YAESU

Radio for Professionals

HF/50/144/430MHz ALL MODE TRANSCEIVER

FTX-1series

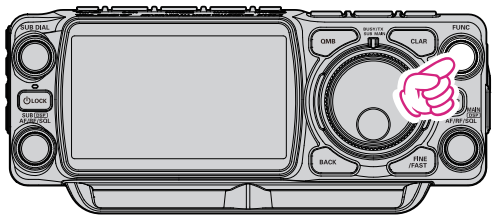
CAT Operation Reference Manual

Important Notes

The CAT operation does not work with **MAIN Firmware before Ver. 1.08.**
Please update the MAIN firmware to Ver. 1.08 or later.

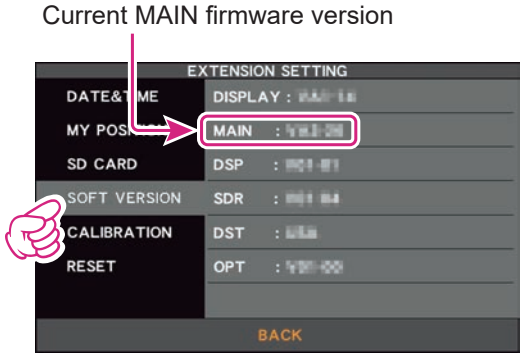
How to Confirm the Firmware Version

1. Press and hold the [FUNC] knob.



2. Touch [EXTENSION SETTING].
   If [EXTENSION SETTING] is not displayed, touch [FWD→] to display [EXTENSION SETTING] and then touch it.

3. Touch [SOFT VERSION].
   The versions of each firmware will be displayed on the TFT screen.



CAT (Computer Aided Transceiver) Operation

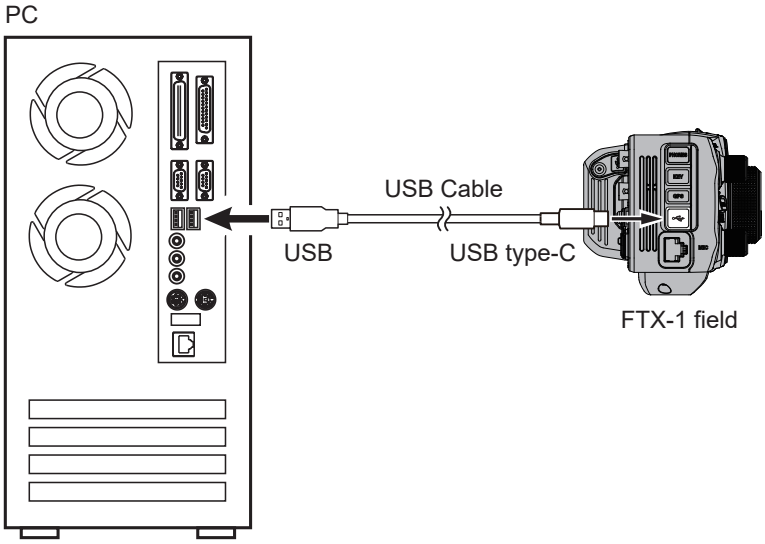
Overview

The CAT (Computer Aided Transceiver) System in the **FTX-1** series transceiver provides control of frequency, VFO, memory, and other settings 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.

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.

Using the USB Cable (CAT-1 / CAT-2)

The **FTX-1** transceiver has a built-in USB to Dual UART Bridge, allowing direct connection from the side-panel USB jack to the USB jack of a computer without the need for an interface device, simply use a USB cable to connect to the USB jack on the computer.



To connect to a PC using a USB cable, a Virtual COM port driver must be installed on the PC.
Visit the Yaesu website http://www.yaesu.com/ to download the Virtual COM port driver and Installation Manual.

How to Confirm the Installation, and the COM Port Number

After the FTX-1 and computer are connected, confirm that the virtual COM driver has been installed successfully:

1. Press and hold the power switch to turn the transceiver ON.
2. Connect the transceiver and PC with a commercially available USB cable (type-C).
3. Open the “Device Manager” screen in Windows.
4. On the Device Manager screen, double-click “Port (COM & LPT)”.

“Silicon Labs Dual CP210x USB to UART Bridge : Enhanced COM Port (COM**)”
“Silicon Labs Dual CP210x USB to UART Bridge : Standard COM Port (COM**)”
*(The number in the “(COM**)” portion may vary from computer to computer.)

The above example indicates that COM5 can be used for CAT communications (CAT-1), while COM6 can be used for TX control (PTT, CW Keying, Digital Mode Operation) or CAT communications (CAT-2).

When performing software port configuration, select the COM port numbers that were confirmed using the procedure above.

If a “!” or “X” is displayed for the port on the Device Manager, uninstall and reinstall the virtual COM driver.

CAT (Computer Aided Transceiver) Operation

The FTX-1 contains two virtual COM ports, an Enhanced COM Port and a Standard COM Port.
These ports offer the following functions:

- **Enhanced COM Port (CAT-1):** CAT Communications (Frequency and Communication Mode Settings)
- **Standard COM Port (CAT-2):** TX Controls (PTT control, CW Keying, Digital Mode Operation) or CAT Communications (Frequency and Communication Mode Settings)*

When performing software port configuration, select the COM port numbers that were confirmed using the procedure above, use the two confirmed COM port numbers for each software function. The frequency and communication mode and PTT control can be set from the software, and CW keying, digital communication, etc. can be performed simultaneously.

NOTE: (When using a standard COM port (CAT-2) for CAT communication (setting frequency, communication mode, etc.) and using hardware flow control by RTS or DTR, be sure to set the following menu items to "**OFF**" (factory default) to disable PTT control by RTS or DTR.)

