APPENDIX A

PARAMETER DESCRIPTIONS

CONTENTS

DECODE AND ENCODE IDENTITIES

ENGINEERING, CALIBRATION AND ERROR COUNTS

MARKETING PARAMETERS

INTRODUCTION

> *Note:* **Parameters listed in this section are applicable only to the FM1 100 Analogue radio.**
>
> **Not all parameters listed here are valid for every FM1 100 radio. When an invalid**
>
> **parameter is selected the PDP will display the message "ERR INVALID PARAM".**

There are over 200 parameters which define the operation of the FM 1000 radio, many of which contain a sequence of values rather than just one value, eg the 13 channel parameters which are replicated 100 times each (once for each channel).

The collection of parameters for each FM1100 radio is known as its configuration. Each parameter is identified by a unique number which is allocated according to the following functional areas:

#100 -#115	Channel parameters
#120 -#132	Scanning and voting
#140 -#148	Switch-on and switch-off action
#201 -#276	Decode and encode identities
#280 -#287	Tones and message actions
#301 -#313	Alarms and alerts
#320 -#336	Channel access restrictions
#391 -#397	Console keys
#500 -#566	and indicators
#901 -#948	Engineering, calibration and error counts
#990 -#996	Marketing parameters

The remaining sections in this chapter describe each of the parameters individually.

CHANNEL PARAMETERS

Each of the parameters in this first group has a separate instance for each of the 100 possible channels. These parameters are referenced by extended parameter numbers which consist of the concatenation of the parameter and channel numbers, separated by a period. Thus parameter #106.34 is the CTCSS decode frequency parameter for channel 34.

#101 - #102 Channel Frequencies

Parameters #101 and #102 of each channel define the receive and transmit frequencies to be used. Parameter #101 defines the receive frequency, while parameter #102 defines the transmit frequency.

Both frequencies are defined in MHz, up to 5 decimal places, and must be exact multiples of either 5,0kHz or 6,25kHz. The frequencies entered must be within the frequency band of the FM 1000 radio, or the programmer will issue an error message during the validation procedure and will disallow them.

Both the receive and transmit frequencies for a channel must be zero if the channel is a voting scan group. If the transmit power for the channel (parameter #104) is zero, then the transmit frequency (parameter #102) should also be zero. This is because defining a transmit frequency is meaningless since the FM1100 radio cannot transmit on the channel anyway. The CDP will issue a warning message during the validation process if this situation occurs.

#103 Microcomputer Clock Offset

This parameter is used to apply a small frequency offset to the micro-computer clock in the EMi 100 radio in order to move any harmonic interference off channel, while making an insignificant difference to the system timing.

The values it may take are:

  0 . No offset
  1 . Apply offset

This parameter will be automatically set by the CDP (during the validation process) for any channel whose receive frequency (parameter #101) is near a multiple of 0,5MHz.

#104 Transmitter Power

The transmitter power parameter may take one of 7 values, which correspond to the following set power levels:
0. Transmission prohibited

1. - 1 watt	4. - 15 watts
2. - 6 watts	5. - 25 watts
3. - 10 watts	6 - 30 watts

Transmission on the relevant channel will not be permitted if the transmitter power is set to zero.
The 30 watt setting is only allowed in bands A, B and E and will be disallowed in any other bands.
(The frequency band is set by parameter #992.)

#105 Squelch

The squelch parameter may take values between 0 and 6 which define preset squelch levels as follows:

  0 . Always open (subject to signalling)
  1 . 9dB SINAD
  2 . 12dB SINAD
  3 . 15dB SINAD
  4 . 18dB SINAD
  5 . 21dB SINAD
  6 . 24dB SINAD

The recommended setting for standard PMR use is 12dB SINAD.

#106 - #107 CTCSS Frequencies

Parameters #106 and #107 define which of the EIA standard RS-220-A frequencies are to be used for the CTCSS functions on this channel. Parameter #106 defines the CTCSS decode frequency, and parameter #107 defines the CTCSS encode frequency. The values 1 to 38 correspond to the following tone frequencies:

1 .	67,0Hz	11 .	97,4Hz	21 .	136,5Hz	31 .	192,8Hz
2 .	71,9Hz	12 .	100,0Hz	22 .	141,3Hz	32 .	203,5Hz
3 .	74,4Hz	13 .	103,5Hz	23 .	146,2Hz	33 .	210,7Hz
4 .	77,0Hz	14 .	107,2Hz	24 .	151,4Hz	34 .	218,1 Hz
5 .	79,7Hz	15 .	110,9Hz	25 .	156,7Hz	35 .	225,7Hz
6 .	82,5Hz	16 .	114,8Hz	26 .	162,2Hz	36 .	233,6Hz
7 .	85,4Hz	17 .	118,8Hz	27 .	167,9Hz	37 .	241,8Hz
8 .	88,5Hz	18 .	123,0Hz	28 .	173,8Hz	38 .	250,3Hz
9 .	91,5Hz	19 .	127,3Hz	29 .	179,9Hz		
10 .	94,8Hz	20 .	131,8Hz	30 .	186,2Hz		

If a value of zero is specified, the CTCSS decode or encode function will be disabled. If the radio is not to use CTCSS signalling on this channel then both these parameters must be zero.

#108 Signalling Enable

This parameter may take one of two values and enables or disables the sequential tone signalling on a channel without affecting the CTCSS unit. The two values are:

> 0 - Signalling disabled on this channel 1 - Signalling enabled

If the radio does not have sequential tone signalling capability, this parameter must be set to zero.

#109 Voting Scan Group

This parameter indicates which voting scan group, if any, this channel represents. Values of 1 to 6 indicate that selection of this channel is to invoke voting using scan group 1 to 6 respectively (parameters #121 - #126), while a value of 0 indicates that this is a single channel and not a voting scan group.

#110 Channel Encode Identity

This parameter contains a value between 1 and 8 which indicates which of the encode identities (stored in parameters #231 to #238) is to be transmitted when the 'Send-0' key is activated while the FM 1000 radio is operating on this channel.

#111 #112 Reference Frequencies

Parameters #111 and #112 set the receive and transmit reference frequencies, which are used in calculating the parameters in the frequency synthesiser. The meanings of the values are:

> 0 5,0kHz reference frequency
> 1 6,25kHz reference frequency

Note that these values will be calculated by the CDP itself (from the entered transmit and receive frequencies) and so should not normally require editing.

#115 Channel Lock

This parameter determines whether the channel is locked or not. Its permissible values are:

> 0 Channel not locked
> 1 Channel locked

When a channel is locked, it may not be used by the FM1100 radio, although it is a valid, programmed channel. At least one channel must be unlocked. This parameter enables a fleet of mobiles to be all programmed with the same channel data, while restricting certain mobiles to using only certain channels.

SCANNING AND VOTING

Note: These parameters are relevant only to issues 2 and 3 software only.

#120 Scanning Type

The FM1100 radio will scan for either occupied channels or for valid calls, depending on the setting of this parameter. When scanning for occupied channels, the scanning will pause when a signal above the squelch threshold is detected until either the scanning resumption timer (parameter #127) has timed out, or until a transmission is started. When scanning for valid calls only, scanning will continue until, and will stop when, a valid call is recognised. The values for this parameter are:

   0   - Scan for occupied channel
   1   - Scan for valid calls

#121 - #126 Scan Group Members

Parameters #121 to #126 define scan groups 1 to 6 respectively. Each parameter defines up to ten scanning channels and an optional priority channel. The channel numbers lie within the range 0 to 99, while typing a space in the field indicates an unused member of the scan group. Each used scan group must contain more than one channel, and none of the channels in any of the scan groups can be voting channels.

