YAESU
The radio

FTDX3000 SERIES

CAT OPERATION

REFERENCE BOOK

YAESU MUSEN CO., LTD.

CAT (COMPUTER AIDED TRANSCEIVER) OPERATION

OVERVIEW

The CAT (Computer Aided Transceiver) System in the **FTDX3000** transceiver provides control of frequency, VFO, memory, and other settings such as dual-channel memories and diversity reception using an external personal computer. This allows multiple control operations to be fully automated with single mouse clicks, or keystroke operations on the computer keyboard.

Using the RS-232C Cable

The **FTDX3000** transceiver has a built-in level converter, allowing direct connection from the rear-panel **CAT** jack to the serial port of your computer without the need of any external boxes.

When using the RS-232C cable, set Menu item "037 CAT SELECT" to "RS232C".

You will need a serial cable for connection to the RS-232C (serial or COM port) connector on your computer. Purchase a ***standard serial cable*** (not the so-called "null modem" type), ensuring it has the correct gender and number of pins (some serial COM port connectors use a 9-pin rather than 25-pin configuration). If your computer uses a custom connector, you may have to construct the cable. In this case, refer to the technical documentation supplied with your computer for correct data connection.

Using the USB Cable

Note: A USB driver is required for remote control from a computer. Download the driver from the Yaesu website (http://www.yaesu.com).

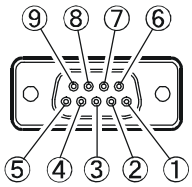
The **FTDX3000** transceiver has a built-in USB to Dual UART Bridge, allowing direct connection from the rear-panel **USB** jack to the **USB** jack of your computer without the need of any external boxes.

When using the USB cable, set Menu item "037 CAT SELECT" to "USB".

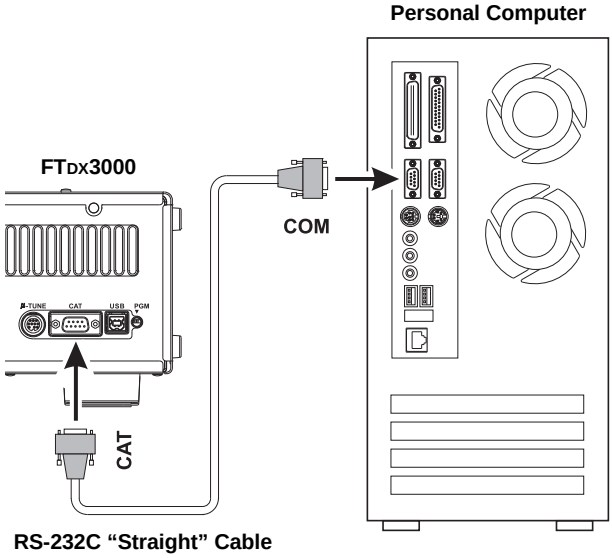
You will need a USB cable to connect to the USB jack on your computer.

YAESU MUSEN does not produce CAT System operating software due to the wide variety of personal computers and operating systems in use today. However, the information provided in this chapter explains the serial data structure and opcodes used by the CAT system. This information, along with the short programming examples, is intended to help you start writing programs on your own. As you become more familiar with CAT operation, you can customize programs for your operating needs and utilize the full operating potential of this system.

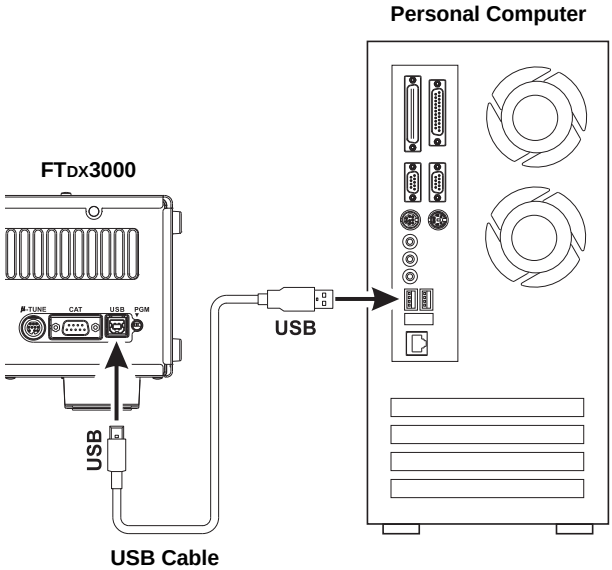
CONNECTION



PIN NO.	PIN NAME	I/O	FUNCTION
①	N/A	—	—
②	SERIAL OUT	Output	Outputs the Serial Data from the transceiver to the computer.
③	SERIAL IN	Input	Inputs the Serial Data from the computer to the transceiver.
④	N/A	—	—
⑤	GND	—	Signal Ground
⑥	N/A	—	—
⑦	RTS	Input	When the computer is not ready to receive data, this port goes to "L" to inhibit the transmit data from the transceiver.
⑧	CTS	Output	When the transceiver is not ready to receive data, this port goes to "L" to inhibit the transmit data from the computer.
⑨	N/A	—	—



RS-232C "Straight" Cable



USB Cable

CONTROL COMMAND

A computer control command is composed of an alphabetical command, various parameters, and the terminator that signals the end of the control command.

Example: Set the VFO-A frequency to 14.250000 MHz.

FA	**14250000**	**;**
↑	↑	↑
Command	Parameter	Terminator

There are three commands for the **FTDX3000** as shown below:

Set command: Set a particular condition (to the **FTDX3000**)

Read command: Reads an answer (from the **FTDX3000**)

Answer command: Transmits a condition (from the **FTDX3000**)

For example, note the following case of the FA command (Set the VFO-A frequency):

- ❒ To set the VFO-A frequency to 14.250000 MHz, the following command is sent from the computer to the transceiver:
  "**FA14250000;**" (Set command)
- ❒ To read the VFO-A frequency, the following command is sent from the computer to the transceiver:
  "**FA;**" (Read command)
- ❒ When the Read command above has been sent, the following command is returned to the computer:
  "**FA14250000;**" (Answer command)

Alphabetical Commands

A command consists of 2 alphabetical characters.

You may use either lower or upper case characters. The commands available for this transceiver are listed in the "PC Control Command Tables" on the following pages.

Parameters

Parameters are used to specify information necessary to implement the desired command.

The parameters to be used for each command are predetermined. The number of digits assigned to each parameter is also predetermined. Refer to the "Control Command List" and the "Control Command Tables" to configure the appropriate parameters.

When configuring parameters, be careful not to make the following mistakes.

For example, when the correct parameter is "**IS0+1000**" (IF SHIFT):

IS01000;
Not enough parameters specified (No direction (+) given for the IF shift)

IS0+100;
Not enough digits (Only three frequency digits given)

IS0_+_1000;
Unnecessary characters between parameters

IS0+10000;
Too many digits (Five frequency digits given)

Note: If a particular parameter is not applicable to the **FTDX3000**, the parameter digits should be filled using any character except the ASCII control codes (00 to 1Fh) and the terminator (**;**).

Terminator

To signal the end of a command, it is necessary to use a semicolon (**;**). The digit where this special character must appear differs depending on the command used.

COMMAND	Function	SET	READ	ANS.	AI
AB	VFO-A TO VFO-B	O	X	X	X
AC	ANTENNA TUNER CONTROL	O	O	O	O
AG	AF GAIN	O	O	O	O
AI	AUTO INFORMATION	O	O	O	X
AM	VFO-A TO MEMORY CHANNEL	O	X	X	X
AN	ANTENNA NUMBER	O	O	O	O
BA	VFO-B TO VFO-A	O	X	X	X
BC	AUTO NOTCH	O	O	O	O
BD	BAND DOWN	O	X	X	X
BI	BREAK-IN	O	O	O	O
BP	MANUAL NOTCH	O	O	O	O
BS	BAND SELECT	O	X	X	X
BU	BAND UP	O	X	X	X
BY	BUSY	X	O	O	O
CH	CHANNEL UP/DOWN	O	X	X	X
CN	CTCSS NUMBER	O	O	O	O
CO	CONTOUR	O	O	O	O
CS	CW SPOT	O	O	O	O
CT	CTCSS	O	O	O	O
DA	DIMMER	O	O	O	X
DN	DOWN	O	X	X	X
ED	ENCORDER DOWN	O	X	X	X
EK	ENT KEY	O	X	X	X
EU	ENCORDER UP	O	X	X	X
EM	ENCODE MEMORY	O	O	O	X
EN	ENCODE	O	X	X	X
EX	MENU	O	O	O	O
FA	FREQUENCY VFO-A	O	O	O	O
FB	FREQUENCY VFO-B	O	O	O	O
FR	FUNCTION RX	O	O	O	O
FS	FAST STEP	O	O	O	O
FT	FUNCTION TX	O	O	O	O
GT	AGC FUNCTION	O	O	O	O
IF	INFORMATION	X	O	O	O
IS	IF-SHIFT	O	O	O	O
KM	KEYER MEMORY	O	O	O	X
KP	KEY PITCH	O	O	O	O
KR	KEYER	O	O	O	O
KS	KEY SPEED	O	O	O	O
KY	CW KEYING	O	X	X	X
LK	LOCK	O	O	O	O
LM	LOAD MESSEGE	O	O	O	X
MA	MEMORY CHANNEL TO VFO-A	O	X	X	X
MC	MEMORY CHANNEL	O	O	O	X
MD	MODE	O	O	O	O
MG	MIC GAIN	O	O	O	O
ML	MONITOR LEVEL	O	O	O	O
MR	MEMORY READ	X	O	O	X
MS	METER SW	O	O	O	O
MW	MEMORY WRITE	O	X	X	X
MX	MOX SET	O	O	O	O
NA	NARROW	O	O	O	O
NB	NOISE BLANKER	O	O	O	O
NL	NOISE BLANKER LEVEL	O	O	O	O
NR	NOISE REDUCTION	O	O	O	O
OI	OPPOSITE BAND NFORMATION	X	O	O	X
OS	OFFSET (Repeater Shift)	O	O	O	O
PA	PRE-AMP (IPO)	O	O	O	O
PB	PLAY BACK	O	O	O	X