Menu Item		Menu Function	Available Settings (Default: Bold)
RADIO SETTING	MODE SSB	RPTT SELECT	**OFF** / RTS / DTR
	MODE AM	RPTT SELECT	**OFF** / RTS / DTR
	MODE FM	RPTT SELECT	**OFF** / RTS / DTR
	MODE DATA	RPTT SELECT	**OFF** / RTS / DTR
	MODE RTTY	RPTT SELECT	**OFF** / RTS / DTR
CW SETTING	MODE CW	RPTT SELECT	**OFF** / RTS / DTR
		PC KEYING	**OFF** / RTS / DTR
PRESET	PRESET1 - 5	RPTT SELECT	OFF / **RTS** / DTR

- If a transceiver with a different serial number is connected and turned on, different COM port numbers will be assigned to it, making it possible to perform individual COM port configurations for separate transceivers.
- When using the USB cable for TX control, the transceiver may switch to the transmit mode when the computer is started.
- Always close the application on the computer before disconnecting the USB cable.

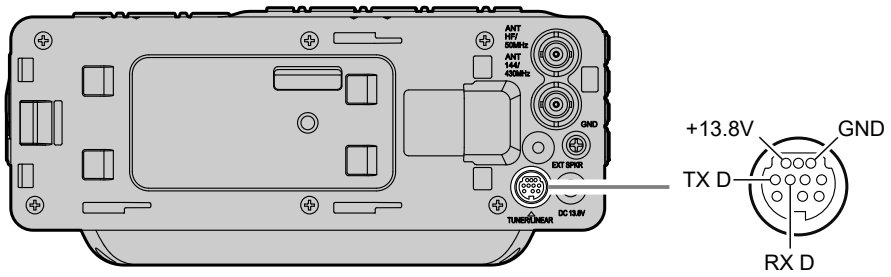
CAT (Computer Aided Transceiver) Operation

Using the UART (CAT-3)

The TUNER/LINEAR jack on the rear panel of the FTX-1 field head can be used for CAT communication (5V CMOS level serial communication).

Set to “CAT-3” in the setting menu [OPERATION SETTING] → [GENERAL] → [TUN/LIN PORT SELECT]. (Factory setting: OPTION)

- Since the serial communication of this jack is 5V CMOS level, it cannot be directly connected to the RS-232C terminal of the PC.
- The connection cable must be prepared by yourself using the optional band data cable T9207451A (mini DIN 10-pin to DIN 10-pin).
- CAT communication cannot be used simultaneously with an external antenna tuner or linear amplifier.



Pin Name	I/O	Function
+13V	–	13 VDC output linked to radio ON
GND	–	Signal Ground
TXD	Output	Outputs the Serial Data from the transceiver to the PC (5V CMOS)
RXD	Input	Inputs the Serial Data from the PC to the transceiver (5V CMOS)

Communication Parameters

- Asynchronous communication
- Baud rate: 38400bps* (CAT-1, CAT-3 terminals) or 4800bps* (CAT-2 terminal)
- Start bit: 1
- Data bits: 8
- Stop bits: 1 or 2* (CAT-2: 1 (Fixed))
- Paritybits: None

  *(Factory default)

CAT communication settings can be changed using the following menu items.

Menu Item		Menu Function	Available Settings (Default: Bold)
OPERATION SETTING	GENERAL	CAT-1 RATE	4800 / 9600 / 19200 / **38400** / 115200 (bps)
		CAT-1 TIME OUT TIMER	**10** / 100 / 1000 / 3000 (msec)
		CAT-1 CAT-3 STOP BIT	**1bit** / 2bit
		CAT-2 RATE	**4800** / 9600 / 19200 / 38400 / 115200 (bps)
		CAT-2 TIME OUT TIMER	**10** / 100 / 1000 / 3000 (msec)
		CAT-3 RATE	4800 / 9600 / 19200 / **38400** / 115200 (bps)
		CAT-3 TIME OUT TIMER	**10** / 100 / 1000 / 3000 (msec)

CAT (Computer Aided Transceiver) Operation

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-side frequency to 14.250000 MHz.

FA	**014250000**	**;**
↑	↑	↑
Command	Parameter	Terminator

There are three commands for the **FTX-1** as shown below:

Set command: Set a particular condition (to the **FTX-1**)
Read command: Reads an answer (from the **FTX-1**)
Answer command: Transmits a condition (from the **FTX-1**)

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

- ❒ To set the MAIN-side frequency to 14.250000 MHz, the following command is sent from the computer to the transceiver:
  "**FA014250000;**" (Set command)
- ❒ To read the MAIN-side 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:
  "**FA014250000;**" (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 "**IS00+1000**" (IF SHIFT):

IS001000;
Not enough parameters specified (No direction (+) given for the IF shift)
IS00+100;
Not enough digits (Only three frequency digits given)
IS00_+_1000;
Unnecessary characters between parameters
IS00+10000;
Too many digits (Five frequency digits given)

Note: If a particular parameter is not applicable to the **FTX-1**, 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.

CAT (Computer Aided Transceiver) Operation

CAT Control Command List

Command	Function	Set	Read	Ans.	AI
AB	MAIN-side to SUB-side	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	MAIN-side to MEMORY CHANNEL	O	X	X	X
AO	AMC OUTPUT LEVEL	O	O	O	O
BA	SUB-side to MAIN-side	O	X	X	X
BC	AUTO NOTCH (DNF)	O	O	O	O
BD	BAND DOWN	O	X	X	X
BI	BREAK-IN	O	O	O	O
BM	SUB-side to MEMORY CHANNEL	O	X	X	X
BP	MANUAL NOTCH	O	O	O	O
BS	BAND SELECT	O	X	X	X
BU	BAND UP	O	X	X	X
CF	CLAR (Clarifier)	O	O	O	O
CH	CHANNEL UP/DOWN	O	X	X	X
CN	CTCSS NUMBER	O	O	O	O
CO	CONTOUR/APF	O	O	O	O
CS	CW SPOT	O	O	O	O
CT	CTCSS	O	O	O	O
DA	LCD CONTRAST/DIMMER	O	O	O	X
DN	DOWN	O	X	X	X
DT	DATE AND TIME	O	O	O	X
EX	MENU	O	O	O	O
FA	FREQUENCY MAIN-side	O	O	O	O
FB	FREQUENCY SUB-side	O	O	O	O
FN	FINE TUNING	O	O	O	O
FR	FUNCTION RX	O	O	O	O
FT	FUNCTION TX	O	O	O	O
GP	GP OUT A/B/C/D	O	O	O	X
GT	AGC FUNCTION	O	O	O	O
ID	IDENTIFICATION	X	O	O	X
IF	INFORMATION (MAIN-side)	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 MEMORY PLAY	O	X	X	X
LK	LOCK	O	O	O	O
LM	LOAD MESSAGE	O	O	O	X
MA	MEMORY CHANNEL to MAIN-side	O	X	X	X
MB	MEMORY CHANNEL to SUB-side	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

