YAESU

FT-2000 SERIES
CAT OPERATION
REFERENCE BOOK

VERTEX STANDARD CO., LTD.

CAT (COMPUTER AIDED TRANSCEIVER) OPERATION

OVERVIEW

The CAT (Computer Aided Transceiver) System in the **FT-2000** series 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 **FT-2000** series 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.

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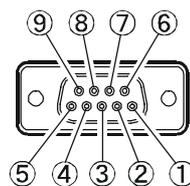
PIN NO.	PIN NAME	I/O	FUNCTION
①	N/A	—	—
②	SERIAL OUT	Output	Outputs the Serial Data from the transceiver to the computer.
③	SERIAL IN	Input	Inputs the Serial Data from the computer to the transceiver.
④	N/A	—	—
⑤	GND	—	Signal Ground
⑥	N/A	—	—
⑦	RTS	Input	When the computer is not ready to receive data,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

COM

CAT

RS-232C "Straight" Cable
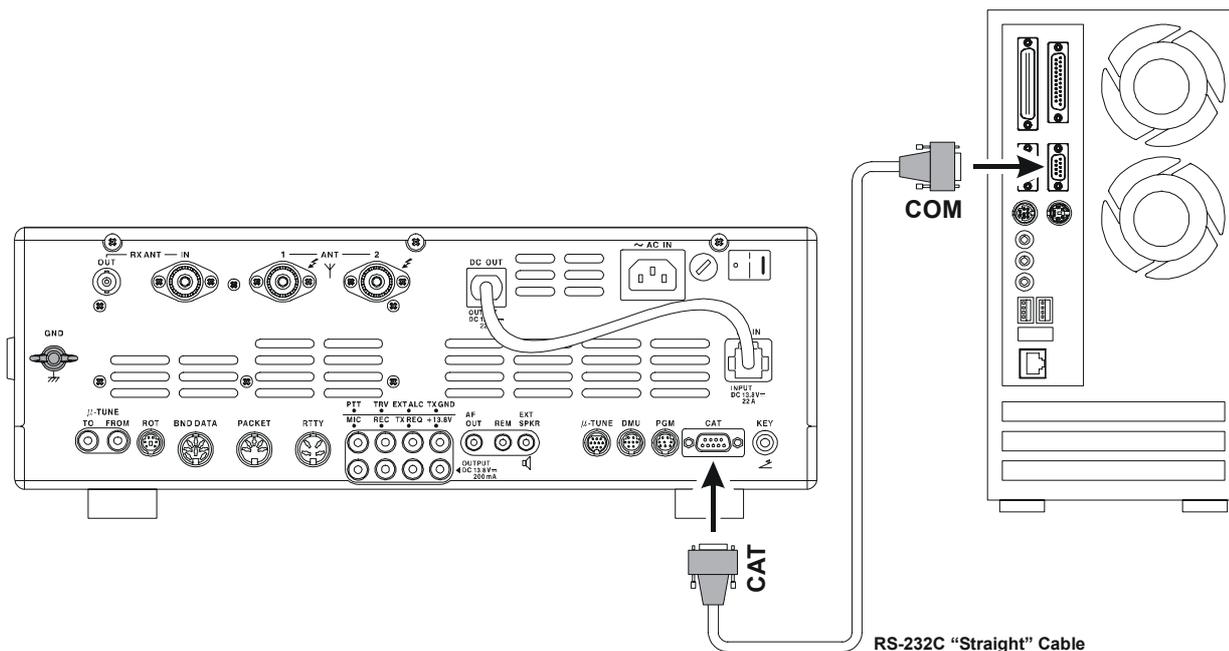
CONTROL COMMAND

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

FA	14250000	;
↑	↑	↑
Command	Parameter	Terminator

There is three for the **FT-2000** Command as shown below:

Set command: Set a particular condition
(to the **FT-2000**)
Read command: Reads an answer
(from the **FT-2000**)
Answer command: Transmits a condition
(from the **FT-2000**)

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)

