KENWOOD

TS-450S
TS-690S

EXTERNAL CONTROL INSTRUCTION MANUAL

KENWOOD CORPORATION

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92/12 11 10 9 8 7 6 5 4 3 2 1 91/12 11 10 9 8 7 6 5 4

CONTENTS

1. SPECIFICATIONS

■Interface

Communication method	....	Serial interface, fullduplex
Transfer rate	.....	4800BPS (bits per second)
Synchronization	.....	Start-stop (Asynchronous)
Bit construction	.....	1 start bit, 8 character bits, 2 stop bits
Parity	.....	None
Signal format	.....	TTL level

■Terminal Connections

Pin No.	Signal Name		I/O
1	GND	Signal ground	
2	$\overline{TXD}$	Transmit data	Output
3	$\overline{RXD}$	Receive data	Input
4	CTS	Transmit enable	Input
5	RTS	Receive enable	Output
6	NC	No connection	

GND: This is the signal ground terminal.

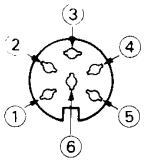
$\overline{TXD}$: The transmit data is the serial data from the transceiver to the computer. The output utilizes negative logic.

$\overline{RXD}$: The receive data is the serial data from the computer to the transceiver. The input utilizes negative logic.

CTS: This signal is supplied from the computer, and is used to inhibit transmit data from the transceiver when the computer is not ready to receive. The input utilizes positive logic. (Transmit data is stopped by a logic low.)

RTS: This signal is applied to the computer, and is used to inhibit transmit data from the computer when the transceiver is not ready to receive it. The output utilizes positive logic. (Inhibit is requested when the level is low.)

Connector pin configuration



(Viewed from the rear)

2. OPERATION

> Caution
> Turn the POWER switch OFF before making connections.

2-1. PRECAUTIONS FOR COMPUTER-CONNECTED OPERATION

When connecting the transceiver with a computer, check the following points.

1. Are the connections correct?
   The transceiver output should be connected to the computer input and the transceiver input to the computer output.
   Example:
   Transceiver's transmission data — Computer's receive data
   Transceiver's RTS — Computer's CTS
2. Is the computer's transmission rate 4800 BPS (bits per second)?
3. Is the computer's bit configuration correct?
   1 start bit, 8 character bits, 2 stop bits, no parity.

2-2. CONTROL OPERATION

Most computers handle data in the form of "bits", and "bytes". A bit is the smallest piece of information that the computer can handle. A byte is composed of 8 bits. This is the most convenient form for most computer data. This data may be sent in the form of either serial or parallel data strings. The parallel mode is faster, but more complicated, while the serial form is slower it requires less complicated equipment, and therefore is less expensive.

Serial transmission of data occurs over a single line using time-division methods. This use of a single line also offers the advantage of reducing the number of errors due to line noise.

For control of the transceiver via the computer only three lines are theoretically required: transmit data ($\overline{TXD}$), receive data ($\overline{RXD}$), and ground (GND). From a practical standpoint it is also necessary to incorporate some means of controlling when this data transfer will occur. We don't want the computer and transceiver sending information at the same time! This is controlled by the RTS and the CTS lines.

The IF-232C is used in conjunction to provide voltage conversion. RS-232C deals in voltages above and below TTL levels, and must be converted to prevent damage to the transceiver. This interface/conversion is handled by the IF-232C.

The actual command sequence would be similar to those described below:

For example, the radio is placed into the transmit mode whenever the character string "TX;" is sent from the computer. The character string "TX;" is called a command. It tells the transceiver to do something. There are 30 different commands available for control of the transceiver. These commands may be incorporated into a computer

program written in BASIC or any other high level language such as PASCAL, etc. Programming methods vary from computer to computer so please refer to the instruction manuals included with your terminal program, and computer.

2-3. COMMANDS

The illustration below demonstrates that a command is composed of two alphabetical characters, various parameters, and the terminator to signal the end of the command.

Example:

FA 00007000000 ; ..... Command to set VFO A to 7 MHz.

↑ ↑ ↑

Command Parameters Terminator

2-3-1. Command Description

A command may consist of either lower or upper case alphabetical characters.

2-3-2. Parameter Description (Refer to the parameter list.)

Parameters are used to specify specific information necessary to implement the desired command. The exact number of parameters necessary for each command is predetermined. If a particular parameter is not applicable to the transceiver you are controlling the parameter digits should be filled using any character except the terminator ";".

For example the MC (Memory channel selector) command uses two parameters, 1 column to specify the memory bank number, and 2 columns to specify the memory channel number. To specify CH9 of memory bank number 1, the command would be:

"MC109;" ..... The memory bank number is not necessary when programming the TS-450S/690S so the command could be as given above "MC109" or as:

"MC_09;" ..... In this case a blank has been used to fill the parameter block for the memory bank number.

The following are examples of bad commands:

"MC09;" ..... No memory bank specification (not enough parameters)

"MC19;" ..... Not enough digits in the memory channel parameter, i.e. CH9 should be given as "09".

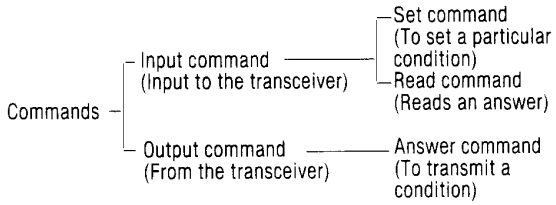
"MC_1_09_;"... Unnecessary characters between parameters.