COMMAND	Function	SET	READ	ANS.	AI
PC	POWER CONTROL	O	O	O	O
PL	SPEECH PROCESSOR LEVEL	O	O	O	O
PR	SPEECH PROCESSOR	O	O	O	O
PS	POWER SWITCH	O	O	O	X
QI	QMB STORE	O	X	X	X
QR	QMB RECALL	O	X	X	X
QS	QUICK SPLIT	O	X	X	X
RA	RF ATTENUATOR	O	O	O	O
RC	CLAR CLEAR	O	X	X	X
RD	CLAR DOWN	O	X	X	X
RF	ROOFING FILTER	O	O	O	O
RG	RF GAIN	O	O	O	O
RI	RADIO INFORMATION	X	O	O	O
RL	NOISE REDUCTION LEVEL	O	O	O	O
RM	READ METER	X	O	O	X
RO	ROTATOR	O	O	O	O
RS	RADIO STATUS	X	O	O	O
RT	CLAR	O	O	O	O
RU	CLAR UP	O	X	X	X
SC	SCAN	O	O	O	O
SD	SEMI BREAK-IN DELAY TIME	O	O	O	O
SF	SUB-DIAL FUNCTION	O	O	O	O
SH	WIDTH	O	O	O	O
SM	S METER	X	O	O	O
SQ	SQUELCH LEVEL	O	O	O	O
SV	SWAP VFO	O	X	X	X
TS	TXW	O	O	O	O
TX	TX SET	O	O	O	O
UL	UNLOCK	X	O	O	O
UP	UP	O	X	X	X
VD	VOX DELAY TIME	O	O	O	O
VF	uTUNE FILTER	O	O	O	O
VG	VOX GAIN	O	O	O	O
VM	[V/M] KEY FUNCTION	O	X	X	X
VS	VFO SELECT	O	O	O	O
VX	VOX	O	O	O	O
XT	TX CLAR	O	O	O	O

AB	VFO-A TO VFO-B									
Set	1	2	3	4	5	6	7	8	9	10
	A	B	;							
Read	1	2	3	4	5	6	7	8	9	10
Answer	1	2	3	4	5	6	7	8	9	10

AC	ANTENNA TUNER CONTROL									
Set	1	2	3	4	5	6	7	8	9	10
	A	C	P1	P2	P3	;				
Read	1	2	3	4	5	6	7	8	9	10
	A	C	;							
Answer	1	2	3	4	5	6	7	8	9	10
	A	C	P1	P2	P3	;				

P1 0: Fixed
P2 0: Fixed
P3 0: Tuner "OFF"
1: Tuner "ON"
2: Tuning Start

AG	AF GAIN									
Set	1	2	3	4	5	6	7	8	9	10
	A	G	P1	P2	P2	P2	;			
Read	1	2	3	4	5	6	7	8	9	10
	A	G	P1	;						
Answer	1	2	3	4	5	6	7	8	9	10
	A	G	P1	P2	P2	P2	;			

P1 0: Fixed
P2 000 - 255

AI	AUTO INFORMATION									
Set	1	2	3	4	5	6	7	8	9	10
	A	I	P1	;						
Read	1	2	3	4	5	6	7	8	9	10
	A	I	;							
Answer	1	2	3	4	5	6	7	8	9	10
	A	I	P1	;						

P1 0: Auto Information "OFF"
1: Auto Information "ON"

This parameter is set to "0" (OFF) automatically when the transceiver is turned "OFF".

AM	VFO-A TO MEMORY CHANNEL									
Set	1	2	3	4	5	6	7	8	9	10
	A	M	;							
Read	1	2	3	4	5	6	7	8	9	10
Answer	1	2	3	4	5	6	7	8	9	10

AN	ANTENNA NUMBER									
Set	1	2	3	4	5	6	7	8	9	10
	A	N	P1	P2	;					
Read	1	2	3	4	5	6	7	8	9	10
	A	N	P1	;						
Answer	1	2	3	4	5	6	7	8	9	10
	A	N	P1	P3	P4	;				

P1 0: Fixed
P2 1: ANT "1"
2: ANT "2"
3: ANT "3"
P3 1: ANT "1"
2: ANT "2"
3: ANT "3"
P4 0: Fixed

BA	VFO-B TO VFO-A									
Set	1	2	3	4	5	6	7	8	9	10
	B	A	;							
Read	1	2	3	4	5	6	7	8	9	10
Answer	1	2	3	4	5	6	7	8	9	10

BC	AUTO NOTCH									
Set	1	2	3	4	5	6	7	8	9	10
	B	C	P1	P2	;					
Read	1	2	3	4	5	6	7	8	9	10
	B	C	P1	;						
Answer	1	2	3	4	5	6	7	8	9	10
	B	C	P1	P2	;					

P1 0:Fixed
P2 0: Auto Notch "OFF"
1: Auto Notch "ON"

BD	BAND DOWN									
Set	1	2	3	4	5	6	7	8	9	10
	B	D	P1	;						
Read	1	2	3	4	5	6	7	8	9	10
Answer	1	2	3	4	5	6	7	8	9	10

P1 0: Fixed

BI — BREAK-IN

	1	2	3	4	5	6	7	8	9	10
Set	B	I	P1	;						
Read	B	I	;							
Answer	B	I	P1	;						

P1 0: Break-in "OFF"
1: Break-in "ON"

BP — MANUAL NOTCH

	1	2	3	4	5	6	7	8	9	10
Set	B	P	P1	P2	P3	P3	P3	;		
Read	B	P	P1	P2	;					
Answer	B	P	P1	P2	P3	P3	P3	;		

P1 0:Fixed
P2 0: Manual NOTCH "ON/OFF"
1: Manual NOTCH LEVEL
P3 P2=0
000: OFF
001: ON
P2=1
001 - 400 (NOTCH Frequency : x 10 Hz)

BS — BAND SELECT

	1	2	3	4	5	6	7	8	9	10
Set	B	S	P1	P1	;					
Read										
Answer										

P1 00: 1.8 MHz
01: 3.5 MHz
02: - - - -
03: 7 MHz
04: 10 MHz
05: 14 MHz
06: 18 MHz
07: 21 MHz
08: 24.5 MHz
09: 28 MHz
10: 50 MHz
11: GEN

BU — BAND UP

	1	2	3	4	5	6	7	8	9	10
Set	B	U	P1	;						
Read										
Answer										

P1 0: Fixed

BY — BUSY

	1	2	3	4	5	6	7	8	9	10
Set										
Read	B	Y	;							
Answer	B	Y	P1	P2	;					

P1 0: RX BUSY "OFF"
1: RX BUSY "ON"
P2 0: Fixed

CH — CHANNEL UP/DOWN

	1	2	3	4	5	6	7	8	9	10
Set	C	H	P1	;						
Read										
Answer										

P1 0: Memory Channel "UP"
1: Memory Channel "DOWN"

CN — CTCSS TONE FREQUENCY

	1	2	3	4	5	6	7	8	9	10
Set	C	N	P1	P2	P2	;				
Read	C	N	P1	;						
Answer	C	N	P1	P2	P2	;				

P1 0: Fixed
P2 0 - 49: Tone Frequency Number (See Table 1)

CO — CONTOUR

	1	2	3	4	5	6	7	8	9	10
Set	C	O	P1	P2	P3	P3	;			
Read	C	O	P1	P2	;					
Answer	C	O	P1	P2	P3	P3	;			

P1 0:Fixed
P2 0: CONTOUR/APF "ON/OFF"
1: CONTOUR FREQ
2: APF FREQ
P3 P2=000: CONTOUR/APF "OFF"
001: CONTOUR "ON"
002: APF "ON"
P2=1
01 - 40 (CONTOUR Frequency:100～4000Hz)
P2=2
00 - 20 (APF Frequency:−250 ～ 250Hz)

CS — CW SPOT

	1	2	3	4	5	6	7	8	9	10
Set	C	S	P1	;						
Read	C	S	;							
Answer	C	S	P1	;						

P1 0: OFF
1: ON

CT	CTCSS										
Set	1	2	3	4	5	6	7	8	9	10	P1 0: Fixed P2 0: CTCSS "OFF" 1: CTCSS ENC/DEC "ON" 2: CTCSS ENC "ON"
	C	**T**	P1	P2	;						
Read	1	2	3	4	5	6	7	8	9	10	
	C	**T**	P1	;							
Answer	1	2	3	4	5	6	7	8	9	10	
	C	**T**	P1	P2	;						

TABLE 1

TABLE 1 (CTCSS TONE CHART)											
00	67.0 Hz	09	91.5 Hz	18	123.0 Hz	27	162.2 Hz	36	189.9 Hz	45	229.1 Hz
01	69.3 Hz	10	94.8 Hz	19	127.3 Hz	28	165.5 Hz	37	192.8 Hz	46	233.6 Hz
02	71.9 Hz	11	97.4 Hz	20	131.8 Hz	29	167.9 Hz	38	196.6 Hz	47	241.8 Hz
03	74.4 Hz	12	100.0 Hz	21	136.5 Hz	30	171.3 Hz	39	199.5 Hz	48	250.3 Hz
04	77.0 Hz	13	103.5 Hz	22	141.3 Hz	31	173.8 Hz	40	203.5 Hz	49	254.1 Hz
05	79.7 Hz	14	107.2 Hz	23	146.2 Hz	32	177.3 Hz	41	206.5 Hz	—	—
06	82.5 Hz	15	110.9 Hz	24	151.4 Hz	33	179.9 Hz	42	210.7 Hz	—	—
07	85.4 Hz	16	114.8 Hz	25	156.7 Hz	34	183.5 Hz	43	218.1 Hz	—	—
08	88.5 Hz	17	118.8 Hz	26	159.8 Hz	35	186.2 Hz	44	225.7 Hz	—	—