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 **FT-2000**, 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.	AI	COMMAND	FUNCTION	SET	READ	ANS.	AI
AB	VFO-A TO VFO-B	O	X	X	X	MR	MEMORY READ	X	O	O	X
AC	ANTENNA TUNER CONTROL	O	O	O	O	MS	METER SW	O	O	O	O
AG	AF GAIN	O	O	O	O	MW	MEMORY WRITE	O	X	X	X
AI	AUTO INFORMATION	O	O	O	X	MX	MOX SET	O	O	O	O
AM	VFO-A TO MEMORY CHANNEL	O	X	X	X	NA	NARROW	O	O	O	O
AN	ANTENNA NUMBER	O	O	O	O	NB	NOISE BLANKER	O	O	O	O
BC	AUTO NOTCH	O	O	O	O	NL	NOISE BLANKER LEVEL	O	O	O	O
BD	BAND DOWN	O	X	X	X	NR	NOISE REDUCTION	O	O	O	O
BI	BREAK-IN	O	O	O	O	OI	OPPOSITE BAND INFORMATION	X	O	O	X
BP	MANUAL NOTCH	O	O	O	O	OS	OFFSET (REPEATER SHIFT)	O	O	O	O
BS	BAND SELECT	O	X	X	X	PA	PRE-AMP (IPO)	O	O	O	O
BU	BAND UP	O	X	X	X	PB	PLAY BACK	O	O	O	X
BY	BUSY	X	O	O	O	PC	POWER CONTROL	O	O	O	O
CH	CHANNEL UP/DOWN	O	X	X	X	PL	SPEECH PROCESSOR LEVEL	O	O	O	O
CN	CTCSS NUMBER	O	O	O	O	PR	SPEECH PROCESSOR	O	O	O	O
CO	CONTOUR	O	O	O	O	PS	POWER SWITH	O	O	O	X
CS	CW SPOT	O	O	O	O	QI	QMB STORE	O	X	X	X
CT	CTCSS	O	O	O	O	QR	QMB RECALL	O	X	X	X
DA	DIMMER	O	O	O	X	QS	QUICK SPLIT	O	X	X	X
DN	DOWN	O	X	X	X	RA	RF ATTENUATOR	O	O	O	O
DP	DISPLAY	O	O	O	O	RC	CLAR CLEAR	O	X	X	X
DS	DIMMER SWITCH	O	O	O	O	RD	CLAR DOWN	O	X	X	X
ED	ENCORDER DOWN	O	X	X	X	RF	ROOFING FILTER	O	O	O	O
EK	ENT KEY	O	X	X	X	RG	RF GAIN	O	O	O	O
EU	ENCORDER UP	O	X	X	X	RI	RADIO INFORMATION	X	O	O	O
EX	MENU	O	O	O	O	RL	NOISE REDUCTION LEVEL	O	O	O	O
FA	FREQUENCY VFO-A	O	O	O	O	RM	READ METER	X	O	O	O
FB	FREQUENCY VFO-B	O	O	O	O	RO	ROTATOR	O	O	O	X
FK	FUNCTION KEY	O	X	X	X	RS	RADIO STATUS	X	O	O	O
FR	FUNCTION RX	O	O	O	O	RT	CLAR	O	O	O	O
FS	FAST STEP	O	O	O	O	RU	CLAR UP	O	X	X	X
FT	FUNCTION TX	O	O	O	O	SC	SCAN	O	O	O	O
GT	AGC FUNCTION	O	O	O	O	SD	SEMI BREAK-IN DELAY TIME	O	O	O	O
ID	IDENTIFICATION	X	O	O	X	SF	SUB-DIAL FUNCTION	O	O	O	O
IF	INFORMATION	X	O	O	O	SH	WIDTH	O	O	O	O
IS	IF-SHIFT	O	O	O	O	SM	S METER	X	O	O	O
KM	KEYER MEMORY	O	O	O	X	SQ	SQUELCH LEVEL	O	O	O	O
KP	KEY PITCH	O	O	O	O	SV	SWAP VFO	O	X	X	X
KR	KEYER	O	O	O	O	TS	TXW	O	O	O	O
KS	KEY SPEED	O	O	O	O	TX	TX SET	O	O	O	O
KY	CW KEYING	O	X	X	X	UL	UNLOCK	X	O	O	O
LK	LOCK	O	O	O	O	UP	UP	O	X	X	X
LM	LOAD MESSEGE	O	O	O	X	VD	VOX DELAY TIME	O	O	O	O
MA	MEMORY CHANNEL TO VFO-A	O	X	X	X	VF	VRF FILTER	O	O	O	O
MC	MEMORY CHANNEL	O	O	O	X	VG	VOX GAIN	O	O	O	O
MD	MODE	O	O	O	O	VM	[V/M] KEY FUNCTION	O	X	X	X
MG	MIC GAIN	O	O	O	O	VS	VFO SELECT	O	O	O	O
MK	MODE KEY	O	X	X	X	VX	VOX	O	O	O	O
ML	MONITOR LEVEL	O	O	O	O	XT	TX CLAR	O	O	O	O

CONTROL COMMAND TABLES

AB — VFO-A TO VFO-B

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

AC — ANTENNA TUNER CONTROL

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

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

AG — AF GAIN

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

P1 0: Main (VFO-A) Band Receiver
     1: Sub (VFO-B) Band Receiver
P2 000 - 255

AI — AUTO INFORMATION

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

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

AN — ANTENNA NUMBER

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

P1 0: Fixed
P2 1: ANT "1"
     2: ANT "2"
     5: ANT "RX"
P3 1: ANT "1"
     2: ANT "2"
P4 0: ANT "RX" "OFF"
     1: ANT "RX" "ON"

BC — AUTO NOTCH

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

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

BD — BAND DOWN

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

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

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"

CONTROL COMMAND TABLES

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 When P2=0
000: OFF
001: ON
When 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   06: 18 MHz
01: 3.5 MHz   07: 21 MHz
02: 5 MHz   08: 24.5 MHz
03: 7 MHz   09: 28 MHz
04: 10 MHz   10: 50 MHz
05: 14 MHz   11: GEN

BU — BAND UP

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

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

BY — BUSY

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

P1 0: Main (VFO-A) Band BUSY "OFF"
1: Main (VFO-A) Band BUSY "ON"
P2 0: Sub (VFO-B) Band BUSY "OFF"
1: Sub (VFO-B) Band BUSY "ON"

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

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 FREQUENCY

P3 When P2=0,
000: CONTOUR/APF "OFF"
001: CONTOUR "ON"
002: APF "ON"
When P2=1,
01 - 40 (CONTOUR FREQUENCY)

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

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

CT — CTCSS

	1	2	3	4	5	6	7	8	9	10
Set	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	;					

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

DA — DIMMER

	1	2	3	4	5	6	7	8	9	10
Set	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	;			

P1 00 - 07: VFD Backlight Brightness Level
P2 00 - 15: Meter (except VFD) Brightness Level

DN — MIC DWN

	1	2	3	4	5	6	7	8	9	10
Set	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 — DISPLAY

	1	2	3	4	5	6	7	8	9	10
Set	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	;						

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

※: This command does not activates when the optional Data Managemnt Unit is not attached.