#127 Scanning Resumption Timer

This parameter gives the time delay (between 1 and 255 seconds) which will elapse before scanning resumes once it has stopped due to either a valid call or an occupied channel being detected. If set to zero, scanning will not restart unless the user explicitly instructs the FM 1000 radio to do so.

#130 Voting Type

The voting type parameter governs whether the FM1100 radio votes on all marked channels (ie the ones on which the correct tone is detected), or just on the occupied channels. Its values are:

   0   - Voting on occupied channels
   1   - Voting on all marked channels

#131 Free Tone Frequency

This parameter specifies the frequency of the free tone, selected from the following options:

   0 - No free tone
   1 - 873Hz   5 -   679Hz
   2 - 820Hz   6 -   638Hz
   3 - 770Hz   7 -   600Hz
   4 - 723Hz   8 -   563Hz

Frequencies of 873Hz and 820Hz will not be allowed unless the EEA tone system has been specified for the tone decoder. If voting on marked channels has been selected (by parameter #130), and sequential signalling is in use then this parameter cannot be zero. If sequential signalling is not in use then a free tone is meaningless and this parameter must be set to zero.

#132 Inter Free-tone period

This defines the period (in 100's of milliseconds) which occurs between each free tone. Any value from 0 to 255 (representing 0 to 25,5 seconds) may be specified.

SEARCHING AND DUAL WATCH

Note: These parameters are relevant only to issue 4 software onwards.

#121 - #126 Search Group Members

Parameters #121 to #126 define search groups 1 to 6 respectively. Each parameter defines up to 10 searching channels and optional priority channel. The channels numbers lie within the range 0 to 99, while typing a space in the field indicates an used member of the search group. Each used search group must contain more than one channel, and none of the channels in any of the search groups can be searching channels.

#127 Search Pause Timer

This parameter gives the time delay (between 1 and 255 seconds) which will elapse before searching resumes once it has stopped due to either a valid call or an occupied channel being detected. If set to zero, searching will not restart unless the user specifically instructs the radio to do so.

#128 Global Priority Channel

Values in the range 0-255. If not required, use 255. Used when Dual Watch is turned on without frequency searching; if frequency-searching is on, the searching priority channel is used, if defined; otherwise the channel specified here is used.

#133 Search Clear Function

Used to define the function of the 'Clear' key when pressed while Frequency Searching is in operation:

0	Remove current channel from search group until searching terminates.
1-254	Remove current channel from search group for the time specified, in units of 1 second.
255	No function.

#134 Search Transmit Function

Defines the channel to be selected when the FM1100 radio is required to transmit while searching is in progress, if not paused on a channel.

0   Use priority channel, if defined for current search group, or first valid channel in search group.

1   Use last channel on which a pause occurred; before the first pause, or if channel has been

removed from group with 'Clear' key, revert to effect of setting this parameter to '0'.

2   Search for the first channel with carrier present.

3   Search for the first channel without carrier.

#135 Search Threshold

Determines the signal strength at or above which frequency searching is terminated prematurely without voting. Setting this parameter high causes voting on weak signals to occur; setting it low suppresses voting - searching terminates on the first valid signal.

Values in the range 0 - 255 may be specified, 0 representing zero signal level and 255 representing a high signal level.

#136 Dual Watch Closed Interval

Defines the time between successive samples of the priority channel in multiples of 10ms. Range is

4 - 1000 (ie 40ms - 1000ms).

#137 Dual Watch Open Interval

Defines the time between successive samples of the priority channel in multiples of 10ins. Range is

4 -100 (ie 40ms - 1000ms).

#138 Dual Watch OH-Hook Interval

Defines the time between successive samples of the priority channel in multiples of 10ms. Range is

4 -100 (ie 40ms - l000ms).

SWITCH-ON AND SWITCH-OFF ACTION

#140 Switch-on Channel

Defines the channel (between 0 and 99) that the FM1100 radio will use when it is first switched on. The channel defined must be unlocked (ie parameter #115 must be zero) and must be valid (ie fully programmed). Entering spaces causes the FM1100 radio to restart on the channel which was in use when it was switched off.

#141 Switch-on Automatic Identity

Values of 1 to 8 will indicate which of the encode identities (parameters #231 to #238 respectively) will be automatically transmitted at switch-on. The identity pointed to must have at least one tone in
it. If the FM1100 radio is configured to use the saved user-defined identity (parameter #146) then the encode identity pointed to by this parameter must contain at least one value $_{\#}$ (the code for a user-defined value).

Entering spaces or a zero indicates that no automatic identity at switch-on is required. If no signalling is in use then this parameter must be set to zero.

#142 Switch-off Status Storage

At switch-on, the FM1100 radio will be either restored to the status immediately before switch-off, or will revert to the default status each time. This parameter controls these alternatives as follows:

    0   Current status is saved at switch-off and restored at switch-on
    1   Current status not saved; the pre-determined switch-on status (#143) is used at every switch-on

#143 Switch-on Status Identity

This parameter defines up to 2 tones which will be used as the FM1100 radio status at each switch-on. It may contain values from 0-9 or A-D If the FM1100 radio is equipped with a no-display console, then this parameter cannot be used, and must be cleared by typing a space as its first character.

#144 Switch-on Condition

Specifies whether the FM11 00 radio is set in the open- or closed-channel condition after any switch-on communications have been completed. If no signalling has been installed, or encode-only operation has been specified, then the FM1100 radio will be set to the open-channel condition regardless of this parameter.

    0   Channel set to closed-channel condition on switch-on
    1   Channel opened at switch-on

#145 Switch-on Reset

Determines whether the FM1 00 radio performs an automatic timed reset at switch-on. If enabled, the FM1100 radio resets itself into the closed-channel condition at a time after switch-on defined by the reset timer (parameter #328). The values of this parameter are:

    0   No timed reset
    1   Timed reset after switch-on

#146 Switch-on User Defined Identity

This parameter determines whether the user-defined decode is reset at switch-on to the pre-determined decode defined by parameter #147, or whether the user-defined decode which was active at switch-off is retained. The choices are:

    0   Use the user-defined identity which was active at switch-off
    1   Use the pre-determined user-defined identity (parameter #147)

This parameter must be set to 1 if the radio has a Basic (No-display) Console.

#147 Pre-determined User-defined Identity

This parameter contains a sequence of up to 15 tones (each in the range 0 9 or A D) which will be used as the user-defined values in the switch-on encode identity if parameter #146 is set to 1. If the user-defined values are not used anywhere (ie the value ₌ does not appear anywhere in parameters #201 #208 or #231 #238) then the pre-determined user-defined identity will never be used.

#148 Switch-on Console Mode

The switch-on console mode determines whether the user's numeric console (if present) starts up in channel-entry or status-entry mode at switch-on. The modes are selected as follows:

    0   Channel-entry
    1   Status-entry

If no signalling system is in use, then this parameter must be set to 0 so that the FM1100 radio always starts up in channel-entry mode.

#149 Display Reversion

This parameter indicates whether the display is to revert to the switch-on mode (as defined by #148) after any period of non-use. The possible values are:
    0   No Function
    1   The Display reverts to switch-on console mode.

#150 Key Beep

This parameter governs whether the FM1100 generates a brief key beep each time a key is pressed. Its possible values are:

0 . No Key Beep
1 . Key Beep whenever a key is pressed.

#151 Tone Burst

This is a flag which indicates whether or not a tone burst (as defined by parameters #152 and #153 is generated when the 'Send 8' key is pressed. The possible values for this parameter are:

1 No tone burst
2 Generate tone burst.

#152 Tone Burst Frequency

If the tone burst frequency is enabled by #151, then this parameter is used to specify the frequency of the tone. It may take any value between 0 and 255, which correspond to frequencies of 4,5kHz to 30kHz in 100Hz steps.