"MC1009" ..... No terminator

2-3-3. Terminator

To signal the end of a command it is necessary to use a special character. The character that has been selected for use is the semicolon";". This special character must appear as the last character in a particular command string.

2-3-4. Types of Commands



Commands can be classified as shown in the chart above. For example, with the FA (Frequency of VFO A) command.

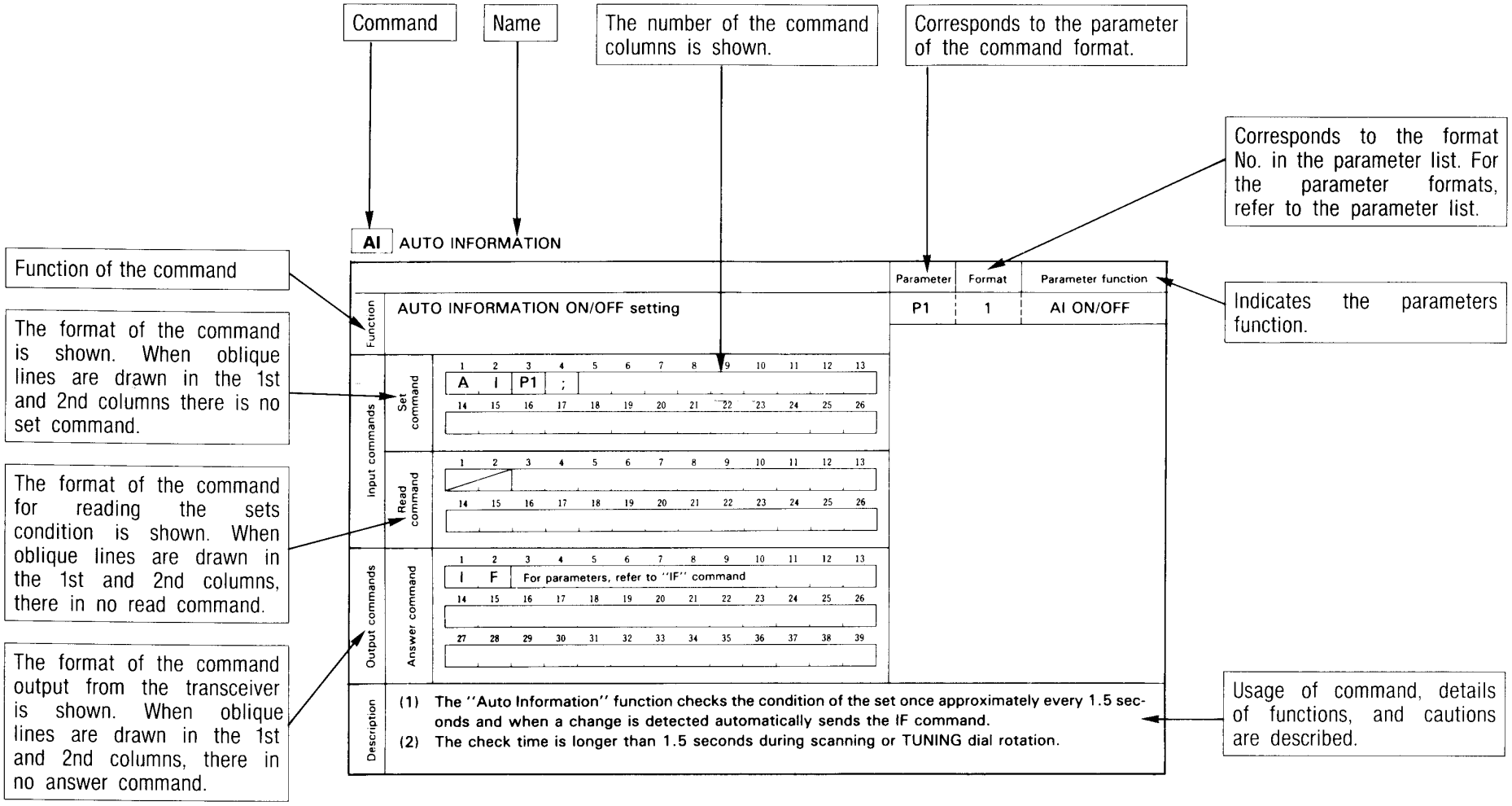
- To set the frequency at 7 MHz, the command sent from the computer to the transceiver is:
  "FA00007000000;" ..... (Set command)
- To read the frequency of VFO A, the command sent from the computer to the transceiver is:
  "FA;" ..... (Read command)
- When the read command, above, has been sent, the command returned to the computer is:
  "FA00007000000;" ..... (Answer command)

2-3-5. Error Messages

In addition to the answer command, the transceiver will send one of the following error messages:

?;	◯ When the command syntax is incorrect. ◯ When the command was not executed due to the current status of the transceiver, even though the command syntax was correct. Note: Occasionally this message may not appear due to microprocessor transients in the transceiver.
E;	When a communication error occurs, such as an overrun error or framing error occurs during serial data transmissions.
O;	When the receive data is sent but processing cannot be completed.

