency plans for these system are allocated by the appropriate authority.

The provision of a USER MPT system type, with its edit facility, allows access to these parameters, so that testing can be carried out to equipment operating on systems other than those available within the SYSTEM PARAMETERS menu. Once set up, the USER MPT system type remains available for future use. The RF channels and frequencies used for testing are defined within channel blocks of consecutive channels, each of which can be included or excluded from the frequency plan of the USER MPT system. Using the channel blocks within a test program is described in detail later.

Edit user

The parameters that can be changed on the <u>EDIT USER</u> menu are described below. The new values or selections are not effective until the *[return]* key has been pressed to display the <u>SYSTEM PARAMETERS</u> menu.

SYSTEM TITLE

This allows you to enter a title of up to ten characters. After a title has been entered as the SYSTEM TITLE and the system type re-elected, it is shown on the <u>SYSTEM PARAMETERS</u> menu and also at the top left of the main title area. The system type keys display the first seven characters of the new title. For example with a title changed to SUPER the soft key would be labeled *[SUPER]*, if it were changed to SUPERMPT the soft key would be labeled *[SUPERMP]*

When the *[SYSTEM TITLE]* key is pressed, a list of characters that can be used in the title is displayed at the bottom of the screen. A cursor, controlled by the variable rotary control, is used to select characters for the title. The right-hand soft keys are configured to control the entry of the title.

To clear the current SYSTEM TYPE title entry from the display either:

- Press the *[delete char]* key

- Press the [DELETE] key on the front panel

- Enter the first character of the new title.

The first character of the title is selected from the character list by placing the cursor over it, then pressing the *[enter char]* key. Pressing the data entry keys, including the decimal point and minus sign, enters their character as the next in the title.

To delete the latest character placed in the title either:

- Press the *[delete char]* key

- Press the [DELETE] key on the front panel.

Pressing the *[title complet]* key, enters the title as the SYSTEM TYPE title. When the *[return]* key is next pressed, this becomes the system title, as described above.

Pressing the *[return]* key while the titling character list is displayed (i.e. before the *[title complet]* key has been pressed), aborts the title entry and displays the EDIT CURRENT screen.

MEAN DATA DEVIATION

The MPT1327 system specification mean deviation level is 1.5 kHz. and is the default value for USER MPT. A different value can be entered by you if required.

DATA SYNC PATTERN

The DATA SYNC pattern is transmitted as the 16 least significant bits in the control channel system codeword (CCSC) frame. The default value of C4D7 hex. is the MPT1327 standard SYNC pattern.

DATA SYNT PATTERN

The DATA SYNT pattern is transmitted as the 16 least significant bits in the traffic channel system codeword frame. The default value of 3B28 hex. is the MPT1327 standard SYNT pattern.
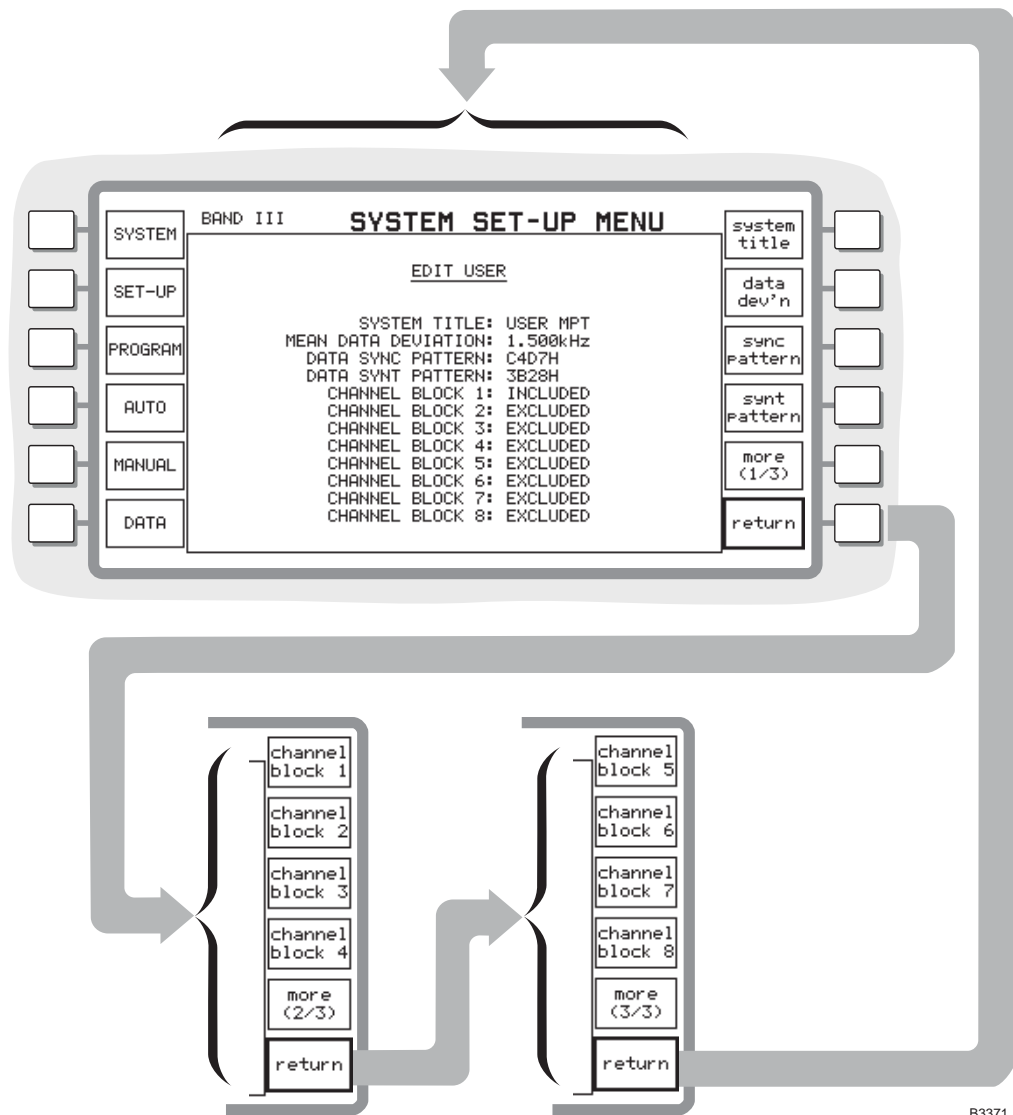
Fig. 2-6 EDIT USER menu.

