YAESU

FTDX9000

CAT OPERATION

REFERENCE BOOK

VERTEX STANDARD CO., LTD.

CAT (COMPUTER AIDED TRANSCEIVR) OPERATION

OVERVIEW

The CAT (Computer Aided Transceiver) System in the **FTDX9000** 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 as single mouse clicks or keystroke operations on the computer keyboard.

The **FTDX9000** 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. 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.

Vertex Standard 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 later on for your operating needs and discover the true operating potential of this system.

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 main band (VFO-A) frequency to 14.250000 MHz.

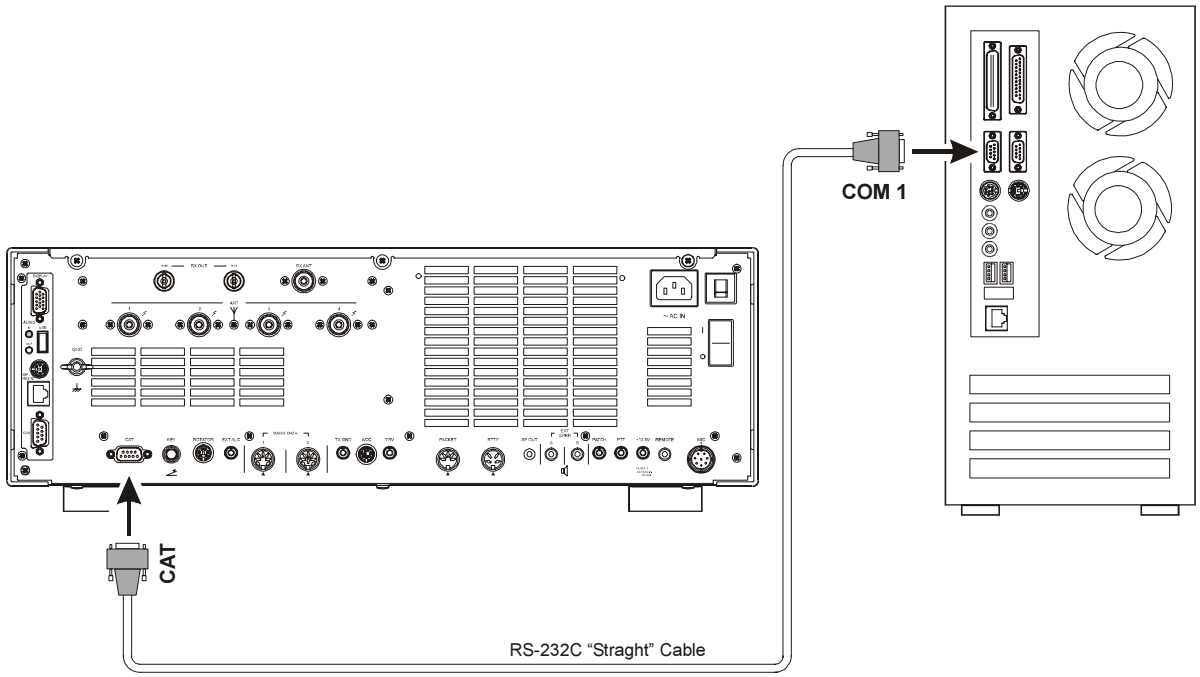
FA	**14250000**	**;**
↑	↑	↑
Command	Parameter	Terminator

There is three for the **FTDX9000** Command as shown below:

Set command: Set a particular condition (to the **FTDX9000**)
Read command: Reads an answer (from the **FTDX9000**)
Answer command: Transmits a condition (from the **FTDX9000**)

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

- ❒ To set the main band (VFO-A) frequency to 14.250000 MHz, the following command is sent from the computer to the transceiver:
  "**FA14250000;**" (Set command)
- ❒ To read the main band (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)



CONTROL 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 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 **FTDX9000**, 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.