Command	Function	Set	Read	Ans.	AI
MR	MEMORY READ	X	O	O	X
MS	METER SW	O	O	O	O
MT	MEMORY CHANNEL WRITE/TAG	O	O	O	X
MW	MEMORY WRITE	O	X	X	X
MX	MOX SET	O	O	O	O
MZ	SPLIT MEMORY	O	O	O	O
NA	NARROW	O	O	O	O
NL	NOISE BLANKER LEVEL	O	O	O	O
OI	OPPOSITE BAND (SUB-side) INFORMATION	X	O	O	O
OS	OFFSET (Repeater Shift)	O	O	O	O
PA	PRE-AMP (IPO)	O	O	O	O
PB	PLAY BACK	O	O	O	X
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
RA	RF ATTENUATOR	O	O	O	O
RG	RF GAIN	O	O	O	O
RI	RADIO INFORMATION	X	O	O	O
RL	NOISE REDUCTION (DNR) LEVEL	O	O	O	O
RM	READ METER	X	O	O	O
SC	SCAN	O	O	O	O
SD	SEMI BREAK-IN DELAY TIME	O	O	O	O
SF	SUB DIAL	O	O	O	O
SH	WIDTH	O	O	O	O
SM	S METER	X	O	O	X
SQ	SQUELCH LEVEL	O	O	O	O
SS	SPECTRUM SCOPE	O	O	O	O
ST	SPLIT	O	O	O	O
SV	SWAP VFO	O	X	X	X
TS	TXW	O	O	O	O
TX	TX SET	O	O	O	O
UP	UP	O	X	X	X
VD	VOX DELAY TIME	O	O	O	O
VE	FIRMWARE VERSION	X	O	O	X
VG	VOX GAIN	O	O	O	O
VM	[V/M(MW)] KEY FUNCTION	O	X	X	X
VM	[V/M(MW)] KEY FUNCTION	O	O	O	O
VS	VFO SELECT	O	O	O	O
VX	VOX	O	O	O	O
ZI	ZERO IN	O	X	X	X

CAT (Computer Aided Transceiver) Operation

AB	MAIN-side to SUB-side									
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: Internal Antenna Tuner (FTX-1 optima)
1: External Antenna Tuner
P2 0: External Antenna Tuner
1: -
2: ATAS
P3 P2=0 (Antenna Tuner):
0: Tuner "OFF" (Tuning Stop)
1: Tuner "ON"
2: -
3: Tuning Start
P2=2 (ATAS):
0: Tuning Stop
1: Tuning frequency up (50 msec)
2: Tuning frequency down (50 msec)
3: 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: MAIN-side
1: SUB-side
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"

NOTES:
- When the status of the radio changes, the Read value of the ***AI*** applicable command (see "CAT Control Command List" (page 5)) is automatically sent to the PC.
- Set ON/OFF for each CAT-1, CAT-2, and CAT-3.
- This parameter is set to "0" (OFF) automatically when the transceiver is turned "OFF".

AM	MAIN-SIDE 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

AO	AMC OUTPUT LEVEL									
Set	1	2	3	4	5	6	7	8	9	10
	A	**O**	P1	P1	P1	;				
Read	1	2	3	4	5	6	7	8	9	10
	A	**O**	;							
Answer	1	2	3	4	5	6	7	8	9	10
	A	**O**	P1	P1	P1	;				

P1 001-100: AMC OUTPUT LEVEL

BA	SUB-side to MAIN-side									
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

CAT (Computer Aided Transceiver) Operation

BC	**AUTO NOTCH (DNF)**										
Set	1	2	3	4	5	6	7	8	9	10	P1 0: MAIN-side 1: SUB-side 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-side 1: SUB-side
	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	

BI	**BREAK-IN**										
Set	1	2	3	4	5	6	7	8	9	10	P1 0: Break-in “OFF” 1: Break-in “ON”
	B	**I**	P1	;							
Read	1	2	3	4	5	6	7	8	9	10	
	B	**I**	;								
Answer	1	2	3	4	5	6	7	8	9	10	
	B	**I**	P1	;							

BM	**SUB-side to MEMORY CHANNEL**									
Set	1	2	3	4	5	6	7	8	9	10
	B	**M**	;							
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**										
Set	1	2	3	4	5	6	7	8	9	10	P1 0: MAIN-side 1: SUB-side P2 0: Manual NOTCH “ON/OFF” 1: Manual NOTCH Frequency P3 P2=0 000: “OFF” 001: “ON” P2=1 001 - 320 (NOTCH Frequency : x 10 Hz)
	B	**P**	P1	P2	P3	P3	P3	;			
Read	1	2	3	4	5	6	7	8	9	10	
	B	**P**	P1	P2	;						
Answer	1	2	3	4	5	6	7	8	9	10	
	B	**P**	P1	P2	P3	P3	P3	;			

BS	**BAND SELECT**										
Set	1	2	3	4	5	6	7	8	9	10	P1 0: MAIN-side 1: SUB-side P2 00: 1.8 MHz 04: 10 MHz 08: 24.5 MHz 12: AIR 01: 3.5 MHz 05: 14 MHz 09: 28 MHz 13: 144 MHz 02: 5 MHz 06: 18 MHz 10: 50 MHz 14: 430 MHz 03: 7 MHz 07: 21 MHz 11: 70 MHz/GEN
	B	**S**	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	

BU	**BAND UP**										
Set	1	2	3	4	5	6	7	8	9	10	P1 0: MAIN-side 1: SUB-side
	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	