DS — DIMMER SWITCH

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

P1 0: DIMMER "OFF"
   1: DIMMER "ON"

ED — ENCORDER DOWN

	1	2	3	4	5	6	7	8	9	10
Set	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

P1 0: MAIN ENCORDER
   1: SUB ENCORDER
P2 01-99: Steps

EK — ENT KEY

	1	2	3	4	5	6	7	8	9	10
Set	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

	1	2	3	4	5	6	7	8	9	10
Set	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

P1 0: MAIN ENCORDER
   1: SUB ENCORDER
P2 01-99: Steps

EX — MENU

	1	2	3	4	5	6	7	8	nn	**
Set	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	;

P1 : 001-149 (MENU Number)
P2 : Parameter
See Table 1 and Table 2

CONTROL COMMAND TABLES

TABLE 1

P1	FUNCTION	P2	BYTE
001	AGC FAST DELAY TIME	0020 ~ 4000 msec (20 msec/step)	4
002	AGC FAST PEAK HOLD TIME	0000 ~ 2000 msec (20 msec/step)	4
003	AGC MID DELAY TIME	0020 ~ 4000 msec (20 msec/step)	4
004	AGC MID PEAK HOLD TIME	0000 ~ 2000 msec (20 msec/step)	4
005	AGC SLOW DELAY TIME	0020 ~ 4000 msec (20 msec/step)	4
006	AGC SLOW PEAK HOLD TIME	0000 ~ 2000 msec (20 msec/step)	4
007	DISPLAY COLOR	0: COOL BLUE 1: CONTRAST BLUE 2: FLASH BLUE 3: CONTRAST UMBER 4: UMBER	1
008	METER DIMMER	00 ~ 15	2
009	DISPLAY DIMMER	00 ~ 07	2
010	TUNING OFFSET INDICATOR	0: CLARIFIER OFFSET 1: CW TUNIG METER 2: VRF PEAK POSITION	1
011	S-METER PEAK HOLD	0: OFF 1: 0.5 sec 2: 1.0 sec 3: 2.0 sec	1
012	ROTATOR STARTING POINT	0: 0° 1: 90° 2: 180° 3: 270°	1
013	ROTATOR NEEDLE PRECISELY	00 ~ 30° (0 ~ −30°, 2° step)	2
014	QMB MAKER	0: DISABLE 1: ENABLE	1
015	LEVEL INDICATOR	0000000 ~ 1111111 (See Chart of the next page)	7
016	VOICE MEMORY AUDIO OUTPUT LEVEL	000 ~ 100	3
017	VOICE MEMORY AUDIO TX LEVEL	000 ~ 100	3
018	CW BEACON	000 (OFF) ~ 255 sec	3
019	CONTEST NUMBER STYLE	0: 1290 1: AunO 2: Aunt 3: A2nO 4: A2nt 5: 12nO 6: 12nt	1
020	CONTEST NUMBER	0000 ~ 9999	4
021	CW MEMORY "1" MEMORY TYPE	0: TEXT MEMORY 1: MESSAGE MEMORY	1
022	CW MEMORY "2" MEMORY TYPE	0: TEXT MEMORY 1: MESSAGE MEMORY	1
023	CW MEMORY "3" MEMORY TYPE	0: TEXT MEMORY 1: MESSAGE MEMORY	1
024	CW MEMORY "4" MEMORY TYPE	0: TEXT MEMORY 1: MESSAGE MEMORY	1
025	CW MEMORY "5" MEMORY TYPE	0: TEXT MEMORY 1: MESSAGE MEMORY	1
026	ANTENNA SELECTION MODE	0: BAND 1: STACK	1
027	BEEP LEVEL	000 ~ 100	3
028	CAT BAUD RATE	0: 4800 bps 1: 9600 bps 2: 19200 bps 3: 38400 bps	1
029	CAT TIME-OUT TIMER	0: 10 msec 1: 100 msec 2: 1000 msec 3: 3000 msec	1
030	CAT RTS PORT	0: DISABLE 1: ENABLE	1
031	CAT DATA INDICATOR	0: DISABLE 1: ENABLE	1
032	MEMORY GROUP	0: DISABLE 1: ENABLE	1
033	QUICK SPLIT TUNING OFFSET	−20 ~ +00 (or −00) ~ +20 kHz	3
034	VFO TRACK	0: OFF 1: BAND 2: FREQUENCY	1
035	TX TIME OUT TIMER	0: OFF 1: 3 min 2: 5 min 3: 10 min 4: 15 min 5: 20 min 6: 30 min	1
036	TRANSVERTER FREQUENCY DISPLAY	30 ~ 49 MHz	2
037	μ-TUNE DIAL	0: STEP-2 1: STEP-1 2: OFF	1
038	SUB (VFO-B) BAND NB LEVEL	1000: NB KNOB 0000 ~ 0100 (FIX)	4
039	SUB (VFO-B) BAND CW NARROW FILTER	0: 1200 Hz 1: 500 Hz 2: 300 Hz	1
040	MIC SCAN	0: DISABLE 1: ENABLE	1
041	SCAN RESUME	0: PAUSE 1: TIME	1
042	VOX ANTI-TRIP LEVEL	000 ~ 100	3
043	FREQUENCY ADJUST	−25 ~ +00 (or −00) ~ +25	3