DA	DIMMER										
Set	1	2	3	4	5	6	7	8	9	10	P1 00 - 15: VFO-A Display Brightness Level P2 00 - 15: Keypad Brightness Level P3 00 - 15: TFT Display Brightness Level
	D	**A**	P1	P1	P2	P2	P3	P3	;		
Read	1	2	3	4	5	6	7	8	9	10	
	D	**A**	;								
Answer	1	2	3	4	5	6	7	8	9	10	
	D	**A**	P1	P1	P2	P2	P3	P3	;		

DN	MIC DWN									
Set	1	2	3	4	5	6	7	8	9	10
	D	**N**	;							
Read	1	2	3	4	5	6	7	8	9	10
Answer	1	2	3	4	5	6	7	8	9	10

ED	ENCORDER DOWN										
Set	1	2	3	4	5	6	7	8	9	10	P1 0: MAIN ENCORDER 1: SUB ENCORDER 4: MIC/SPEED ENCORDER 5: PROC/CAR ENCORDER 6: NOTCH ENCORDER 7: CONT ENCORDER P2 01-99: Steps
	E	**D**	P1	P2	P2	;					
Read	1	2	3	4	5	6	7	8	9	10	
Answer	1	2	3	4	5	6	7	8	9	10	

EK	ENT KEY									
Set	1	2	3	4	5	6	7	8	9	10
	E	**K**	;							
Read	1	2	3	4	5	6	7	8	9	10
Answer	1	2	3	4	5	6	7	8	9	10

EU	ENCORDER UP										
Set	1	2	3	4	5	6	7	8	9	10	P1 0: MAIN ENCORDER 1: SUB ENCORDER 4: MIC ENCORDER 5: PROC ENCORDER 6: NOTCH ENCORDER 7: CONT ENCORDER P2 01-99: Steps
	E	**U**	P1	P2	P2	;					
Read	1	2	3	4	5	6	7	8	9	10	
Answer	1	2	3	4	5	6	7	8	9	10	

EX	MENU										
Set	1	2	3	4	5	6	7	8	nn	**	P1 : 001-196 (MENU Number) P2 : Parameter (See Table 2 and Table 4)
	E	**X**	P1	P1	P1	P2	P2	~	P2	;	
Read	1	2	3	4	5	6	7	8	9	10	
	E	**X**	P1	P1	P1	;					
Answer	1	2	3	4	5	6	7	8	nn	**	
	E	**X**	P1	P1	P1	P2	P2	~	P2	;	

EM	ENCODE MEMORY										
Set	1	2	3	4	5	6	7	~	54	55	P1 0: RTTY 1: PSK P2: 1 - 5 : Memory Channel P3: Message Characters (up to 50 characters)
	E	**N**	P1	P2	P3	P3	P3	~	P3	;	
Read	1	2	3	4	5	6	7	8	9	10	
	E	**M**	P1	P2	;						
Answer	1	2	3	4	5	6	7	~	54	55	
	E	**M**	P1	P2	P3	P3	P3	~	P3	;	

TABLE 2

P1	FUNCTION	P2
001	AGC FAST-DELAY	20 ~ 4000 msec (20 msec/step)
002	AGC MID DELAY	20 ~ 4000 msec (20 msec/step)
003	AGC SLOW DELAY	20 ~ 4000 msec (20 msec/step)
004	AGC AGC SLOPE	0: NORMAL 1: SLOPE
005	DISPLAY MY CALL	Max 12 characters
006	DISPLAY MY CALL TIME	0 ~ 5sec
007	DISPLAY DIMMER VFO	0 ~ 15
008	DISPLAY DIMMER BACKLIGHT	0: 1 1: 2
009	DISPLAY DIMMER TFT	0 ~ 15
010	DISPLAY BAR DISPLAY SELECT	0: CLAR 1: CW TUNE 2: uTUNE
011	DISPLAY METER TYPE SELECT	0: ANALOG 1: BAR
012	DISPLAY BAR MTR PEAK HOLD	0: OFF 1: 0.5 sec 2: 1.0 sec 3: 2.0 sec
013	DISPLAY ROTATOR START UP	0: 0° 1: 90° 2: 180° 3: 270°
014	DISPLAY ROTATOR OFFSET ADJ	-30° ~ 0° (P2=30 ~ 00, 2° step)
015	DVS RX OUT LEVEL	0 ~ 100
016	DVS TX OUT LEVEL	0 ~ 100
017	KEYER F KEYER TYPE	0: OFF 1: BUG 2: ELEKEY 3: ACS
018	KEYER F CW KEYER	0: NORNAL 1: REVERSE
019	KEYER R KEYER TYPE	0: OFF 1: BUG 2: ELEKEY 3: ACS
020	KEYER F CW KEYER	0: NORNAL 1: REVERSE
021	KEYER ELEKEY TYPE	0: ELEKEY-A 1: ELEKEY-B
022	KEYER CW WEIGHT	25 (1:2.5) ~ 45 (1:4.5)
023	KEYER BEACON TIME	OFF/1 ~ 690sec (0: OFF)
024	KEYER NUMBER STYLE	0: 1290 1: AUNO 2: AUNT 3: A2NO 4: A2NT 5: 12NO 6: 12NT
025	KEYER CONTEST NUMBER	0000 ~ 9999
026	KEYER CW MEMORY 1	0: TEXT 1: MESSAGE
027	KEYER CW MEMORY 2	0: TEXT 1: MESSAGE
028	KEYER CW MEMORY 3	0: TEXT 1: MESSAGE
029	KEYER CW MEMORY 4	0: TEXT 1: MESSAGE
030	KEYER CW MEMORY 5	0: TEXT 1: MESSAGE
031	GENERAL ANT SELECT	0: BAND 1: STACK
032	GENERAL ANT3 SETTING	0: TRX 1: R3/1 2: R3/2
033	GENERAL NB LEVEL	000 ~ 100
034	GENERAL BEEP LEVEL	000 ~ 100
035	GENERAL MONITOR LEVEL	000 ~ 100
036	GENERAL RF/SQL VR	0: RF 1: SQL
037	GENERAL CAT SELECT	0: RS232C 1: USB
038	GENERAL CAT RATE	0: 4800 bps 1: 9600 bps 2: 19200 bps 3: 38400 bps
039	GENERAL CAT TIME OUT TIMER	0: 10 msec 1: 100 msec 2: 1000 msec 3: 3000 msec
040	GENERAL CAT RTS	0: DISABLE 1: ENABLE
041	GENERAL MEM GROUP	0: DISABLE 1: ENABLE
042	GENERAL QUICK SPLIT FREQ	–20 ~ +00 (or –00) ~ +20 kHz
043	GENERAL TX TIME OUT TIMER	00 (OFF) ~ 30 min
044	GENERAL µTUNE DIAL STEP	0: DIAL STEP-2 1: DIAL STEP-1
045	GENERAL MIC SCAN	0: DISABLE 1: ENABLE
046	GENERAL SCAN RESUME	0 PAUSE 1: TIME
047	GENERAL FREQ ADJ	–25 ~ +00 (or –00) ~ +25
048	MODE-AM AM LCUT FREQ	00: OFF 1: 100Hz ~ 19: 1000Hz (50Hz steps)
049	MODE-AM AM LCUT SLOPE	0: 6dB/oct 1: 18dB/oct
050	MODE-AM AM HCUT FREQ	00: OFF 01: 700Hz ~ 67: 4000Hz (50Hz steps)
051	MODE-AM AM HCUT SLOPE	0: 6dB/oct 1: 18dB/oct
052	MODE-AM AM MIC GAIN	MCVR/FIX(0 ~ 100) (P2 = 1000: MCVR, 0000 ~ 0100: FIX(0 ~ 100))
053	MODE-AM AM MIC SEL	0: FRONT 1: DATA 2: USB
054	MODE-CW CW PITCH	00: 300 01: 350 ~ 14: 1000 15: 1050Hz (50Hz steps)
055	MODE-CW CW LCUT FREQ	00: OFF 1: 100Hz ~ 19: 1000Hz (50Hz steps)
056	MODE-CW CW LCUT SLOPE	0: 6dB/oct 1: 18dB/oct
057	MODE-CW CW HCUT FREQ	00: OFF 01: 700Hz ~ 67: 4000Hz (50Hz steps)
058	MODE-CW CW HCUT SLOPE	0: 6dB/oct 1: 18dB/oct
059	MODE-CW CW AUTO MODE	0: OFF 1: 50 MHz 2: ON
060	MODE-CW CW BFO	0: USB 1: LSB 2: AUTO
061	MODE-CW CW BK-IN	0: SEMI BREAK-IN 1: FULL BREAK-IN
062	MODE-CW CW BK-IN DELAY	30 ~ 3000 msec (10 msec/step)
063	MODE-CW CW WAVE SHAPE	0: 1 1: 2 2: 4 3: 6 msec
064	MODE-CW CW FREQ DISPLAY	0: DIRECT FREQ 1: PITCH OFFSET
065	MODE-CW PC KEYING	0: OFF 1: ON
066	MODE-CW QSK	0: 15 msec 1: 20 msec 2: 25 mesc 3: 30 msec
067	MODE-DATA DATA MODE	0: PSK 1: OTHER
068	MODE-DATA DATA TONE	0: 1000 1: 1500 2: 2000Hz
069	MODE-DATA OTHER DISP (SSB)	-3000 ~ 0 ~ +3000Hz (10Hz steps) (P2 = -3000 ~ x0000 ~ +3000)
070	MODE-DATA OTHER SHIFT (SSB)	-3000 ~ 0 ~ +3000Hz (10Hz steps) (P2 = -3000 ~ x0000 ~ +3000)
071	MODE-DATA DATA LCUT FREQ	00: OFF 1: 100Hz ~ 19: 1000Hz (50Hz steps)
072	MODE-DATA DATA LCUT SLOPE	0: 6dB/oct 1: 18dB/oct
073	MODE-DATA DATA HCUT FREQ	00: OFF 01: 700Hz ~ 67: 4000Hz (50Hz steps)
074	MODE-DATA DATA HCUT SLOPE	0: 6dB/oct 1: 18dB/oct
075	MODE-DATA DATA IN SELECT	0: DATA 1: USB
076	MODE-DATA DATA MIC GAIN	MCVR/FIX(0 ~ 100) (P2 = 1000: MCVR, 0000 ~ 0100: FIX(0 ~ 100))
077	MODE-DATA DATA OUT LEVEL	0 ~ 100
078	MODE-DATA DATA VOX GAIN	000 ~ 100
079	MODE-DATA DATA VOX DELEY	30 ~ 300 ~ 3000 msec (10 msec/step)