CAT (Computer Aided Transceiver) Operation

CF	CLAR ON/OFF										
Set	1	2	3	4	5	6	7	8	9	10	11
	C	**F**	P1	P2	P3	P4	P5	P6	P7	P8	;
Read	1	2	3	4	5	6	7	8	9	10	11
	C	**F**	P1	P2	P3	;					
Answer	1	2	3	4	5	6	7	8	9	10	11
	C	**F**	P1	P2	P3	P4	P5	P6	P7	P8	;

P1 0: MAIN-side
1: SUB-side
P2 0: (Fixed)
P3 0: CLAR Setting
1: CLAR Frequency
P3=0 (CLAR Setting):
P4 0: RX CLAR OFF
1: RX CLAR ON
P5 0: TX CLAR OFF
1: TX CLAR ON
P6-P8 0: (Fixed)

P3=1 (CLAR Frequency):
P4 + / -
P5-P8 0000 - 9999 Hz

CH	CHANNEL UP/DOWN									
Set	1	2	3	4	5	6	7	8	9	10
	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

P1 0: Memory Channel “UP”
1: Memory Channel “DOWN”

CN	CTCSS TONE FREQUENCY / DCS CODE									
Set	1	2	3	4	5	6	7	8	9	10
	C	**N**	P1	P2	P3	P3	P3	;		
Read	1	2	3	4	5	6	7	8	9	10
	C	**N**	P1	P2	;					
Answer	1	2	3	4	5	6	7	8	9	10
	C	**N**	P1	P2	P3	P3	P3	;		

P1 0: MAIN-side
1: SUB-side
P2 0: CTCSS
1: DCS
P3 P2=0 (CTCSS) 000 - 049: Tone Frequency Number (See Table 1)
P2=1 (DCS) 000 - 103: DCS Number (See Table 2)

Table 1 (CTCSS Tone Chart)

000	67.0 Hz	009	91.5 Hz	018	123.0 Hz	027	162.2 Hz	036	189.9 Hz	045	229.1 Hz
001	69.3 Hz	010	94.8 Hz	019	127.3 Hz	028	165.5 Hz	037	192.8 Hz	046	233.6 Hz
002	71.9 Hz	011	97.4 Hz	020	131.8 Hz	029	167.9 Hz	038	196.6 Hz	047	241.8 Hz
003	74.4 Hz	012	100.0 Hz	021	136.5 Hz	030	171.3 Hz	039	199.5 Hz	048	250.3 Hz
004	77.0 Hz	013	103.5 Hz	022	141.3 Hz	031	173.8 Hz	040	203.5 Hz	049	254.1 Hz
005	79.7 Hz	014	107.2 Hz	023	146.2 Hz	032	177.3 Hz	041	206.5 Hz	-	-
006	82.5 Hz	015	110.9 Hz	024	151.4 Hz	033	179.9 Hz	042	210.7 Hz	-	-
007	85.4 Hz	016	114.8 Hz	025	156.7 Hz	034	183.5 Hz	043	218.1 Hz	-	-
008	88.5 Hz	017	118.8 Hz	026	159.8 Hz	035	186.2 Hz	044	225.7 Hz	-	-

Table 2 (DCS Code Chart)

000	023	015	074	030	165	045	261	060	356	075	462	090	627
001	025	016	114	031	172	046	263	061	364	076	464	091	631
002	026	017	115	032	174	047	265	062	365	077	465	092	632
003	031	018	116	033	205	048	266	063	371	078	466	093	654
004	032	019	122	034	212	049	271	064	411	079	503	094	662
005	036	020	125	035	223	050	274	065	412	080	506	095	664
006	043	021	131	036	225	051	306	066	413	081	516	096	703
007	047	022	132	037	226	052	311	067	423	082	523	097	712
008	051	023	134	038	243	053	315	068	431	083	526	098	723
009	053	024	143	039	244	054	325	069	432	084	532	099	731
010	054	025	145	040	245	055	331	070	445	085	546	100	732
011	065	026	152	041	246	056	332	071	446	086	565	101	734
012	071	027	155	042	251	057	343	072	452	087	606	102	743
013	072	028	156	043	252	058	346	073	454	088	612	103	754
014	073	029	162	044	255	059	351	074	455	089	624	-	-

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

P1 0: MAIN-side
1: SUB-side
P2 0: CONTOUR “ON/OFF”
1: CONTOUR FREQ
2: APF “ON/OFF”
3: APF FREQ

P3 P2=0 0000: CONTOUR “OFF”
0001: CONTOUR “ON”
P2=1 0010 - 3200
(CONTOUR Frequency:10 - 3200Hz)
P2=2 0000: APF “OFF”
0001: APF “ON”
P2=3 0000 - 0050 (APF Frequency: -250 - 250 Hz)

CAT (Computer Aided Transceiver) Operation

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: CW SPOT "OFF"
1: CW SPOT "ON"

CT — SQL TYPE

	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-side
1: SUB-side
P2 0: CTCSS "OFF"
1: CTCSS ENC "ON" / DEC "OFF"
2: CTCSS ENC "ON" / DEC "ON"
3: DCS "ON"
4: PR FREQ
5: REV TONE

DA — DIMMER

	1	2	3	4	5	6	7	8	9	10	11
Set	D	A	P1	P1	P2	P2	P3	P3	P4	P4	;
Read	D	A	;								
Answer	D	A	P1	P1	P2	P2	P3	P3	P4	P4	;

P1 00: (Fixed)
P2 00 - 20: TFT Display Contrast
P3 00 - 20: TFT Display Brightness Level
P4 00 - 20: LED Indicators Brightness Level

DN — MIC DOWN

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

DT — DATE AND TIME

	1	2	3	4	5	6	7	~	n-1	n
Set	D	T	P1	P2	P2	P2	P2	~	P2	;
Read	D	T	P1	;						
Answer	D	T	P1	P2	P2	P2	P2	~	P2	;

	1	2	3	4	5	6	7	8	9	10
Read	D	T	P1	;						

P1 0: Date
1: Time (Local)
P2 P1=0 yyyymmdd (Year/Month/Date)
P1=1 hhmmss (Hour/Minute/Second, 24 hour time system)

