

KENWOOD

IC KIT

IC-10

INSTRUCTION MANUAL

KENWOOD CORPORATION

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Thank you for purchasing the new IC-10 IC kit. Please read this instruction manual carefully before placing your IC kit in service. This unit has been carefully engineered and manufactured to rigid quality standard, and should give you satisfactory and dependable operation for many years.

The IC-10 IC kit is designed to be installed internally in transceiver the TS-440S, to allow computer assisted control of various transceiver operating parameters. Control is performed via the computers RS-232C terminal via the IF-232C interface (level translator).

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1. FEATURES

1. A wide variety of control instructions are possible.
2. Powerful, easy-to-understand instruction set.
3. Common commands that are interchangeable between different transceivers, reducing the number of changes necessary in software development.
4. Simultaneous operation of personal computer and transceiver.

2. SUPPLIED ACCESSORIES

The following accessories are supplied this kit. Confirm that all are present.

1. IC (μ PD8251AFC)..... 1 ea.
2. IC (TC4040BP)..... 1 ea.
3. Instruction manual..... (B50-8081-10)..... 1 ea.

Note:

The TS-440S does not include computer software, guidelines are provided but due to the wide variety of computers available, all of which have their own languages it is left up to the owner to design his or her own software package.

3. SPECIFICATIONS

3-1. Interface

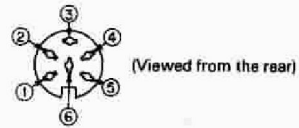
Communication method Serial interface, full-duplex
 Transfer rate 4800 BPS (bits per second)
 Synchronization..... Start-stop (Asynchronous)
 Bit construction 1 start bit, 8 character bits, 2 stop bits
 Parity None
 Signal format TTL level

3-2. Terminal connections

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

GND: This is the signal ground terminal.
 TXD: The transmit data is the serial data from the transceiver to the computer. The output utilizes negative logic.
 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



4. INSTALLATION

Refer to TS-440S instruction manual.

5. OPERATION

Caution:

Turn the POWER switch OFF before making connections.

5-1. 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 receive 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.

5-2. 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 (TXD), receive data (RXD), and ground (GND). From a practical standpoint it is also necessary to incorporate some means of controlling when this data transfer will occur. The transceiver has the buffer for reception and the computer may have also that. Then the RTS and the CTS lines will control each data transfer never overflow those buffers.

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 23 differ-

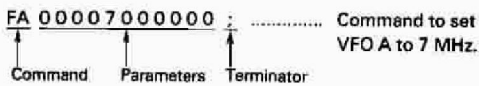
ent commands available for control of the transceiver.

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.

5-3. 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:



5-3-1. Command description

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

5-3-2. Parameter description (Refer to the parameter list.)

Parameters are used to specify specific information neces-

sary 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-440S 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".
- "MC1 09;" Unnecessary characters between parameters.
- "MC109" No terminator

Parameter list

Format No.	Name	Number of columns	Format
1	SW	1	0 = OFF 1 = ON
2	MODE	1	1 = LSB 4 = FM 2 = USB 5 = AM 3 = CW 6 = FSK
3	FUNCTION	1	0 = VFO A 2 = MEMORY 1 = VFO B
4	FREQUENCY	11	Represented in Hz, using 11 columns Example: Q000720000Q is 7.2 MHz 10 GHz 1 MHz 1 kHz 1 Hz
5	RIT FREQUENCY	5	The first column is "+" or "-", and the remaining four columns indicate the frequency in Hz. Example: +1050 is +1.05 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

Format No.	Name	Number of columns	Format
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.