044	SUB (VFO-B) BAND IF SHIFT (LSB)	−1000 ~ +0000 (or −0000) ~ +1000 Hz	5
045	SUB (VFO-B) BAND IF SHIFT (USB)	−1000 ~ +0000 (or −0000) ~ +1000 Hz	5
046	SUB (VFO-B) BAND IF SHIFT (CW-LSB)	−1000 ~ +0000 (or −0000) ~ +1000 Hz	5
047	SUB (VFO-B) BAND IF SHIFT (CW-USB)	−1000 ~ +0000 (or −0000) ~ +1000 Hz	5
048	SUB (VFO-B) BAND IF SHIFT (RTTY-LSB)	−1000 ~ +0000 (or −0000) ~ +1000 Hz	5
049	SUB (VFO-B) BAND IF SHIFT (RTTY-USB)	−1000 ~ +0000 (or −0000) ~ +1000 Hz	5
050	SUB (VFO-B) BAND IF SHIFT (PKT-LSB)	−1000 ~ +0000 (or −0000) ~ +1000 Hz	5
051	SUB (VFO-B) BAND IF SHIFT (PKT-USB)	−1000 ~ +0000 (or −0000) ~ +1000 Hz	5
052	AM MIC GAIN	1000: MIC KNOB 0000 ~ 0100 (FIX)	4
053	AM MIC SELECT	0: MIC JACK 1: DATA JACK 2: N.C.	1
054	FRONT PANEL KEY JACK TYPE	0: OFF 1: BUG 2: IAMBIC KEYER W/O ACS 3: IAMBIC KEYER W/ACS	1
055	FRONT PANEL KEY JACK WIRING	0: NORNAL 1: REVERSE	1
056	REAR PANEL KEY JACK TYPE	0: OFF 1: BUG 2: IAMBIC KEYER W/O ACS 3: IAMBIC KEYER W/ACS	1
057	REAR PANEL KEY JACK WIRING	0: NORNAL 1: REVERSE	1
058	CW AUTO MODE	0: OFF 1: 50 MHz ONLY 2: ON	1
059	CW BFO INJECTION SIDE	0: USB 1: LSB 2: AUTO	1
060	CW BREAK-IN MODE	0: SEMI BREAK-IN 1: FULL BREAK-IN	1
061	CW CARRIER WAVE FORM SHAPE	0: 1 msec 1: 2 msec 2: 4 msec 3: 6 msec	1
062	CW WEIGHT	25 (1:2.5) ~ 45 (1:4.5)	2
063	CW FREQUENCY DISPLAY	0: DIRECT FREQUENCY 1: PITCH OFFSET	1
064	CW PC KEYING	0: DISABLE 1: ENABLE	1
065	CW QSK TIME	0: 15 msec 1: 20 msec 2: 25 mesc 3: 30 msec	1
066	AFSK MODE DATA INPUT PORT	0: DATA JACK 1: N.C.	1
067	AFSK MODE DATA INPUT LEVEL	000 ~ 100	3
068	AFSK MODE DATA OUTPUT BAND	0: MAIN (VFO-A) BAND 1: SUB (VFO-B) BAND	1
069	AFSK MODE DATA OUTPUT LEVEL	000 ~ 100	3
070	PSK MODE VOX DELAY TIME	0030 ~ 3000 msec	4
071	PSK MODE VOX GAIN	000 ~ 100	3
072	PACKET MODE FREQUENCY DISPLAY OFFSET	−3000 ~ +0000 (or −0000) ~ +3000 Hz (10 Hz/step)	5
073	PACKET MODE CARRIER POINT FREQUENCY	−3000 ~ +0000 (or −0000) ~ +3000 Hz (10 Hz/step)	5
074	FM MIC GAIN	1000: MIC KNOB 0000 ~ 0100 (FIX)	4
075	FM MIC SELECT	0: MIC JACK 1: DATA JACK 2: N.C.	1
076	28 MHz REPEATER SHIFT	0000 ~ 1000 kHz (10 Hz/step)	4
077	50 MHz REPEATER SHIFT	0000 ~ 4000 kHz (10 Hz/step)	4
078	RTTY MODE RX POLARITY (MARK/SPACE)	0: NORMAL 1: REVERSE	1
079	RTTY MODE TX POLARITY (MARK/SPACE)	0: NORMAL 1: REVERSE	1
080	RTTY MODE DATA OUTPUT BAND	0: MAIN (VFO-A) BAND 1: SUB (VFO-B) BAND	1
081	RTTY MODE DATA OUTPUT LEVEL	000 ~ 100	3
082	RTTY MODE SHIFT FREQUENCY	0: 170 Hz 1: 200 Hz 2: 425 Hz 3: 850 Hz	1
083	RTTY MODE MARK FREQUENCY	0: 1275 Hz 1: 2125 Hz	1
084	SSB MODE MIC SELECT	0: MIC JACK 1: DATA JACK 2: N.C.	1
085	SSB MODE TX BPF BANDWIDTH	0: 50 - 3000 Hz 1: 100 - 2900 Hz 2: 200 - 2800 Hz 3: 300 - 2700 Hz 4: 400 - 2600 Hz 5: 3000WB	1
086	MAIN (VFO-A) BAND LSB CARRIER POINT	−200 ~ +000 (or −000) ~ +200 Hz (10 Hz/step)	4
087	MAIN (VFO-A) BAND USB CARRIER POINT	−200 ~ +000 (or −000) ~ +200 Hz (10 Hz/step)	4
088	SUB (VFO-B) BAND LSB CARRIER POINT	−200 ~ +000 (or −000) ~ +200 Hz (10 Hz/step)	4
089	SUB (VFO-B) BAND USB CARRIER POINT	−200 ~ +000 (or −000) ~ +200 Hz (10 Hz/step)	4
090	AGC GAIN CURVE	0: NORMAL 1: SLOPED	1