#153 Tone Burst Duration

This parameter specifies the duration of the tone burst. It make take values between 0 and 255 representing 0 to 2.55 seconds in steps of 10ms.

Reserved for future use.

DECODE AND ENCODE IDENTITIES

The decode and encode identities define the tone sequences for sequential tone signalling. The decode identities define those sequences which the FM1100 radio will recognise on receiving them, while the encode sequences are the signals which it transmits.

The diagrams on the next page give an example of how the decode identities are defined. Each decode identity is defined as a sequence of up to 17 tones. These tones may either be a standard tone (as defined under #201-208) or they may be special tones such as a no-tone (ie a pause in the sequence) or a user-defined tone. Note that the identities only define the number of the tone to use
- ie which row of Table A.1 is to be used for each tone. The actual frequencies of each tone also depend on parameters #282 and #283 which defines the tone systems (ie the column of Table A.1) to be used.

As well as defining which tones are to be used, the decode identities also specify the length of each tone. This is done in two stages. Firstly, parameters #211 - #218 specify which of eight possible timers is to be used for that tone. Secondly, parameters #261 - #268 define the durations of each of the eight timers.

Parameter #202 defines decode identity 2 as consisting of the tones 7, 9, 4 and 0. Parameter #212 states that timers 1, 1, 3 and 1 respectively are to be used for the tones. Parameters #261 and #263 define timers 1 and 3 to be 70ms and l20ms respectively. Decode identity 2 is therefore 70ms of tone 7, 70ms of tone 9, l20ms of tone 4 and 70ms of tone 0.

The encode identities are defined in a similar manner using parameters #241 - #248 to define the timings and #283 to define which tone system to use. Note that the decode and encode identities use the same set of timer values (parameters #261 - #268).

#201 - #208 Decode Identities

Parameters #201 to #208 each contain a sequence of up to 17 tones which are used as the decode identities. Each tone is identified by a singie value as indicated in the table of tone frequencies below, but the length and frequency of the selected tones depend on which type of signalling is in use. The sequential tone signalling unit in the FM1 100 radio, which encodes and decodes multiple tone messages between 4 and 17 tones in length, operates with the following standard tone signalling systems:

Philips ST-500 COIR	CML CCIR
Philips ST-500 EEA	CML EEA
Philips ST-500 ZVEI	CML ZVEI
Philips ST-500 DZVEI	CML DZVEI

Although Table A.2 shows the durations of the tones within each system being of equal length, the FM1100 radio actually varies the length of the transmitted tones according to the timer values set in parameters #211 - #218. The lengths specified in Table A.2 are therefore ignored, with the result that the FM1100 radio does not distinguish between Philips ST-500 EEA and ST-500 CCIR tone systems.

The tones and pseudo-tones (such as the no-tone value) are all represented in the CDP (and PDP) by single characters. Tones 0 - 9 are entered as the digits 0 - 9, the letters A - F and the characters and '#'. The end of each tone sequence is indicated by typing a space.

In Philips ST-500 tone systems, tone A is the Group tone, and tone C is the Alarm/Reset tone. In CML systems, this is not always the case. Parameters #280 and #286 define the group and remote reset tones respectively for use in any of the tone systems. Tone E is always used as the repeat tone in all tone systems, and so should not be used in identities.

Parameters #201 to #208 simply define which tones are to be used; the durations of the tones must be specified in parameters #211 to #218. Any combination of tones or special values (apart from the repeat tone) may be entered for all the identities, with a few exceptions. There cannot be two no-tone values (two Fs) in sequence, nor an F immediately followed by a C. An unused identity is indicated by entering the terminator (a space) for its first value.

The tone frequencies (all given in Hz) which are used for sequential tone signalling correspond to the tone numbers as follows:

As well as the 15 tone numbers, the following special values may also be entered into the decode identities.

Table A.2

Tone	Philips ST-500				CML				
	CCIR	EEA	ZVEI	DZVEI	EEA	CCIR	ZVEI	DZVEI	ZVEI2
0	1981	1981	2400	2200	1981	1981	2400	2200	2400
1	1124	1124	1060	970	1124	1124	1060	970	1060
2	1197	1197	1160	1060	1197	1197	1160	1060	1160
3	1275	1275	1270	1160	1275	1275	1270	1160	1270
4	1358	1358	1400	1270	1358	1358	1400	1270	1400
5	1446	1446	1530	1400	1446	1446	1530	1400	1530
6	1540	1540	1670	1530	1540	1540	1670	1530	1670
7	1640	1640	1830	1670	1640	1640	1830	1670	1830
8	1747	1747	2000	1830	1747	1747	2000	1830	2000
9	1860	1860	2200	2000	1860	1860	2200	2000	2200
A	1055	1055	970	825	1055	2400	2800	2600	886
B	—	—	—	—	930	930	810	—	—
C	2400	2400	2800	2600	2247	2247	970	886	810
D	—	—	—	—	991	991	886	810	—
E	2110	2110	2600	2400	2110	2110	2600	2400	970
Std Tone Lgth (ms)	100	40	70	70	40	100	70	70	70

F – No tone
- User-selectable decode tone
* - Message tone
space - End of sequence

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
#201																	
#202	7	9	4	0													
#203	8	8	D	2	#	F	5										
#204																	
#205	4	3	2	1	0												
#206																	
#207	6	7	2	4	D	9	F	3	*	8	#	0	0	1	6	9	4
#208																	

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
#211																	
#212	1	1	3	1													
#213	1	2	4	8	8	2	1										
#214																	
#215	1	2	5	8	8												
#216																	
#217	4	2	1	8	2	1	3	1	2	2	8	3	3	1	2	4	4
#218																	

#261	7
#262	102
#263	12
#264	6
#265	0
#266	18
#267	
#268	4

Top: Parameters #201 - #208 define the decode identities. Each consists of up to 17 tones.

Centre: Parameters #211 - #218 specify which tone timer to use for each identity.

Left: Parameters #261 - #268 specify the actual lengths of tone timers 1 to 8 respectively.

Table AI

#211 - #218 Decode Identity Timing

Parameters #211 to #218 each contain up to 17 length codes which correspond to the tones defined in parameters #201 to #208 respectively. Each of the length codes is a value between 1 and 8, indicating which of the tone timers (parameters #261 to #268) to use for each tone in each sequence.

#221 - #228 Decode Identity Functions

Each of the eight decode identities (defined in parameters #201 to #208), must have a specified decode function. Each parameter may take values between 0 and 16 which correspond to functions as follows:

0-No function		9-Group Call	1
1-Individual Call	1	10-Group Call	2
2-Individual Call	2	11- Group Call	3
3-Individual Call	3	12-Group Call	4
4-Individual Call	4	13-Group Call	5
5-Individual Call	5	14-Group Call	6
6-Individual Call	6	15-Group Call	7
7-Individual Call	7	16-Group Call	8
8 Individual Call	8		

Thus if the decode identity function for the fourth decode identity is set to 12, an incoming tone sequence matching that in parameters #204 (the tones) and #214 (their lengths) would cause the FM 1100 radio to indicate that a group call 4 had been received.

If any of the decode functions are defined (ie non-zero) then one of parameters #551-#566 must correspond to the same function, or must have the value of the general call function. This is because the FM 1100 radio must have an indicator which it can use to indicate that a call has been received; either an indicator specifically for that function or the general call indicator must be programmed.

#231 - #238 Encode Identities

These parameters define the encode identities, which may be used by any functions which require an identity to be transmitted. Each identity consists of up to 17 values, as defined for the decode identities (parameters #201 #208).

#241 - #248 Encode Identity Timings

These eight parameters define the duration's of each of the tones defined in parameters #231 #238, as detailed for the decode identity timings (parameters #211 #218).