CHANNEL BLOCKS 1-8

The allocation of frequencies to service providers for MPT1327 is not necessarily in continuous frequency bands. To make maximum use of allocated frequencies, some frequency plans for a system may be complex. The duplex offset and channel spacing can be different for different channels within a system. To allow testing of mobiles programmed with such frequency plans, the Service Monitor has 8 channel blocks which can each hold a simple channel plan and can have the duplex offset and channel spacing defined for the channels within it. See Fig. 2-6.

INCLUDED/EXCLUDED

Each channel block can be included or excluded in the USER MPT frequency plan by using the *[channel block]* key and then selecting *[include]* or *[exclude]*. This allows you to include only those channel blocks necessary.

LOWEST CHANNEL

The lowest physical channel to be included in the block is entered here.

Note that if the channel number to be entered is higher than the current highest channel number, then the new lowest channel number is not accepted. For this situation, enter the new highest channel number first.

HIGHEST CHANNEL

The highest physical channel to be included in the block is entered here.

Note that if the channel number to be entered is lower than the current lowest channel number, then the new highest channel number is not accepted. For this situation, enter the new lowest channel number first.

LOWEST CHAN TX FREQ

The mobile transmitter frequency of the lowest channel is entered here.

DUPLEX OFFSET

The duplex offset RF frequency is entered here. A positive value places the base station frequency higher than that of the mobile, a negative value places the base station frequency lower than that of the mobile.

CHANNEL SPACING

The MPT1327 standard channel spacing is 12.5 kHz. and is the default value for USER MPT. A different value can be entered by you if required.

LOGICAL CHANNEL OFFSET

The allocation of channels to a system does not necessarily start at 1. Therefore the first channel in a system may be logically channel 1 in the signaling between a base station and a mobile and not the physical channel 1. In the case of BAND III, logical channel 1 corresponds to physical channel 58. The Service Monitor functions in physical channels but allows an offset to be defined.

The logical channel to physical channel offset is entered here. A positive value gives a logical channel number higher than the physical channel number, a negative value gives a logical channel number lower than the physical channel number.

Setting up channel blocks

When building a channel plan for testing mobiles on system with non-consecutive channel allocations note the following points:

Each channel block can, if necessary accept only a single channel. If used in this way, you may set up to 8 spot frequencies to be used, one in each of the 8 channel blocks.

Any gaps in a frequency plan are jumped over when running an auto test program. In manual test, you are prohibited from entering channel numbers which do not exist in the set up frequency plan.

Broadcast messages

The MPT1327 test system in the Service Monitor has provision for up to four broadcast messages to be included in the continuous overhead data. The procedure to access these messages is included here but is not evident on the display of the Service Monitor. The are six different message types plus customization provision. Editing the system definition field controls the message type; the parameter fields of the messages can also be edited by you.

Message access

Access to the messages, for editing and to include or exclude from the continuous forward data, is possible only when the SYSTEM PARAMETERS set-up menu is displayed. Pressing the [SYSTEM] key followed by the data key [1], [2], [3] or [4] displays the corresponding broadcast message.

The current settings relating to the message are displayed in the lower part of the display alongside the legends:

MESSAGE IS:

SYSDEF:

PARAMETERS:

Pressing the *[include exclude]* key displays individual *[include]* and *[exclude]* keys. These are used to select the displayed message for inclusion in the continuous overhead data.

The *[sysdef]* key allows the five system definition bits of the message to be set, which selects the message type. This is done by pressing the *[sysdef]* key to highlight the system definition fields of the message, then entering the equivalent hex number within the range 00 to 1F. The hex numbers and corresponding messages are show below.

Hex number	Message
00	ANNOUNCE CONTROL CHANNEL
01	WITHDRAW CONTROL CHANNEL
02	CALL MAINTENANCE PARAMETERS
03	REGISTRATION PARAMETERS
04	ADJACENT SITE CONTROL CHANNEL
05	VOTE NOW ADVICE
06 to 1F	CUSTOM

The *[params]* key allows the 18 parameter bits to be set. This is done by pressing the *[params]* key to highlight the parameter fields of the message, then entering the equivalent hex number within the range 00 to 3FFFF.

Any of the four messages set up as 'INCLUDED' form part of the 'CONTINUOUS OVERHEAD DATA' sent from the Service Monitor while running all autotest programs. They are also sent when in the broadcast mode of manual tests.

Test details

A description of each test explains the system function that is being tested and describes the signaling between the Service Monitor and the mobile under test. The failure messages associated with each test are explained.

Description of tests

Registration

Registration of mobile on a control channel.

This test forces the mobile to register by addressing it with its individual prefix/identity which has to be known before the test is started.

It also obtains the serial number of the mobile, which it stores and displays in decimal, hexadecimal or standard depending on the setting of the NUMBER FORMAT in the AUTORUN CONTROL MENU.

Upon initialization, the test title is displayed.

The Service Monitor is tuned to the correct RF frequencies and a control channel is generated which includes any broadcast messages which are enabled. The message 'ACTIVE CONTROL CHANNEL use 'xxx' is displayed to indicate the progress of the test.

The individually addressed ALHR frame which demands that the mobile registers is assembled and transmitted in keeping with the slot synchronization of the control channel. The Service Monitor waits 1 second for a response before re-transmitting the ALHR frame and, if nothing is received within the time specified in the TIMEOUT parameter, the message *FAIL* NO RESPONSE is displayed and the test exits.

If the mobile responds with an ACKX frame which indicates that it is unable to register, then the message *FAIL* CANNOT REGISTER is displayed and the test exits.

If the mobile responds correctly with an RQR frame, then the prefix/identity is updated and displayed. The Service Monitor then displays 'REQUESTING SERIAL NUMBER', sends an AHYC frame to demand the mobile serial number and, if this is answered correctly with a SAMIS frame, the serial number is updated. If an ACKX frame is received, the test passes but displays 'NO SERIAL NUMBER'. Otherwise an error message is generated.

Then the prefix/identity and serial number of the mobile are displayed along with the skew timing and any system specific information provided by the mobile during the registration.

If any of the responses is incorrect, then the message, '*FAIL* UNEXPECTED MESSAGE' is displayed.

Other failure messages are:

FAIL EMERGENCY CALL REJECTED	Emergency call has been received and rejected.
FAIL NOT ON CONTROL CHANNEL	Mobile is not on control channel (i.e. still in conversation).
FAIL NO RESPONSE	No response was received from mobile.
FAIL ABORTED BY USER	User halted program before test was complete.
FAIL NO SERIAL NO RESPONSE	No serial number response was received from mobile.

Place call

Call placement from mobile to TSC (Trunking System Controller).

