



**FTDx9000**  
**CAT OPERATION**  
**REFERENCE BOOK**

**VERTEX STANDARD CO., LTD.**

# CAT (COMPUTER AIDED TRANSCEIVER) 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.

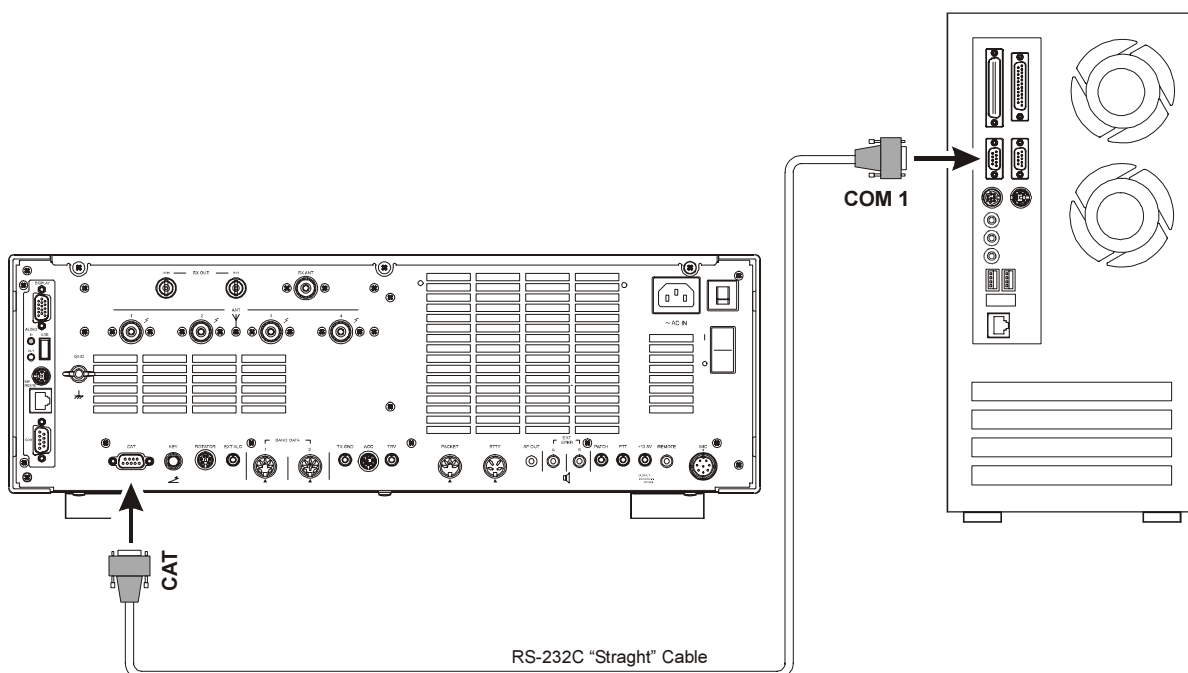
**FA**                    **14250000**    ;  
  ↑                    ↑                    ↑  
  Command    Parameter    Terminator

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)