In addition to the 15 tone numbers, the value may be entered as a user-selectable or status encode digit.

#261 - #268 Tone Timers

The tone timer parameters allow up to eight different tone lengths to be used by the FM1100 radio in the encode and decode identities. Each tone timer may take any value between 0 and 255, representing 0 to 2,55 seconds in increments of 10ms. The duration's of individual tones used in decode identities may not be less than 40ms.

A duration of zero indicates that a continuous tone is to be used (which can only be stopped by switching off the FM1100 radio).

#270 - #276 Encode Identity Functions

Parameters #231 - #238 and #241 - #248 define the encode identity tones and duration's respectively, but the identities are meaningless until they have been assigned to particular functions. Parameters #270 - #276 each assign one of the encode identities to a particular function as follows:

    270 . Off-Hook identity
    271 . On-Hook identity
    272 . Individual call acknowledge
    273 . Individual reset acknowledge
    274 . Paging identity
    275 . PTT identity
    276 . Alarm identity

The value of each of these parameters should be in the range 0 . 8. Values of 1 to 8 indicate which of the encode identities should be used for that function, while a value of zero or a space indicates that the function is not required.

TONES AND MESSAGE ACTIONS

#280 Group Tone

This parameter specifies which tone (in the range 0 . 9 or A . D) is to be used within the individual call address when a group call is set up. A value of F or a space indicates that no group tone is required. The Group tone cannot be the same as the remote reset tone (parameter #286). In Philips ST-500 tone systems, tone A is normally the Group tone.

#281 Link Establishment Time

This parameter defines the link establishment time in multiples of 10ms. It may take any value between 1 and 255 (representing 10ms to 2,55 seconds).

#282 - #283 Tone System Selection

Parameter #282 specifies which tone system will be used for sequential tone decoding, while parameter #283 specifies the system for encoding. The tone systems are chosen from the following list:

    0 . Encoder/Decoder disabled
    1 . Philips ST-500 CCIR/EEA   4 . CML CCIR
    2 . Philips ST-500 ZVEI   5 . CML EEA
    3 . Philips ST-500 DZVEI   6 . CML ZVEI
                                        7 . CML DZVEI
                                        8 . ZVEI2

If the sequential tone signalling system is not in use then both these parameters must be zero.

#284 Message Function

The message function parameter defines how the FM1100 radio uses incoming message digits after decoding. The only option currently available is to display them on the FM1100 console. This parameter must be set to zero.

#285 Call Acknowledge Mode

The FM1100 radio may provide manual, automatic or no acknowledgement of incoming calls. If no acknowledgement is required then the receiver audio and PTT are immediately enabled on receipt of a valid call. In automatic acknowledge mode the FM1100 radio transmits the call acknowledge identity (pointed to by parameter #272) before enabling the audio and PTT. In manual acknowledge mode, the FM1100 radio generates an audible tone for four seconds, and waits for the user to acknowledge the call by keying the call acknowledge button. The FM1100 radio then sends the acknowledge identity before enabling the channel as before.

The choice is made as follows:

    0   No call acknowledgement
    1   Automatic call acknowledge (Transpond)
    2   Manual call acknowledge

A value of 2 (manual call acknowledge) will not be allowed unless one of the buttons has been assigned the function of manual call acknowledge (ie one of parameters #500 #516 has the value
26).

#286 Remote Reset Tone

If remote resets are to be performed by a reset tone on the end of a valid identity, then a reset tone must be specified by this parameter. The specified tone will automatically be appended to individual and group call addresses. The reset tone specified may be in the range 0 9 or A D, while a value of F or a space indicates that no reset tone will be recognised. The reset tone may not be the same as the group tone (parameter #280). The remote reset tone is normally tone C in Philips ST-500 tone systems.

#287 3rd Tone Reset

If this parameter is set, the current channel will be closed on reception of an incoming tone sequence whose first three tones match the first three tones of any one of the decode identities specified by parameters #201 #208, as long as the rest of the tone sequence does not decode to a valid message. This parameter may take one of two values as follows:

    0   No 3rd tone reset
    1   3rd tone reset enabled

#288 Guard Tone Function

Values in the range 0 to 2 are permitted. The following functions have been defined:

    0   Ignore leading 'repeat' tones.

ALARMS AND ALERTS

Parameters #301 - #307 allow the FM1100 radio to respond in several ways to an alarm condition. An alarm condition arises when the user keys either the button which has been programmed as the alarm key, or when the remote alarm switch is operated. The first thing that the FM1100 radio does when an alarm occurs is to look at parameter #305 to see if one of the channels has been designated as a special alarm channel. If an alarm channel has been nominated, then the FM1100 radio switches to it immediately, otherwise it remains on the channel where it is currently operating.

Next, the alarm identity is transmitted, if one has been defined by parameter #276. The
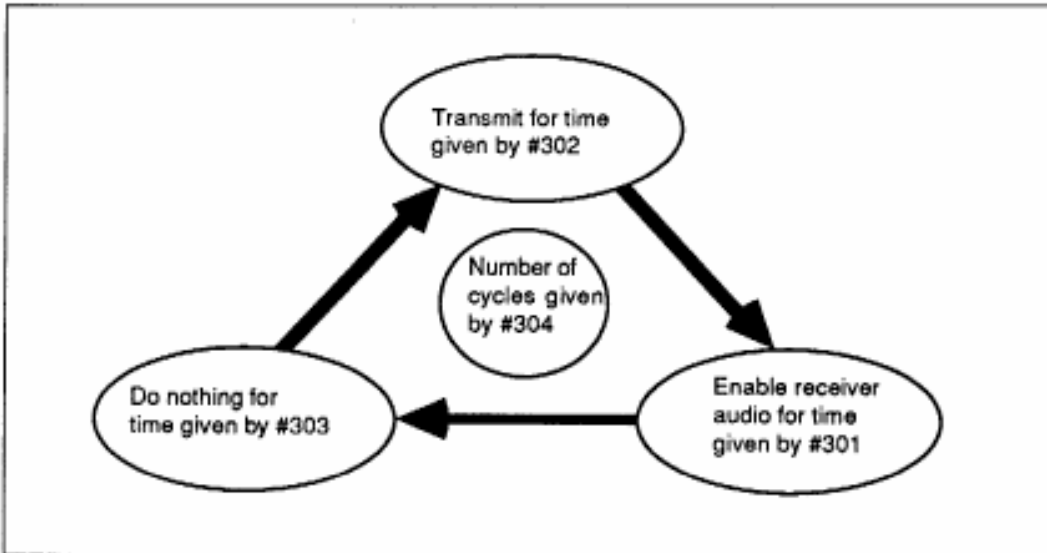

Fig A.1

FM1100 radio then enters a cycle of transmitting, receiving and waiting as illustrated in Fig A.1.

#301 Alarm Live Receive Timer

When an alarm condition occurs, the receiver audio will be enabled for the time specified by this parameter. Values of 1 to 255 will enable the receiver audio for between 1 and 255 seconds, while a value of zero indicates that the receiver audio is disabled whilst the alarm condition prevails.

#302 Alarm Live Transmit Timer

This parameter specifies the time during which the FM 1100 radio stays in transmit with an unmuted microphone during an alarm condition. Values of 1 to 255 indicate that the microphone is to be enabled for between 1 and 255 seconds respectively, while a value of zero indicates that the FM1100 radio is to return to receive mode immediately after sending its alarm identity.

#303 Alarm Closed Receive Timer

This parameter gives the delay after the alarm receive timer has expired before the alarm sequence repeats. It is specified in one-second increments from 0 to 255 seconds.

#304 Alarm Repeat Count

This parameter specifies the number of times that the alarm cycle is to be repeated. It may take values from 1 to 255. If set to zero, the alarm cycles will be continuously repeated until a remote reset is received.