CONTROL COMMAND TABLES

TABLE 2

P1	FUNCTION	P2						BYTE
091	HEADPHONE MODE	0: SEPARATE 1: COMBINE 1 2: COMBIN 2						1
092	CONTOUR GAIN	−40 ~ +00 (or −00) ~ +20 dB						3
093	CONTOUR WIDTH	01 ~ 11						2
094	IF NOTCH WIDTH	0: NARROW 1: WIDE						1
095	DSP CW FILTER PASSBAND CHARACTER	0: SOFT 1: SHARP						1
096	DSP CW FILTER SHAPE FACTOR	0: STEEP 1: MEDIUM 2: GENTLE						1
097	DSP CW NARROW FILTER BANDWIDTH	00: 25 Hz 01: 50 Hz 02: 100 Hz 03: 200 Hz 04: 300 Hz 05: 400 Hz 06: 500 Hz 07: 800 Hz 08: 1200 Hz 09: 1400 Hz 10: 1700 Hz 11: 2000 Hz						2
098	DSP PKT FILTER PASSBAND CHARACTER	0: SOFT 1: SHARP						1
099	DSP PKT FILTER SHAPE FACTOR	0: STEEP 1: MEDIUM 2: GENTLE						1
100	DSP PKT FILTER BANDWIDTH	00: 25 Hz 01: 50 Hz 02: 100 Hz 03: 200 Hz 04: 300 Hz 05: 400 Hz						2
101	DSP RTTY FILTER PASSBAND CHARACTER	0: SOFT 1: SHARP						1
102	DSP RTTY FILTER SHAPE FACTOR	0: STEEP 1: MEDIUM 2: GENTLE						1
103	DSP RTTY FILTER BANDWIDTH	00: 25 Hz 01: 50 Hz 02: 100 Hz 03: 200 Hz 04: 300 Hz 05: 400 Hz						2
104	DSP SSB FILTER PASSBAND CHARACTER	0: SOFT 1: SHARP						1
105	DSP SSB FILTER SHAPE FACTOR	0: STEEP 1: MEDIUM 2: GENTLE						1
106	DSP SSB NARROW FILTER BANDWIDTH	00: 200 Hz 01: 400 Hz 02: 600 Hz 03: 850 Hz 04: 1100 Hz 05: 1350 Hz 06: 1500 Hz 07: 1650 Hz 08: 1800 Hz 09: 1950 Hz 10: 2100 Hz 11: 2250 Hz						2
107	SPECTRUM SCOPE SCAN START FREQUENCY (1.8 MHz)	01800 ~ 01999 (1.800 MHz ~ 1.999 MHz)						5
108	SPECTRUM SCOPE SCAN START FREQUENCY (3.5 MHz)	03500 ~ 03999 (3.500 MHz ~ 3.999 MHz)						5
109	SPECTRUM SCOPE SCAN START FREQUENCY (5.0 MHz)	05250 ~ 05499 (5.250 MHz ~ 5.499 MHz)						5
110	SPECTRUM SCOPE SCAN START FREQUENCY (7.0 MHz)	07000 ~ 07299 (7.000 MHz ~ 7.299 MHz)						5
111	SPECTRUM SCOPE SCAN START FREQUENCY (10 MHz)	10100 ~ 10149 (10.100 MHz ~ 10.149 MHz)						5
112	SPECTRUM SCOPE SCAN START FREQUENCY (14 MHz)	14000 ~ 14349 (14.000 MHz ~ 14.349 MHz)						5
113	SPECTRUM SCOPE SCAN START FREQUENCY (18 MHz)	18000 ~ 18199 (18.000 MHz ~ 18.199 MHz						5
114	SPECTRUM SCOPE SCAN START FREQUENCY (21 MHz)	21000 ~ 21449 (21.000 MHz ~ 21.449 MHz)						5
115	SPECTRUM SCOPE SCAN START FREQUENCY (24.5 MHz)	24800 ~ 24989 (24.800 MHz ~ 24.989 MHz)						5
116	SPECTRUM SCOPE SCAN START FREQUENCY (28 MHz)	28000 ~ 29699 (28.000 MHz ~ 29.699 MHz)						5
117	SPECTRUM SCOPE SCAN START FREQUENCY (50 MHz)	50000 ~ 53999 (50.000 MHz ~ 53.999 MHz)						5
118	DIAL KNOB DIALSTEP	0: 1 Hz 1: 5 Hz 2: 10 Hz						1
119	DIAL KNOB CW FINE TUNING	0: DISABLE 1: ENABLE						1
120	SUB VFO-B KNOB MHz STEP	0: 1 MHz 1: 100 kHz						1
121	MICROPHNE [UP]/[DOWN] KEY AM STEP	0: 2.5 kHz 1: 5 kHz 2: 9 kHz 3: 10 kHz 4:12.5 kHz						1
122	MICROPHNE [UP]/[DOWN] KEY FM STEP	0: 5 kHz 1: 6.25 kHz 2: 10 kHz 3: 12.5 kHz 4: 25 kHz						1
123	MAIN TUNING DIAL KNOB DIALSTEP (FM MODE)	0: 10 Hz 1: 100 Hz						1
124	MY BAND SELECT	0000000000000 ~ 1111111111111 (See Chart Below)						13
125	MIC EQUAQLIZER CENTER FREQUENCY (LOW RANGE)	00: OFF 01: 100 Hz 02: 200 Hz 03: 300 Hz 04: 400 Hz 05: 500 Hz 06: 600 Hz 07: 700 Hz						2
126	MIC EQUAQLIZER GAIN (LOW RANGE)	−20 ~ +00 (or −00) ~ +10						3
127	MIC EQUAQLIZER BANDWIDTH (LOW RANGE)	01 ~ 10						2
128	MIC EQUAQLIZER CENTER FREQUENCY (MID RANGE)	00: OFF 01: 700 Hz 02: 800 Hz 03: 900 Hz 04: 1000 Hz 05: 1100 Hz 06: 1200 Hz 07: 1300 Hz 08: 1400 Hz 09: 1500 Hz						2
129	MIC EQUAQLIZER GAIN (MID RANGE)	−20 ~ +00 (or −00) ~ +10						3
130	MIC EQUAQLIZER BANDWIDTH (MID RANGE)	01 ~ 10						2
131	MIC EQUAQLIZER CENTER FREQUENCY (HIGH RANGE)	00: OFF 01: 1500 Hz 02: 1600 Hz 03: 1700 Hz 04: 18000 Hz 05: 1900 Hz 06: 2000 Hz 07: 2100 Hz 08: 2200 Hz 09: 2300 Hz 10: 2400 Hz 11: 2500 Hz 12: 2600 Hz 13: 2700 Hz 14: 2800 Hz 15: 2900 Hz 16: 3000 Hz 17: 3100 Hz 18: 3200 Hz						2
132	MIC EQUAQLIZER GAIN (HIGH RANGE)	−20 ~ +00 (or −00) ~ +10						3
133	MIC EQUAQLIZER BANDWIDTH (HIGH RANGE)	01 ~ 10						2
134	SPEECH PROCESSOR EQUAQLIZER CENTER FREQUENCY (LOW RANGE)	00: OFF 01: 100 Hz 02: 200 Hz 03: 300 Hz 04: 400 Hz 05: 500 Hz 06: 600 Hz 07: 700 Hz						2
135	SPEECH PROCESSOR EQUAQLIZER GAIN (LOW RANGE)	−20 ~ +00 (or −00) ~ +10						3
136	SPEECH PROCESSOR EQUAQLIZER BANDWIDTH (LOW RANGE)	01 ~ 10						2
137	SPEECH PROCESSOR EQUAQLIZER CENTER FREQUENCY (MID RANGE)	00: OFF 01: 700 Hz 02: 800 Hz 03: 900 Hz 04: 1000 Hz 05: 1100 Hz 06: 1200 Hz 07: 1300 Hz 08: 1400 Hz 09: 1500 Hz						2
138	SPEECH PROCESSOR EQUAQLIZER GAIN (MID RANGE)	−20 ~ +00 (or −00) ~ +10						3
138	SPEECH PROCESSOR EQUAQLIZER BANDWIDTH (MID RANGE)	01 ~ 10						2
140	SPEECH PROCESSOR EQUAQLIZER CENTER FREQUENCY (HIGH RANGE)	00: OFF 01: 1500 Hz 02: 1600 Hz 03: 1700 Hz 04: 1800 Hz 05: 1900 Hz 06: 2000 Hz 07: 2100 Hz 08: 2200 Hz 09: 2300 Hz 10: 2400 Hz 11: 2500 Hz 12: 2600 Hz 13: 2700 Hz 14: 2800 Hz 15: 2900 Hz 16: 3000 Hz 17: 3100 Hz 18: 3200 Hz						2
141	SPEECH PROCESSOR EQUAQLIZER GAIN (HIGH RANGE)	−20 ~ +00 (or −00) ~ +10						3
142	SPEECH PROCESSOR EQUAQLIZER BANDWIDTH (HIGH RANGE)	01 ~ 10						2
143	BIAS LEVEL	FT-2000 NON FUNCTION FT-2000D 0000 ~ 0100: CLASS A (BIAS LEVEL) 1000: CLASS AB						4
144	MAXIMUM OUTPUT POWER LIMIT	FT-2000 0: 10 W 1: 20 W 2: 50 W 3: 100 W FT-2000D 0: 20 W 1: 50 W 2: 100 W 3: 200 W						1
145	RF PWR KNOB FUNCTION	0: ALL MODE 1: CARRIER						1
146	TX-GND JACK	0: DISABLE 1: ENABLE						1
147	TUNER DRIVEING POWER	FT-2000 0: 10 W 1: 20 W 2: 50 W 3: 100 W FT-2000D 0: 20 W 1: 50 W 2: 100 W 3: 200 W						1
148	VOX OPERATION	0: MIC INPUT 1: DATA INPUT						1
149	EMERGENCY CHANNEL	0: DISABLE 1: ENABLE						1