TABLE 3

P1	FUNCTION	P2
080	MODE-FM FM LCUT FREQ	00: OFF 1: 100Hz ~ 19: 1000Hz (50Hz steps)
081	MODE-FM FM LCUT SLOPE	0: 6dB/oct 1: 18dB/oct
082	MODE-FM FM HCUT FREQ	00: OFF 01: 700Hz ~ 67: 4000Hz (50Hz steps)
083	MODE-FM FM HCUT SLOPE	0: 6dB/oct 1: 18dB/oct
084	MODE-FM FM MIC GAIN	MCVR/FIX(0 ~ 100) (P2 = 1000: MCVR, 0000 ~ 0100: FIX(0 ~ 100))
085	MODE-FM FM MIC SEL	0: FRONT 1: DATA 2: USB
086	MODE-FM RPT SHIFT(28MHz)	0 ~ 100 ~ 1000 kHz (10 kHz/step)
087	MODE-FM RPT SHIFT(50MHz)	0 ~ 100 ~ 1000 ~ 4000 kHz (10 kHz/step)
088	MODE-FM TONE FREQ	67.0 ~ 254 Hz
089	MODE-RTY RTTY LCUT FREQ	00: OFF 1: 100Hz ~ 19: 1000Hz (50Hz steps)
090	MODE-RTY RTTY LCUT SLOPE	0: 6dB/oct 1: 18dB/oct
091	MODE-RTY RTTY HCUT FREQ	00: OFF 01: 700Hz ~ 67: 4000Hz (50Hz steps)
092	MODE-RTY RTTY HCUT SLOPE	0: 6dB/oct 1: 18dB/oct
093	MODE-RTY RTTY SHIFT PORT	0: REAR 1: USB
094	MODE-RTY RTTY POLARITY-R	0: NOR 1: REV
095	MODE-RTY RTTY POLARITY-T	0: NOR 1: REV
096	MODE-RTY RTTY OUT LEVEL	0 ~ 100
097	MODE-RTY RTTY SHIFT	1: 170 Hz 1: 200 Hz 2: 425 Hz 3: 850 Hz
098	MODE-RTY RTTY MARK FREQ	1: 1275 Hz 2: 2125 Hz
099	MODE-SSB SSB LCUT FREQ	00: OFF 1: 100Hz ~ 19: 1000Hz (50Hz steps)
100	MODE-SSB SSB LCUT SLOPE	0: 6dB/oct 1: 18dB/oct
101	MODE-SSB SSB HCUT FREQ	00: OFF 01: 700Hz ~ 67: 4000Hz (50Hz steps)
102	MODE-SSB SSB HCUT SLOPE	0: 6dB/oct 1: 18dB/oct
103	MODE-SSB SSB MIC SEL	0: FRONT 1: DATA 2: USB
104	MODE-SSB SSB TX BPF	0: 50 ~ 3000 1: 100 ~ 2900 2: 200 ~ 2800 3: 300 ~ 2700 4: 400 ~ 2600 (Hz) 5: 3000WB
105	MODE-SSB LSB RX CARRIER	-200Hz ~ 0 ~ +200Hz (10Hz steps) (P2= -200 ~ x000 ~ +200)
106	MODE-SSB USB RX CARRIER	-200Hz ~ 0 ~ +200Hz (10Hz steps) (P2= -200 ~ x000 ~ +200)
107	RX DSP APF WIDTH	0: NARROW 1: MEDIUM 2: WIDE
108	RX DSP CONTOUR LEVEL	−40 ~ 0 ~ +20 (P2= −40 ~ x00 ~ +20)
109	RX DSP CONTOUR WIDTH	01 ~ 11
110	RX DSP DNR LEVEL	1 ~ 15
111	RX DSP IF NOTCH WIDTH	0: NARROW 1: WIDE
112	RX DSP HF CW SHAPE	0: SOFT 1: SHARP
113	RX DSP HF CW SLOPE	0: STEEP 1: MEDIUM 2: GENTLE
114	RX DSP 6M CW SHAPE	0: SOFT 1: SHARP
115	RX DSP 6M CW SLOPE	0: STEEP 1: MEDIUM 2: GENTLE
116	RX DSP HF PSK SHAPE	0: SOFT 1: SHARP
117	RX DSP HF PSK SLOPE	0: STEEP 1: MEDIUM 2: GENTLE
118	RX DSP HF FSK SHAPE	0: SOFT 1: SHARP
119	RX DSP HF FSK SLOPE	0: STEEP 1: MEDIUM 2: GENTLE
120	RX DSP HF SSB SHAPE	0: SOFT 1: SHARP
121	RX DSP HF SSB SLOPE	0: STEEP 1: MEDIUM 2: GENTLE
122	RX DSP 6M SSB SHAPE	0: SOFT 1: SHARP
123	RX DSP 6M SSB SLOPE	0: STEEP 1: MEDIUM 2: GENTLE
124	SCOPE SCPE MODE	0: CENTER 1: FIX
125	SCOPE SCPE SPEED	0: FAST 1: SLOW
126	SCOPE SCPE AUTO TIME	0: OFF 1: 3 2: 5 3: 10 4: 30 5: 60 (sec)
127	SCOPE START DIAL SPEED	0: 0.5k 1: 1k 2: 2k 3: 4k 4: 8k 5: 16k
128	SCOPE SPAN FREQ	0: 20k 1: 50k 2: 100k 3: 200k 4: 500k 5: 1000k
129	SCOPE FIX 1.8MHz	1.800MHz ~ 1.999MHz (1kHz steps)
130	SCOPE FIX 1.8MHz SPAN	2: 20k 3: 50k 4: 100k 5: 200k 6: 500k 7: 1000kHz
131	SCOPE FIX 3.5MHz	3.500MHz ~ 3.999MHz (1kHz steps)
132	SCOPE FIX 3.5MHzSPAN	2: 20k 3: 50k 4: 100k 5: 200k 6: 500k 7: 1000kHz
133	SCOPE FIX 5.0MHz	5.250MHz ~ 5.499MHz (1kHz steps)
134	SCOPE FIX 5.0MHz SPAN	2: 20k 3: 50k 4: 100k 5: 200k 6: 500k 7: 1000kHz
135	SCOPE FIX 7.0MHz	7.000MHz ~ 7.299MHz (1kHz steps)
136	SCOPE FIX 7.0MHz SPAN	2: 20k 3: 50k 4: 100k 5: 200k 6: 500k 7: 1000kHz
137	SCOPE FIX 10MHz	10.100MHz ~ 10.149MHz (1kHz steps)
138	SCOPE FIX 10MHz SPAN	2: 20k 3: 50k 4: 100k 5: 200k 6: 500k 7: 1000kHz
139	SCOPE FIX 14MHz	14.000MHz ~ 14.3499Hz (1kHz steps)
140	SCOPE FIX 14MHz SPAN	2: 20k 3: 50k 4: 100k 5: 200k 6: 500k 7: 1000kHz
141	SCOPE FIX 18MHz	18.000MHz ~ 18.199MHz (1kHz steps)
142	SCOPE FIX 18MHzSPAN	2: 20k 3: 50k 4: 100k 5: 200k 6: 500k 7: 1000kHz
143	SCOPE FIX 21MHz	21.000MHz ~ 21.449MHz (1kHz steps)
144	SCOPE FIX 21MHz SPAN	2: 20k 3: 50k 4: 100k 5: 200k 6: 500k 7: 1000kHz
145	SCOPE FIX 24MHz	24.800MHz ~ 24.989MHz (1kHz steps)
146	SCOPE FIX 24MHz SPAN	2: 20k 3: 50k 4: 100k 5: 200k 6: 500k 7: 1000kHz
147	SCOPE FIX 28MHz	28.000MHz ~ 29.699MHz (1kHz steps)
148	SCOPE FIX 28MHz SPAN	2: 20k 3: 50k 4: 100k 5: 200k 6: 500k 7: 1000kHz
149	SCOPE FIX 50MHz	50.000MHz ~ 53.999MHz (1kHz steps)
150	SCOPE FIX 50MHzSPAN	2: 20k 3: 50k 4: 100k 5: 200k 6: 500k 7: 1000kHz
151	TUNING CW DIAL STEP	0: 1 1: 5Hz 2: 10Hz
152	TUNING DATA DIAL STEP	0: 1 1: 5Hz 2: 10Hz
153	TUNING AM/FM DIAL STEP	0: 10 1: 100Hz
154	TUNING RTTY DIAL STEP	0: 1 1: 5Hz 2: 10Hz
155	TUNING SSB DIAL STEP	0: 1 1: 5Hz 2: 10Hz
156	TUNING AM CH STEP	0: 2.5 1: 5 2: 9 3: 10 4: 12.5kHz
157	TUNING FM CH STEP	0: 2.5 1: 6.25 2: 10 3: 12.5 4: 20 5: 25kHz
158	TUNING 1MHz/100kHz SELECT	0: 1MHz 1: 100kHz
159	TX AUDIO PRMTRC EQ1 FREQ	1: 100 2: 200 3: 300 4: 400 5: 500 6: 600 7: 700
160	TX AUDIO PRMTRC EQ1 LEVEL	-20 ~ 0 ~ +10 (P2 = -20 ~ x00 ~ +10)
161	TX AUDIO PRMTRC EQ1 BWTH	1 ~ 10
162	TX AUDIO PRMTRC EQ2 FREQ	1: 700 2: 800 3: 900 4: 1000 5: 1100 6: 1200 7: 1300 8: 1400 9: 1500
163	TX AUDIO PRMTRC EQ2 LEVEL	-20 ~ 0 ~ +10 (P2 = -20 ~ x00 ~ +10)
164	TX AUDIO PRMTRC EQ2 BWTH	1 ~ 10
165	TX AUDIO PRMTRC EQ3 FREQ	1: 1500 2: 1600 3: 1700 4: 1800 5: 1900 6: 2000 18: 3200
166	TX AUDIO PRMTRC EQ3 LEVEL	-20 ~ 0 ~ +10 (P2 = -20 ~ x00 ~ +10)
167	TX AUDIO PRMTRC EQ3 BWTH	1 ~ 10
168	TX AUDIO P-PRMTRC EQ1 FREQ	1: 100 2: 200 3: 300 4: 400 5: 500 6: 600 7: 700
169	TX AUDIO P-PRMTRC EQ1 LEVEL	-20 ~ 0 ~ +10 (P2 = -20 ~ x00 ~ +10)
170	TX AUDIO P-PRMTRC EQ1 BWTH	1 ~ 10