The alarm repeat count cannot be zero (ie continuously repeated) if the three tone reset (parameter #287) is disabled and no group tone (parameter #286) has been defined, or no tone decoding system has been specified (parameter #282) since there will then be no way to stop the alarm sequence.

#305 Alarm Channel

A value in the range 0 to 99 in this parameter indicates a special alarm channel to which the FM1100 100 radio will automatically switch when the alarm button is activated. If a special alarm channel is not required, this parameter may be set to 255, or a space may be entered, in which case the FM1100 radio will not change channel when an alarm occurs.

The selected alarm channel must not be locked (parameter #115), and must not have a transmit power setting of zero (parameter #109), since both these conditions prevent the channel from being used.

#306 Alarm Switch-Off Inhibit

This facility prevents the FM1100 radio from being switched off while an alarm is active. The console will be turned off, so the radio will appear to be turned off, but the FM1100 radio will continue to execute the specified number of alarm cycles. The alarm live receive portion of the sequence will be omitted, however, so that the radio will remain silent throughout.

Under such conditions, the alarm condition will only be reset by a reset message from the system controller, or when the cycle count has been reached. The values for this parameter are:

- 0   No switch-off inhibit
- 1   Switch-off inhibit enabled

#307 External Alert During Alarm

The FM 1100 radio may be configured to activate the external alert function (eg .to switch on the vehicle's horn and/or lights) during an alarm condition if enabled by this parameter.

- 0   External alert remains off
- 1   External alert switched on for duration of alarm

#310 Busy Alert

This parameter indicates whether the FM1100 radio generates a busy tone if the user tries to transmit while the selected channel is busy. (The busy tone is generated locally as a warning to the user, not transmitted.) Its values are:

- 0   No busy tone
- 1   Busy tone generated

#311 .#312 Incoming Call Alerts

Parameters #311 and #312 dictate whether the FM1100 radio will issue an audible call alert on receipt of incoming calls. Parameter #311 controls individual calls, and parameter #312 controls group calls. The call alerts operate in both open- and closed-channel conditions and cause the appropriate call indicator to be turned on.

- 0   No call alert
- 1   Call alert enabled

#313 Acknowledge Alert

The acknowledge alert parameter determines whether the FM 1100 radio will generate an audible acknowledge alert when a reset message is received, under either open- or closed-channel conditions.

- 0 - No acknowledge alert
- 1 - Acknowledge alert enabled

#314 Talk-Now Alert

The customising data must indicate if. a Comfort Tone' is to be generated when an identity has been sent as a result of pressing the PTT key (see #322 Send with PTT').

- 0 - No Talk-Now Alert
- 1 - Talk-Now Alert

CHANNEL ACCESS RESTRICTIONS

#320 Transmit Inhibit

This parameter determines whether or not the radio is prevented from transmitting in the closed-channel condition, if the receive channel contains a signal which exceeds the squelch threshold.

- 0 - No inhibit
- 1 - Transmit inhibit enabled

#321 Open Channel With Send

This parameter partially determines the condition of a channel (ie either open or closed) after one of the send keys has been pressed, and the corresponding encode identity has been transmitted. It controls the channel condition as follows:

- 0 - Channel remains in previous condition
- 1 - Channel set to open condition

#322 Send With PTT

If this parameter is set, the user may use the PTT to transmit the PTT encode identity (parameter #275) while in the closed-channel condition.

- 0 - PTT identity not transmitted
- 1 - PTT identity transmitted when PTT keyed while in the closed-channel condition

#323 Open Channel with PTT

When the PTT is keyed on a channel, this parameter determines whether the channel changes to the open condition or not. The function is controlled as follows:

- 0 - Channel remains in previous condition
- 1 - Channel set to open condition

#324 Transmission Timer

This parameter defines the maximum length of time for which the FM11 00 radio may transmit continuously. It may take values of 1 to 255 representing 1 to 255 seconds, or may take the value zero, indicating that no transmission timer is required.

#325 Release Timer

The release timer defines the time delay which must occur between successive transmissions, If the user attempts to start another transmission before the release timer has expired then it will be reset and the count will start again. The timer is specified in seconds (between 1 and 255) or zero may be set if the release timer is to be unused.

#326 Open Channel With Hookswitch

This parameter determines whether the selected channel is set to the open-channel condition when the microphone is taken off its hook or whether it remains in its current condition. The choices are:

0 Channel condition unchanged
1 Channel set to open condition when microphone taken off-hook

#327 Release Function

When the PTT is released, the FM1100 radio may take one of three actions. It may simply stop transmitting immediately, or it may transmit either the entire PTT identity, or transmit just the first tone of the PTT identity (thus giving a single pip) before ending the transmission. These options are selected as follows:

0 No action
1 Encode the PTT identity (parameter #275)
2 Encode a pip tone

#328 Reset Timer

If a channel in the open condition is not used for the time set by this parameter, then it will automatically revert to the closed-channel condition. The call lamp will not be affected. The timer may be specified to be between 1 and 255 seconds, with a zero value indicating that the timer is not required.

#330 Reset With Hookswitch

This parameter determines what action the FM 1100 radio will take when the microphone is placed back on its hook. The choices of action are:

0 No action taken
1 The FM1100 radio is reset (set to closed-channel) when the microphone goes on-hook

#331 Call Lamp Remote Reset

This determines whether the call lamp is extinguished by a remote reset or not.

0 Call lamp unaffected

1 Call lamp extinguished by a remote reset

#332 Auto Interrogate

When auto interrogate is employed, the FM1100 radio transmits its individual reset acknowledge identity (parameter

#273) on receipt of an individual call which contains the reset tone.

    0   - No auto-interrogate
    1   - Auto-interrogate on receipt of individual remote reset

#333 Low Power Level

This parameter defines the transmitter power setting when the FM1100 radio is set to low-power mode by pressing the low power button. The power levels correspond to the following values:

    0 - Transmission prohibited
    1 - 1 watt   3 - 10 watts
    2 - 6 watts   4 - l5 watts

#334 Paging Channel

The paging channel is a special channel that the FM1100 radio uses for forwarding paging messages. If a message arrives at an FM1100 which has had paging turned on, then the message will be re-transmitted on the selected channel. Values of 0 to 99 may be used to select the appropriate channel, while a value of 255 indicates that forwarding of paging messages is not required. Definition of a paging channel will not be allowed unless one of the buttons has been programmed to provide the paging on/off function (parameters #500 - #516).

User-defined CTCSS

This parameter determines whether the FM1100 radio derives its CTCSS tones from the parameters corresponding to the current channel (parameters #101 - #114) or whether the CTCSS tones are defined by the user. If user-defined CTCSS tones are used, then the same tones will be used for both receive and transmit. The values are:

    0   - CTCSS tones are derived from parameters #106 and #107 for each channel
    1   - User-defined CTCSS tone is used for both receive and transmit

#336 CTCSS Reverse Tone Burst

Dictates whether the FM1100 radio uses a reverse tone burst which is a standard feature of some CTCSS systems. The reverse tone burst involves shifting the phase of the CTCSS signal by a nominal 126 deg for 1 50MS after the PTT is released.