Menu Item 015 LEVEL INDICATOR
Command P2 7-Byte Details
1 Byte ----- 7-Byte
X X X X X X X
— VOX DELAY
— CW DELAY
— DNR FREQUENCY
— NOTCH FREQUENCY
— CONTOUR FREQUENCY
— CW SPEED
— CW PITCH
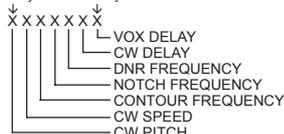
Menu Item 124 MY BAND SELECT
Command P2 13-Byte Details
1 Byte ------------- 13-Byte
X X X X X X X X X X X X X
— TRANSVERTER
— GENERAL
— 50 MHz
— 28 MHz
— 24.5 MHz
— 21 MHz
— 18 MHz
— 14 MHz
— 10 MHz
— 7 MHz
— 5 MHz
— 3.5 MHz
— 1.8 MHz
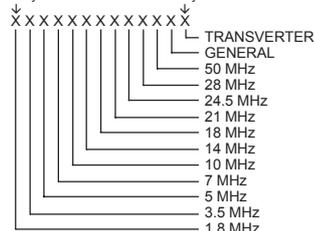
CONTROL COMMAND TABLES

FA — FREQUENCY VFO-A

	1	2	3	4	5	6	7	8	9	10	P1 00030000 - 60000000 (Hz)
Set	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

	1	2	3	4	5	6	7	8	9	10	P1 00030000 - 60000000 (Hz)
Set	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	;								
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	
	;										

FK — FUNCTION KEY

	1	2	3	4	5	6	7	8	9	10	P1 1: F1
Set	F	K	P1	;							2: F2
Read	1	2	3	4	5	6	7	8	9	10	3: F3
											4: F4
Answer	1	2	3	4	5	6	7	8	9	10	5: F5
											6: F6
											7: F7