TABLE 4

P1	FUNCTION	P2
171	TX AUDIO P-PRMTRC EQ2 FREQ	1: 700 2: 800 3: 900 4: 1000 5: 1100 6: 1200 7: 1300 8: 1400 9: 1500
172	TX AUDIO P-PRMTRC EQ2 LEVEL	-20 ~ 0 ~ +10 (P2 = -20 ~ x00 ~ +10)
173	TX AUDIO P-PRMTRC EQ2 BWTH	1 ~ 10
174	TX AUDIO P-PRMTRC EQ3 FREQ	1: 1500 2: 1600 3: 1700 4: 1800 5: 1900 6: 2000 18: 3200
175	TX AUDIO P-PRMTRC EQ3 LEVEL	-20 ~ 0 ~ +10 (P2 = -20 ~ x00 ~ +10)
176	TX AUDIO P-PRMTRC EQ3 BWTH	1 ~ 10
177	TX GNRL TX PWR/PROC CONTROL	0: TX PWR 1: PROC
178	TX GNRL EXT AMP TUNING PWR	0: 10 1: 20 2: 50 3: 100
179	TX GNRL TUNER SELECT	0: INTERNAL 1: EXTERNAL
180	TX GNRL VOX SELECT	0: MIC 1: DATA
181	TX GNRL VOX GAIN	0 ~ 100
182	TX GNRL VOX DELAY	30 ~ 300 ~ 3000 msec (10 msec/step)
183	TX GNRL ANTI VOX GAIN	0 ~ 100
184	TX GNRL EMERGENCY FREQ TX	0: DISABLE 1: ENABLE
185	AF SCOPE FFT DISPLAY MODE	0: SPECTRUM 1: WATER FALL
186	AF SCOPE FFT ATT	0: 0 1: 10 2: 20 dB
187	DEC CW CW DECODE BW	0: 25 1: 50 2: 100 3: 250Hz
188	E/D RTTY RX USOS	0: DISABLE 1: ENABLE
189	E/D RTTY TX USOS	0: DISABLE 1: ENABLE
190	E/D RTTY RX NEW LINE CODE	0: CR, LF, CR+L 1: CR+LF
191	E/D RTTY TX AUTO CR+LF	0: DISABLE 1: ENABLE
192	E/D RTTY TX DIDDLE	0: OFF 1: BLANK 2: LTRS
193	E/D RTTY BAUDOT CODE	0: CCIT 1: US
194	E/D PSK PSK MODE	0: BPSK 1: QPSK
195	E/D PSK DECODE AFC RANGE	0: ±8 1: ±15 2: ±30
196	E/D PSK QPSK POLARITY REV	0: RX-N, TX-N 1: RX-R, TX-N 2: RX-N, TX-R 3: RX-R, TX-R

EN	**ENCODE**										
Set	1	2	3	4	5	6	7	~	54	55	P1 0: RTTY 1: PSK P2: 1: Message Memory "1" Playback 2: Message Memory "2" Playback 3: Message Memory "3" Playback 4: Message Memory "4" Playback 5: Message Memory "5" Playback
	E	**N**	P1	P2	;						
Read	1	2	3	4	5	6	7	8	9	10	
Answer	1	2	3	4	5	6	7	~	54	55	

FA	**FREQUENCY VFO-A**										
Set	1	2	3	4	5	6	7	8	9	10	P1 0030000 - 60000000 (Hz)
	F	**A**	P1	P1	P1	P1	P1	P1	P1	P1	
	11	12	13	14	15	16	17	18	19	20	
	;										
Read	1	2	3	4	5	6	7	8	9	10	
	F	**A**	;								
Answer	1	2	3	4	5	6	7	8	9	10	
	F	**A**	P1	P1	P1	P1	P1	P1	P1	P1	
	11	12	13	14	15	16	17	18	19	20	
	;										

FB	**FREQUENCY VFO-B**										
Set	1	2	3	4	5	6	7	8	9	10	P1 0030000 - 60000000 (Hz)
	F	**B**	P1	P1	P1	P1	P1	P1	P1	P1	
	11	12	13	14	15	16	17	18	19	20	
	P1	P1	P1	;							
Read	1	2	3	4	5	6	7	8	9	10	
	F	**B**	;								
Answer	1	2	3	4	5	6	7	8	9	10	
	F	**B**	P1	P1	P1	P1	P1	P1	P1	P1	
	11	12	13	14	15	16	17	18	19	20	
	P1	P1	P1	;							

FR	**FUNCTION RX**										
Set	1	2	3	4	5	6	7	8	9	10	P1 0: VFO-A Band Receiver: "RX", VFO-B Band Receiver: "OFF" 1: VFO-A Band Receiver: "Mute", VFO-B Band Receiver: "OFF" 4: VFO-A Band Receiver: "OFF", VFO-B Band Receiver: "RX" 5: VFO-A Band Receiver: "OFF", VFO-B Band Receiver: "Mute"
	F	**R**	P1	;							
Read	1	2	3	4	5	6	7	8	9	10	
	F	**R**	;								
Answer	1	2	3	4	5	6	7	8	9	10	
	F	**R**	P1	;							

FS	**FAST STEP**										
Set	1	2	3	4	5	6	7	8	9	10	P1 0: VFO-A FAST Key "OFF" 1: VFO-A FAST Key "ON" 2: VFO-B FAST Key "OFF" 3: VFO-B FAST Key "ON" 4: VFO-A FAST Key "OFF", VFO-B FAST Key "OFF" 5: VFO-A FAST Key "ON", VFO-B FAST Key "OFF" 6: VFO-A FAST Key "OFF", VFO-B FAST Key "ON" 7: VFO-A FAST Key "ON", VFO-B FAST Key "ON"
	F	**S**	P1	;							
Read	1	2	3	4	5	6	7	8	9	10	
	F	**S**	;								
Answer	1	2	3	4	5	6	7	8	9	10	
	F	**S**	P1	;							

FT — FUNCTION TX

	1	2	3	4	5	6	7	8	9	10
Set	F	T	P1	;						
Read	F	T	;							
Answer	F	T	P2	;						

P1 0: VFO-A Band: TX/RX (Toggle)
1: VFO-B Band: TX/RX (Toggle)
2: VFO-A Band Transmitter: TX
3: VFO-B Band Transmitter: TX
P2 0: VFO-A Band Transmitter: TX
1: VFO-B Band Transmitter: TX

GT — AGC FUNCTION

	1	2	3	4	5	6	7	8	9	10
Set	G	T	P1	P2	;					
Read	G	T	P1	;						
Answer	G	T	P1	P3	;					

P1 0: Fixed
P2 0: AGC "OFF"
1: AGC "FAST"
2: AGC "MID"
3: AGC "SLOW"
4: AGC "AUTO"
P3 0: AGC "OFF"
1: AGC "FAST"
2: AGC "MID"
3: AGC "SLOW"
4: AGC "AUTO-FAST"
5: AGC "AUTO-MID"
6: AGC "AUTO-SLOW"

IF — INFORMATION

	1	2	3	4	5	6	7	8	9	10
Set										
Read	I	F	;							
Answer	I	F	P1	P1	P1	P2	P2	P2	P2	P2
	11	12	13	14	15	16	17	18	19	20
	P2	P2	P2	P3	P3	P3	P3	P3	P4	P5
	21	22	23	24	25	26	27	28	29	30
	P6	P7	P8	P9	P9	P10	;			