This test is used to simulate the placement of a call from the mobile under test to the TSC. The mobile provides its prefix/identity as part of the call request so this test is usually the first in a sequence. The test accepts extended addressing calls to an inter-prefix mobile, a PABX or a PSTN as well as short addressing calls to another mobile or a PABX.

Upon initialization, the test title is displayed.

The Service Monitor is tuned to the correct RF frequencies and a control channel is generated which includes any broadcast messages that are enabled. The message ACTIVE **** PLACE CALL **** is displayed.

The Service Monitor waits to receive an RQS/RQE frame from the mobile but, if nothing is received within the time specified in the TIMEOUT parameter, then the message *FAIL* NO RESPONSE is displayed and the test exits.

If the RQS frame indicates that an extended addressing call is requested, then the Service Monitor sends an AHYC frame to instruct the mobile to send any additional information in a SAMIS frame with appended data code words if necessary.

When all of the required address information has been received, the Service Monitor sends the mobile into conversation on a traffic channel using a GTC frame and if TC CONFIRMATION has been selected, checks that it has reached the channel.

The number that the unit has called is displayed either in the form of a prefix/identity or as dialed digits for a PABX/PSTN emergency call. The skew timing of the RQS frame is also displayed along with the prefix/identity of the mobile.

If any of the responses is incorrect, then the message *FAIL* UNEXPECTED MESSAGE is displayed. Other messages are:
ACTIVE REQUESTING EXT ADDRESSING
ACTIVE WAITING FOR TC
ACTIVE WAITING FOR RESPONSE
PASSED xxx/yyy
PASSED x/yyyy
PASSED nnnnnnnnn

Other failure messages are:

FAIL NOT ON CONTROL CHANNEL	Mobile is not on control channel (i.e. still in conversation).
FAIL ABORTED BY USER	User halted program before test was complete.
FAIL CALL REJECTED	The call has been rejected.
FAIL NO ANSWER	Call has not been answered.

Clear From Mobile

Clearing down from mobile on a traffic channel.

This test simulates the termination of a call by the mobile.

Upon initialization, the test title is displayed and the Service Monitor checks that the mobile is in conversation. Otherwise, the message *FAIL* NOT ON VOICE CHANNEL is displayed.

The flashing message ACTIVE **** END CALL **** is displayed and the Service Monitor waits to receive a disconnect frame from the mobile. If nothing is received within the time specified in the TIMEOUT parameter, the message *FAIL* NO RESPONSE is displayed and the test is terminated.

If the correct number of disconnect frames are not received then the message *FAIL* WRONG DISCONNECT QTY is displayed and the test is terminated.

The Service Monitor is re-tuned to the correct control channel and the control channel frames are assembled and transmitted.

Other messages are:

FAIL ABORTED BY USER	User halted program before test was complete.
FAIL WRONG RESPONSE	The response from the mobile was wrong for the message that was sent.
PASSED CLEARED DOWN	

Page Mobile

The Page Mobile test routine is used to simulate the placement of a call from the TSC to the mobile under test. The number of the mobile to be called is stored in the prefix/identity as shown in the MOBILE PARAMETERS MENU. In addition to this, a calling unit number is also set up in the MOBILE PARAMETERS MENU and this allows the simulation of inter-prefix, PABX and PSTN calls.

Upon initialization, the test title is displayed.

The Service Monitor is tuned to the correct RF frequencies and a control channel is generated which includes any broadcast messages which are enabled. The message 'ACTIVE CONTROL CHANNEL use 'xxx' is displayed to indicate the progress of the test.

The individually addressed AHY frame which demands a response from the mobile is assembled and transmitted in keeping with the slot synchronization of the control channel. The Service Monitor waits 1 second for a response before re-transmitting the AHY frame and, if nothing is received within the timeout period, the message *FAIL* NO RESPONSE is displayed and the test terminates.

If the mobile responds with an ACKI frame, which indicates that you have set your RFCC (ready for communication control) to 'User not ready' and that FULL OFF-AIR is enabled under the TEST PARAMETERS MENU, then the message ACTIVE **** ANSWER CALL **** is displayed. The Service Monitor then waits for the duration of the timeout period to receive an RQQ frame. This leads to either the message:

> *FAIL* CALL REJECTED and the test exiting with an error.

or

> The intermediate message ACTIVE WAITING FOR TC before proceeding to the CONVERSATION mode or to one of the fail messages.

If the mobile responds correctly with an ACK frame, then the Service Monitor sends the mobile into conversation on a traffic channel using a GTC frame and if TC confirmation has been selected, checks that the mobile has reached the channel.

If any of the responses are incorrect, then the message *FAIL* UNEXPECTED MESSAGE is displayed. Other messages are:

FAIL NOT ON CONTROL CHANNEL	Mobile is not on control channel (i.e. still in conversation.
FAIL NO ANSWER	Call has not been answered.
FAIL ABORTED BY USER	User halted program before test was complete.
FAIL WRONG RESPONSE	The response from the mobile was wrong for the message that was sent.
FAIL RU UNAVAILABLE	The mobile is not available to receive a call.

FAIL CALL BACK

ACTIVE WAITING FOR RESPONSE

PASSED TRAFFIC CHANNEL

Handoff

Handoff from current to next traffic channel.

This test is used to simulate the switching of a call in progress (handoff) from the current traffic channel to the next traffic channel as determined by the HANDOFF INCREMENT parameter specified in the system parameters menu.

Upon initialization, the test title is displayed and the Service Monitor checks that the mobile is in conversation. Otherwise, the message '*FAIL* NOT ON VOICE CHANNEL' is displayed.

The mobile is sent from the current channel to the next traffic channel with a GTC frame sent from the Service Monitor. The message 'ACTIVE ASSIGNING TCxxx' is displayed.

The Service Monitor is then tuned to the correct RF frequencies for the new traffic channel, and then, if TC CONFIRMATION parameter has been set to [ahoy] or [pressel], the Service Monitor checks that the mobile has reached that channel.

If the mobile has handed off correctly, then PASSED TCxxx TO TCyyy is displayed and the test exits.

Other failure messages are:

FAIL ABORTED BY USER	User halted program before test was complete.

Clear from land

Clearing down from TSC.

This test simulates the termination of a call by the TSC.

Upon initialization, the test title is displayed and the Service Monitor checks that the mobile is in conversation. Otherwise, the message *FAIL* NOT ON VOICE CHANNEL is displayed.

A check is then made to see if any RF carrier is being received. If so, the message *FAIL* CARRIER ON is displayed and the test terminates.

Two CLR frames are assembled and transmitted to the mobile.

The Service Monitor is re-tuned to the correct control channel and the control or broadcast channel frames are assembled and transmitted.

The message 'PASSED CLEARED DOWN' is displayed.