FR — FUNCTION RX

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

FS — FAST STEP

	1	2	3	4	5	6	7	8	9	10	P1 0: FAST Key "OFF"
Set	F	S	P1	;							1: FAST Key "ON"
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	P1
Set	F	T	P1	;							0: TX Band = Main (VFO-A) Band ↔ Sub (VFO-B) Band (Toggle)
Read	1	2	3	4	5	6	7	8	9	10	1: TX Band = Sub (VFO-B) Band ↔ Main (VFO-A) Band (Toggle)
	F	T	;								2: TX Band = Main (VFO-A) Band
Answer	1	2	3	4	5	6	7	8	9	10	3: TX Band = Sub (VFO-B) Band
	F	T	P2	;							P2 0: TX Band = Main (VFO-A) Band
											1: TX Band = Sub (VFO-B) Band

GT — AGC FUNCTION

	1	2	3	4	5	6	7	8	9	10	P1 0: Main (VFO-A) Band	P3 0: AGC "OFF"
Set	G	T	P1	P2	;						1: Sub (VFO-B) Band	1: AGC "FAST"
Read	1	2	3	4	5	6	7	8	9	10	P2 0: AGC "OFF"	2: AGC "MID"
	G	T	P1	;							1: AGC "FAST"	3: AGC "SLOW"
Answer	1	2	3	4	5	6	7	8	9	10	2: AGC "MID"	4: AGC "AUTO-FAST"
	G	T	P1	P3	;						3: AGC "SLOW"	5: AGC "AUTO-MID"
											4: AGC "AUTO"	6: AGC "AUTO-SLOW"

ID — IDENTIFICATION

	1	2	3	4	5	6	7	8	9	10	P1 0251: FT-2000
Set											0252: FT-2000D
Read	1	2	3	4	5	6	7	8	9	10	
	I	D	;								
Answer	1	2	3	4	5	6	7	8	9	10	
	I	D	P1	P1	P1	P1	;				

CONTROL COMMAND TABLES

IF — INFORMATION

	1	2	3	4	5	6	7	8	9	10
Set										
Read	1	2	3	4	5	6	7	8	9	10
	I	F	;							
Answer	1	2	3	4	5	6	7	8	9	10
	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 001-117 (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: Tone Number (See Page 5: "CTCSS Tone Chart")
P10 0: Simplex   1: Plus Shift   2: Minus Shift

IS — IF-SHIFT

	1	2	3	4	5	6	7	8	9	10
Set	1	2	3	4	5	6	7	8	9	10
	I	S	P1	-/+	P2	P2	P2	P2	;	
Read	1	2	3	4	5	6	7	8	9	10
	I	S	P1	;						
Answer	1	2	3	4	5	6	7	8	9	10
	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	1	2	3	4	5	6	7	~	53	**
	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	;

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

P1 00: 300 Hz   07: 650 Hz   14: 1000 Hz
   01: 350 Hz   08: 700 Hz   15: 1050 Hz
   02: 400 Hz   09: 750 Hz
   03: 450 Hz   10: 800 Hz
   04: 500 Hz   11: 850 Hz
   05: 550 Hz   12: 900 Hz
   06: 600 Hz   13: 950 Hz

KR — KEYER

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

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

KS — KEY SPEED

	1	2	3	4	5	6	7	8	9	10
Set	1	2	3	4	5	6	7	8	9	10
	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	;				

P1 004 - 060 (WPM)

KY — CW KEYING

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

LK — LOCK

	1	2	3	4	5	6	7	8	9	10
Set	1	2	3	4	5	6	7	8	9	10
	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"

CAT (COMPUTER AIDED TRANSCEIVER) OPERATION

CONTROL COMMAND TABLES

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 When 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)

When 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 001 - 117: Memory Channel Number
  001 - 099: Regular Memory Channel
  100: P1L
  101: P1U
  ≀
  116: P9L
  117: P9U

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: Main (VFO-A) Band
  1: Sub (VFO-B) Band
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	M	G	;							
Answer	M	G	P1	P1	P1	;				

P1 000 - 255

MK — MODE KEY

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

P1 KEY   0: LSB
  1: USB
  2: CW
  3: AM
  4: FM
  5: RTTY
  6: PKT

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 When P1=0
  000: MONI "OFF"
  001: MONI "ON"
When P1=1
  001 - 255

MR — MEMORY CHANNEL READ

	1	2	3	4	5	6	7	8	9	10
Set										
Read	M	R	P1	P1	P1	;				
Answer	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   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 Page 5: "CTCSS Tone Chart")
P10 0: Simplex   1: Plus Shift   2: Minus Shift

CONTROL COMMAND TABLES

MS — METER SW

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

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

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	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   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 Tone Number (See Page 5: "CTCSS Tone Chart")
P10 0: Simplex   1: Plus Shift   2: Minus Shift

MX — MOX SET

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

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

NA — NARROW

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

P1 0: Main (VFO-A) Band Receiver
1: Sub (VFO-B) Band Receiver
P2 0: OFF
1: ON

NB — NOISE BLANKER STATUS

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

P1 0: Main (VFO-A) Band Receiver
1: Sub (VFO-B) Band 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	N	L	P1	;						
Answer	N	L	P1	P2	P2	P2	;			

P1 0: Main (VFO-A) Band Receiver
1: Sub (VFO-B) Band Receiver
P2 000 - 255

NR — NOISE REDUCTION

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

	1	2	3	4	5	6	7	8	9	10
Set										
Read	O	I	;							
Answer	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   P2 VFO-B Frequency (Hz)
P3 Clarifier Direction +: Plus Shift, −: Minus Shift
Crarifier 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 Page 5: "CTCSS Tone Chart")
P10 0: Simplex   1: Plus Shift   2: Minus Shift