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## 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	0	0	0	NB	Noise Blanker Set	0	0	0
AG	AF GAIN	0	0	0	NL	Noise Blanker Level	0	0	0
AN	Antenna Select	0	0	0	NR	Noise Reduction Status	0	0	0
BC	Auto NOTCH Status	0	0	0	OI	Sub Band (VFO-B) Status	X	0	0
BD	BAND DOWN	0	X	X	OS	Repeater Shift	0	0	0
BP	Manual NOTCH Filter	0	0	0	PA	IPO Status	0	0	0
BU	BAND UP	0	X	X	PB	Voice Memory Status	0	0	0
BY	BUSY Indicator Status	X	0	0	PC	TX Power Level	0	0	0
CH	Memory Channel Up/Down	0	X	X	PL	RF Speech Processor Level	0	0	0
CN	CTCSS Tone Frequency	0	0	0	PR	RF Speech Processor Status	0	0	0
CT	CTCSS Status	0	0	0	QI	QMB Store	0	X	X
DA	Dimmer Set	0	0	0	QR	QMB Recall	0	X	X
DN	Microphone "DWN" Button	0	X	X	RC	RX Clarifier Offset Clear	0	X	X
DP	TFT Display Set	0	0	0	RD	RX Clarifier Minus Offset	0	X	X
FA	Main Band (VFO-A) Frequency	0	0	0	RG	RF Gain	0	0	0
FB	Sub Band (VFO-B) Frequency	0	0	0	RL	Noise Reduction Level	0	0	0
FR	Receiver Status	0	0	0	RT	RX Clarifier Status	0	0	0
FT	Transmitter Status	0	0	0	RU	RX Clarifier Plus Offset	0	X	X
GT	AGC Status	0	0	0	SC	SCAN Status	0	0	0
IF	Main Band (VFO-A) Status	X	0	0	SD	CW Break-in Delay Time	0	0	0
IS	IF SHIFT	0	0	0	SH	WIDTH Status	0	0	0
KM	Keyer Memory	0	0	0	SM	S-meter Reading	X	0	0
KS	Keyer Speed	0	0	0	SQ	Squelch Level	0	0	0
KY	CW Keying	0	X	X	TX	TX Status	0	0	0
LK	DIAL Lock Status	0	0	0	UL	PLL Unlock Status	X	0	0
MC	Memory Channel Set	0	0	0	UP	Microphone "UP" Button	0	X	X
MD	Operating Mode	0	0	0	VD	VOX Delay Time	0	0	0
MG	MIC Gain	0	0	0	VG	VOX Gain	0	0	0
ML	Monitor Level	0	0	0	VX	VOX Status	0	0	0
MR	Memory Channel Read	X	0	0	XT	TX Clarifier Status	0	0	0
MW	Memory Channel Write	0	X	X					

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## CONTROL COMMAND TABLES

<b>AC</b>		<b>Antenna Tuner Control</b>									
Set	1	2	3	4	5	6	7	8	9	10	P1 (Set) (Answer) 0: Tuner "OFF" 0: Tuner "OFF" 1: Tuner "ON" 1: Tuner "ON" 2: Tuning Start
	<b>A</b>	<b>C</b>	<b>P1</b>	;							
Read	1	2	3	4	5	6	7	8	9	10	
	<b>A</b>	<b>C</b>	;								
Answer	1	2	3	4	5	6	7	8	9	10	
	<b>A</b>	<b>C</b>	<b>P1</b>	;							

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

<b>AN</b>		<b>Antenna Select</b>									
Set	1	2	3	4	5	6	7	8	9	10	P1 0: Main Band (VFO-A) P2 (Set) 1: ANT "1" P2 (Answer) 1: ANT "1," ANT "RX" "OFF" 1: Sub Band (VFO-B) 2: ANT "2" 2: ANT "2," ANT "RX" "OFF" 3: ANT "3" 3: ANT "3," ANT "RX" "OFF" 4: ANT "4" 4: ANT "4," ANT "RX" "OFF" 5: ANT "4" 5: ANT "4," ANT "RX" "ON" 6: ANT "2," ANT "RX" "ON" 7: ANT "3," ANT "RX" "ON" 8: ANT "4," ANT "RX" "ON"
	<b>A</b>	<b>N</b>	<b>P1</b>	<b>P2</b>	;						
Read	1	2	3	4	5	6	7	8	9	10	
	<b>A</b>	<b>N</b>	<b>P1</b>	;							
Answer	1	2	3	4	5	6	7	8	9	10	
	<b>A</b>	<b>N</b>	<b>P1</b>	<b>P2</b>	;						

<b>BC</b>		<b>Auto NOTCH Status</b>									
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>B</b>	<b>C</b>	<b>P1</b>	<b>P2</b>	;						
Read	1	2	3	4	5	6	7	8	9	10	
	<b>B</b>	<b>C</b>	<b>P1</b>	;							
Answer	1	2	3	4	5	6	7	8	9	10	
	<b>B</b>	<b>C</b>	<b>P1</b>	<b>P2</b>	;						

<b>BD</b>		<b>BAND DOWN</b>									
Set	1	2	3	4	5	6	7	8	9	10	P1 0: Main Band (VFO-A) 1: Sub Band (VFO-B)
	<b>B</b>	<b>D</b>	<b>P1</b>	;							
Read	1	2	3	4	5	6	7	8	9	10	
Answer	1	2	3	4	5	6	7	8	9	10	