2-3-6. How to read the command tables



2-3-7. Parameter List

Format No.	Name	Number of columns	Format
1	SW	1	0=OFF 1=ON
2	MODE	1	1=LSB, 2=USB, 3=CW, 4=FM, 5=AM, 6=FSK, 7=CW-R, 9=FSK-R
3	FUNCTION	1	0=VFO A, 1=VFO B, 2=MEMORY
4	FREQUENCY	11	Represented in Hz, using 11 columns. Example: 00007000000 is 7 MHz (10GHz 1MHz 1kHz 1Hz)
5	RIT/XIT FREQUENCY	5	The first column is "+" or "−", and the remaining four columns indicate the frequency in Hz. Example: +0830 is +0.83 kHz
6	———	—	
7	MEMORY CHANNEL	2	Represented in two columns. Example: 02 is CH2
8	———	—	
9	MEMORY CHANNEL SPLIT SPECIFICATION	1	0=Receive 1=Transmit
10	MEMORY LOCKOUT	1	0=Not locked out 1=Locked out
11	TX/RX	1	0=Receive 1=Transmit
12	———	—	
13	———	—	
14	———	—	
15	———	—	
16	MODEL NO.	3	Three column number specifying each set.
17	———	—	
18	———	—	
19	———	—	
20	———	—	
21	———	—	
22	METER	4	0000(MIN)↔ 0030(MAX)
23	———	—	
24	METER SW	1	0=NO SELECT, 1=SWR, 3=ALC, 6=dB
25	PITCH	2	Represented using two columns, from 00 to 08. "00" is the low tone and "08" is the high tone.
26	FILTER	3	000=NO SELECT 002=FM WIDE 003=FM NARROW 005=AM, 007=SSB 009=CW

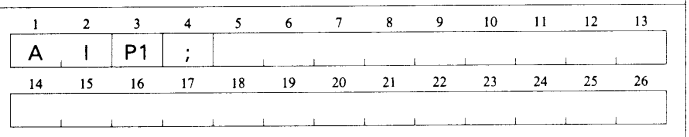
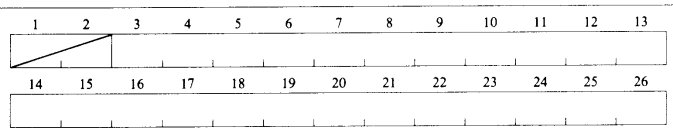
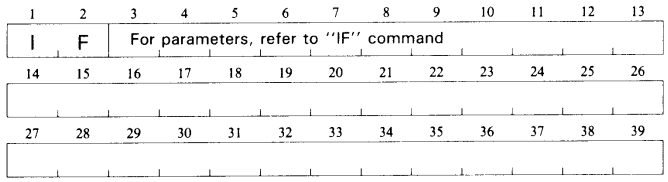
2-3-8. Command Use Precautions

1. The control characters (00 to 1FH) when included in receive data are ignored.
2. Program execution may be delayed during rapid encoder rotation.
3. Receive data is not processed when directly entering the frequency from the keyboard.
4. To enter the transmitter frequency for split frequency operations using the MW command, enter any number from 1 thru 7, 9 as the mode and either a "0" or a "1" to indicate the memory channel lockout statue.

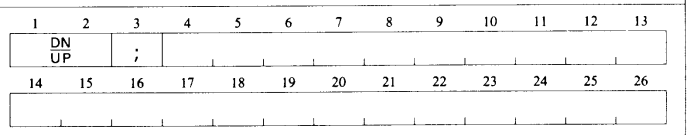
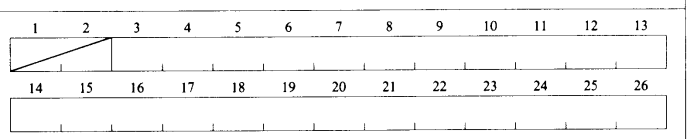
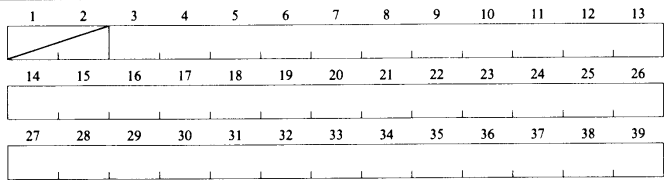
2-3-9. Command List

Command	Function	Page
AI	AUTO INFORMATION	8
DN/UP	DOWN/UP	8
FA/FB	FREQUENCY VFO A/ FREQUENCY VFO B	9
FL	FILTER	9
FR/FT	FUNCTION RX/TX	10
FS	FINE STEP	10
ID	ID	11
IF	INFORMATION	11
LK	LOCK	12
MC	MEMORY CHANNEL	12
MD	MODE	13
MR	MEMORY READ	13
MW	MEMORY WRITE	14
MX	AIP	14
PT	PITCH	15
RC	RIT CLEAR	15
RD/RU	RIT DOWN/RIT UP	16
RM	READ METER	16
RT	RIT	17
RX/TX	RX/TX	17
SC	SCAN	18
SM	S METER	18
TO	TONE	19
VR	VOICE RECALL	19
XT	XIT	20

AI AUTO INFORMATION

		Parameter	Format	Parameter function
Function	AUTO INFORMATION ON/OFF setting	P1	1	AI ON/OFF
Input commands — Set command				
Input commands — Read command				
Output commands — Answer command				
Description	(1) The "Auto Information" function checks the condition of the set once approximately every 1.5 seconds and when a change is detected automatically sends the IF command. (2) The check time is longer than 1.5 seconds during scanning or TUNING dial rotation.			