Other failure messages are:

FAIL NO RESPONSE	No response was received from mobile.
FAIL ABORTED BY USER	User halted program before test was complete.

PTT ON

Start mobile transmission on a traffic channel.

This test is used to start the mobile transmitting RF.

You can select what type of response the mobile is to be tested for. If the USE PRESSEL test parameter is 'ON', then the Service Monitor expects a pressel on (MAINT) message to be received when the mobiles PTT switch is pressed. If the USE PRESSEL test parameter is 'OFF' then the Service Monitor expects to receive RF power from the mobile in order for the test to pass.

The flashing message **** PRESS PTT **** is displayed. If you have configured the test to expect a pressel on message, then the Service Monitor waits for a time specified in the TIMEOUT test parameter, for a pressel on message to be received from the mobile. If a pressel on message is received then the PASSED PRESSEL ON message is displayed and the test exits. If no pressel on message is received then the *FAIL* NO PRESSEL ON message is displayed and the test exits. If a disconnect message (MAINT) message is received, then the *FAIL* CLEARED DOWN message is displayed and the test exits.

If you have configured the test to test for mobile RF power, then the Service Monitor waits for a time specified in the TIMEOUT test parameter, for at least 100 mW of RF power to be transmitted by the mobile. When sufficient RF power is detected, the PASSED CARRIER ON message is displayed and the test exits. If insufficient RF power is detected the *FAIL* CARRIER OFF message is displayed and the test exits.

Other failure messages are:

FAIL ABORTED BY USER	User halted program before test was complete.
FAIL WRONG RESPONSE	The response from the mobile was wrong for the message that was sent.

PTT OFF

Start mobile transmission on a traffic channel.

This test is used to stop the mobile transmitting RF.

You can select what type of response the mobile is to be tested for. If the USE PRESSEL test parameter is 'ON', then the Service Monitor expects a pressel off (MAINT) message to be received when the mobile's PTT switch is released. If the USE PRESSEL test parameter is 'OFF' then the Service Monitor expects to see RF power from the mobile turned off in order for the test to pass.

The flashing message **** RELEASE PTT **** is displayed. If you have configured the test to expect a pressel off message, then the Service Monitor waits for a time specified in the TIMEOUT test parameter, for a pressel off message to be received from the mobile. If a pressel off message is received, the PASSED PRESSEL OFF message is displayed and the test exits. If no pressel off message is received the *FAIL* NO PRESSEL OFF message is displayed and the test exits. If a disconnect message (MAINT) message is received, the *FAIL* CLEARED DOWN message is displayed and the test exits.

If you have configured the test to test for no mobile RF power, the Service Monitor waits for a time specified in the TIMEOUT test parameter, for the RF power transmitted by the mobile to drop below 100 mW. When this happens the PASSED CARRIER OFF message is displayed and the test exits. If RF power is still present the *FAIL* CARRIER ON message is displayed and the test exits.

Other messages are:

FAIL ABORTED BY USER	User halted program before test was complete.
FAIL WRONG RESPONSE	The response from the mobile was wrong for the message that was sent.

Tx level

Transmitter RF power.

Measures the RF power output from the mobile.

Messages are:

FAIL ABORTED BY USER	User halted program before test was complete.

Tx frequency

Transmitter RF frequency.

The Tx frequency test is used to determine the accuracy of the RF frequency generated by the mobile on the current traffic channel. The test fails if the RF frequency is found to be outside the prescribed limits. The message '*FAIL* OUT OF RANGE' is displayed.

Other messages are:

FAIL ABORTED BY USER	User halted program before test was complete.

Tx SINAD

Transmitter SINAD.

The Tx SINAD test is used to measure the SINAD level of the modulated transmission from the mobile.

The test fails if the measured SINAD level is below the prescribed level.

The Service Monitor AF generator frequency is set to 1 kHz and its level is adjusted until the mobile generates the nominal modulation level. The Service Monitor then measures the Tx SINAD of the modulated signal of the mobile.

Failure messages are:

FAIL OUT OF RANGE	SINAD level is below the prescribed limit.
FAIL ABORTED BY USER	User halted program before test was complete.
FAIL NO MODULATION	No modulation has been received from the mobile.
FAIL UNSTABLE DEMOD	Demodulation was not within 5% after 3 readings or 1% after 10 readings.

Tx distortion

Transmitter distortion.

The Tx Distortion test is used to measure the distortion level of the modulated signal from the mobile.

The test fails if the distortion level is above the prescribed limit.

The Service Monitor AF generator frequency is set to 1 kHz and its level is adjusted until the mobile generates the nominal modulation level. The Service Monitor then measures the Tx distortion of the modulated signal of the mobile.

Failure messages are:

FAIL OUT OF RANGE	Distortion level is above the prescribed limit.
FAIL ABORTED BY USER	User halted program before test was complete.
FAIL NO MODULATION	No modulation has been received from the mobile.
FAIL UNSTABLE DEMOD	Demodulation was not within 5% after 3 readings or 1% after 10 readings.

Tx S/N

Transmitter S/N.

The Tx S/N test measures the signal-to-noise level of the modulated signal from the mobile. The test fails if the signal-to-noise level is below the prescribed limit.

The Service Monitor AF generator frequency is set to 1 kHz and its level is adjusted until the mobile generates the nominal modulation level. The Service Monitor then measures the Tx S/N of the modulated signal of the mobile.

Failure messages are:

FAIL OUT OF RANGE	Signal-to-noise level is below the prescribed limit.
FAIL ABORTED BY USER	User halted program before test was complete.
FAIL NO MODULATION	No modulation has been received from the mobile.
FAIL UNSTABLE DEMOD	Demodulation was not within 5% after 3 readings or 1% after 10 readings.

FAIL UNSTABLE DEMOD	Signal-to-noise level is below the prescribed limit.

Tx noise

Transmitter residual noise.

The Tx Noise test determines the level of 'FM noise' produced by the mobile. The test fails if the noise level is above the prescribed limit.

The Service Monitor measures the modulation level of the mobile in the absence of a modulating signal from the Service Monitor.

Failure messages are:

FAIL OUT OF RANGE	Noise level is above the prescribed limit.
FAIL ABORTED BY USER	User halted program before test was complete.

Tx limiting

Transmitter modulation limiting.

The Tx Limiting test measures the level of carrier deviation from the mobile transmitter for differing levels of AF input, thereby establishing the effectiveness of the deviation limiting circuits of the transmitter.

The test fails if the deviation level is above the prescribed limit.

The Service Monitor adjusts the level of the AF generator until the mobile generates the nominal modulation level.