P1 000-117 (Memory Channel) P2 VFO-A Frequency (Hz)
P3 Clarifier Direction +: Plus Shift, –: Minus Shift
Clarifier Offset: 0000 - 9999 (Hz)
P4 0: RX CLAR "OFF" 1: RX CLAR "ON"
P5 0: TX CLAR "OFF" 1: TX CLAR "ON"
P6 MODE 1: LSB 2: USB 3: CW 4: FM 5: AM 6: FSK (RTTY-LSB)
7: CW-R 8: PKT-L 9: FSK-R (RTTY-USB) A: PKT-FM
B: FM-N C: PKT-U
P7 0: VFO 1: Memory 2: Memory Tune 3: Quick Memory Bank (QMB) 4: QMB-MT
P8 0: CTCSS "OFF" 1: CTCSS ENC/DEC 2: CTCSS ENC
P9: 00 (Fixed)
P10 0: Simplex 1: Plus Shift 2: Minus Shift

IS — IF-SHIFT

	1	2	3	4	5	6	7	8	9	10
Set	I	S	P1	-/+	P2	P2	P2	P2	;	
Read	I	S	P1	;						
Answer	I	S	P1	-/+	P2	P2	P2	P2	;	

P1 0:Fixed
P2: –1000 ~ +1000 Hz

KM — KEYER MEMORY

	1	2	3	4	5	6	7	~	53	**
Set	K	M	P1	P2	P2	P2	P2	~	P2	;
Read	K	M	P1	;						
Answer	K	M	P1	P2	P2	P2	P2	~	P2	;

P1 1 - 5 : Keyer Memory Channel Number
P2: Message Characters (up to 50 characters)

KP — KEY PITCH

	1	2	3	4	5	6	7	8	9	10
Set	K	P	P1	P1	;					
Read	K	P	;							
Answer	K	P	P1	P1	;					

P1 00: 300 Hz - 75: 1050 Hz (10Hz steps)

KR — KEYER

	1	2	3	4	5	6	7	8	9	10
Set	K	R	P1	;						
Read	K	R	;							
Answer	K	R	P1	;						

P1 0: KEYER "OFF"
1: KEYER "ON"

KS — KEY SPEED

	1	2	3	4	5	6	7	8	9	10
Set	K	S	P1	P1	P1	;				
Read	K	S	;							
Answer	K	S	P1	P1	P1	;				

P1 004 - 060 (WPM)

KY CW KEYING

	1	2	3	4	5	6	7	8	9	10
Set	K	Y	P1	;						
Read										
Answer										

P1 1: Keyer Memory "1" Playback
2: Keyer Memory "2" Playback
3: Keyer Memory "3" Playback
4: Keyer Memory "4" Playback
5: Keyer Memory "5" Playback
6: Message Keyer "1" Playback
7: Message Keyer "2" Playback
8: Message Keyer "3" Playback
9: Message Keyer "4" Playback
A: Message Keyer "5" Playback

LK LOCK

	1	2	3	4	5	6	7	8	9	10
Set	L	K	P1	;						
Read	L	K	;							
Answer	L	K	P1	;						

P1 0: VFO-A DIAL Lock "OFF"
1: VFO-A DIAL Lock "ON"
2: VFO-B DIAL Lock "OFF"
3: VFO-B DIAL Lock "ON"
4: VFO-A DIAL Lock "OFF", VFO-B DIAL Lock "OFF"
5: VFO-A DIAL Lock "ON", VFO-B DIAL Lock "OFF"
6: VFO-A DIAL Lock "OFF", VFO-B DIAL Lock "ON"
7: VFO-A DIAL Lock "ON", VFO-B DIAL Lock "ON"

LM LOAD MESSEGE

	1	2	3	4	5	6	7	8	9	10
Set	L	M	P1	P2	;					
Read	L	M	P1	;						
Answer	L	M	P1	P2	;					

P1 0: DVS
1: P/B

P2 P1=0
0: DVS (Recording Stop)
1: DVS (CH "1" Recording Start/Stop)
2: DVS (CH "2" Recording Start/Stop)
3: DVS (CH "3" Recording Start/Stop)
4: DVS (CH "4" Recording Start/Stop)
5: DVS (CH "5" Recording Start/Stop)

P1=1
0: P.B (Recording Stop)
1: P.B (Recording Start)

MA MEMORY CHANNEL TO VFO-A

	1	2	3	4	5	6	7	8	9	10
Set	M	A	;							
Read										
Answer										

MC MEMORY CHANNEL

	1	2	3	4	5	6	7	8	9	10
Set	M	C	P1	P1	P1	;				
Read	M	C	;							
Answer	M	C	P1	P1	P1	;				

P1 000 - 117: Memory Channel Number
000 - 099: Regular Memory Channel
100: P-1L
101: P-1U
≀
116: P-9L
117: P-9U

MD OPERATING MODE

	1	2	3	4	5	6	7	8	9	10
Set	M	D	P1	P2	;					
Read	M	D	P1	;						
Answer	M	D	P1	P2	;					

P1 0: Fixed
P2 MODE 1: LSB 2: USB 3: CW 4: FM 5: AM 6: FSK (RTTY-LSB)
7: CW-R 8: PKT-L 9: FSK-R (RTTY-USB) A: PKT-FM
B: FM-N C: PKT-U D: AM-N

MG MIC GAIN

	1	2	3	4	5	6	7	8	9	10
Set	M	G	P1	P1	P1	;				
Read	M	G	;							
Answer	M	G	P1	P1	P1	;				

P1 000 - 100

ML MONITOR LEVEL

	1	2	3	4	5	6	7	8	9	10
Set	M	L	P1	P2	P2	P2	;			
Read	M	L	P1	;						
Answer	M	L	P1	P2	P2	P2	;			

P1 0: MONI "ON/OFF"
1: MONI Level
P2 P1=0
000: MONI "OFF"
001: MONI "ON"
P1=1
001 - 100

MR — MEMORY CHANNEL READ

Set	1	2	3	4	5	6	7	8	9	10
Read	1	2	3	4	5	6	7	8	9	10
	M	R	P1	P1	P1	;				
Answer	1	2	3	4	5	6	7	8	9	10
	M	R	P1	P1	P1	P2	P2	P2	P2	P2
	11	12	13	14	15	16	17	18	19	20
	P2	P2	P2	P3	P3	P3	P3	P3	P4	P5
	21	22	23	24	25	26	27	28	29	30
	P6	P7	P8	P9	P9	P10	;			

P1 Memory Channel Number(001 ~ 117) P2 Memory Channel Frequency (Hz)
P3 Clarifier Direction +: Plus Shift, −: Minus Shift
Clarifier Offset: 0000 - 9999 (Hz)
P4 0: RX CLAR "OFF" 1: RX CLAR "ON"
P5 0: TX CLAR "OFF" 1: TX CLAR "ON"
P6 MODE 1: LSB 2: USB 3: CW 4: FM 5: AM 6: FSK (RTTY-LSB)
7: CW-R 8: PKT-L 9: FSK-R (RTTY-USB) A: PKT-FM
B: FM-N C: PKT-U
P7 0: VFO 1: Memory
P8 0: CTCSS "OFF" 1: CTCSS ENC/DEC 2: CTCSS ENC
P9: Tone Number (See Table 1)
P10 0: Simplex 1: Plus Shift 2: Minus Shift

MS — METER SW

Set	1	2	3	4	5	6	7	8	9	10
	M	S	P1	;						
Read	1	2	3	4	5	6	7	8	9	10
	M	S	;							
Answer	1	2	3	4	5	6	7	8	9	10
	M	S	P1	;						

P1 0: COMP
1: ALC
3: SWR
4: ID
5: VDD

MW — MEMORY CHANNEL WRITE

Set	1	2	3	4	5	6	7	8	9	10
	M	W	P1	P1	P1	P2	P2	P2	P2	P2
	11	12	13	14	15	16	17	18	19	20
	P2	P2	P2	P3	P3	P3	P3	P3	P4	P5
	21	22	23	24	25	26	27	28	29	30
	P6	P7	P8	P9	P9	P10	;			
Read	1	2	3	4	5	6	7	8	9	10
Answer	1	2	3	4	5	6	7	8	9	10

P1 Memory Channel Number(001 ~ 117) P2 Memory Channel Frequency (Hz)
P3 Clarifier Direction +: Plus Shift, −: Minus Shift
Clarifier Offset: 0000 - 9999 (Hz)
P4 0: RX CLAR "OFF" 1: RX CLAR "ON"
P5 0: TX CLAR "OFF" 1: TX CLAR "ON"
P6 MODE 1: LSB 2: USB 3: CW 4: FM 5: AM 6: FSK (RTTY-LSB)
7: CW-R 8: PKT-L 9: FSK-R (RTTY-USB) A: PKT-FM
B: FM-N C: PKT-U
P7 0: (Fixed)
P8 0: CTCSS "OFF" 1: CTCSS ENC/DEC 2: CTCSS ENC
P9: 0: (Fixed)
P10 0: Simplex 1: Plus Shift 2: Minus Shift

MX — MOX SET

Set	1	2	3	4	5	6	7	8	9	10
	M	X	P1	;						
Read	1	2	3	4	5	6	7	8	9	10
	N	X	;							
Answer	1	2	3	4	5	6	7	8	9	10
	N	X	P1	;						

P1 0: MOX "OFF"
1: MOX "ON"