EO — ENCODER OFFSET

	1	2	3	4	5	6	7	8	9	10
Set	E	O	P1	P2	P3	P4	P5	P5	P5	;
Read										
Answer										

P1 0: MAIN-side
1: SUB-side
2: MAIN-side and SUB-side
P2 0: MAIN dial
1: FUNC knob
P3 +: Up
-: Down
P4 P2=0
0: Hz
1: kHz
2: MHz
P2=1
0: fix
P5 000 - 999

EX — MENU

	1	2	3	4	5	6	7	8	9	~	nn	**
Set	E	X	P1	P1	P2	P2	P3	P3	P4	~	P4	;
Read	E	X	P1	P1	P2	P2	P3	P3	;			
Answer	E	X	P1	P1	P2	P2	P3	P3	P4	~	P4	;

	1	2	3	4	5	6	7	8	9	10	nn	**
Read	E	X	P1	P1	P2	P2	P3	P3	;			

P1 : 01 - 07
P2 : 01 - 07
P3 : 01 - 26
P4 : Parameter (See Table 3)

CAT (Computer Aided Transceiver) Operation

Table 3 (MENU Chart)					
P1	**P2**	**P3**	**Function**	**P4**	**Digits**
01 (RADIO SETTING)	01 (MODE SSB)	01	AF TREBLE GAIN	-20 - -00 (or +00) - +10 (P4 = -20 - -00 or +00 - +10)	3
		02	AF MIDDLE TONE GAIN	-20 - -00 (or +00) - +10 (P4 = -20 - -00 or +00 - +10)	3
		03	AF BASS GAIN	-20 - -00 (or +00) - +10 (P4 = -20 - -00 or +00 - +10)	3
		04	AGC FAST DELAY	20 - 4000 msec (P4= 0020 - 4000, 20 msec/step)	4
		05	AGC MID DELAY	20 - 4000 msec (P4= 0020 - 4000, 20 msec/step)	4
		06	AGC SLOW DELAY	20 - 4000 msec (P4= 0020 - 4000, 20 msec/step)	4
		07	LCUT FREQ	00: OFF 01: 100 Hz - 19: 1000 Hz (50 Hz steps)	2
		08	LCUT SLOPE	0: 6 dB/oct 1: 18 dB/oct	1
		09	HCUT FREQ	00: OFF 01: 700 Hz - 67: 4000 Hz (50 Hz steps)	2
		10	HCUT SLOPE	0: 6 dB/oct 1: 18 dB/oct	1
		11	USB OUT LEVEL	000 - 100	3
		12	TX BPF SEL	0: 50 - 3050 1: 100 - 2900 2: 200 - 2800 3: 300 - 2700 4: 400 - 2600 (Hz)	1
		13	MOD SOURCE	0: MIC 1: USB 2: Bluetooth 3: AUTO	1
		14	USB MOD GAIN	000 - 100	3
		15	RPTT SELECT	0: OFF 1: RTS 2: DTR	1
		16	NAR WIDTH	00: 300 01: 400 02: 600 03: 850 04: 1100 05: 1200 06: 1500 07: 1650 08: 1800 09: 1950 10: 2100 11: 2250 12: 2400 13: 2450 14: 2500 15: 2600 16: 2700 17: 2800 18: 2900 19: 3000 20: 3200 21: 3500 22: 4000 (Hz)	2
		17	CW AUTO MODE	0: OFF 1: 50MHz 2: ON	1
	02 (MODE AM)	01	AF TREBLE GAIN	-20 - -00 (or +00) - +10 (P4 = -20 - -00 or +00 - +10)	3
		02	AF MIDDLE TONE GAIN	-20 - -00 (or +00) - +10 (P4 = -20 - -00 or +00 - +10)	3
		03	AF BASS GAIN	-20 - -00 (or +00) - +10 (P4 = -20 - -00 or +00 - +10)	3
		04	AGC FAST DELAY	20 - 4000 msec (P4= 0020 - 4000, 20 msec/step)	4
		05	AGC MID DELAY	20 - 4000 msec (P4= 0020 - 4000, 20 msec/step)	4
		06	AGC SLOW DELAY	20 - 4000 msec (P4= 0020 - 4000, 20 msec/step)	4
		07	LCUT FREQ	00: OFF 01: 100 Hz - 19: 1000 Hz (50 Hz steps)	2
		08	LCUT SLOPE	0: 6 dB/oct 1: 18 dB/oct	1
		09	HCUT FREQ	00: OFF 01: 700 Hz - 67: 4000 Hz (50 Hz steps)	2
		10	HCUT SLOPE	0: 6 dB/oct 1: 18 dB/oct	1