The Service Monitor then increases the AF level by the overload factor and checks that the result from the mobile is below the limit.

Failure messages are:

FAIL OUT OF RANGE	Deviation level is above the prescribed limit.
FAIL NO MODULATION	No modulation has been received from the mobile.
FAIL ABORTED BY USER	User halted program before test was complete.
FAIL UNSTABLE DEMOD	Demodulated signal was not within 5% after 3 readings or 1% after 10 readings
FAIL LOW MIC I/P SENS	The AF level required to set the transmitter reference modulation level was too high to overload by the factor given.

Tx compression

Transmitter modulation compression.

Not used in built-in test programs for MPT1327.

The Tx compression test measures the RF carrier deviation from the mobile at two levels to test the operation of the compression circuits.

The test fails if the compression ratio is outside the tolerance limit.

The Service Monitor adjusts the AF level until the mobile generates the nominal modulation level, then increases the AF level by 10 dB and measures the modulation level. The AF level is then decreased by 20 dB and the modulation level measured.

The compression ratio is the ratio of the two measured modulation levels.

Failure messages are:

FAIL OUT OF RANGE	Compression ratio is outside the tolerance level.
FAIL ABORTED BY USER	User halted program before test was complete.
FAIL LOW MIC I/P SENS	AF level required to set the transmitter to +10 dB modulation level was too high to overload by the factor given
FAIL NO MODULATION	No modulation has been received from the mobile
FAIL UNSTABLE MOD	Demodulated signal was not within 5% after 3

readings or 1% after 10 readings

Rx SINAD

The Rx SINAD test measures the SINAD level of the signal received and demodulated by the mobile.

The test fails if the SINAD level is below the prescribed limit.

The Service Monitor RF carrier is modulated at a frequency of 1 kHz at the nominal modulation level. The demodulated audio from the mobile is fed to the AF INPUT of the Service Monitor, which measures the Rx SINAD.

Failure messages are:

FAIL OUT OF RANGE	SINAD level is below the prescribed limit.
FAIL ABORTED BY USER	User halted program before test was complete.
FAIL LOW DEMOD LEVEL	Receiver audio level <5 mV

Rx distortion

Receiver distortion.

The Rx Distortion test measures the distortion level of the signal received and demodulated by the mobile.

The test fails if the distortion level is above the prescribed limit.

The Service Monitors RF carrier is modulated at a frequency of 1 kHz at the nominal modulation level. The demodulated audio from the mobile is fed to the AF INPUT of the Service Monitor which measures the Rx distortion.

Failure messages are:

FAIL OUT OF RANGE	Distortion level is above the prescribed limit.
FAIL ABORTED BY USER	User halted program before test was complete.
FAIL LOW DEMOD LEVEL	Receiver audio level <5 mV

Rx S/N

Receiver S/N.

The Rx S/N test measures the signal-to-noise level.

The test fails if the signal-to-noise level is below the prescribed limit.

The Service Monitors RF carrier is modulated at a frequency of 1 kHz at the nominal modulation level. The demodulated audio from the mobile is fed to the AF INPUT of the Service Monitor, which measures the Rx S/N.

Failure messages are:

FAIL OUT OF RANGE	Signal-to-noise level is below the prescribed limit.
FAIL ABORTED BY USER	User halted program before test was complete.
FAIL LOW DEMOD LEVEL	Receiver audio level <5 mV

Rx sensitivity

This test determines the sensitivity of the mobile receiver.

The test fails if the sensitivity is below the prescribed limit.

The Service Monitor generates an RF carrier, modulated with 1 kHz frequency at the nominal modulation level. The Service Monitor then reduces the RF level in steps, while measuring the Rx SINAD until the Rx SINAD threshold is passed.

If the mobile mutes its audio during the test, the Service Monitor sets the RF level to -80 dBm until the mobile 'un-mutes'. The test is then continued at a slightly higher RF level.

Failure messages are:

FAIL OUT OF RANGE	Sensitivity is below the prescribed limit.
FAIL ABORTED BY USER	User halted program before test was complete.
FAIL DROPPED OUT	Mobile has dropped the call because the RF generator level was to low.
FAIL LOW DEMOD LEVEL	Receiver audio level <20 mV
FAIL LOW SINAD LEVEL	Unable to reach reference SINAD level at -80 dBm

Rx expansion

Receiver demodulation expansion.

Not used in built-in test programs for MPT1327.

The Rx expansion test measures the audio output level from the mobile for various levels of carrier deviation to test the operation of the demodulated signal expander circuits (refer to Tx Compression test earlier in this section).

The Service Monitor generates an RF carrier modulated at the nominal modulation level. It increases the modulation level by 5 dB and measures the AF level from the mobile. It then decreases the modulation level by 10 dB and again measures the AF level. The expansion is the ratio of low to high AF level measurements.

Other failure messages are:

FAIL NO DEMODULATION	+10 dB change in modulation level produced insufficient change in received AF level.
FAIL ABORTED BY USER	User halted program before test was complete.

Selecting the AUTORUN Test Program
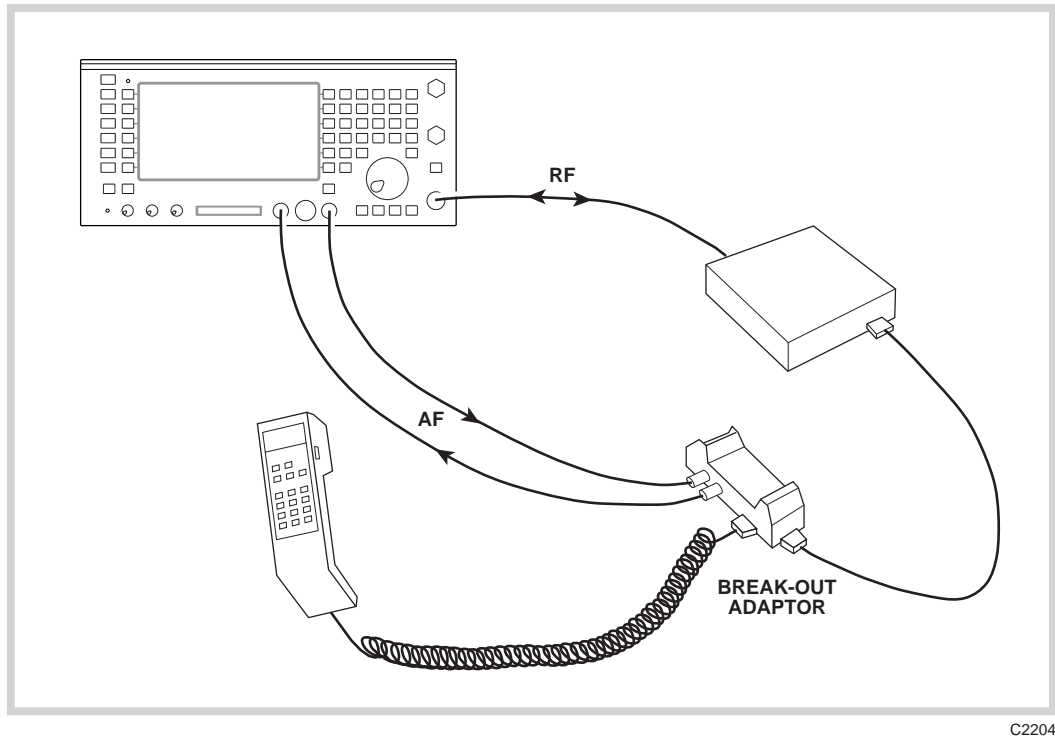
[PROGRAM]