NA — NARROW

Set	1	2	3	4	5	6	7	8	9	10
	M	A	P1	P2	;					
Read	1	2	3	4	5	6	7	8	9	10
	N	A	P1	;						
Answer	1	2	3	4	5	6	7	8	9	10
	N	A	P1	P2	;					

P1 Fixed
P2 0: OFF
1: ON

NB — NOISE BLANKER STATUS

Set	1	2	3	4	5	6	7	8	9	10
	N	B	P1	P2	;					
Read	1	2	3	4	5	6	7	8	9	10
	N	B	P1	;						
Answer	1	2	3	4	5	6	7	8	9	10
	N	B	P1	P2	;					

P1 Fixed
P2 0: Noise Blanker "OFF"
1: Noise Blanker "ON"
2: Noise Blanker (Wide) "ON"

NL — NOISE BLANKER LEVEL

Set	1	2	3	4	5	6	7	8	9	10
	N	L	P1	P2	P2	P2	;			
Read	1	2	3	4	5	6	7	8	9	10
	N	L	P1	;						
Answer	1	2	3	4	5	6	7	8	9	10
	N	L	P1	P2	P2	P2	;			

P1 Fixed
P2 000 - 100

NR — NOISE REDUCTION

Set	1	2	3	4	5	6	7	8	9	10
	N	R	P1	P2	;					
Read	1	2	3	4	5	6	7	8	9	10
	N	R	P1	;						
Answer	1	2	3	4	5	6	7	8	9	10
	N	R	P1	P2	;					

P1 Fixed
P2 0: Noise Reduction "OFF"
1: Noise Reduction "ON"

OI — OPPOSITE BAND INFORMATION

	1	2	3	4	5	6	7	8	9	10
Set										
Read	1	2	3	4	5	6	7	8	9	10
	O	I	;							
Answer	1	2	3	4	5	6	7	8	9	10
	O	I	P1	P1	P1	P2	P2	P2	P2	P2
	11	12	13	14	15	16	17	18	19	20
	P2	P2	P2	P3	P3	P3	P3	P3	P4	P5
	21	22	23	24	25	26	27	28	29	30
	P6	P7	P8	P9	P9	P10	;			

P1 Current Memory Channel(001 ~ 117) P2 VFO-B Frequency (Hz)
P3 Clarifier Direction +: Plus Shift, –: Minus Shift
Clarifier Offset: 0000 - 9999 (Hz)
P4 0: RX CLAR "OFF" 1: RX CLAR "ON"
P5 0: TX CLAR "OFF" 1: TX CLAR "ON"
P6 MODE 1: LSB 2: USB 3: CW 4: FM 5: AM 6: FSK (RTTY-LSB)
7: CW-R 8: PKT-L 9: FSK-R (RTTY-USB) A: PKT-FM
B: FM-N C: PKT-U
P7 0: VFO 1: Memory
P8 0: CTCSS "OFF" 1: CTCSS ENC/DEC 2: CTCSS ENC
P9: Tone Number (See Table 1)
P10 0: Simplex 1: Plus Shift 2: Minus Shift

OS — OFFSET (REPEATER SHIFT)

	1	2	3	4	5	6	7	8	9	10
Set	O	S	P1	P2	;					
Read	1	2	3	4	5	6	7	8	9	10
	O	S	P1	;						
Answer	1	2	3	4	5	6	7	8	9	10
	O	S	P1	P2	;					

P1 Fixed
P2 0: Simplex
1: Plus Shift
2: Minus Shift
※: This command can be activated only with an FM mode.

PA — PRE-AMP (IPO)

	1	2	3	4	5	6	7	8	9	10
Set	P	A	P1	P2	;					
Read	1	2	3	4	5	6	7	8	9	10
	P	A	P1	;						
Answer	1	2	3	4	5	6	7	8	9	10
	P	A	P1	P2	;					

P1 0:Fixed
P2 0: IPO
1: AMP 1
2: AMP 2

PB — PLAY BACK

	1	2	3	4	5	6	7	8	9	10
Set	P	B	P1	P2	;					
Read	1	2	3	4	5	6	7	8	9	10
	P	B	P1	;						
Answer	1	2	3	4	5	6	7	8	9	10
	P	B	P1	P2	;					

P1 0: DVS P2 P1=0 P1=1
1: P/B 0: DVS (Playback Stop) 0: P.B (Playback Stop)
1: DVS (CH "1" Playback Start/Stop) 1: P.B (Playback Start)
2: DVS (CH "2" Playback Start/Stop)
3: DVS (CH "3" Playback Start/Stop)
4: DVS (CH "4" Playback Start/Stop)
5: DVS (CH "5" Playback Start/Stop)

PC — POWER CONTROL

	1	2	3	4	5	6	7	8	9	10
Set	P	C	P1	P1	P1	;				
Read	1	2	3	4	5	6	7	8	9	10
	P	C	;							
Answer	1	2	3	4	5	6	7	8	9	10
	P	C	P1	P1	P1	;				

P1 005 -100

PL — SPEECH PROCESSOR LEVEL

	1	2	3	4	5	6	7	8	9	10
Set	P	L	P1	P1	P1	;				
Read	1	2	3	4	5	6	7	8	9	10
	P	L	;							
Answer	1	2	3	4	5	6	7	8	9	10
	P	L	P1	P1	P1	;				

P1 000 - 100

PR — SPEECH PROCESSOR

	1	2	3	4	5	6	7	8	9	10
Set	P	R	P1	P2	;					
Read	1	2	3	4	5	6	7	8	9	10
	P	R	P1	;						
Answer	1	2	3	4	5	6	7	8	9	10
	P	R	P1	P2	;					

P1 0: Speech Processor "OFF"
1: Parametric Microphone Equalizer "ON"

P2 1: "OFF"
2: "ON"

PS — POWER SWITCH

	1	2	3	4	5	6	7	8	9	10
Set	P	S	P1	;						
Read	1	2	3	4	5	6	7	8	9	10
	P	S	;							
Answer	1	2	3	4	5	6	7	8	9	10
	P	S	P1	;						

P1 0: POWER "OFF"
1: POWER "ON"

This command requires dummy data be initially sent. Then after one second and before two seconds the command is sent.

QI	QMB STORE									
Set	1	2	3	4	5	6	7	8	9	10
	Q	**I**	;							
Read	1	2	3	4	5	6	7	8	9	10
Answer	1	2	3	4	5	6	7	8	9	10

QR	QMB RECALL									
Set	1	2	3	4	5	6	7	8	9	10
	Q	**R**	;							
Read	1	2	3	4	5	6	7	8	9	10
Answer	1	2	3	4	5	6	7	8	9	10

QS	QUICK SPLIT									
Set	1	2	3	4	5	6	7	8	9	10
	Q	**S**	;							
Read	1	2	3	4	5	6	7	8	9	10
Answer	1	2	3	4	5	6	7	8	9	10

RA	RF ATTENUATOR									
Set	1	2	3	4	5	6	7	8	9	10
	R	**A**	P1	P2	;					
Read	1	2	3	4	5	6	7	8	9	10
	R	**A**	P1	;						
Answer	1	2	3	4	5	6	7	8	9	10
	R	**A**	P1	P2	;					

P1 0:Fixed
P2 0: OFF
1: 6 dB
2: 12 dB
3: 18 dB

RC	CLAR CLEAR									
Set	1	2	3	4	5	6	7	8	9	10
	R	**C**	;							
Read	1	2	3	4	5	6	7	8	9	10
Answer	1	2	3	4	5	6	7	8	9	10

RD	CLAR DOWN									
Set	1	2	3	4	5	6	7	8	9	10
	R	**D**	P1	P1	P1	P1	;			
Read	1	2	3	4	5	6	7	8	9	10
Answer	1	2	3	4	5	6	7	8	9	10

P1 0000 - 9999 (Hz)

RF	ROOFING FILTER									
Set	1	2	3	4	5	6	7	8	9	10
	R	**F**	P1	P2	;					
Read	1	2	3	4	5	6	7	8	9	10
	R	**F**	P1	;						
Answer	1	2	3	4	5	6	7	8	9	10
	R	**F**	P1	P3	;					

P1 0:Fixed
P2 0: AUTO
1: 15 kHz
2: 6 kHz
3: 3 kHz
4: 600 Hz
5: 300 Hz

P3 1: 15 kHz
2: 6 kHz
3: 3 kHz
4: AUTO - 15 kHz
5: AUTO - 6kHz
6: AUTO - 3 kHz
7: 600 Hz
8: 300 Hz
9: AUTO - 600 Hz
A: AUTO - 300 Hz

RG	RF GAIN									
Set	1	2	3	4	5	6	7	8	9	10
	R	**G**	P1	P2	P2	P2	;			
Read	1	2	3	4	5	6	7	8	9	10
	R	**G**	P1	;						
Answer	1	2	3	4	5	6	7	8	9	10
	R	**G**	P1	P2	P2	P2	;			

P1 0: Fixed
P2 000 - 255

RI	RADIO INFORMATION									
Set	1	2	3	4	5	6	7	8	9	10
Read	1	2	3	4	5	6	7	8	9	10
	R	**I**	P1	;						
Answer	1	2	3	4	5	6	7	8	9	10
	R	**I**	P1	P2	;					

P1 0: Hi-SWR
1: MIC-EQ
3: REC
4: PLAY
5: VFO-A TX
6: VFO-B TX
7: VFO-A RX
8: VFO-B-RX

P2 0: OFF
1: ON

RL — NOISE REDUCTION LEVEL

	1	2	3	4	5	6	7	8	9	10
Set	R	L	P1	P2	P2	;				
Read	R	L	P1	;						
Answer	R	L	P1	P2	P2	;				