<b>BP</b>		<b>Manual NOTCH Filter</b>									
Set	1	2	3	4	5	6	7	8	9	10	P1 0: Main Band (VFO-A) 1: Sub Band (VFO-B) P2 000: Manual NOTCH "OFF" 001 - 300: NOTCH Frequency (x10 Hz), NOTCH "ON"
	<b>B</b>	<b>P</b>	<b>P1</b>	<b>P2</b>	<b>P2</b>	;					
Read	1	2	3	4	5	6	7	8	9	10	
	<b>B</b>	<b>P</b>	<b>P1</b>	;							
Answer	1	2	3	4	5	6	7	8	9	10	
	<b>B</b>	<b>P</b>	<b>P1</b>	<b>P2</b>	<b>P2</b>	;					

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

<b>BY</b>		<b>BUSY Indicator Status</b>									
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>B</b>	<b>Y</b>	;								
Answer	1	2	3	4	5	6	7	8	9	10	
	<b>B</b>	<b>Y</b>	<b>P1</b>	<b>P2</b>	;						

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

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CN	CTCSS Tone Frequency										
Set	1	2	3	4	5	6	7	8	9	10	P1 0: Main Band (VFO-A) 1: Sub Band (VFO-B) P2 0 - 49: Tone Frequency Number (See Table 1)
	C	N	P1	P2	P2	;					
Read	1	2	3	4	5	6	7	8	9	10	
	C	N	P1	;							
Answer	1	2	3	4	5	6	7	8	9	10	
	C	N	P1	P2	P2	;					

CT	CTCSS 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: 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	;						

DA	Dimmer Set										
Set	1	2	3	4	5	6	7	8	9	10	P1 00 - 15: TFT Backlight Brightness Level P2 00 - 15: Meter Brightness Level
	D	A	P1	P1	P2	P2	;				
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	;				

DN	Microphone "DWN" Button										
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	

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

FA	Main Band (VFO-A) Frequency										
Set	1	2	3	4	5	6	7	8	9	10	P1 0030000 - 6000000 (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	;								
	11	12	13	14	15	16	17	18	19	20	
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	Sub Band (VFO-B) Frequency										
Set	1	2	3	4	5	6	7	8	9	10	P1 00300000 - 60000000 (Hz)
	F	B	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	B	;								
	11	12	13	14	15	16	17	18	19	20	
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	

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	—	—

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## CONTROL COMMAND TABLES

<b>FR</b>		<b>Receiver Status</b>											
Set	1	2	3	4	5	6	7	8	9	10	P1	0: Main Band (VFO-A) Receiver: RX, 1: Main Band (VFO-A) Receiver: Mute, 2: Main Band (VFO-A) Receiver: RX, 3: Main Band (VFO-A) Receiver: Mute,	Sub Band (VFO-B) Receiver: "OFF" Sub Band (VFO-B) Receiver: "OFF" Sub Band (VFO-B) Receiver: RX Sub Band (VFO-B) Receiver: RX
	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	;									

<b>FT</b>		<b>Transmitter Status</b>											
Set	1	2	3	4	5	6	7	8	9	10	P1	0: Main Band (VFO-A) Transmitter: TX 1: Sub Band (VFO-B) Transmitter: TX	
	F	T	P1	;									
Read	1	2	3	4	5	6	7	8	9	10			
	F	T	;										
Answer	1	2	3	4	5	6	7	8	9	10			
	F	T	P1	;									

<b>GT</b>		<b>AGC Status</b>												
Set	1	2	3	4	5	6	7	8	9	10	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"
	G	T	P1	P2	;									
Read	1	2	3	4	5	6	7	8	9	10				
	G	T	P1	;										
Answer	1	2	3	4	5	6	7	8	9	10				
	G	T	P1	P2	;									

<b>IF</b>		<b>Main Band (VFO-A) Status</b>												
Set	1	2	3	4	5	6	7	8	9	10	P1	Current Memory Channel	P2	VFO-A Frequency (Hz)
Read	1	2	3	4	5	6	7	8	9	10				
	I	F	;											
Answer	1	2	3	4	5	6	7	8	9	10	P4	Clarifier Offset: 0000 - 9999 (Hz)	P5	0: RX CLAR "OFF" 1: RX CLAR "ON"
	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	;							

P3 Clarifier Direction +: Plus Shift, -: Minus Shift  
 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 D: AM-N  
 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