    0   No reverse tone burst
    1   Use CTCSS reverse tone burst
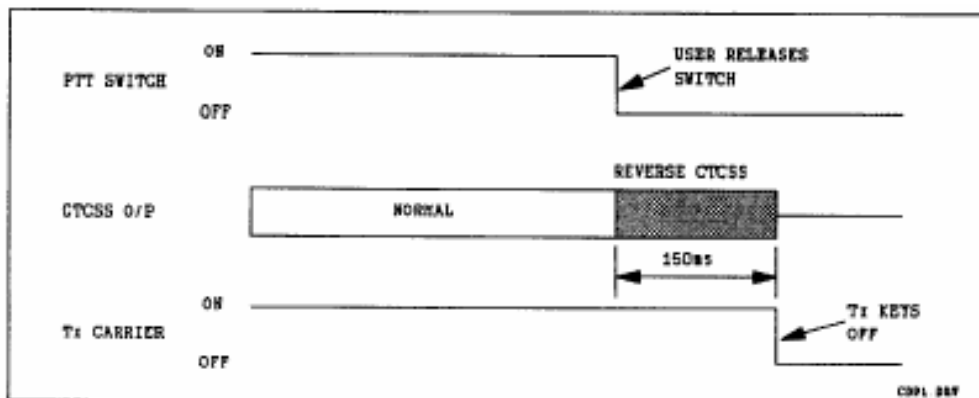
Fig A.2

CONSOLE KEYS AND INDICATORS

Each of the keys and indicators on the console is individually programmable, as long as certain conditions outlined below are fulfilled. Figures A.3 - A.5 show the layout of keys
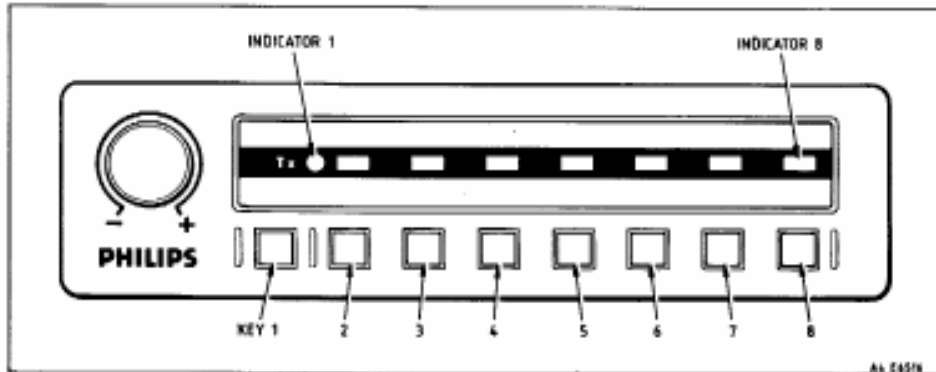

Fig A.3 Basic Console

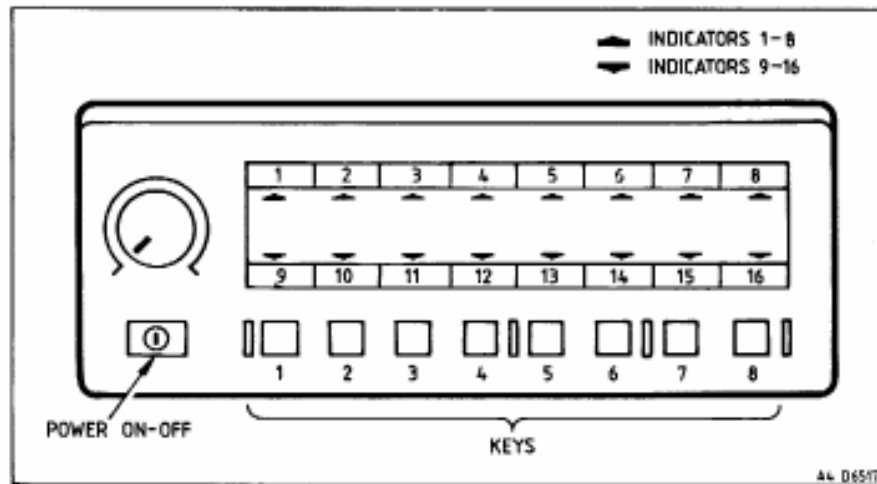and indicators on the Basic, Standard (Display) and Keypad Consoles respectively.
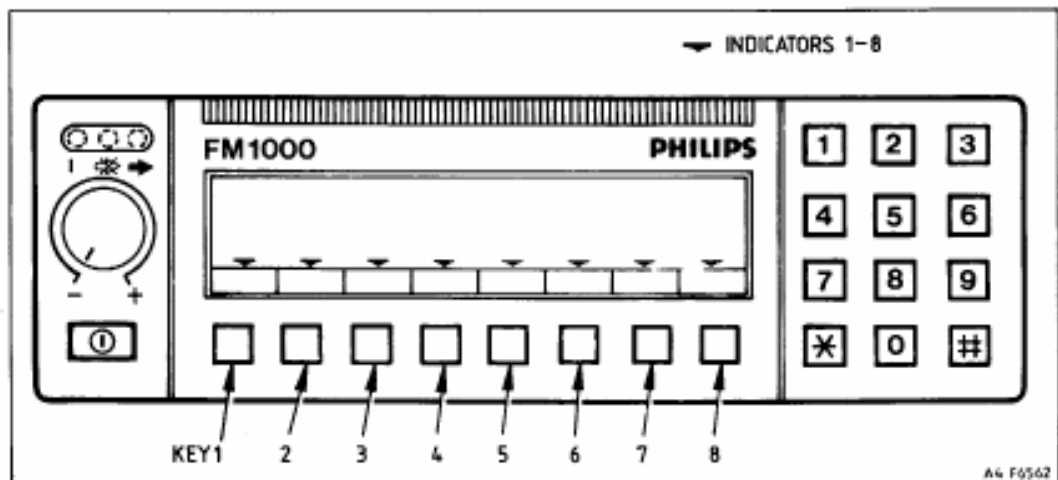

Fig A.4 Standard Console

Fig A.5 Keypad Console

#391 - #397 Channel Key Data

Parameters #500 - #516 allow certain keys on the console and/or keypad to be assigned channel key functions. The parameters between #391 and #397 are used to specify which channel is selected by each channel key. Each may be set to a valid channel number in the range 0 - 99, or a space may be entered if the channel key is not used.

Thus if parameter #393 is set to 45, pressing channel key 3 will cause the FM1100 radio to switch to channel 45. (Note that channel key 3 is only a logical function, not a physical button. The relationship between physical buttons and their functions is specified by parameters #500 - #516).

The channel keys can only be used in conjunction with the no-display console; channel selection on the numeric display consoles is performed by incrementing and decrementing the channel number displayed on the console.

#500 - #516 Key Functions

The FM1100 radio contains up to 16 keys on the console, and a facility key on the microphone, each of which may be individually programmed to perform a particular function. The locations of the keys are as follows:

#500	Key 0:	Microphone facility button
#501-508	Keys 1 - 8:	Located on Basic or Display Consoles
#509 -516	Keys 9 -16:	Not used at present

The function of each of the console keys is normally fixed for each application package, and so cannot be altered.

Functions 50 -53 are only valid when CTCSS signalling is in use, while functions 0-8,10-11, 13, 26 and 46-47 are only valid when sequential signalling is in use. Functions 27-44 are reserved for future use.