CONTROL COMMAND LIST

COMMAND	FUNCTION	SET	READ	ANS.	COMMAND	FUNCTION	SET	READ	ANS.
AC	Antenna Tuner Control	O	O	O	**NB**	Noise Blanker Set	O	O	O
AG	AF GAIN	O	O	O	**NL**	Noise Blanker Level	O	O	O
AN	Antenna Select	O	O	O	**NR**	Noise Reduction Status	O	O	O
BC	Auto NOTCH Status	O	O	O	**OI**	Sub Band (VFO-B) Status	X	O	O
BD	BAND DOWN	O	X	X	**OS**	Repeater Shift	O	O	O
BP	Manual NOTCH Filter	O	O	O	**PA**	IPO Status	O	O	O
BU	BAND UP	O	X	X	**PB**	Voice Memory Status	O	O	O
BY	BUSY Indicator Status	X	O	O	**PC**	TX Power Level	O	O	O
CH	Memory Channel Up/Down	O	X	X	**PL**	RF Speech Processor Level	O	O	O
CN	CTCSS Tone Frequency	O	O	O	**PR**	RF Speech Processor Status	O	O	O
CT	CTCSS Status	O	O	O	**QI**	QMB Store	O	X	X
DA	Dimmer Set	O	O	O	**QR**	QMB Recall	O	X	X
DN	Microphone “DWN” Button	O	X	X	**RC**	RX Clarifier Offset Clear	O	X	X
DP	TFT Display Set	O	O	O	**RD**	RX Clarifier Minus Offset	O	X	X
FA	Main Band (VFO-A) Frequency	O	O	O	**RG**	RF Gain	O	O	O
FB	Sub Band (VFO-B) Frequency	O	O	O	**RL**	Noise Reduction Level	O	O	O
FR	Receiver Status	O	O	O	**RT**	RX Clarifier Status	O	O	O
FT	Transmitter Status	O	O	O	**RU**	RX Clarifier Plus Offset	O	X	X
GT	AGC Status	O	O	O	**SC**	SCAN Status	O	O	O
IF	Main Band (VFO-A) Status	X	O	O	**SD**	CW Break-in Delay Time	O	O	O
IS	IF SHIFT	O	O	O	**SH**	WIDTH Status	O	O	O
KM	Keyer Memory	O	O	O	**SM**	S-meter Reading	X	O	O
KS	Keyer Speed	O	O	O	**SQ**	Squelch Level	O	O	O
KY	CW Keying	O	X	X	**TX**	TX Status	O	O	O
LK	DIAL Lock Status	O	O	O	**UL**	PLL Unlock Status	X	O	O
MC	Memory Channel Set	O	O	O	**UP**	Microphone “UP” Button	O	X	X
MD	Operating Mode	O	O	O	**VD**	VOX Delay Time	O	O	O
MG	MIC Gain	O	O	O	**VG**	VOX Gain	O	O	O
ML	Monitor Level	O	O	O	**VX**	VOX Status	O	O	O
MR	Memory Channel Read	X	O	O	**XT**	TX Clarifier Status	O	O	O
MW	Memory Channel Write	O	X	X					

CONTROL COMMAND TABLES

AC	Antenna Tuner Control										
Set	1	2	3	4	5	6	7	8	9	10	P1 0: Tuner "OFF" or Tuning Stop (While Tuner is engaged) 1: Start Antenna Tuning (While Tuner is engaged) 2: Tuning has failed (Answer only)
	A	**C**	P1	;							
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	;							

AG	AF GAIN										
Set	1	2	3	4	5	6	7	8	9	10	P1 0: Main Band (VFO-A) Receiver 1: Sub Band (VFO-B) Receiver P2 000 - 255
	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	;				

AN	Antenna Select										
Set	1	2	3	4	5	6	7	8	9	10	P1 0: Main Band (VFO-A) 1: Sub Band (VFO-B) P2 0: No Change 1: Antenna "1" 2: Antenna "2" 3: Antenna "3" 4: Antenna "4" 5: Antenna "RX"
	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	P2	;						

BC	Auto NOTCH Status										
Set	1	2	3	4	5	6	7	8	9	10	P1 0: Main Band (VFO-A) 1: Sub Band (VFO-B) P2 0: Auto Notch "OFF" 1: Auto Notch "ON"
	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	;						

BD	BAND DOWN										
Set	1	2	3	4	5	6	7	8	9	10	P1 0: Main Band (VFO-A) 1: Sub Band (VFO-B)
	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	

BP	Manual NOTCH Filter										
Set	1	2	3	4	5	6	7	8	9	10	P1 000: Manual NOTCH "OFF" 001 - 300: NOTCH Frequency (x10 Hz)
	B	**P**	P1	P1	P1	;					
Read	1	2	3	4	5	6	7	8	9	10	
	B	**P**	;								
Answer	1	2	3	4	5	6	7	8	9	10	
Answer	**B**	**P**	P1	P1	P1	;					

BU	BAND UP										
Set	1	2	3	4	5	6	7	8	9	10	P1 0: Main Band (VFO-A) 1: Sub Band (VFO-B)
	B	**U**	P1	;							
Read	1	2	3	4	5	6	7	8	9	10	
Answer	1	2	3	4	5	6	7	8	9	10	