<b>IS</b>		<b>IF SHIFT</b>											
Set	1	2	3	4	5	6	7	8	9	10	P1	0: Main Band (VFO-A) 1: Sub Band (VFO-B)	
	I	S	P1	P2	P3	P3	P3	P3	;				
Read	1	2	3	4	5	6	7	8	9	10	P2	Shift Direction +: Plus, -: Minus	
	I	S	P1	;									
Answer	1	2	3	4	5	6	7	8	9	10	P3	0000 - 1000 (Hz) (20 Hz multiple)	
	I	S	P1	P2	P3	P3	P3	P3	;				

<b>KM</b>		<b>Keyer Memory</b>												
Set	1	2	3	4	5	6	7	~	53	**	P1	1 - 5 : Keyer Memory Channel Number	P2	Message Characters (up to 50 characters)
	K	M	P1	P2	P2	P2	P2	~	P2	;				
Read	1	2	3	4	5	6	7	8	9	10				
	K	M	P1	;										
Answer	1	2	3	4	5	6	7	~	53	**				
	K	M	P1	P2	P2	P2	P2	~	P2	;				

<b>KS</b>		<b>Keyer Speed</b>											
Set	1	2	3	4	5	6	7	8	9	10	P1	004 - 060 (WPM)	
	K	S	P1	P1	P1	;							
Read	1	2	3	4	5	6	7	8	9	10			
	K	S	;										
Answer	1	2	3	4	5	6	7	8	9	10			
	K	S	P1	P1	P1	;							

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## CONTROL COMMAND TABLES

KY	CW Keying												
Set	1	2	3	4	5	6	7	8	9	10	P1	1: Keyer Memory "1" Playback 3: Keyer Memory "3" Playback 5: Keyer Memory "5" Playback 6: Message Keyer "1" Playback 8: Message Keyer "3" Playback A: Message Keyer "5" Playback	2: Keyer Memory "2" Playback 4: Keyer Memory "4" Playback 7: Message Keyer "2" Playback 9: Message Keyer "4" Playback
	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			

LK	DIAL Lock Status												
Set	1	2	3	4	5	6	7	8	9	10	P1	0: DIAL Lock "OFF" 1: DIAL Lock "ON"	
	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	;									

MC	Memory Channel Set												
Set	1	2	3	4	5	6	7	8	9	10	P1	000 - 117: Memory Channel Number 000 - 099: Regular Memory Channel 100: P1L 101: P1U 116: P9L 117: P9U	118: U51 (60 m band CH "1") ? 112: U55 (60 m band CH "5") ??? (Answer): Invalid Channel
	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	;							

MD	Operating Mode													
Set	1	2	3	4	5	6	7	8	9	10	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 D: AM-N
	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	;									

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

ML	Monitor Level												
Set	1	2	3	4	5	6	7	8	9	10	P1	000 - 255	
	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	;							

MR	Memory Channel Read													
Set	1	2	3	4	5	6	7	8	9	10	P1	Memory Channel Number	P2	Memory Channel Frequency (Hz)
Read	1	2	3	4	5	6	7	8	9	10	P3	Clarifier Direction +: Plus Shift, -: Minus Shift	P4	Clarifier Offset: 0000 - 9999 (Hz)
	M	R	P1	P1	P1	;								
Answer	1	2	3	4	5	6	7	8	9	10	P5	0: RX CLAR "OFF" 1: RX CLAR "ON"	P6	0: TX CLAR "OFF" 1: TX CLAR "ON"
	11	12	13	14	15	16	17	18	19	20				
	P2	P2	P2	P3	P4	P4	P4	P4	P5	P6	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 D: AM-N	P8	0: VFO 1: Memory
	21	22	23	24	25	26	27	28	29	30				
	P7	P8	P9	P10	P10	P11	;				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		