A space should be entered for any key which is not assigned a function. Each key can be assigned a function drawn from the following list:

0 - Send 0	
1 - Send 1	26 - Manual call acknowledge
2 - Send 2	27 - Digit 0
3 - Send 3	28 - Digit 1
4 - Send 4	29 - Digit 2
5 - Send 5	30 - Digit 3
6 - Send 6	31 - Digit 4
7 - Send 7	32 - Digit 5
8 - Send 8	33 - Digit 6
9 - Alarm	34 - Digit 7
10 - Local Reset	35 - Digit 8
11 - Monitor/local reset	36 - Digit 9
12 - Squelch override/local reset	37 - Digit A
13 - External alert	38 - Digit B
14 - Mute microphone	39 - Digit C
15 - Scan on/off	40 - Digit D
16 - Clear	41- Digit E
17 - Priority scan on/off	42 - Digit F
18 - Channel key 1	43 - DTMF *
19 - Channel key 2	44 - DTMF #
20 - Channel key 3	45 - Mute loudspeaker
21 - Channel key 4	46 - Paging on/off
22 - Channel key 5	47 - Mode
23 - Channel key 6	48 + key
24 - Channel key 7	49 - key
25 - Low power on/off	50 - Control of CTCSS encode

51 - Control of CTCSS decode
52 - Control of CTCSS en/decode
53 - CTCSS set-up key
54 - Illumination On/Off
55 - User-defined Channel
56 - CTCSS increment
57 - Status increment
58 - Status access
59 - Channel access
60 - DTMF mode
61 - Tone-burst function
62 - Define decode
63 - unused
64 - Status mode

#551 - #566 Console Indicators

#551 - #558   Indicators 1 - 8 Basic & Display Consoles
#559 - #566   Indicators 9 - 16 Display Console only

Each key may be assigned a function drawn from the following list:

0 - No function	
1 - Individual call 1	26 - Monitor indicator
2 - Individual call 2	27 - Scan indicator
3 - Individual call 3	28 - Priority scan
4 - Individual call 4	29 - Alarm indicator
5 - Individual call 5	30 - Microphone mute
6 - Individual call 6	31 - External alert
7 - Individual call 7	32 - Busy indicator
8 - Individual call 8	33 - Loudspeaker mute
9 - Group call 1	34 - Paging indicator
10 - Group call 2	35 - Transmit indicator
11 - Group call 3	36 - Out-of-range
12 - Group call 4	37 - Low power indicator
13 - Group call 5	38 - Power-on indicator
14 - Group call 6	39 - Status mode
15 - Group call 7	40 - Channel mode
16 - Group call 8	41 - CTCSS setup
17 - General call	42 - Message indicator
18 - Channel key 1	43 - User-defined channel
19 - Channel key2	44 - Transmit tone
20 - Channel key 3	45 - Squelch override
21 - Channel key 4	46 - Identity access
22 - Channel key 5	47 - Channel access
23 - Channel key6	48 - DTMF indicator
24 - Channel key 7	49 - User-defined decode mode
25 - CTCSS on/off	50 - Dual Watch indicator

The function of each of the console indicators is normally fixed for each application package, and so cannot be altered. Functions 25 and 41 are only valid when CTCSS signalling is in use, while functions 1 - 17, 31, 34, 36, 39 and 42 are only valid when sequential signalling is in use.

If the radio has a Basic (No-Display) Console, one of the indicators must be assigned to be the transmit indicator (i.e. one of parameters #551 - #566 must have the value 35).

ENGINEERING, CALIBRATION AND ERROR COUNTS

#900 EPROM Label

The label to be printed on the EPROM may be entered in this field. The maximum length for the label is currently 12 characters.

#901 Synthesiser Reference Crystal

This parameter MUST be set so that it matches the frequency of the reference crystal installed in the FM1 100 radio. The possible frequencies are:

    0   .8,4MHz
    1   .7,2MHz
    2   .7,8MHz
    3   .9,0MHz

The required reference crystal is calculated during the validation procedure, and this parameter is automatically set to the corresponding code. The CDP issues a message during the validation process indicating which crystal is required. Further information on selecting and changing this crystal is given in Section 4.

#902 Second Oscillator Injection

The FM1100 radio uses a first IF of 21,4MHz, and a second IF of 455kHz. There is therefore a choice of frequencies which could be used for the second oscillator injection frequency .either 20,495MHz or 21 ,855MHz, depending on whether 455kHz is added to or subtracted from 21 ,4MHz. The choice between the two depends on the frequency band that the FM1100 radio is configured to operate on, and this parameter must match the frequency of the second oscillator crystal.

    0   .Injection low (20,945MHz)
    1   .Injection high (21 ,855MHz)

The required second oscillator crystal frequency is calculated during the validation procedure, and this parameter is automatically set to the corresponding code. The CDP issues a message during the validation process indicating which crystal is required. Further information on selecting and changing this crystal is given in Section 4.

#903 Write Count

This parameter contains a count of the number of times that data has been written to the EEPROM in the FM1100 radio. This will occur every time the FM1100 radio is switched off. It is possible that the EEPROM will start to lose its ability to erase data correctly after some 50 000 erasures (10 years under normal conditions), and so replacement of the EEPROM chip should be considered when the write count approaches this level. The protection level of this parameter will always be set to level 3, so that its value may be read although it cannot be edited by the CDP or PDP.

#904 EEPROM Type

This parameter is used to inform the FM1100 radio of the type of EEPROM which has been installed. The possible values are:

    0   512 bytes
    1   2048 bytes

#905 Software Version

Indicates the version number of the software in EPROM. Since it is part of the main FM1100 software, it cannot be altered by the CDP or the PDP.

#906 Software Part Number

A 17 alpha-numeric character string which is Read-only. This parameter may replace #905 on some equipments.

#907 Serial Number

This parameter may appear on some PDP displays, although the PDP will be unable to overwrite it and the CDP will be unable to read it at all. This parameter gives the serial number of the equipment as a 13-character string, and should agree with the number on the equipment serial number plate/label.

#909 Market Variation

Two bytes of data which are reserved for future use.

#910 HF Transmitter Power Compensation

Stores a value between 0 and 255 which is used for high-frequency compensation of the transmitter power-control calibration points in the top half of the frequency band in use. Mid-range (ie a value of 128) corresponds to a compensation factor of 1.0.

#911 - #916 Transmitter Power Calibration Points

These six parameters store the calibrated values (between 0 and 127) which correspond to the six possible power levels of 1W, 6W, 10W, 15W, 25W and 30W respectively.

#921 - #924 Receiver Audio Noise calibration Points

These four parameters store calibrated values (between 0 and 255) which correspond to noise levels of 9dB, 12dB, 15dB and 18dB SINAD respectively.

#931 - #934 RSSI Calibration Points

These four parameters store calibrated values (between 0 and 255) which correspond to RSSI levels of 15dB, 18dB, 21dB and 24dB SINAD respectively.

#941 - #948 Error Counts

The FM1100 radio maintains eight error counters to assist in fault tracing and debugging. Each of the error counts should be reset to zero after the equipment has been serviced. The functions of the error counters relate to parameter numbers as follows:

    #941   Temperature errors
    #942   Hardware errors
    #943   Peripheral errors
    #944   Message errors
    #945   Access errors
    #946   User errors
    #947   Lock errors
    #948   Power errors

MARKETING PARAMETERS

The final group of parameters are used for identification purposes and to reflect the hardware

configuration of the FM1100 radio in some way.

#990 Country Code

A single byte of data for identification purposes.

#991 Market Application Code

Two bytes of data for identification purposes.

#992 Frequency Band

This parameter indicates which frequency band the FM1100 radio will operate on. The value of
the parameter may be between 0 and 8, which corresponds to the following frequency bands:

> 0 - Band EO (68 - 88MHZ)
> 1 - Band BO (132 - 156MHz)
> 2 - Band A9 (146 - 174MHz)
> 3 - Band K1 (174 - 208MHz)
> 4 - Band K2 (192 - 225MHz)
> 5 - Band TM (400 - 440MHz)
> 6 - Band T4 (425 - 450MHz)
> 7 - Band UO (440 - 470MHz)
> 8 - Band WM (470 - 520MHz)

#993 Channel Spacing

This is a single byte of data used for identification purposes to indicate the spacing of the
channels within the selected frequency band. The values are:

> 0 - 12,5kHz
> 1 - 20kHz
> 2 - 25kHz

#994 Frequency Stability

This parameter is used to indicate the frequency stability of the reference crystal installed in the
FM1 100 radio. Its possible values are:

> 0 - ±5,Oppm
> 1 - ±2,Oppm

#995 Signalling Type

This parameter specifies whether sequential tone signalling is in use or not. Its possible values
are:

> 0 - No signalling
> 1 - Sequential Tone signalling

Note that this parameter only relates to the sequential tone signalling; CTCSS signalling may
be used together with, or instead of, sequential signalling.