BY	BUSY Indicator Status										
Set	1	2	3	4	5	6	7	8	9	10	P1 0: Main Band (VFO-A) BUSY "OFF" 1: Main Band (VFO-A) BUSY "ON" P2 0: Sub Band (VFO-B) BUSY "OFF" 1: Sub Band (VFO-B) BUSY "ON"
Read	1	2	3	4	5	6	7	8	9	10	
	B	**Y**	P1	;							
Answer	1	2	3	4	5	6	7	8	9	10	
	B	**Y**	P1	P2	;						

CH	Memory Channel Up/Down										
Set	1	2	3	4	5	6	7	8	9	10	P1 0: Memory Channel "UP" 1: Memory Channel "DOWN"
	C	**H**	P1	;							
Read	1	2	3	4	5	6	7	8	9	10	
Answer	1	2	3	4	5	6	7	8	9	10	

CONTROL COMMAND TABLES

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: Main Band (VFO-A)
1: Sub Band (VFO-B)
P2 0 - 49: Tone Frequency Number (See Table 1)

CT — CTCSS Status

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

P1 0: Main Band (VFO-A)
1: Sub Band (VFO-B)
P2 0: CTCSS "OFF"
1: CTCSS ENC/DEC "ON"
2: CTCSS ENC "ON"

DA — Dimmer Set

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

P1 00 - 15: TFT Backlight Brightness Level
P2 00 - 15: Meter Brightness Level

DN — Microphone "DWN" Button

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

DP — TFT Display Set

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

P1 0: World Clock Display
1: Band Scope Display
2: AF Oscilloscope/Spectrum Analyzer Display
3: Log Book Display
4: Temperature/SWR Display
5: Rotator Display
6: Memory Channel List Display

FA — Main Band (VFO-A) Frequncy

	1	2	3	4	5	6	7	8	9	10
Set	F	A	P1	P1	P1	P1	P1	P1	P1	P1
	11	12	13	14	15	16	17	18	19	20
	;									
Read	F	A	;							
Answer	F	A	P1	P1	P1	P1	P1	P1	P1	P1
	11	12	13	14	15	16	17	18	19	20
	;									

P1 0030000 - 60000000 (Hz)

FB — Sub Band (VFO-B) Frequncy

	1	2	3	4	5	6	7	8	9	10
Set	F	B	P1	P1	P1	P1	P1	P1	P1	P1
	11	12	13	14	15	16	17	18	19	20
	;									
Read	F	B	;							
Answer	F	B	P1	P1	P1	P1	P1	P1	P1	P1
	11	12	13	14	15	16	17	18	19	20
	;									

P1 00300000 - 60000000 (Hz)

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	—	—

CONTROL COMMAND TABLES

FR — Receiver Status

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

P1 0: Main Band (VFO-A) Receiver: RX, Sub Band (VFO-B) Receiver: "OFF"
1: Main Band (VFO-A) Receiver: Mute, Sub Band (VFO-B) Receiver: "OFF"
2: Main Band (VFO-A) Receiver: RX, Sub Band (VFO-B) Receiver: RX
3: Main Band (VFO-A) Receiver: Mute, Sub Band (VFO-B) Receiver: RX

FT — Transmitter Status

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

P1 0: Main Band (VFO-A) Transmitter: TX
1: Sub Band (VFO-B) Transmitter: TX

GT — AGC Status

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

P1 0: Main Band (VFO-A)
1: Sub Band (VFO-B)
P2 0: AGC "OFF"
1: AGC "FAST"
2: AGC "MID"
3: AGC "SLOW"
4: AGC "AUTO"

IF — Main Band (VFO-A) Status

	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	P4	P4	P4	P4	P5	P6
	21	22	23	24	25	26	27	28	29	30
	P7	P8	P9	P10	P10	P11	;			

P1 Space (Fix) P2 VFO-A Frequency (Hz)
P3 Clarifier Direction +: Plus Shift, –: Minus Shift
P4 Clarifier Offset: 0000 - 9999 (Hz)
P5 0: RX CLAR "OFF" 1: RX CLAR "ON"
P6 0: TX CLAR "OFF" 1: TX CLAR "ON"
P7 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
P8 0: VFO 1: Memory
P9 0: CTCSS "OFF" 1: CTCSS ENC/DEC 2: CTCSS ENC
P10: Tone Number (See Table 1)
P11 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	P3	P3	P3	P3	;	
Read	I	S	P1	;						
Answer	I	S	P1	P2	P3	P3	P3	P3	;	

P1 0: Main Band (VFO-A)
1: Sub Band (VFO-B)
P2 Shift Direction +: Plus, –: Minus
P3 0000 - 1000 (Hz) (20 Hz multiple)