CONTROL COMMAND TABLES

OS — OFFSET (REPEATER SHIFT)

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

P1 0: Main (VFO-A) Band
1: Sub (VFO-B) Band
P2 0: Simplex
1: Plus Shift
2: Minus Shift
※: FM mode only

PA — PRE-AMP (IPO)

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

P1 0: DVS
1: P.B

P2 When P1=0
0: DVS
1: DVS (CH "1" Playback Start)
2: DVS (CH "2" Playback Start)
3: DVS (CH "3" Playback Start)
4: DVS (CH "4" Playback Start)
5: DVS (CH "5" Playback Start)

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

PC — POWER CONTROL

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

P1 000 - 255

PL — SPEECH PROCESSOR LEVEL

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

P1 000 - 255

PR — SPEECH PROCESSOR

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

P1 0: Speech Processor "OFF"
1: Speech Processor "ON"

PS — POWER SWITCH

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

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

QI — QMB STORE

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

QR — QMB RECALL

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

CONTROL COMMAND TABLES

QS — QUICK SPLIT

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

RA — RF ATTENUATOR

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

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

RC — CLAR CLEAR

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

RD — CLAR MINUS OFFSET

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

P1 0000 - 9999 (Hz)

RF — ROOFING FILTER

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

P1 0:Fixed
P2 0: AUTO
1: 15 kHz
2: 6 kHz
3: 3 kHz
P3 1: 15 kHz
2: 6 kHz
3: 3 kHz
4: AUTO - 15 kHz
5: AUTO - 6kHz
6: AUTO - 3 kHz

RG — RF GAIN

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

P1 0: Main (VFO-A) Band Receiver
1: Sub (VFO-B) Band Receiver
P2 000 - 255

RI — RADIO INFORMATION

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

P1 0:Hi-SWR
1:MIC-EQ
2: CLASS-A
3: REC
4: PLAY
5: DUAL
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 of the front panel's METER knob
1: S Meter (Main)   5: PO Meter
2: S Meter (Sub)   6: SWR Meter
3: COMP Meter   7: ID Meter
4: ALC Meter   8: VDD Meter
P2 0 - 255

CONTROL COMMAND TABLES

RO — ROTATOR

	1	2	3	4	5	6	7	8	9	10	
Set	R	O	P1	;							P1 0: OFF
Read	R	O	;								1: Counter Clockwise
Answer	R	O	P1	P2	P2	P2	P3	P3	P3	;	2: Clockwise

- 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" (Upward)
  - 2: Scan "ON" (Downward)

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 0000: Full Break-in
  - 0001 - 5000 mS

SF — SUB VFO-B KNOB FUNCTION

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

- P1 0: BAND (VFO-A) 4: BAND (VFO-B)
  - 1: MHz (VFO-A) 5: MHz (VFO-B)
  - 2: GRP 6: FAST (VFO-B)
  - 3: MCH 7: A/B
  - 8: Off (Read only)

SH — WIDTH

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

- P1 0: Fixed
- P2 00 (Counter Clockwise) - 31 (Clockwise), 16 (Center)

SM — S-METER READING

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

- P1 0: Main (VFO-A) Band S-meter
  - 1: Sub (VFO-B) Band S-meter
- P2 000 - 255

CONTROL COMMAND TABLES

SQ — SQUELCLH LEVEL

	1	2	3	4	5	6	7	8	9	10	
Set	S	Q	P1	P2	P2	P2	;				P1 0: Main (VFO-A) Band
Read	S	Q	P1	;							1: Sub (VFO-B) Band
Answer	S	Q	P1	P2	P2	P2	;				P2 000 - 255

SV — SWAP VFO

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

TS — TXW

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

TX — TX SET

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

UL — PLL UNLOCK STATUS

	1	2	3	4	5	6	7	8	9	10	
Set											P1 0: PLL "Lock"
Read	U	L	;								1: PLL "Unlock"
Answer	U	L	P1	;							

UP — MIC UP

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

VD — VOX DELAY TIME

	1	2	3	4	5	6	7	8	9	10	
Set	V	D	P1	P1	P1	P1	;				P1 0000 - 5000 mS (20 mS multiples)
Read	V	D	;								
Answer	V	D	P1	P1	P1	P1	;				

VF — VRF FILTER

	1	2	3	4	5	6	7	8	9	10	
Set	V	F	P1	P2	P3	P4	;				P1 0: Fixed P4 0 - 9 (Step)
Read	V	F	P1;								P2 0: OFF P5 000 - 255
Answer	V	F	P1	P2	P5	P5	P5	P6	;		1: ON P6 0: VRF

P1 0: Fixed — P4 0 - 9 (Step)
P2 0: OFF / 1: ON / 2: Default set — P5 000 - 255 — P6 0: VRF / 1: µTUNE
P3 +: Plus Shift / –: Minus Shift

VG — VOX GAIN

	1	2	3	4	5	6	7	8	9	10	
Set	V	G	P1	P1	P1	;					P1 000 - 255
Read	V	G	;								
Answer	V	G	P1	P1	P1	;					

CONTROL COMMAND TABLES

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	P1 0: VFO-A
	V	S	P1	;							1: VFO-B
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	;							

VX	VOX STATUS										
Set	1	2	3	4	5	6	7	8	9	10	P1 0: VOX "OFF"
	V	X	P1	;							1: VOX "ON"
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 CLAR										
Set	1	21	3	4	5	6	7	8	9	10	P1 0: TX CLAR "OFF"
	X	T	P1	;							1: TX CLAR "ON"
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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