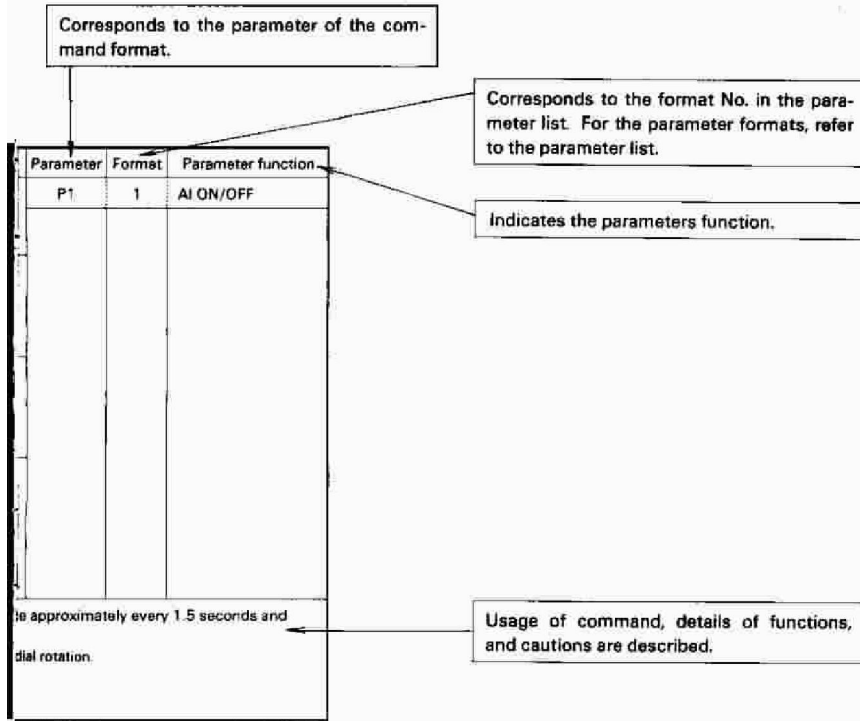
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12	—	—	
13	—	—	
14	—	—	
15	—	—	
16	MODEL NO.	3	Three column number specifying each set.

5-3-6. How to read the command tables

Command	Name	The number of the command columns is shown.																																																
AI	AUTO INFORMATION																																																	
Applicable models for the command	Applicable models	TS-440S																																																
Function of the command	Function	AUTO INFORMATION ON/OFF setting																																																
The format of the command is shown. When oblique lines are drawn in the 1st and 2nd columns there is no set command.	Input commands	<table border="1"> <tr> <td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td><td>11</td><td>12</td> </tr> <tr> <td>A</td><td> </td><td>P1</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td> </tr> <tr> <td>14</td><td>15</td><td>16</td><td>17</td><td>18</td><td>19</td><td>20</td><td>21</td><td>22</td><td>23</td><td>24</td><td>25</td> </tr> </table>	1	2	3	4	5	6	7	8	9	10	11	12	A		P1										14	15	16	17	18	19	20	21	22	23	24	25												
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The format of the command for reading the sets condition is shown. When oblique lines are drawn in the 1st and 2nd columns, there is no read command.	Input commands	<table border="1"> <tr> <td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td><td>11</td><td>12</td> </tr> <tr> <td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td> </tr> <tr> <td>14</td><td>15</td><td>16</td><td>17</td><td>18</td><td>19</td><td>20</td><td>21</td><td>22</td><td>23</td><td>24</td><td>25</td> </tr> </table>	1	2	3	4	5	6	7	8	9	10	11	12													14	15	16	17	18	19	20	21	22	23	24	25												
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The format of the command output from the transceiver is shown. When oblique lines are drawn in the 1st and 2nd columns, there is no answer command.	Output commands	<table border="1"> <tr> <td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td><td>11</td><td>12</td> </tr> <tr> <td> </td><td>F</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td> </tr> <tr> <td>14</td><td>15</td><td>16</td><td>17</td><td>18</td><td>19</td><td>20</td><td>21</td><td>22</td><td>23</td><td>24</td><td>25</td> </tr> <tr> <td>27</td><td>28</td><td>29</td><td>30</td><td>31</td><td>32</td><td>33</td><td>34</td><td>35</td><td>36</td><td>37</td><td>38</td> </tr> </table>	1	2	3	4	5	6	7	8	9	10	11	12		F											14	15	16	17	18	19	20	21	22	23	24	25	27	28	29	30	31	32	33	34	35	36	37	38
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Description	<p>(1) The "Auto Information" function checks the condition of the set when a change is detected automatically sends the IF command.</p> <p>(2) The check time is longer than 1.5 seconds during scanning or TUNING.</p>																																																	



5-3-7. Command Use Precautions

1. When control characters (OO to IFH) have been included in the receive data, string the command following these control characters may not be correctly received and/or executed. Do not use these control characters.
2. Program execution may be delayed during encoder rotation.

5-3-8. Command list

Command	Function	Page
AI	AUTO INFORMATION	13
DN/UP	DOWN/UP	14
FA/FB	FREQUENCY VFO A/ FREQUENCY VFO B	15
FN	FUNCTION	16
ID	ID	17
IF	INFORMATION	18
LK	LOCK	19
MC	MEMORY CHANNEL	20
MD	MODE	21
MR	MEMORY READ	22
MW	MEMORY WRITE	23
RC	RIT CLEAR	24
RD/RU	RIT DOWN/RIT UP	25
RT	RIT	26
RX/TX	RX/TX	27
SC	SCAN	28
SP	SPLIT	29
VR	VOICE RECALL	30
XT	XIT	31