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 0 - 5 : Keyer Memory Channel Number
P2 Message Characters (up to 50 characters)

KS — Keyer 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)

CONTROL COMMAND TABLES

KY — CW Keying

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

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 — DIAL Lock Status

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

P1 0: DIAL Lock "OFF"
1: DIAL Lock "ON"

MC — Memory Channel Set

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

P1 0: Main Band (VFO-A)
1: Sub Band (VFO-B)
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

MG — MIC Gain

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

P1 000 - 255

ML — Monitor Level

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

P1 000 - 255

MR — Memory Channel Read

	1	2	3	4	5	6	7	8	9	10
Set										
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	P4	P4	P4	P4	P5	P6
	21	22	23	24	25	26	27	28	29	30
	P7	P8	P9	P10	P10	P11	;			

P1 Memory Channel Number P2 Memory Channel Frequency (Hz)
P3 Clarifier Direction +: Plus Shift, –: Minus Shift
P4 Clarifier Offset: 0000 - 9999 (Hz)
P5 0: RX CLAR "OFF" 1: RX CLAR "ON"
P6 0: TX CLAR "OFF" 1: TX CLAR "ON"
P7 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
P8 0: VFO 1: Memory
P9 0: CTCSS "OFF" 1: CTCSS ENC/DEC 2: CTCSS ENC
P10: Tone Number (See Table 1)
P11 0: Simplex 1: Plus Shift 2: Minus Shift

CONTROL COMMAND TABLES

MW — Memory Channel Write

	1	2	3	4	5	6	7	8	9	10
Set	**M**	**W**	P1	P1	P1	P2	P2	P2	P2	P2
	11	12	13	14	15	16	17	18	19	20
	P2	P2	P2	P3	P4	P4	P4	P4	P5	P6
	21	22	23	24	25	26	27	28	29	30
	P7	P8	P9	P10	P10	P11	;			
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 P2 Memory Channel Frequency (Hz)
P3 Clarifier Direction +: Plus Shift, –: Minus Shift
P4 Clarifier Offset: 0000 - 9999 (Hz)
P5 0: RX CLAR "OFF" 1: RX CLAR "ON"
P6 0: TX CLAR "OFF" 1: TX CLAR "ON"
P7 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
P8 0: (Fixed)
P9 0: CTCSS "OFF" 1: CTCSS ENC/DEC 2: CTCSS ENC
P10: Tone Number (See Table 1)
P11 0: Simplex 1: Plus Shift 2: Minus Shift

NB — Noise Blanker Status

	1	2	3	4	5	6	7	8	9	10
Set	**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 0: Main Band (VFO-A) Receiver
1: Sub Band (VFO-B) Receiver
P2 0: Noise Blanker "OFF"
1: Noise Blanker "ON"
2: Noise Blanker (Wide) "ON"

NL — Noise Blanker Level

	1	2	3	4	5	6	7	8	9	10
Set	**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 0: Main Band (VFO-A) Receiver
1: Sub Band (VFO-B) Receiver
P2 000 - 255

NR — Noise Reduction Status

	1	2	3	4	5	6	7	8	9	10
Set	**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 0: Main Band (VFO-A) Receiver
1: Sub Band (VFO-B) Receiver
P2 0: Noise Reduction "OFF"
1: Noise Reduction "ON"

OI — Sub Band (VFO-B) Status

	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	P4	P4	P4	P4	P5	P6
	21	22	23	24	25	26	27	28	29	30
	P7	P8	P9	P10	P10	P11	;			

P1 Space (Fix) P2 VFO-B Frequency (Hz)
P3 Clarifier Direction +: Plus Shift, –: Minus Shift
P4 Crarifier Offset: 0000 - 9999 (Hz)
P5 0: RX CLAR "OFF" 1: RX CLAR "ON"
P6 0: TX CLAR "OFF" 1: TX CLAR "ON"
P7 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
P8 0: VFO 1: Memory
P9 0: CTCSS "OFF" 1: CTCSS ENC/DEC 2: CTCSS ENC
P10: Tone Number (See Table 1)
P11 0: Simplex 1: Plus Shift 2: Minus Shift

OS — 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 0: Main Band (VFO-A) Receiver
1: Sub Band (VFO-B) Receiver
P2 0: Simplex
1: Plus Shift
2: Minus Shift
※: FM mode only

PA — IPO Status

	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: Main Band (VFO-A) Receiver
1: Sub Band (VFO-B) Receiver
P2 0: IPO "ON" (Pre-Amp Disable)
1: IPO "OFF" (Pre-Amp Enable)