#996 Console Type

This parameter is used to inform the FM1100 radio of which type of console has been attached to it. The valid values are:

         0 - Basic (No-Display) Console
         4 - Standard (Display) Console using 4-digit display
         6 - Standard (Display) Console using 6-digit display
         10 - Keypad Console

#997 ID Schedule Code

The ID schedule code is a two digit number which is briefly displayed on the console (in the position of the status digits) at power-up. The schedule code can therefore be used as a means of providing the user with a means of identifying which unit he is using. The schedule code may take values between 0 and 99, or 255 if the schedule code is to be unused.

#998 Console Graphics Label

This parameter appears on the CDP, not in the FM1100 radio.

#999 TEE Customisation State

Used for manufacturing purposes only.
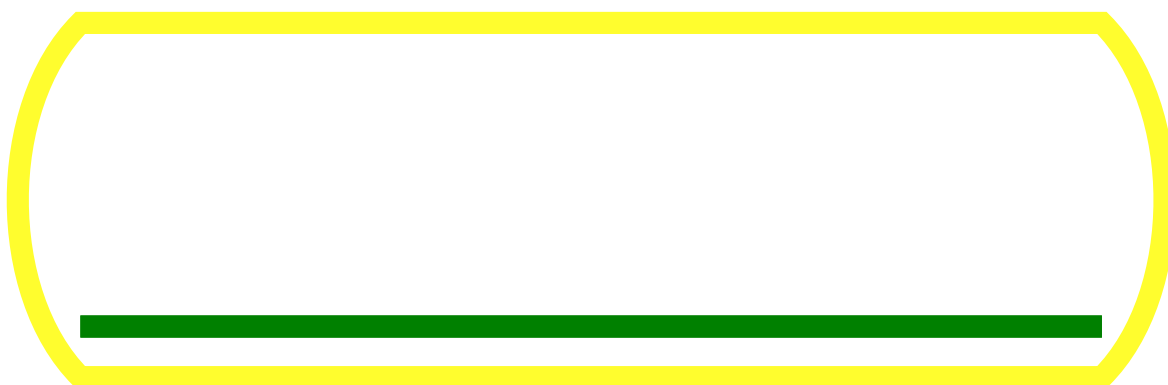
1750Hz Tone Burst for FM1100 fitted with Standard LCD/Keypad LCD Head

Note: Your FM1100 must be fitted with IC404 (Selective Signalling chip)

Here are the parameter settings based on use with UK Repeaters:

```
238   8
248   8
268  50
281  20
283   5
506   0   (501 - 508 for keys 1 - 8)
995   1
```

```
108 xx  set to 1 for every repeater channel/tone burst channel
110 xx  set to 8 for every repeater channel/tone burst channel
```

Note: Params 261 - 267 must be set to a value of between 1 - 255.
If they are set to 0, all you will get is a constant tone.

Advised levels...

```
12.5KHz operation: Max Deviation - 2.5KHz, Tone Burst Deviation - 1.5KHz
25KHz operation:   Max Deviation - 5.0KHz, Tone Burst Deviation - 3KHz
10KHz operation:   Max Deviation - 2.5KHz, Tone Burst Deviation - 1.5KHz
```

Furthermore, here is a given example of the parameters enabling
user selectable 5 Digit Sellcal/Tonecall...

(KEYPAD LCD HEADS ONLY:)

```
282    5 -      Tone System Selection  (Decode)  - (EEA)
283    5 -      Tone System Selection  (Encode)  - (EEA)
995    1 -      Signalling Type                  - (enable 5 Tone)
237  *****      Encoder 7 ID
247  11111      Decoder 7 ID
505      7 (501 - 508 / 510 / 511 for keys 1 - 8 / * / #) Send Tone 7 (1 - 8)
511     64 (501 - 508 / 510 / 511 for keys 1 - 8 / * / #) Selcall/Tonecall Set-up Key... then
use the keypad to enter a 5 Digit code.
```

(STANDARD LCD HEADS ONLY:)

```
282      5 (EEA)
283      5 (EEA)
995      1
505     47 (501 - 508 for keys 1 - 8) Switch between Channel Mode & Status Mode
Use the +/- keys whilst in Status mode to alter upp to 3 Digits of the Selcall/Tonecall code.
Note:  996 = 6 to alter up to 3 Digits. If 996 = 4 only up to 2 Digits will be altered.
       143 = xx (ie 70) for up to 2 Digits displayed. 143 = xxx (ie 433) for up to 3 Digits
displayed.
```

ALSO, CTCSS Parameters...

Note: Your FM1100 must be fitted with IC501 (CTCSS chip)

Parameter Defined:

Note: THE FOLLOWING APPLY FOR EACH CHANNEL:
Parameter Defined: 107   x/xx   For example 1 - 38 (67,0Hz - 250,3Hz) ENCODE
Parameter Defined: 106   x/xx   For example 1 - 38 (67,0Hz - 250,3Hz) DECODE

```
Setting either of the above to 0 disables CTCSS
335    0   (Parameter defined)
-

User Defined: (BOTH Encode & Decode ONLY)

507    53  (CTCSS set-up key)
335    1   (User defined)

KEYPAD LCD HEAD - Enter value 01 - 38 for tones 67,0Hz - 250,3Hz) via keypad
STANDARD LCD HEAD - Use +/- channel keys whilst in CTCSS access mode to select 01 - 38 for tones
67,0Hz - 250,3Hz (quit using set-up key)
-

User Defined ENCODE ONLY (permitting audio from non-CTCSS signals) requires a Hardware Mod.

-----

Good luck!

Dave
fx996@hotmail.com
UK
```

SELCALL TONE FREQUENCIES (All frequencies In Hz)

SYSTEM TONE FREQUENCIES

Philips ST—500

	CODING			CCIR/EEA	ZVEI	DZVEI	CCIR	
FUNCTION	CHARACTER			Type 1	Type 2	Type 3	Type 4	Type
EEA Type 5	ZVEI Type 6	DZVEI Type 7	ZVEI2 Type 8					5
"0" TONE	0			1981	2400	2200	1981	
1981	2400	2200	2400					
"1" TONE	1			1124	1060	970	1124	
1124	1060	970	1060					
"2" TONE	2			1197	1160	1060	1197	
1197	1160	1060	1160					
"3" TONE	3			1275	1270	1160	1275	
1275	1270	1160	1270					
"4" TONE	4			1358	1400	1270	1358	
1358	1400	1270	1400					
"5" TONE	5			1446	1530	1400	1446	
1446	1530	1400	1530					
"6" TONE	6			1540	1670	1530	1540	
1540	1670	1530	1670					
"7" TONE	7			1640	1830	1670	1640	
1640	1830	1670	1830					
"8" TONE	8			1747	2000	1830	1747	
1747	2000	1830	2000					
"9" TONE	9			1860	2200	2000	1860	
1860	2200	2000	2200					
GROUP TUNE	A			1055	970	825	2400	
1055	2800	2600	886					
EXTENDED TONE	B			—	—	—	—	
930	930	810	—	—				
ALARM TONE	C			2400	2800	2600	2247	
2247	970	886	810					
SELECTABLE TONE	0			—	—	—	—	
991	991	886	810	—				
REPEAT TONE	E			2110	2600	2400	2110	
2110	2600	2400	970					