The *[PROGRAM]* soft key gives you access to the selection of five test programs. Each test program is made up of selected tests. These tests have been described in detail earlier in this chapter under Description of Tests.

The five programs are:

CALL PROCESSING ONLY

CALL AND RF TESTING

BRIEF TESTING

COMPREHENSIVE TESTING

USER DEFINED TEST

Making tests to mobiles

Fig. 2-7 A typical test set-up showing connections to a mobile

RF connections

For mobiles that have an RF service connection, this is connected to the N-type RF connector of the Service Monitor using a suitable RF cable.

Mobiles that do not have RF breakout facilities can be tested using a 'Through Air' RF link between the mobile's normal antenna and a suitable antenna fitted to the Service Monitor. If this method is used, the 'Through Air' link must be enclosed in a environment that has a high level of RF screening.

CAUTION | **Do not use the ANTENNA input for direct connection when in SYSTEM mode.**

With SYSTEM mode selected, setting the ANTENNA port as the RF input port causes the input sensitivity to switch to the most sensitive range and disables the automatic gain control.

AF connections

For tests that require parametric measurements to be made, connections must be made from the AF GEN OUTPUT connector of the Service Monitor to the audio input of the mobile and from the audio output of the mobile to the AF INPUT of the Service Monitor: see Fig. 2-7.

Automatic testing

With a mobile connected to the Service Monitor and with the 'SET-UP' configured to suit the mobile, an automatic test can be carried out.

Select the program to be run e.g. CALL PROCESSING ONLY, by using the *[PROGRAM]*, *[call process]*, *[AUTO]*, sequence. The selected program is shown at the top of the display.

The results of the test program are displayed and placed into the results store. To make a permanent record of the results when the program has finished, you may print out a hard copy using the *[print store]* key.

To run the program press the *[start]* key.

When an AUTORUN program is running , soft keys *[stop]* and *[pause]* are displayed.

Pressing the *[stop]* key stops the program immediately and abort the current test. The STATUS message *FAIL* ABORTED BY USER is displayed and a *[cont]* key appears. Pressing this continues the AUTORUN program commencing at the next test. Pressing the *[stop]* key rather than the *[cont]* key prevents the program continuing and prepares for the AUTORUN program to be started again.

Pressing the *[pause]* key while a program is running makes the program pause at the end of the current test. The program is then in the same condition as when paused due to your setting of the PAUSE MODE in the AUTORUN CONTROL menu.

Manual testing

The manual testing mode is provided to assist in fault location and repair. You are able to set system parameters for the test to be carried out independently from the values in the set-up, system parameters menu. From the mode selection soft key list, each aspect of the system operation can be selected for testing. If one of the other main modes of the Service Monitor is selected while in manual test, the mobile remains active and all the settings of the basic instrument modes relate to the ongoing system test. This allows measurements to be made to the receiver or transmitter of the mobile.

When the manual test mode is accessed the following system parameters require setting to the relevant values.

CONTROL CHANNEL

Before any testing can be carried out on an MPT1327 mobile, the CONTROL CHANNEL number must be set to a value that the mobile can recognize and use.

Note

If the correct SYSTEM ID and the correct control channel number for the mobile are not entered the mobile may not go into service.

TRAFFIC CHANNEL

This must by set to a channel within the range of the mobile.

RESPONSE DELAY

This parameter allows you to simulate heavy traffic conditions when the system is unable to allocate a traffic channel to a request from a mobile.

In the case of a speech or non-standard data call from the mobile, if the response delay is non-zero, instead of sending a 'GTC' in response to a 'RQS' from the mobile, the Service Monitor sends a 'ACKI' and waits for the number of seconds set in the RESPONSE DELAY parameter. After that time the Service Monitor sends a 'GTC'.

The response delay is also used in status calls to the mobile, and in the CALL RU test.

The response delay allows testing of call termination from either the mobile or the Service Monitor.

DATA LEVEL

The data level should be set to the deviation level specified for the system unless the value is required to be different to perform a specific test.

MODE selection

The *[mode]* key displays the test options available to you with the mobile in the current state. When first entering manual test mode, the options available are; control channel, broadcast, registration, call RU (mobile,) call group (of mobiles), and place call. From this menu the control channel number can also be changed.

Selecting each of the options has the action described below:

[control channel] The mobile transmits the continuous forward data on the control channel.

[broadcast] Selecting this mode causes the Service Monitor to generate the control channel system code word on the control channel. This is produced continuously until stopped or changed by you.

[registn] The mobile is requested to register. The mobile's prefix/ident and serial number are displayed on the screen.

[call RU] The mobile is called using the individual prefix/ident number and goes into conversation mode on the traffic channel as defined by TRAFFIC CHANNEL. The FULL OFF-AIR and TC CONFIRMATION options set in the SYSTEM PARAMETERS MENU are active. The response of the mobile to these options is described in the page mobile test on page 2-15.

[call group] The mobile is called as above but using the group prefix/ident number.

[place call] The Service Monitor tells you to place a call from the mobile. When you do so, the Service Monitor displays relevant information about the call: the prefix/ident number of the mobile under test, the prefix number of the called mobile or the digits of the number dialed, the call type, e.g. SIMPLE SPEECH, the traffic channel slot and the number of 'skew' bits.

The MODE legend shows that the traffic channel is active. The mobile remains in conversation mode until action is taken by you. This can be 'END CALL' from the mobile, which clears the call and returns the mode to control channel. Alternatively, pressing the *[mode]* key gives the choice of *[handoff]* or *[clear down]* from the Service Monitor. If 'HANDOFF' is selected, the *[traffic channel]* legend at the top of the screen is highlighted and the new traffic channel must be entered. Pressing the *[handoff]* key causes the Service Monitor to instruct the mobile to change to the new channel. When the mobile has done so, following any acknowledgments that might be required, the Service Monitor shows TRAFFIC CHANNEL mode.