AI AUTO INFORMATION

Applicable models		TS-440S		Parameter	Format	Parameter function																																																																																
Function	AUTO INFORMATION ON/OFF setting			P1	1	AI ON/OFF																																																																																
Input commands	Set command	<table border="1"> <tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td><td>11</td><td>12</td><td>13</td></tr> <tr><td>A</td><td>I</td><td>P1</td><td>:</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>14</td><td>15</td><td>16</td><td>17</td><td>18</td><td>19</td><td>20</td><td>21</td><td>22</td><td>23</td><td>24</td><td>25</td><td>26</td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> </table>					1	2	3	4	5	6	7	8	9	10	11	12	13	A	I	P1	:										14	15	16	17	18	19	20	21	22	23	24	25	26																																									
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Description	<p>(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.</p> <p>(2) The check time is longer than 1.5 seconds during scanning or TUNING dial rotation.</p>																																																																																					

		Applicable models	TS-440S	Parameter	Format	Parameter function																																																				
Function	Same function as microphone UP/DOWN switch																																																									
	Input commands	Set command	<table border="1"> <tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td><td>11</td><td>12</td><td>13</td></tr> <tr><td>DN</td><td>.</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>UP</td><td>.</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>14</td><td>15</td><td>16</td><td>17</td><td>18</td><td>19</td><td>20</td><td>21</td><td>22</td><td>23</td><td>24</td><td>25</td><td>26</td></tr> </table>	1	2	3	4	5	6	7	8	9	10	11	12	13	DN	.												UP	.												14	15	16	17	18	19	20	21	22	23	24	25	26			
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Description																																																										

FN FUNCTION		Applicable models	Parameter	Format	Parameter function																																																																														
Function	VFO A, VFO B and MEMORY setting		P1	3	FUNCTION																																																																														
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Description																																																																																			

ID ID

Applicable models		TS-440S											Parameter	Format	Parameter function
Function	Model No. readout for transceiver recognition.											P1	16	MODEL No. : 004	
	Input commands														
Read command															
Output commands															
Description															

IF INFORMATION

Applicable models		TS-440S		Parameter	Format	Parameter function	
Function	Display of transceivers current condition			P1	4	DISPLAY FREQUENCY	
				P2	-		
Input commands	Set command	1 2 3 4 5 6 7 8 9 10 11 12 13			P3	5	RIT FREQUENCY
		14 15 16 17 18 19 20 21 22 23 24 25 26			P4	1	RIT ON/OFF
					P5	1	XIT ON/OFF
					P6	-	
					P7	7	MEMORY CHANNEL
					P8	11	TX/RX
	Read command	1 2 3 4 5 6 7 8 9 10 11 12 13			P9	2	MODE
		14 15 16 17 18 19 20 21 22 23 24 25 26			P10	3	FUNCTION
					P11	1	SCAN ON/OFF
					P12	1	SPLIT ON/OFF
					P13	-	
					P14	-	
Output commands	Answer command	1 2 3 4 5 6 7 8 9 10 11 12 13			P15	-	
		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							

LK LOCK

Applicable models		TS-440S		Parameter	Format	Parameter function																																																																																	
Function	LOCK ON/OFF setting and display			P1	1	LOCK ON/OFF																																																																																	
Input commands	Set command	<table border="1"> <tr> <td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td><td>11</td><td>12</td><td>13</td> </tr> <tr> <td>L</td><td>K</td><td>P1</td><td>:</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td> </tr> <tr> <td>14</td><td>15</td><td>16</td><td>17</td><td>18</td><td>19</td><td>20</td><td>21</td><td>22</td><td>23</td><td>24</td><td>25</td><td>26</td> </tr> <tr> <td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td> </tr> </table>					1	2	3	4	5	6	7	8	9	10	11	12	13	L	K	P1	:										14	15	16	17	18	19	20	21	22	23	24	25	26																																										
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Output commands	Answer command	<table border="1"> <tr> <td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td><td>11</td><td>12</td><td>13</td> </tr> <tr> <td>L</td><td>K</td><td>P1</td><td>:</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td> </tr> <tr> <td>14</td><td>15</td><td>16</td><td>17</td><td>18</td><td>19</td><td>20</td><td>21</td><td>22</td><td>23</td><td>24</td><td>25</td><td>26</td> </tr> <tr> <td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td> </tr> <tr> <td>27</td><td>28</td><td>29</td><td>30</td><td>31</td><td>32</td><td>33</td><td>34</td><td>35</td><td>36</td><td>37</td><td>38</td><td>39</td> </tr> <tr> <td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td> </tr> </table>					1	2	3	4	5	6	7	8	9	10	11	12	13	L	K	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																
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MC MEMORY CHANNEL