		11	USB OUT LEVEL	000 - 100	3
		12	TX BPF SEL	0: 50 - 3050 1: 100 - 2900 2: 200 - 2800 3: 300 - 2700 4: 400 - 2600	1
		13	MOD SOURCE	0: MIC 1: USB 2: Bluetooth 3: AUTO	1
		14	USB MOD GAIN	000 - 100	3
		15	RPTT SELECT	0: OFF 1: RTS 2: DTR	1
	03 (MODE FM)	01	AF TREBLE GAIN	-20 - -00 (or +00) - +10 (P4 = -20 - -00 or +00 - +10)	3
		02	AF MIDDLE TONE GAIN	-20 - -00 (or +00) - +10 (P4 = -20 - -00 or +00 - +10)	3
		03	AF BASS GAIN	-20 - -00 (or +00) - +10 (P4 = -20 - -00 or +00 - +10)	3
		04	AGC FAST DELAY	20 - 4000 msec (P4= 0020 - 4000, 20 msec/step)	4
		05	AGC MID DELAY	20 - 4000 msec (P4= 0020 - 4000, 20 msec/step)	4
		06	AGC SLOW DELAY	20 - 4000 msec (P4= 0020 - 4000, 20 msec/step)	4
		07	LCUT FREQ	00: OFF 01: 100 Hz - 19: 1000 Hz (50 Hz steps)	2
		08	LCUT SLOPE	0: 6 dB/oct 1: 18 dB/oct	1
		09	HCUT FREQ	00: OFF 01: 700 Hz - 67: 4000 Hz (50 Hz steps)	2
		10	HCUT SLOPE	0: 6 dB/oct 1: 18 dB/oct	1
		11	USB OUT LEVEL	000 - 100	3
		12	MOD SOURCE	0: MIC 1: USB 2: Bluetooth 3: AUTO	1
		13	USB MOD GAIN	000 - 100	3
		14	RPTT SELECT	0: OFF 1: RTS 2: DTR	1
		15	RPT SHIFT	0: - 1: SIMPLEX 2: + 3: ARS	1
		16	RPT SHIFT(28MHz)	0 - 1000 kHz (P4 = 0000 - 1000, 10 kHz/step)	4
		17	RPT SHIFT(50MHz)	0 - 4000 kHz (P4 = 0000 - 4000, 10 kHz/step)	4
		18	RPT SHIFT(144MHz)	0 - 100MHz (P4 = 0000 - 0100, 50 kHz/step)	4
		19	RPT SHIFT(430MHz)	0 - 100MHz (P4 = 0000 - 0100, 50 kHz/step)	4
		20	SQL TYPE	0: OFF 1: ENC 2: TSQ 3: DCS 4: PR FREQ 5: REV TONE	1
		21	TONE FREQ	00: 67.0 - 49: 254.1Hz	2
		22	DCS CODE	00: 023 - 103: 754	2
		23	DCS RX REVERS	0: NORMAL 1: REVERS 2: BOTH	1
		24	DCS TX REVERS	0: NORMAL 1: REVERS	1
		25	PR FREQ	300 - 3000 Hz (P4= 0300 - 3000, 100 Hz/step)	4
		26	DTMF DELAY	0: 50 1: 250 2: 450 3: 750 4: 1000 (ms)	1
		27	DTMF SPEED	0: 50 1: 100 (ms)	1
		28	DTMF MEMORY1	0 - 9, A, B, C, D, *, #, - (space) (Up to 16 characters)	16
		29	DTMF MEMORY2	0 - 9, A, B, C, D, *, #, - (space) (Up to 16 characters)	16
		30	DTMF MEMORY3	0 - 9, A, B, C, D, *, #, - (space) (Up to 16 characters)	16
		31	DTMF MEMORY4	0 - 9, A, B, C, D, *, #, - (space) (Up to 16 characters)	16
		32	DTMF MEMORY5	0 - 9, A, B, C, D, *, #, - (space) (Up to 16 characters)	16
		33	DTMF MEMORY6	0 - 9, A, B, C, D, *, #, - (space) (Up to 16 characters)	16
		34	DTMF MEMORY7	0 - 9, A, B, C, D, *, #, - (space) (Up to 16 characters)	16
		35	DTMF MEMORY8	0 - 9, A, B, C, D, *, #, - (space) (Up to 16 characters)	16
		36	DTMF MEMORY9	0 - 9, A, B, C, D, *, #, - (space) (Up to 16 characters)	16
		37	DTMF MEMORY10	0 - 9, A, B, C, D, *, #, - (space) (Up to 16 characters)	16