You then have the same choice again.

If *[clear down]* is selected, the Service Monitor sends the disconnect command to the mobile and the mode changes to 'CONTROL CHANNEL'.

Data displays

Introduction

To enable the data display mode, press the *[DATA]* key at the left-hand side of the screen.

The data display mode allows you to view the data messages that are sent between the Service Monitor and the mobile. You can rapidly identify incorrect bits sent by the mobile that may have caused a test to fail. The data displays can also serve as an educational or reference facility for users who are unfamiliar with trunking signaling.

FORWARD/REVERSE DATA screen.

Data messages directly relating to the operation of the mobile during tests and those generated by the mobile are displayed on the forward and reverse data screen.

CONTINUOUS FORWARD DATA screen.

The data messages generated by the Service Monitor to provide the continuous forward control data required by the mobile for it to be in service are displayed on the CONTINUOUS FORWARD DATA screen.

The Service Monitor has capacity to retain up to 20 data words for each display format. This shows the last 20 words of continuous forward data sent on the control channel, while the FORWARD/REVERSE DATA display uses the memory to retain the up to the last 40 data words transmitted or received.

Forward and reverse data

This screen has five active soft keys assigned to it on the right of the display: see Fig. 2-8.

The *[forward data]* key selects the 'CONTINUOUS FORWARD DATA' display.

The *[↑]* and *[↓]* keys select the word to be displayed in the expanded data window at the top of the screen.

The *[clear]* key removes the current information from the display. **IT CANNOT BE RETRIEVED.**

The *[print]* key causes the expanded data window to be printed if the printer is active.

In the lower half, the display lists (in hexadecimal) the code words which have been sent between the Service Monitor and the mobile.

The number of times the code word has been sent and received, and the identity of the code word, are shown against each word.

The upper half of the display shows one of the code words from the list in binary form. The code word displayed is highlighted in the list and is selected by using either the *[up]* or *[down]* keys, or by using the variable rotary control. Above this window is shown the full title of the code word.

The binary display of the code word is presented in two parts.

The small window labeled 'PARITY' shows the contents of the parity field of the code word. This field consists of the 16 least significant bits of the code word.

The larger window, comprising three character lines, displays the main part of the code word, which consists of 48 bits.

The lower line shows the contents of the code word (without parity), with the most significant on the left. The upper two lines show the meaning of the bits.

See Fig. 2-9.

Fig. 2-8 FORWARD/REVERSE DATA display

BROADCAST - CALL MAINTENANCE PARAMETERS

PERIODIC INTERVAL
PERIODIC
FUNCTION
TYPE
CATAGORY
Fixed '1'
SYSTEM IDENTIFICATION

Field Codes

1	SYSID	—CAT—FUN—IVAL —I— SPARE
—SYSDF—	—1—TY—R—N—R —

Line indicates 'size' of Field Codes

10001010100000000000011000111100100000010000000000

8 0 0 C 7 2 0

PARITY 0011111001010000 BINARY

3 E 5 0 HEX

8A800C720400 3E50   1 BCAST
800004012000FF3C   3 ALH<0>

C1909

Fig. 2-9 Data screen format. (A typical display explained)

Continuous forward data

This screen has four active soft keys assigned to it on the right of the display. See Fig. 2-10.

The *[forward reverse]* key selects the 'FORWARD/REVERSE DATA' display.

The *[↑]* and *[↓]* keys select the word to be displayed in expanded data window at the top of the screen.

The *[print]* key causes the expanded data window to be printed if the printer is active.

In the lower half, the display lists (in hexadecimal) the code words which have been sent by the Service Monitor to the mobile.

The information provided by the continuous forward data screen is of the same format as that provided on the forward/reverse data screen.

Fig. 2-10 CONTINUOUS FORWARD DATA display

Store and recall facility

Introduction

The Service Monitor has a memory facility that can be used to store front-panel settings and test results when in non-system modes. The capability of this facility can be extended by the optional memory card drive . The Service Monitor Operating Manuals have a section explaining the use of this facility.

Results, settings and MI-BASIC programs relating to SYSTEM mode can be stored on memory cards.

When using the Autorun test mode, the results of the tests carried out by the program are placed in volatile memory, which allows them to be scrolled on the display, printed, and saved onto a memory card. From the memory card the results can be recalled into the Service Monitor for observation, printing or transferring to other memory cards. By using a card reader connected to a suitable PC, the results can be analyzed without using a Service Monitor.

System parameter settings and MI-BASIC programs can be saved on memory cards, then recalled when required for future use.

Memory cards

The memory card must have a capacity of between 128 Kbytes and 8 Mbytes, and be formatted for use with the Service Monitor. You can check whether or not a card is formatted from the MEMORY CARD FORMAT screen, which is accessed by the key sequence [HELP SET-UP], *[card setup]*. The message No Card Present is shown until a card is inserted into the memory card slot. With a card in place the message Card Not Formatted, or 128k Mem Card (---- 8M Mem Card), is shown.

To format (or re-format) a card, press the *[Format Card]* key.

With a formatted card in place, 100 store locations are available. Data is stored on the memory card in files, using a DOS style format. These files can use as much empty card space as they require. Therefore, if large files are stored, such as SYSTEM USER DEFINED test programs, the number of usable store locations available on the card are reduced.

Store

Storing system test results

To store results of an Autorun test program, access the STORE/RECALL screen by pressing the orange [MEM] key. Press the *[Store Sys Par]* key, which changes the right-hand top three soft keys to *[Store Sys Set]*, *[Store Sys Res]* and *[Store Basic]*. The Service Monitor must be in System mode with a System selected, otherwise the *[Store Sys Par]* key is not shown. Press the *[Store Sys Res]* key, which causes a flashing message Store Sys Results To Store No to be displayed. Decide which store location is to hold the results and press the appropriate two data keys. The results from the last Autorun test program are stored at the selected location on the memory card. The message Writing To Mem Card DO NOT REMOVE, is displayed while writing is taking place. To the right of the store location number a message is shown, describing the contents of the store location. With system results stored the message shows Syst Res

Storing system parameters

To store system parameters to a memory card, access the STORE/RECALL screen by pressing the orange [MEM] key. Press the *[Store Sys Par]* key, then the *[Store Sys Set]* key. Decide which store location is to hold the settings and press the appropriate two data keys. The settings are stored at the selected location on the memory card. The message Writing To Mem Card DO NOT REMOVE, is displayed while writing is taking place. With system settings stored, the message against the store location shows Syst Set. The setting stored by this action relates to every parameter of the system mode. This includes AUTORUN and MANUAL setting for the system selected and for the system not selected. For example:

- You are using the Service Monitor to test a mobile which operates on the AMPS system and set up a handoff increment of 10.