# CAT (COMPUTER AIDED TRANSCEIVER) OPERATION

## CONTROL COMMAND TABLES

<b>MW</b>		<b>Memory Channel Write</b>												
Set	1	2	3	4	5	6	7	8	9	10	P1	Memory Channel Number	P2	Memory Channel Frequency (Hz)
	<b>M</b>	<b>W</b>	P1	P1	P1	P2	P2	P2	P2	P2	P3	Clarifier Direction +: Plus Shift, -: Minus Shift		
	11	12	13	14	15	16	17	18	19	20	P4	Clarifier Offset: 0000 - 9999 (Hz)		
	P2	P2	P2	P3	P4	P4	P4	P4	P5	P6	P5	0: RX CLAR "OFF" 1: RX CLAR "ON"		
	21	22	23	24	25	26	27	28	29	30	P6	0: TX CLAR "OFF" 1: TX CLAR "ON"		
Read	P7	P8	P9	P10	P10	P11	;				P7	MODE 1: LSB 2: USB 3: CW 4: FM 5: AM 6: FSK (RTTY-LSB)		
	1	2	3	4	5	6	7	8	9	10		7: CW-R 8: PKT-L 9: FSK-R (RTTY-USB) A: PKT-FM		
Answer	1	2	3	4	5	6	7	8	9	10		B: FM-N C: PKT-U D: AM-N		
											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		

<b>NB</b>		<b>Noise Blanker Status</b>												
Set	1	2	3	4	5	6	7	8	9	10	P1	0: Main Band (VFO-A) Receiver		
	<b>N</b>	<b>B</b>	P1	P2	;						1	Sub Band (VFO-B) Receiver		
Read	1	2	3	4	5	6	7	8	9	10	P2	0: Noise Blanker "OFF"		
	<b>N</b>	<b>B</b>	P1	;							1	Noise Blanker "ON"		
Answer	1	2	3	4	5	6	7	8	9	10	2	Noise Blanker (Wide) "ON"		
	<b>N</b>	<b>B</b>	P1	P2	;									

<b>NL</b>		<b>Noise Blanker Level</b>												
Set	1	2	3	4	5	6	7	8	9	10	P1	0: Main Band (VFO-A) Receiver		
	<b>N</b>	<b>L</b>	P1	P2	P2	P2	;				1	Sub Band (VFO-B) Receiver		
Read	1	2	3	4	5	6	7	8	9	10	P2	000 - 255		
	<b>N</b>	<b>L</b>	P1	;										
Answer	1	2	3	4	5	6	7	8	9	10				
	<b>N</b>	<b>L</b>	P1	P2	P2	P2	;							

<b>NR</b>		<b>Noise Reduction Status</b>												
Set	1	2	3	4	5	6	7	8	9	10	P1	0: Main Band (VFO-A) Receiver		
	<b>N</b>	<b>R</b>	P1	P2	;						1	Sub Band (VFO-B) Receiver		
Read	1	2	3	4	5	6	7	8	9	10	P2	0: Noise Reduction "OFF"		
	<b>N</b>	<b>R</b>	P1	;							1	Noise Reduction "ON"		
Answer	1	2	3	4	5	6	7	8	9	10				
	<b>N</b>	<b>R</b>	P1	P2	;									

<b>OI</b>		<b>Sub Band (VFO-B) Status</b>												
Set	1	2	3	4	5	6	7	8	9	10	P1	Current Memory Channel	P2	VFO-B Frequency (Hz)
											P3	Clarifier Direction +: Plus Shift, -: Minus Shift		
Read	1	2	3	4	5	6	7	8	9	10	P4	Clarifier Offset: 0000 - 9999 (Hz)		
	<b>O</b>	<b>I</b>	;								P5	0: RX CLAR "OFF" 1: RX CLAR "ON"		
Answer	1	2	3	4	5	6	7	8	9	10	P6	0: TX CLAR "OFF" 1: TX CLAR "ON"		
	<b>O</b>	<b>I</b>	P1	P1	P1	P2	P2	P2	P2	P2	P7	MODE 1: LSB 2: USB 3: CW 4: FM 5: AM 6: FSK (RTTY-LSB)		
	11	12	13	14	15	16	17	18	19	20		7: CW-R 8: PKT-L 9: FSK-R (RTTY-USB) A: PKT-FM		
	P2	P2	P2	P3	P4	P4	P4	P4	P5	P6		B: FM-N C: PKT-U D: AM-N		
	21	22	23	24	25	26	27	28	29	30	P8	0: VFO 1: Memory		
	P7	P8	P9	P10	P10	P11	;				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		

<b>OS</b>		<b>Repeater Shift</b>												
Set	1	2	3	4	5	6	7	8	9	10	P1	0: Main Band (VFO-A) Receiver		
	<b>O</b>	<b>S</b>	P1	P2	;						1	Sub Band (VFO-B) Receiver		
Read	1	2	3	4	5	6	7	8	9	10	P2	0: Simplex		
	<b>O</b>	<b>S</b>	P1	;							1	Plus Shift		
Answer	1	2	3	4	5	6	7	8	9	10	2	Minus Shift		
	<b>O</b>	<b>S</b>	P1	P2	;						⊗: FM mode only			