DN UP DOWN/UP

		Parameter	Format	Parameter function
Function	Same function as microphone UP/DOWN switch			
Input commands — Set command				
Input commands — Read command				
Output commands — Answer command				
Description				

FA FB FREQUENCY VFO A/FREQUENCY VFO B

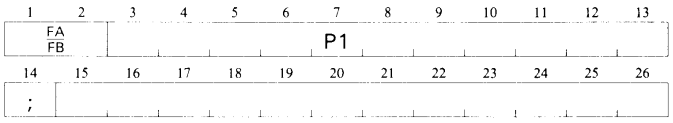
Parameter	Format	Parameter function
P1	4	FREQUENCY

Function

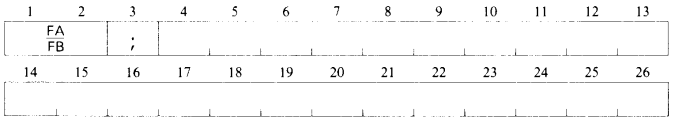
VFO A and VFO B frequency selection and readout

Input commands

Set command

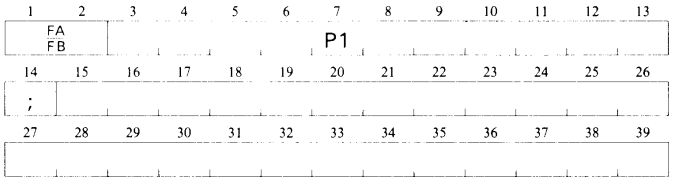


Read command



Output commands

Answer command



Description

FL FILTER

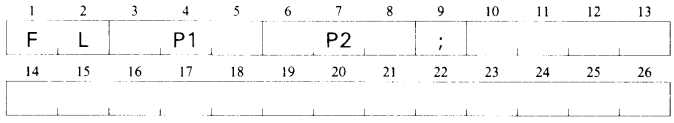
Parameter	Format	Parameter function
P1, P2	26	FILTER

Function

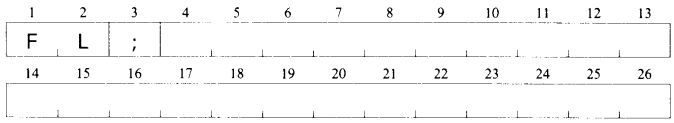
FILTER selection

Input commands

Set command

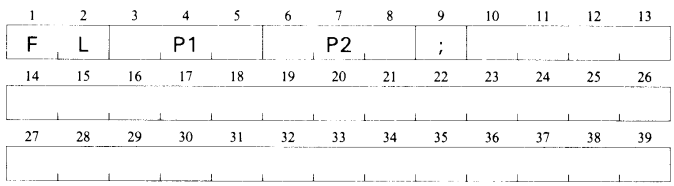


Read command



Output commands

Answer command



Description

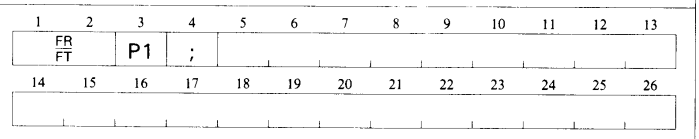
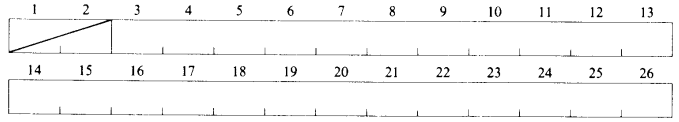
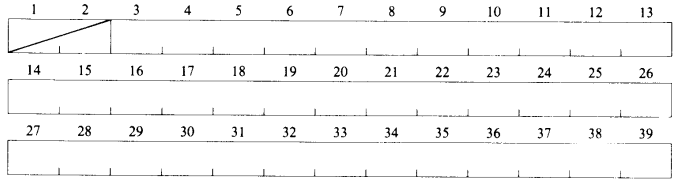
P1: 8.83 MHz Filter

MODE	Command	Filter
FM	002	THRU
	003	THRU
LSB, USB, AM, FSK	002	THRU
	005	6 K
	007	2.4 K
	009	500

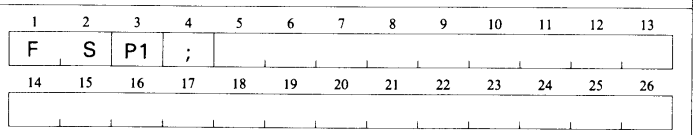
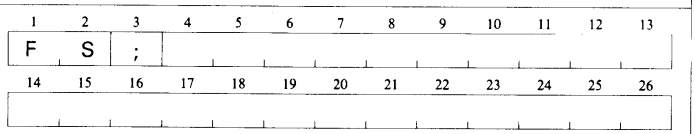
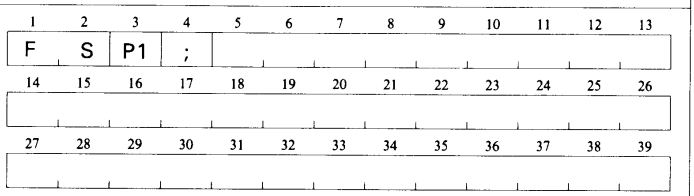
P2: 455 kHz Filter