- You complete the task and commence another.

- This requires a mobile which operates on the TACS system to be tested.

- You set up the service monitor, setting the system parameters to values different to the default values.

- You decide to save these setting on a memory card for future use.

- At a later date you use the saved setting from the memory card to set up a Service Monitor.

- The TACS system is set up with the required settings and the AMPS system has the handoff increment set to 10.

Storing MI-BASIC User Defined Test programs

MI-BASIC USER DEFINED TEST programs can be stored on memory cards and recalled into the Service Monitor when required. Before a program can be stored, it must be loaded into the Service Monitor.

To store the program, access the STORE/RECALL screen by pressing the orange [MEM] key. Press the *[Store Sys Par]* key, which changes the right-hand top three soft keys to *[Store Sys Set]*, *[Store Sys Res]* and *[Store Basic]*. The Service Monitor must be in System mode with a System selected, otherwise the *[Store Sys Par]* key is not shown. Press the *[Store Basic]* key, which causes a flashing message Store BASIC Prog To Store No to be displayed. Decide which store location is to hold the program and press the appropriate two data keys. The USER DEFINED TEST program currently loaded in the Service Monitor is stored at the selected location on the memory card. The message, Writing To Mem Card DO NOT REMOVE, is displayed while writing is taking place. To the right of the store location number, a message is shown, describing the contents of the store location. With a user-defined program stored the message against the store location shows BASIC.

If a location on a memory card is written to using the *[Store Basic]* key, when no MI-BASIC program is loaded in the Service Monitor, the location is still given the label BASIC. If the contents of the store are later recalled, when an attempt is made to run the USER DEFINED TEST program, the message Syntax error: line 1 (STORE) is shown on the AUTORUN screen.

Adding a title to a store location

To give a title to a store location, first press the *[Enter Title]* key. A flashing message, TITLE STORE NO is displayed. Enter the number of the location to be titled.

A row of letters, numerals and the symbols #, +,− and = are displayed at the bottom of the screen. The character on the left of the is be shown as a solid cursor. (If the location already has a title, the cursor causes the first character of the existing title to be shown in inverse video).

The name of a store location can contain up to 20 characters including spaces. The first character cannot be a space. To title a store location, proceed as follows:

(1) Using the VARIABLE knob, move the selection cursor to the first character of the title that you want to enter and press the *[Enter Char]* key. The highlighted character becomes the first character of the store location title. The cursor in the location title area moves to the next character position.

(2) Enter the next character of the title in the same way as described above.

(3) You can over-write characters in a title while the titling procedure is active by moving the cursor in the location title area to cover the character to be over-written. This cursor is moved by use of the *[�]* and *[←]* keys. Selecting and entering a new character replaces the original character. Unwanted characters can be removed by over-typing with a space.

(4) When the name of the store location is complete, press the *[Title Complet]* key. The Writing To Mem Card DO NOT REMOVE message is displayed as described above.

Recall

Recalling system parameters

To recall a set of system parameters from a memory card, insert the card and access the STORE/RECALL screen by pressing the orange [MEM] key.

The store locations and titles on the card are listed from store No 10 onwards. Press the *[Recall]* key, then enter the appropriate store number, using the data keys. The required system parameters are recalled from the store.

The message Reading from Mem Card DO NOT REMOVE is displayed. When the message has disappeared from the screen, the system parameters have been read from the card and copied into the system parameters set-up of the Service Monitor. All system parameters for AUTORUN and MANUAL testing are now as they were when the settings were stored.

Recalling Autorun test results

Autorun test results previously stored onto a memory card can be recalled into the results store of the Autorun function.

Note

Before doing so, ensure that the latest results within the Service Monitor results store are either no longer required or are stored elsewhere. Recalling results from a memory card overwrites the contents of the results store.

To recall a set of results from a memory card, insert the card and access the STORE/RECALL screen by pressing the orange [MEM] key.

Press the *[Recall]* key and follow the procedure described above for recalling system parameters.

The message Reading from Mem Card DO NOT REMOVE is displayed. When the message has disappeared from the screen, the system results have been recalled from the card and into the Autorun test results store. These can be seen by calling up the system AUTORUN display.

The recalled results can be printed by pressing the *[print]* key.

Recalling **MI-BASIC User Defined Test programs**

To recall an MI-BASIC User Defined Test program from a memory card, insert the card and access the STORE/RECALL screen by pressing the orange [MEM] key.

The store locations and titles on the card are listed from store No 10 onwards. Press the *[Recall]* key, then enter the appropriate store number, using the data keys. The required program is recalled from the store. It is possible for a store location to be labeled BASIC but to not contain a program. Recalling the store results in the message Syntax error: line 1 (STORE) being displayed if an attempt is made to run the USER DEFINED TEST program. (See Storing MI-BASIC User Defined Test programs, above.)

Appendix A
ERROR CODES

Autotest error codes

Error codes and their meanings, as returned as the first parameter when using the 'NUMRESULTS' BASIC command or the PROG:NUMRESULTS? remote command. These error codes are generated when a BASIC 'TEST' command is executed.

Error code	Error String
0	(test passed)
1	(undefined test failure)
101	"INVALID PARAMETERS"
102	"TIMED OUT",
103	"ABORTED BY USER"
104	"NOT ON CONTROL CHANNEL"
105	"NOT ON VOICE CHANNEL"
106	"NO RESPONSE"
107	"WRONG RESPONSE"
114	"OUT OF RANGE"
115	"LOW MIC I/P SENS"
116	"NO MODULATION"
117	"NO DEMODULATION"
118	"UNSTABLE DEMOD"
119	"LOW DEMOD LEVEL"
120	"LOW SINAD LEVEL"
121	"CARRIER ON"
122	"CARRIER OFF"
123	"NO REGISTRATION"
124	"PRESSEL ON"
125	"PRESSEL OFF"
126	"NO PRESSEL ON"
127	"NO PRESSEL OFF"
128	"DROPPED OUT"
129	"NO SERIAL NO RESPONSE"
130	"CANNOT REGISTER"
131	"CALL REJECTED"
132	"RU UNAVAILABLE"
133	"CALL BACK"
134	"NO ACK ON TC"
135	"WRONG DISCONNECT QTY"
136	"RU CLEARED DOWN"
137	"UNEXPECTED MESSAGE"
138	"EMERGENCY CALL REJECTED"

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