<b>PA</b>		<b>IPO Status</b>												
Set	1	2	3	4	5	6	7	8	9	10	P1	0: Main Band (VFO-A) Receiver		
	<b>P</b>	<b>A</b>	P1	P2	;						1	Sub Band (VFO-B) Receiver		
Read	1	2	3	4	5	6	7	8	9	10	P2	0: IPO "ON" (Pre-Amp Disable)		
	<b>P</b>	<b>A</b>	P1	;							1	IPO "OFF" (Pre-Amp Enable)		
Answer	1	2	3	4	5	6	7	8	9	10				
	<b>P</b>	<b>A</b>	P1	P2	;									

<b>PB</b>		<b>Voice Memory Status</b>												
Set	1	2	3	4	5	6	7	8	9	10	P1	0: Stop		
	<b>P</b>	<b>B</b>	P1	;							1	Voice Message "1" Playback		
Read	1	2	3	4	5	6	7	8	9	10	2	Voice Message "2" Playback		
	<b>P</b>	<b>B</b>	;								3	Voice Message "3" Playback		
Answer	1	2	3	4	5	6	7	8	9	10	4	Voice Message "4" Playback		
	<b>P</b>	<b>B</b>	P1	;							5	Voice Message "5" Playback		

# CAT (COMPUTER AIDED TRANSCEIVER) OPERATION

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

# CAT (COMPUTER AIDED TRANSCEIVER) OPERATION

## 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) 2: 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 (Set) 0: CAT TX "OFF" 1: CAT TX "ON" P1 (Answer) 0: RADIO TX "OFF" CAT TX "OFF" 1: RADIO TX "OFF" CAT TX "ON" 2: RADIO TX "ON" CAT TX "OFF" RADIO TX have Priority
	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	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	;							

# CAT (COMPUTER AIDED TRANSCEIVER) OPERATION

## CONTROL COMMAND TABLES

<b>UP</b>	<b>Microphone "UP" Button</b>										
Set	1	2	3	4	5	6	7	8	9	10	
	<b>U</b>	<b>P</b>	;								
Read	1	2	3	4	5	6	7	8	9	10	
Answer	1	2	3	4	5	6	7	8	9	10	

<b>VD</b>	<b>VOX Delay Time</b>										
Set	1	2	3	4	5	6	7	8	9	10	P1 0000 - 5000 mS (20 mS multiples)
	<b>V</b>	<b>D</b>	P1	P1	P1	P1	;				
Read	1	2	3	4	5	6	7	8	9	10	
	<b>V</b>	<b>D</b>	;								
Answer	1	2	3	4	5	6	7	8	9	10	
	<b>V</b>	<b>D</b>	P1	P1	P1	P1	;				

<b>VG</b>	<b>VOX Gain</b>										
Set	1	2	3	4	5	6	7	8	9	10	P1 000 - 255
	<b>V</b>	<b>G</b>	P1	P1	P1	;					
Read	1	2	3	4	5	6	7	8	9	10	
	<b>V</b>	<b>G</b>	;								
Answer	1	2	3	4	5	6	7	8	9	10	
	<b>V</b>	<b>G</b>	P1	P1	P1	;					

<b>VX</b>	<b>VOX Status</b>										
Set	1	2	3	4	5	6	7	8	9	10	P1 0: VOX "OFF" 1: VOX "ON"
	<b>V</b>	<b>X</b>	P1	;							
Read	1	2	3	4	5	6	7	8	9	10	
	<b>V</b>	<b>X</b>	;								
Answer	1	2	3	4	5	6	7	8	9	10	
	<b>V</b>	<b>X</b>	P1	;							

<b>XT</b>	<b>TX Clarifier Status</b>										
Set	1	2	3	4	5	6	7	8	9	10	P1 0: TX Clarifier "OFF" 1: TX Clarifier "ON"
	<b>X</b>	<b>T</b>	P1	;							
Read	1	2	3	4	5	6	7	8	9	10	
	<b>X</b>	<b>T</b>	;								
Answer	1	2	3	4	5	6	7	8	9	10	
	<b>X</b>	<b>T</b>	P1	;							



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