MODE	Command	Filter
FM	002	12 K
	003	6 K
LSB, USB, AM, FSK	002	12 K
	005	6 K
	007	2.4 K
	009	500

FR FT FUNCTION RX, FUNCTION TX

		Parameter	Format	Parameter function
Function	VFO A, VFO B and MEMORY CHANNEL setting	P1	3	FUNCTION
Input commands – Set command				
Input commands – Read command				
Output commands – Answer command				
Description				

FS FINE STEP

		Parameter	Format	Parameter function
Function	FINE ON/OFF	P1	1	FINE ON/ OFF
Input commands – Set command				
Input commands – Read command				
Output commands – Answer command				
Description				

ID ID

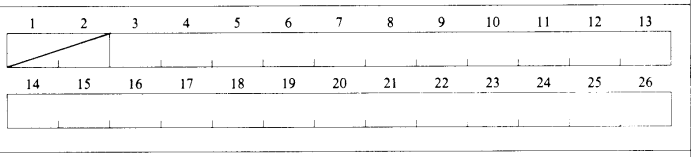
Function

Model No. readout transceiver recognization.

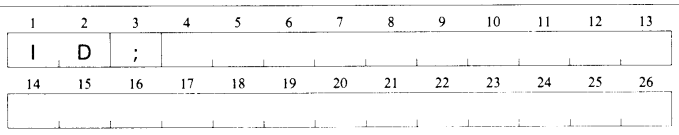
Parameter	Format	Parameter function	
P1	16	TS-450	010
		TS-690	011

Input commands

Set command

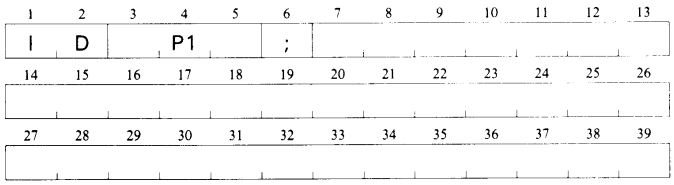


Read command



Output commands

Answer command



Description

IF INFORMATION

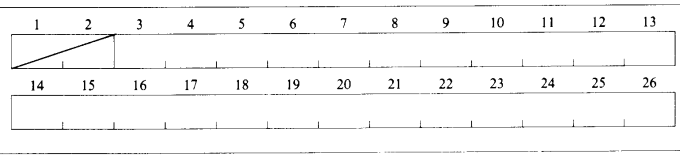
Function

Display of transceivers current condition

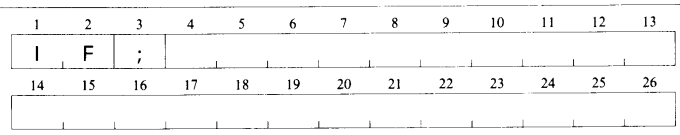
Parameter	Format	Parameter function
P1	4	DISPLAY FREQUENCY
P2	–	
P3	5	RIT FREQUENCY
P4	1	RIT ON/OFF
P5	1	XIT ON/OFF
P6	–	
P7	7	MEMORY CHANNEL
P8	11	TX/RX
P9	2	MODE
P10	3	FUNCTION
P11	1	SCAN ON/OFF
P12	1	SPLIT ON/OFF
P13	1	TONE ON/OFF
P14	–	
P15	–	