P1 0:Fixed
P2 01 - 15

RM — READ METER

	1	2	3	4	5	6	7	8	9	10
Set										
Read	R	M	P1	;						
Answer	R	M	P1	P2	P2	P2	;			

P1 0: Depends on the front panel METER
1: S
2: Depends on the front panel METER (COMP /ALC /SWR /ID/VDD)
3: COMP
4: ALC
5: PO
6: SWR
7: ID
8: VDD
P2 0 - 255

RO — ROTATOR

	1	2	3	4	5	6	7	8	9	10
Set	R	O	P1	;						
Read	R	O	;							
Answer	R	O	P1	P2	P2	P2	P3	P3	P3	;

P1 0: OFF
1: Counter Clockwise
2: Clockwise
3: SPEED 1 % DOWN
4: SPEED 1 % UP
P2 DIRECTION (0 - 450)
P3 SPEED (0 - 100 %)

RS — RADIO STATUS

	1	2	3	4	5	6	7	8	9	10
Set										
Read	R	S	;							
Answer	R	S	P1	;						

P1 0: NORMAL MODE
1: MENU MODE

RT — CLAR

	1	2	3	4	5	6	7	8	9	10
Set	R	T	P1	;						
Read	R	T	;							
Answer	R	T	P1	;						

P1 0: RX Clarifier “OFF”
1: RX Clarifier “ON”

RU — RX CLARIFIER PLUS OFFSET

	1	2	3	4	5	6	7	8	9	10
Set	R	U	P1	P1	P1	P1	;			
Read										
Answer										

P1 0000 - 9999 (Hz)

SC — SCAN

	1	2	3	4	5	6	7	8	9	10
Set	S	C	P1	;						
Read	S	C	;							
Answer	S	C	P1	;						

P1 0: Scan “OFF”
1: Scan “ON” (UP ward)
2: Scan “ON” (DOWN ward)

SD — CW BREAK-IN DELAY TIME

	1	2	3	4	5	6	7	8	9	10
Set	S	D	P1	P1	P1	P1	;			
Read	S	D	;							
Answer	S	D	P1	P1	P1	P1	;			

P1 0030 - 3000 mS

SF — SUB-DIAL FUNCTION

	1	2	3	4	5	6	7	8	9	10
Set	S	F	P1	;						
Read	S	F	;							
Answer	S	F	P1	;						

P1 1: MHz
2: GRP
3: MCH
4:DIAL-B
5: CLAR
6: MODE
7: uTUNE

SH	WIDTH										
Set	1	2	3	4	5	6	7	8	9	10	P1 0:Fixed P2 00 (See Table 5)
	S	**H**	P1	P2	P2	;					
Read	1	2	3	4	5	6	7	8	9	10	
	S	**H**	P1	;							
Answer	1	2	3	4	5	6	7	8	9	10	
	S	**H**	P1	P2	P2	;					

TABLE 5

COMMAND	BANDWIDTH					
P2	SSB (Narrow)	SSB (Wide)	CW (Narrow)	CW (Wide)	RTTY/PSK (Narrow)	RTTY/PSK (Wide)
00	1500 Hz	2400 Hz	500 Hz	2400 Hz	500 Hz	2400 Hz
01	200 Hz	—	50 Hz	—	50 Hz	—
02	400 Hz	—	100 Hz	—	100 Hz	—
03	600 Hz	—	150 Hz	—	150 Hz	—
04	850 Hz	—	200 Hz	—	200 Hz	—
05	1100 Hz	—	250 Hz	—	250 Hz	—
06	1350 Hz	—	300 Hz	—	300 Hz	—
07	1500 Hz	—	350 Hz	—	350 Hz	—
08	1650 Hz	—	400 Hz	—	400 Hz	—
09	1800 Hz	1800 Hz	450 Hz	—	450 Hz	—
10	—	1950 Hz	500 Hz	500 Hz	500 Hz	500 Hz
11	—	2100 Hz	—	800 Hz	—	800 Hz
12	—	2200 Hz	—	1200 Hz	—	1200 Hz
13	—	2300 Hz	—	1400 Hz	—	1400 Hz
14	—	2400 Hz	—	1700 Hz	—	1700 Hz
15	—	2500 Hz	—	2000 Hz	—	2000 Hz
16	—	2600 Hz	—	2400 Hz	—	2400 Hz
17	—	2700 Hz	—	—	—	—
18	—	2800 Hz	—	—	—	—
19	—	2900 Hz	—	—	—	—
20	—	3000 Hz	—	—	—	—
21	—	3200 Hz	—	—	—	—
22	—	3400 Hz	—	—	—	—
23	—	3600 Hz	—	—	—	—
24	—	3800 Hz	—	—	—	—
25	—	4000 Hz	—	—	—	—

SM	S-METER READING										
Set	1	2	3	4	5	6	7	8	9	10	P1 0: Fixed P2 000 - 255
Read	1	2	3	4	5	6	7	8	9	10	
	S	**M**	P1	;							
Answer	1	2	3	4	5	6	7	8	9	10	
	S	**M**	P1	P2	P2	P2	;				

SQ	SQUELCLH LEVEL										
Set	1	2	3	4	5	6	7	8	9	10	P1 0: Fixed P2 000 - 255
	S	**Q**	P1	P2	P2	P2	;				
Read	1	2	3	4	5	6	7	8	9	10	
	S	**Q**	P1	;							
Answer	1	2	3	4	5	6	7	8	9	10	
	S	**Q**	P1	P2	P2	P2	;				

SV	SWAP VFO										
Set	1	2	3	4	5	6	7	8	9	10	
	S	**V**	;								
Read	1	2	3	4	5	6	7	8	9	10	
Answer	1	2	3	4	5	6	7	8	9	10	

TS	TXW										
Set	1	2	3	4	5	6	7	8	9	10	P1 0: TXW "OFF" 1: TXW "ON"
	T	**S**	P1	;							
Read	1	2	3	4	5	6	7	8	9	10	
	T	**S**	;								
Answer	1	2	3	4	5	6	7	8	9	10	
	T	**S**	P1	;							

TX	TX SET										
Set	1	2	3	4	5	6	7	8	9	10	P1 0: RADIO TX "OFF" CAT TX "OFF" 1: RADIO TX "OFF" CAT TX "ON" 2: RADIO TX "ON" CAT TX "OFF" (Answer)
	T	**X**	P1	;							
Read	1	2	3	4	5	6	7	8	9	10	
	T	**X**	;								
Answer	1	2	3	4	5	6	7	8	9	10	
	T	**X**	P1	;							

UL	PLL UNLOCK STATUS									
Set	1	2	3	4	5	6	7	8	9	10
Read	1	2	3	4	5	6	7	8	9	10
	U	**L**	;							
Answer	1	2	3	4	5	6	7	8	9	10
	U	**L**	P1	;						

P1 0: PLL "Lock"
1: PLL "Unlock"

UP	UP									
Set	1	2	3	4	5	6	7	8	9	10
	U	**P**	;							
Read	1	2	3	4	5	6	7	8	9	10
Answer	1	2	3	4	5	6	7	8	9	10

VD	VOX DELAY TIME									
Set	1	2	3	4	5	6	7	8	9	10
	V	**D**	P1	P1	P1	P1	;			
Read	1	2	3	4	5	6	7	8	9	10
	V	**D**	;							
Answer	1	2	3	4	5	6	7	8	9	10
	V	**D**	P1	P1	P1	P1	;			

P1 0030 - 3000 mS (10 mS multiples)

VF	VRF FILTER									
Set	1	2	3	4	5	6	7	8	9	10
	V	**F**	P1	P2	P3	P4	;			
Read	1	2	3	4	5	6	7	8	9	10
	V	**F**	P1;							
Answer	1	2	3	4	5	6	7	8	9	10
	V	**F**	P1	P2	P5	P5	P5	P6	;	

P1 0: Fixed
P2 0: OFF
1: ON
2: Default set
P3 +: Plus Shift
-: Minus Shift
P4 0 - 9
P5 000 - 255
P6 1: µTUNE

VG	VOX GAIN									
Set	1	2	3	4	5	6	7	8	9	10
	V	**G**	P1	P1	P1	;				
Read	1	2	3	4	5	6	7	8	9	10
	V	**G**	;							
Answer	1	2	3	4	5	6	7	8	9	10
	V	**G**	P1	P1	P1	;				

P1 000 - 100

VM	VFO-A TO MEMORY CHANNEL									
Set	1	2	3	4	5	6	7	8	9	10
	V	**M**	;							
Read	1	2	3	4	5	6	7	8	9	10
Answer	1	2	3	4	5	6	7	8	9	10

VS	VFO SELECT									
Set	1	2	3	4	5	6	7	8	9	10
	V	**S**	P1	;						
Read	1	2	3	4	5	6	7	8	9	10
	V	**S**	;							
Answer	1	2	3	4	5	6	7	8	9	10
	V	**S**	P1	;						

P1 0: VFO-A
1: VFO-B

VX	VOX STATUS									
Set	1	2	3	4	5	6	7	8	9	10
	V	**X**	P1	;						
Read	1	2	3	4	5	6	7	8	9	10
	V	**X**	;							
Answer	1	2	3	4	5	6	7	8	9	10
	V	**X**	P1	;						

P1 0: VOX "OFF"
1: VOX "ON"

XT	TX CLAR									
Set	1	2	3	4	5	6	7	8	9	10
	X	**T**	P1	;						
Read	1	2	3	4	5	6	7	8	9	10
	X	**T**	;							
Answer	1	2	3	4	5	6	7	8	9	10
	X	**T**	P1	;						

P1 0: TX CLAR "OFF"
1: TX CLAR "ON"

YAESU
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1410-A0

E H 0 4 6 H 1 2 1