Applicable models		TS-440S		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

Applicable models		TS-440S		Parameter	Format	Parameter function
Function	Mode setting			P1	2	MODE
	Input commands	Set command				
Read command						
Output commands	Answer command					
	Description					

MR MEMORY READ

Applicable models		TS-440S		Parameter	Format	Parameter function	
Function	Memory display			P1	9	SPLIT SPECIFICAITON	
				P2	-	MEMORY BANK	
Input commands	Set command				P3	7	MEMORY CHANNEL
					P4	4	FREQUENCY
	Read command				P5	2	MODE
					P6	10	MEMORY LOCKOUT
Output commands	Answer command				P7	-	
					P8	-	
					P9	-	
Description	(1) All parameters are set to OFF when the memory channel is vacant.						

MW MEMORY WRITE

Applicable models		TS-440S	Parameter	Format	Parameter function
Function	Memory entry		P1	9	SPLIT SPECIFICATION
			P2	-	
Input commands	Set command		P3	7	MEMORY CHANNEL
			P4	4	FREQUENCY
	P5	2	MODE		
	P6	8	MEMORY LOCKOUT		
	Read command		P7	-	
			P8	-	
Output commands	Answer command		P9	-	
Description	<p>(1) The MW command is valid when all parameters have been 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.</p>				

RC RIT CLEAR		Applicable models	TS-440S	Parameter	Format	Parameter function
Function	RIT frequency clearance					
Input commands	Set command					
	Read command					
Output commands	Answer command					
Description	<p>When this command is used, the actual RIT frequency becomes different from that indicated by the knob position. When the knob is rotated again, the RIT frequency corresponding to the knob position resumes.</p>					

RD		RU		RIT DOWN/RIT UP			
Applicable models		TS-440S		Parameter	Format	Parameter function	
Function	RIT frequency UP/DOWN						
	Input commands	Set command					
		Read command					
Output commands	Answer command						
Description	<p>When this command is used, the actual RIT frequency becomes different from that indicated by the knob position. When the knob is rotated again, the RIT frequency corresponding to the knob position resumes.</p>						

RT RIT

Applicable models		TS-440S	Parameter	Format	Parameter function
Function	RIT ON/OFF setting		P1	1	RIT ON/OFF
Input commands	Set command				
	Read command				
Output commands	Answer command				
Description					

RX		TX		RX/TX					
Applicable models		TS-440S				Parameter	Format	Parameter function	
Function	RX: For receive operation TX: For transmit operation								
	Input commands	Set command							
		Read command							
Output commands	Answer command								
Description	<p>After the TX command is executed, the receiving mode cannot be resumed by the SEND switch, etc. on the transceiver. (This condition is reset by turning the power off.) Unless the receiving mode is resumed by the RX command, operation of the SEND switch on the transceiver cannot be performed.</p> <p>Special attention should be paid, when this command is executed at frequencies which do not have actual power, the ON AIR LED is not lit.</p> <p>When "?:" is replied to the TX command, the TX command is ignored, however, it is recommended to use the TX command in combination with the RX command if possible.</p>								

SC SCAN

Applicable models		TS-440S											Parameter	Format	Parameter function		
Function	Scan ON/OFF setting											P1	1	SCAN ON/OFF			
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				
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				
Description																	

SP SPLIT

Applicable models		TS-440S	Parameter	Format	Parameter function
Function	SPLIT ON/OFF setting		P1	1	SPLIT ON/OFF
Input commands	Set command				
	Read command				
Output commands	Answer command				
Description					

VR VOICE RECALL

Applicable models		TS-440S	Parameter	Format	Parameter function
Function	Generation of synthesized voice.				
Input commands	Set command				
	Read command				
Output commands	Answer command				
Description					

XT XIT

Applicable model		TS-440S											Parameter	Format	Parameter function																																																																													
Function	XIT ON/OFF setting											P1	1	XIT ON/OFF																																																																														
	Input commands	<table border="1"> <tr> <td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td><td>11</td><td>12</td><td>13</td> </tr> <tr> <td>X</td><td>T</td><td>P1</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td> </tr> <tr> <td>14</td><td>15</td><td>16</td><td>17</td><td>18</td><td>19</td><td>20</td><td>21</td><td>22</td><td>23</td><td>24</td><td>25</td><td>26</td> </tr> <tr> <td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td> </tr> </table>											1	2	3	4	5	6	7	8	9	10	11	12	13	X	T	P1											14	15	16	17	18	19	20	21	22	23	24	25	26																																									
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