Input commands

Set command

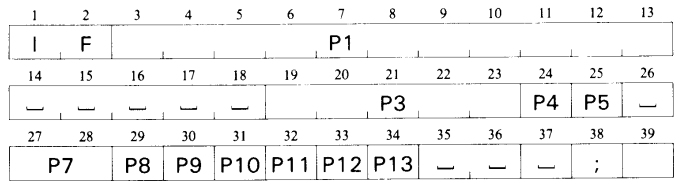


Read command



Output commands

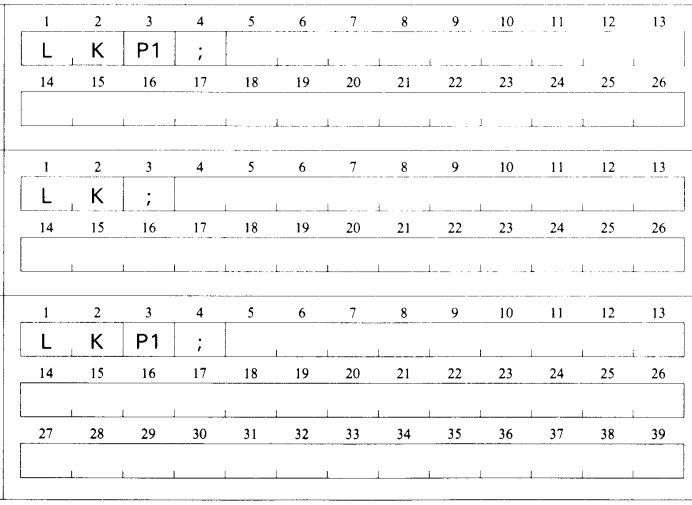
Answer command



Description

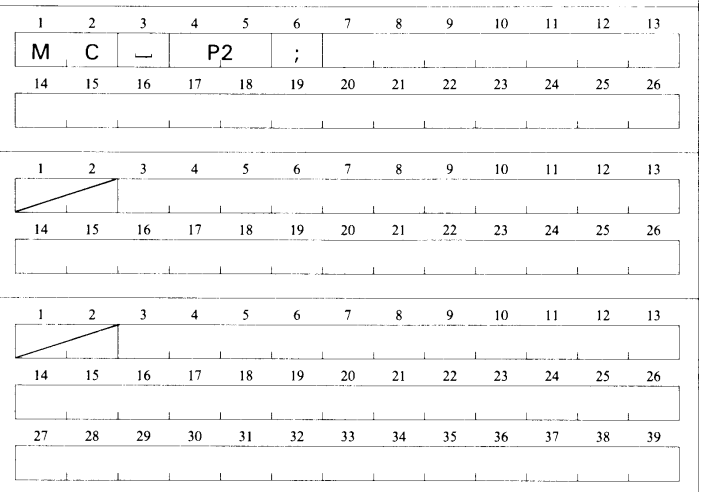
LK LOCK

		Parameter	Format	Parameter function
Function	LOCK ON/OFF setting and display	P1	1	LOCK ON/OFF
Input commands	Set command			
	Read command			
Output commands	Answer command			
Description				



MC MEMORY CHANNEL

		Parameter	Format	Parameter function
Function	Memory channel setting	P1	—	
		P2	7	MEMORY CHANNEL
Input commands	Set command			
	Read command			
Output commands	Answer command			
Description				



MD MODE

Function	Mode setting

Input commands — Set command

1	2	3	4	5	6	7	8	9	10	11	12	13
M	D	P1	;									
14	15	16	17	18	19	20	21	22	23	24	25	26

Input commands — Read command

1	2	3	4	5	6	7	8	9	10	11	12	13
14	15	16	17	18	19	20	21	22	23	24	25	26

Output commands — Answer command

1	2	3	4	5	6	7	8	9	10	11	12	13
14	15	16	17	18	19	20	21	22	23	24	25	26
27	28	29	30	31	32	33	34	35	36	37	38	39

Parameter	Format	Parameter function
P1	2	MODE

Description

MR MEMORY READ

Function	Memory display

Input commands — Set command

1	2	3	4	5	6	7	8	9	10	11	12	13
14	15	16	17	18	19	20	21	22	23	24	25	26

Input commands — Read command

1	2	3	4	5	6	7	8	9	10	11	12	13
M	R	P1	—	P3		;						
14	15	16	17	18	19	20	21	22	23	24	25	26

Output commands — Answer command

1	2	3	4	5	6	7	8	9	10	11	12	13
M	R	P1	—	P3			P4					
14	15	16	17	18	19	20	21	22	23	24	25	26
				P5	P6	P7	—	—	—	;		
27	28	29	30	31	32	33	34	35	36	37	38	39

Parameter	Format	Parameter function
P1	9	SPLIT SPECIFICATION
P2	—	
P3	7	MEMORY CHANNEL
P4	4	FREQUENCY
P5	2	MODE
P6	10	MEMORY LOCKOUT
P7	1	TONE ON/OFF
P8	—	
P9	—	

Description

All parameters are set to OFF when the memory channel is vacant.
To recall the lowest operating frequency of the section use P1 = 0, and to recall the highest operating frequency use P1 = 1.

MW MEMORY WRITE

Function: Memory entry

Input commands — Set command

1	2	3	4	5	6	7	8	9	10	11	12	13
M	W	P1	—	P3					P4			

14	15	16	17	18	19	20	21	22	23	24	25	26
				P5	P6	P7	—	—	—	;		

Input commands — Read command

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

14	15	16	17	18	19	20	21	22	23	24	25	26

Output commands — Answer command

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

14	15	16	17	18	19	20	21	22	23	24	25	26

27	28	29	30	31	32	33	34	35	36	37	38	39

Parameter	Format	Parameter function
P1	9	SPLIT SPECIFICATION
P2	—	
P3	7	MEMORY CHANNEL
P4	4	FREQUENCY
P5	2	MODE
P6	10	MEMORY LOCKOUT
P7	1	TONE ON/OFF
P8	—	
P9	—	

Description

(1) The MW command is valid when all parameters have be correctly entered.
(2) When all effective frequency columns are "0", the memory is set to an open channel.
(3) When the split channel is open, the transceiver will be set for the same transmit and receive frequencies, i.e. simplex.
(4) To recall the lowest operating frequency of the section use P1 = 0, and to recall the highest operating frequency use P1 = 1.

MX AIP (Advanced Intercept Point)

Function: AIP ON/OFF setting

Input commands — Set command

1	2	3	4	5	6	7	8	9	10	11	12	13
M	X	P1	;									

14	15	16	17	18	19	20	21	22	23	24	25	26

Input commands — Read command

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

14	15	16	17	18	19	20	21	22	23	24	25	26

Output commands — Answer command

1	2	3	4	5	6	7	8	9	10	11	12	13
M	X	P1	;									