CAT (Computer Aided Transceiver) Operation

Table 3 (MENU Chart)					
P1	**P2**	**P3**	**Function**	**P4**	**Digits**
01 (RADIO SETTING)	04 (MODE DATA)	01	AF TREBLE GAIN	-20 - -00 (or +00) - +10 (P4 = -20 - -00 or +00 - +10)	3
		02	AF MIDDLE TONE GAIN	-20 - -00 (or +00) - +10 (P4 = -20 - -00 or +00 - +10)	3
		03	AF BASS GAIN	-20 - -00 (or +00) - +10 (P4 = -20 - -00 or +00 - +10)	3
		04	AGC FAST DELAY	20 - 4000 msec (P4= 0020 - 4000, 20 msec/step)	4
		05	AGC MID DELAY	20 - 4000 msec (P4= 0020 - 4000, 20 msec/step)	4
		06	AGC SLOW DELAY	20 - 4000 msec (P4= 0020 - 4000, 20 msec/step)	4
		07	LCUT FREQ	00: OFF 01: 100 Hz - 19: 1000 Hz (50 Hz steps)	2
		08	LCUT SLOPE	0: 6 dB/oct 1: 18 dB/oct	1
		09	HCUT FREQ	00: OFF 01: 700 Hz - 67: 4000 Hz (50 Hz steps)	2
		10	HCUT SLOPE	0: 6 dB/oct 1: 18 dB/oct	1
		11	USB OUT LEVEL	000 - 100	3
		12	TX BPF SEL	0: 50 - 3050 1: 100 - 2900 2: 200 - 2800 3: 300 - 2700 4: 400 - 2600	1
		13	MOD SOURCE	0: MIC 1: USB 2: Bluetooth 3: AUTO	1
		14	USB MOD GAIN	000 - 100	3
		15	RPTT SELECT	0: OFF 1: RTS 2: DTR	1
		16	NAR WIDTH	00: 50 01:100 02: 150 03: 200 04: 250 05: 300 06: 350 07: 400 08: 450 09: 500 10: 600 11: 800 12: 1200 13: 1400 14: 1700 15: 2000 16: 2400 17: 3000 18: 3200 19: 3500 20: 4000 (Hz)	2
		17	PSK TONE	0: 1000Hz 1: 1500Hz 2: 2000Hz	1
		18	DATA SHIFT (SSB)	0 - 3000 Hz (P4 = 0000 - 3000, 10 Hz steps)	4
	05 (MODE RTTY)	01	AF TREBLE GAIN	-20 - -00 (or +00) - +10 (P4 = -20 - -00 or +00 - +10)	3
		02	AF MIDDLE TONE GAIN	-20 - -00 (or +00) - +10 (P4 = -20 - -00 or +00 - +10)	3
		03	AF BASS GAIN	-20 - -00 (or +00) - +10 (P4 = -20 - -00 or +00 - +10)	3
		04	AGC FAST DELAY	20 - 4000 msec (P4= 0020 - 4000, 20 msec/step)	4
		05	AGC MID DELAY	20 - 4000 msec (P4= 0020 - 4000, 20 msec/step)	4
		06	AGC SLOW DELAY	20 - 4000 msec (P4= 0020 - 4000, 20 msec/step)	4
		07	LCUT FREQ	00: OFF 01: 100 Hz - 19: 1000 Hz (50 Hz steps)	2
		08	LCUT SLOPE	0: 6 dB/oct 1: 18 dB/oct	1
		09	HCUT FREQ	00: OFF 01: 700 Hz - 67: 4000 Hz (50 Hz steps)	2
		10	HCUT SLOPE	0: 6 dB/oct 1: 18 dB/oct	1
		11	USB OUT LEVEL	000 - 100	3
		12	RPTT SELECT	0: OFF 1: RTS 2: DTR	1
		13	NAR WIDTH	00: 50 01:100 02: 150 03: 200 04: 250 05: 300 06: 350 07: 400 08: 450 09: 500 10: 600 11: 800 12: 1200 13: 1400 14: 1700 15: 2000 16: 2400 17: 3000 18: 3200 19: 3500 20: 4000 (Hz)	2
		14	MARK FREQUENCY	0: 1275 Hz 1: 2125 Hz	1
		15	SHIFT FREQUENCY	0: 170 Hz 1: 200 Hz 2: 425 Hz 3: 850 Hz	1
		16	POLARITY-TX	0: NOR 1: REV	1
	06 (DIGITAL)	01	DIGITAL POPUP	00: OFF 01: 2 sec - 59: 60sec 60: CONTINUE	2
		02	LOCATION SERVICE	0: OFF 1: ON	1
		03	STANDBY BEEP	0: OFF 1: ON	1
		04	DP-ID LIST	—	-
		05	RADIO ID	—	-
02 (CW SETTING)	01 (MODE CW)	01	AF TREBLE GAIN	-20 - -00 (or +00) - +10 (P4 = -20 - -00 or +00 - +10)	3
		02	AF MIDDLE TONE GAIN	-20 - -00 (or +00) - +10 (P4 = -20 - -00 or +00 - +10)	3
		03	AF BASS GAIN	-20 - -00 (or +00) - +10 (P4 = -20 - -00 or +00 - +10)	3
		04	AGC FAST DELAY	20 - 4000 msec (P4= 0020 - 4000, 20 msec/step)	4
		05	AGC MID DELAY	20 - 4000 msec (P4= 0020 - 4000, 20 msec/step)	4
		06	AGC SLOW DELAY	20 - 4000 msec (P4= 0020 - 4000, 20 msec/step)	4
		07	LCUT FREQ	00: OFF 01: 100 Hz - 19: 1000 Hz (50 Hz steps)	2
		08	LCUT SLOPE	0: 6 dB/oct 1: 18 dB/oct	1
		09	HCUT FREQ	00: OFF 01: 700 Hz - 67: 4000 Hz (50 Hz steps)	2
		10	HCUT SLOPE	0: 6 dB/oct 1: 18 dB/oct	1
		11	USB OUT LEVEL	000 - 100	3
		12	RPTT SELECT	0: OFF 1: RTS 2: DTR	1
		13	NAR WIDTH	00: 50 01:100 02: 150 03: 200 04: 250 05: 300 06: 350 07: 400 08: 450 09: 500 10: 600 11: 800 12: 1200 13: 1400 14: 1700 15: 2000 16: 2400 17: 3000 18: 3200 19: 3500 20: 4000 (Hz)	2
		14	PC KEYING	0: OFF 1: RTS 2: DTR	1
		15	CW BK-IN TYPE	0: SEMI 1: FULL	1
		16	CW FREQ DISPLAY	0: DIRECT FREQ 1: PITCH OFFSET	1
		17	QSK DELAY TIME	0: 15 msec 1: 20 msec 2: 25 mesc 3: 30 msec	1
		18	CW INDICATOR	0: OFF 1: ON	1
	02 (KEYER)	01	KEYER TYPE	0: OFF 1: BUG 2: ELEKEY-A 3: ELEKEY-B 4: ELEKEY-Y 5: ACS	1
		02	KEYER DOT/DASH	0: NOR 1: REV	1
		03	CW WEIGHT	2.5 - 4.5 (P4 = 25 - 45)	2
		04	NUMBER STYLE	0: 1290 1: AUNO 2: AUNT 3: A2NO 4: A2NT 5: 12NO 6: 12NT	1
		05	CONTEST NUMBER	0001 - 9999	4
		06	CW MEMORY 1	0: TEXT 1: MESSAGE	1
		07	CW MEMORY 2	0: TEXT 1: MESSAGE	1
		08	CW MEMORY 3	0: TEXT 1: MESSAGE	1
		09	CW MEMORY 4	0: TEXT 1: MESSAGE	1
		10	CW MEMORY 5	0: TEXT 1: MESSAGE	1
		11	REPEAT INTERVAL	1 - 60 sec (P4 = 01 - 60)	2