PB — Voice Memory Status

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

P1 0: Stop
1: Voice Message "1" Playback
2: Voice Message "2" Playback
3: Voice Message "3" Playback
4: Voice Message "4" Playback
5: Voice Message "5" Playback

CONTROL COMMAND TABLES

PC	TX Power Level										
Set	1	2	3	4	5	6	7	8	9	10	P1 000 - 255
	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	;					

PL	RF Speech Processor Level										
Set	1	2	3	4	5	6	7	8	9	10	P1 000 - 255
	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	;					

PR	RF Speech Processor Status										
Set	1	2	3	4	5	6	7	8	9	10	P1 0: RF Speech Processor "OFF" 1: RF Speech Processor "ON"
	P	**C**	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	;							

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	

RC	RX Clarifier Offset 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	RX Clarifier Minus Offset										
Set	1	2	3	4	5	6	7	8	9	10	P1 0000 - 9999 (Hz)
	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	

RG	RF Gain										
Set	1	2	3	4	5	6	7	8	9	10	P1 0: Main Band (VFO-A) Receiver 1: Sub Band (VFO-B) Receiver P2 000 - 255
	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	;				

RL	Noise Reduction Level										
Set	1	2	3	4	5	6	7	8	9	10	P1 0: Main Band (VFO-A) Receiver 1: Sub Band (VFO-B) Receiver P2 01 - 15
	R	**L**	P1	P2	P2	;					
Read	1	2	3	4	5	6	7	8	9	10	
	R	**L**	P1	;							
Answer	1	2	3	4	5	6	7	8	9	10	
	R	**L**	P1	P2	P2	;					

CONTROL COMMAND TABLES

RT	RX Clarifier Status										
Set	1	2	3	4	5	6	7	8	9	10	P1 0: RX Clarifier "OFF" 1: RX Clarifier "ON"
	R	**T**	P1	;							
Read	1	2	3	4	5	6	7	8	9	10	
	R	**T**	;								
Answer	1	2	3	4	5	6	7	8	9	10	
	R	**T**	P1	;							

RU	RX Clarifier Plus Offset										
Set	1	2	3	4	5	6	7	8	9	10	P1 0000 - 9999 (Hz)
	R	**U**	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	

SC	SCAN Status										
Set	1	2	3	4	5	6	7	8	9	10	P1 0: Scan "OFF" 1: Scan "ON" (Upward) 1: Scan "ON" (Downward)
	S	**C**	P1	;							
Read	1	2	3	4	5	6	7	8	9	10	
	S	**C**	;								
Answer	1	2	3	4	5	6	7	8	9	10	
	S	**C**	P1	;							

SD	CW Break-in Delay Time										
Set	1	2	3	4	5	6	7	8	9	10	P1 0000: Full Break-in 0001 - 5000 mS
	S	**D**	P1	P1	P1	P1	;				
Read	1	2	3	4	5	6	7	8	9	10	
	S	**D**	;								
Answer	1	2	3	4	5	6	7	8	9	10	
	S	**D**	P1	P1	P1	P1	;				

SH	WIDTH Status										
Set	1	2	3	4	5	6	7	8	9	10	P1 0: Main Band (VFO-A) Receiver 1: Sub Band (VFO-B) Receiver P2 00 (Counter Clockwise) - 31 (Clockwise), 16 (Center)
	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	;					

SM	S-meter Reading										
Set	1	2	3	4	5	6	7	8	9	10	P1 0: Main Band (VFO-A) S-meter 1: Sub Band (VFO-B) S-meter 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	Squelch Level										
Set	1	2	3	4	5	6	7	8	9	10	P1 0: Main Band (VFO-A) Receiver 1: Sub Band (VFO-B) Receiver 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	;				

TX	TX Status										
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" 3: RADIO TX "ON" CAT TX "ON"
	T	**X**	P1	;							
Read	1	2	3	4	5	6	7	8	9	10	
	T	**M**	;								
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	P1 0: PLL "Lock" 1: PLL "Unlock"
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	;							

CONTROL COMMAND TABLES

UP	Microphone "UP" Button									
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	P1 0000 - 5000 mS (20 mS multiples)
	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	;				

VG	VOX Gain										
Set	1	2	3	4	5	6	7	8	9	10	P1 000 - 255
	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	;					

VX	VOX Status										
Set	1	2	3	4	5	6	7	8	9	10	P1 0: VOX "OFF" 1: VOX "ON"
	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	;							

XT	TX Clarifier Status										
Set	1	2	3	4	5	6	7	8	9	10	P1 0: TX Clarifier "OFF" 1: TX Clarifier "ON"
	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	;							

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