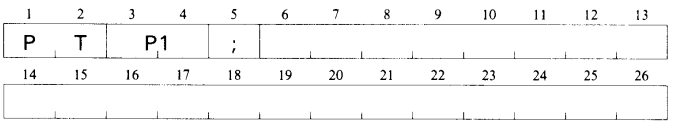
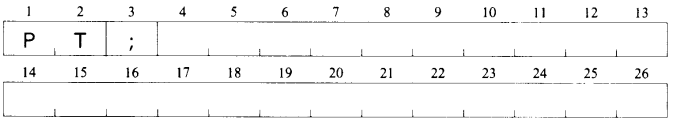
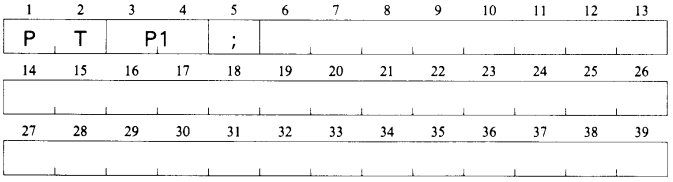
14	15	16	17	18	19	20	21	22	23	24	25	26

27	28	29	30	31	32	33	34	35	36	37	38	39

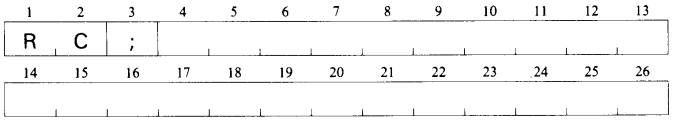
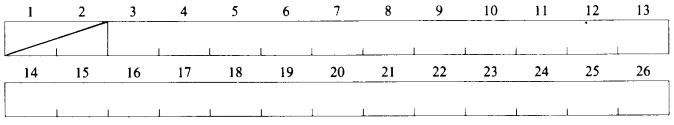
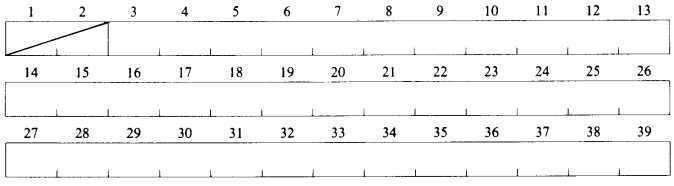
Parameter	Format	Parameter function
P1	1	AIP ON/OFF

Description

PT PITCH

		Parameter	Format	Parameter function
Function	PITCH setting	P1	25	PITCH
Input commands — Set command				
Input commands — Read command				
Output commands — Answer command				
Description				

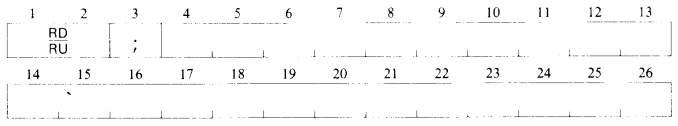
RC RIT CLEAR

		Parameter	Format	Parameter function
Function	RIT/XIT frequency clearance			
Input commands — Set command				
Input commands — Read command				
Output commands — Answer command				
Description	When this command is executed both the RIT and the XIT will be cleared. When using these commands the center frequency point on the RIT control may not coincide with the center point printed on the front panel. The center point will coincide with the position of the RIT control before these commands were initiated.			

RD RU RIT DOWN/UP

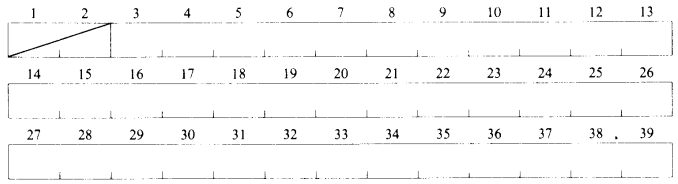
	Parameter	Format	Parameter function
Function: RIT/XIT frequency UP/DOWN			

Input commands – Set command:



Input commands – Read command:

Output commands – Answer command:



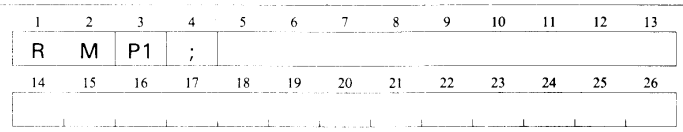
Description:

When this command is executed both the RIT and the XIT will be changed.
When using these commands the center frequency point on the RIT control may not coincide with the center point printed on the front panel. The center point will coincide with the position of the RIT control before these commands were initiated.

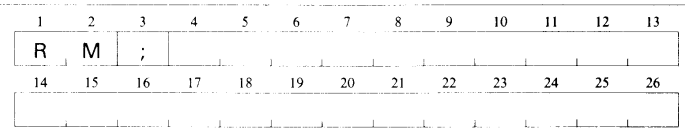
RM READ METER

	Parameter	Format	Parameter function
Function: METER selection and readout	P1	24	METER selection
	P2	22	METER level

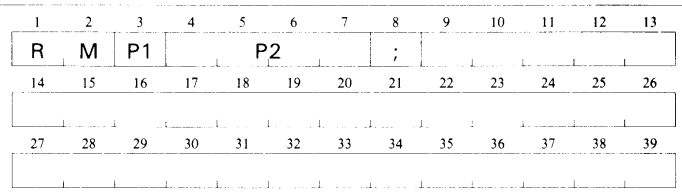
Input commands – Set command:



Input commands – Read command:

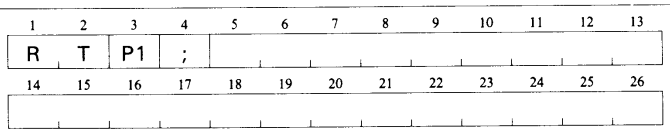
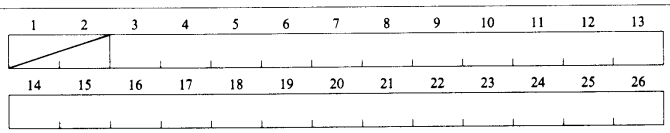
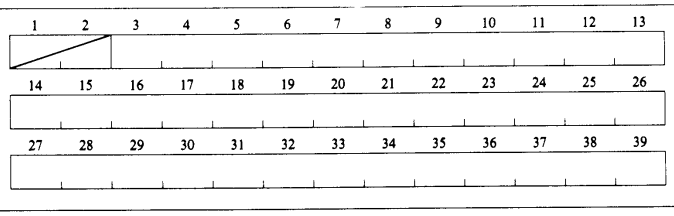


Output commands – Answer command:

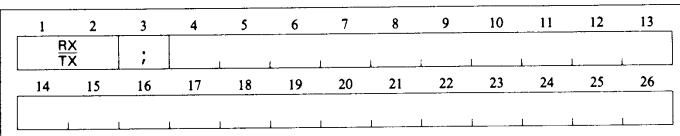
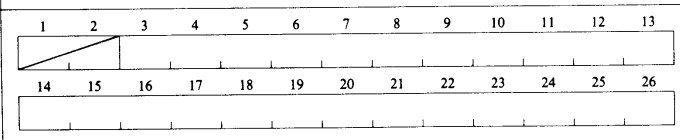
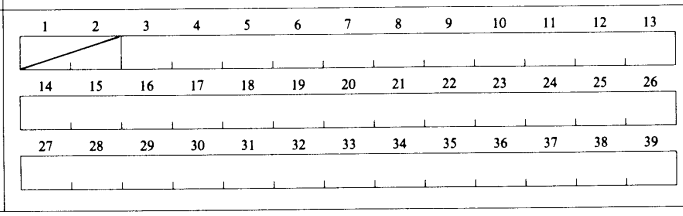


Description:

RT RIT

		Parameter	Format	Parameter function
Function	RIT ON/OFF setting	P1	1	RIT ON/OFF
Input commands – Set command				
Input commands – Read command				
Output commands – Answer command				
Description				

RX TX RX/TX

		Parameter	Format	Parameter function
Function	RX: For receive operation TX: For transmit operation			
Input commands – Set command				
Input commands – Read command				
Output commands – Answer command				
Description	Place the REC/SEND switch to REC.			

SC SCAN

Parameter	Format	Parameter function
P1	1	SCAN ON/OFF

Function: Scan ON/OFF setting

Input commands

Set command

1	2	3	4	5	6	7	8	9	10	11	12	13
S	C	P1	;									
14	15	16	17	18	19	20	21	22	23	24	25	26

Read command

1	2	3	4	5	6	7	8	9	10	11	12	13
14	15	16	17	18	19	20	21	22	23	24	25	26

Output commands

Answer command

1	2	3	4	5	6	7	8	9	10	11	12	13
14	15	16	17	18	19	20	21	22	23	24	25	26
27	28	29	30	31	32	33	34	35	36	37	38	39
.												

Description

SM S-METER

Parameter	Format	Parameter function
P1	22	METER level

Function: S-Meter signal output

Input commands

Set command

1	2	3	4	5	6	7	8	9	10	11	12	13
14	15	16	17	18	19	20	21	22	23	24	25	26

Read command

1	2	3	4	5	6	7	8	9	10	11	12	13
S	M	;										
14	15	16	17	18	19	20	21	22	23	24	25	26

Output commands

Answer command

1	2	3	4	5	6	7	8	9	10	11	12	13
S	M	P1				;						
14	15	16	17	18	19	20	21	22	23	24	25	26
27	28	29	30	31	32	33	34	35	36	37	38	39

Description

During transmit, the meter displays the transmitter power output.

TO TONE ON/OFF

		Parameter	Format	Parameter function
Function	Sub-tone setting	P1	1	TONE ON/OFF
Input commands	Set command	T O P1 ;		
Input commands	Read command			
Output commands	Answer command			
Description	Condition Mode: FM VFO : SPLIT			

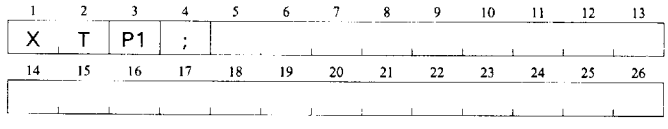
VR VOICE RECALL

		Parameter	Format	Parameter function
Function	Generation of synthesized voice.			
Input commands	Set command	V R ;		
Input commands	Read command			
Output commands	Answer command			
Description	Requires the use of the optional VS-2 Voice Synthesizer.			

XT XIT

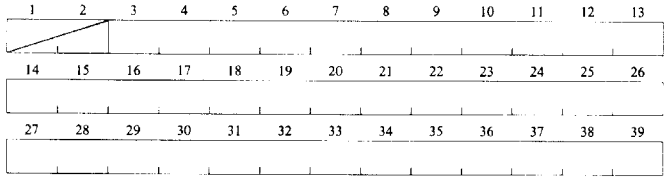
		Parameter	Format	Parameter function
Function	XIT ON/OFF setting	P1	1	XIT ON/OFF

Input commands — Set command



Input commands — Read command

Output commands — Answer command



Description

KENWOOD