CAT (Computer Aided Transceiver) Operation

Table 3 (MENU Chart)					
P1	**P2**	**P3**	**Function**	**P4**	**Digits**
03 (OPERATION SETTING)	01 (GENERAL)	01	BEEP LEVEL	000 - 100	3
		02	RF/SQL VR	0: RF 1: SQL 2:SQL (FM MODE only)	1
		03	TUN/LIN PORT SELECT	0: EXT-TUNER 1: LINEAR 2: CAT-3 3: GPO	1
		04	TUNER SELECT	0: INT 1: INT (FAST) 2: EXT 3: ATAS	1
		05	CAT-1 RATE	0: 4800 bps 1: 9600 bps 2: 19200 bps 3: 38400 bps 4:115200 bps	1
		06	CAT-1 TIME OUT TIMER	0: 10 msec 1: 100 msec 2: 1000 msec 3: 3000 msec	1
		07	CAT-1 CAT-3 STOP BIT	0: 1 bit 1: 2 bit	1
		08	CAT-2 RATE	0: 4800 bps 1: 9600 bps 2: 19200 bps 3: 38400 bps 4:115200 bps	1
		09	CAT-2 TIME OUT TIMER	0: 10 msec 1: 100 msec 2: 1000 msec 3: 3000 msec	1
		10	CAT-3 RATE	0: 4800 bps 1: 9600 bps 2: 19200 bps 3: 38400 bps 4:115200 bps	1
		11	CAT-3 TIME OUT TIMER	0: 10 msec 1: 100 msec 2: 1000 msec 3: 3000 msec	1
		12	TX TIME OUT TIMER	00: OFF 01: 01 min - 30: 30 min (P4= 00 - 30)	2
		13	REF FREQ ADJ	-25 - +00 (or -00) - +25 (P4= -25 - +00 or -00 - +25)	3
		14	CHARGE CONTROL	0: OFF 1: ON	1
		15	SUB BAND MUTE	0: OFF 1: ON	1
		16	SPEAKER SELECT	0: Auto 1: INT 2: BOTH	1
		17	DITHER	0: OFF 1: ON	1
	02 (BAND-SCAN)	01	QMB CH	0: 5ch 1: 10ch	1
		02	BAND STACK	0: OFF 1: ON	1
		03	BAND EDGE	0: OFF 1: ON	1
		04	SCAN RESUME	0: BUSY 1: HOLD 2: 1sec 3: 3sec 4: 5sec	1
	03 (RX-DSP)	01	IF NOTCH WIDTH	0: NARROW 1: WIDE	1
		02	NB REJECTION	0: LOW 1: MID 2: HIGH	1
		03	NB WIDTH	0: NARROW 1: MEDIUM 2: WIDE	1
		04	APF WIDTH	0: NARROW 1: MEDIUM 2: WIDE	1
		05	CONTOUR LEVEL	-40 - -00 (or +00) - +20 (P4 = -40 - -00 or +00 - +20)	3
		06	CONTOUR WIDTH	01 - 11	2
	04 (TX AUDIO)	01	AMC RELEASE TIME	0: FAST 1: MID 2: SLOW	1
		02	PRMTRC EQ1 FREQ	00 : OFF 01: 100 Hz - 07: 700 Hz (100 Hz steps)	2
		03	PRMTRC EQ1 LEVEL	-20 - -00 (or +00) - +10 (P4 = -20 - -00 or +00 - +10)	3
		04	PRMTRC EQ1 BWTH	00 - 10	2
		05	PRMTRC EQ2 FREQ	00: OFF 01: 700 Hz - 09: 1500 Hz (100 Hz steps)	2
		06	PRMTRC EQ2 LEVEL	-20 - -00 (or +00) - +10 (P4 = -20 - -00 or +00 - +10)	3
		07	PRMTRC EQ2 BWTH	00 - 10	2
		08	PRMTRC EQ3 FREQ	00 : OFF 01: 1500 Hz - 18: 3200 Hz (100 Hz steps)	2
		09	PRMTRC EQ3 LEVEL	-20 - -00 (or +00) - +10 (P4 = -20 - -00 or +00 - +10)	3
		10	PRMTRC EQ3 BWTH	00 - 10	2
		11	P PRMTRC EQ1 FREQ	00 : OFF 01: 100 Hz - 07: 700 Hz (100 Hz steps)	2
		12	P PRMTRC EQ1 LEVEL	-20 - -00 (or +00) - +10 (P4 = -20 - -00 or +00 - +10)	3
		13	P PRMTRC EQ1 BWTH	00 - 10	2
		14	P PRMTRC EQ2 FREQ	00: OFF 01: 700 Hz - 09: 1500 Hz (100 Hz steps)	2
		15	P PRMTRC EQ2 LEVEL	-20 - -00 (or +00) - +10 (P4 = -20 - -00 or +00 - +10)	3
		16	P PRMTRC EQ2 BWTH	00 - 10	2
		17	P PRMTRC EQ3 FREQ	00 : OFF 01: 1500 Hz - 18: 3200 Hz (100 Hz steps)	2
		18	P PRMTRC EQ3 LEVEL	-20 - -00 (or +00) - +10 (P4 = -20 - -00 or +00 - +10)	3
		19	P PRMTRC EQ3 BWTH	00 - 10	2
	05 (TX GENERAL)	01	MAX POWER (BAT)	005 - 060 (P4 = 005 - 060)	3
		02	QRP MODE	0: OFF 1: ON	1
		03	HF MAX POWER	005 - 010 (P4 = 005 - 010)	3
		04	50M MAX POWER	005 - 010 (P4 = 005 - 010)	3
		05	70M MAX POWER	005 - 060 (P4 = 005 - 060)	3
		06	144M MAX POWER	005 - 100 (P4 = 005 - 100)	3
		07	430M MAX POWER	005 - 100 (P4 = 005 - 100)	3
		08	AM HF/50 MAX POWER	005 - 025 (P4 = 005 - 025)	3
		09	AM V/U MAX POWER	005 - 025 (P4 = 005 - 025)	3
		10	VOX SELECT	0: MIC 1: USB 2: Bluetooth	1
		11	EMERGENCY FREQ TX	0: OFF 1: ON	1
		12	TX INHIBIT	0: OFF 1: ON	1
		13	METER DETECTOR	0: AVERAGE 1: PEAK	1
	06 (KEY/DIAL)	01	SSB/CW DIAL STEP	0: 5 1: 10 2: 20 (Hz)	1
		02	RTTY/PSK DIAL STEP	0: 5 1: 10 2: 20 (Hz)	1
		03	FM DIAL STEP	0: 5 1: 6.25 2: 10 3: 12.5 4: 20 5: 25 (kHz) 6: Auto	1
		04	CH STEP	0: 1 1: 2.5 2: 5 3: 10 (kHz)	1
		05	AM CH STEP	0: 2.5 1: 5 2: 9 3: 10 4: 12.5 5: 25 (kHz)	1
		06	FM CH STEP	0: 5 1: 6.25 2: 10 3: 12.5 4: 20 5: 25 (kHz)	1
		07	MAIN STEPS PER REV.	0: 50 1: 100 2: 200	1
		08	MIC P1	00:LOCK 01:QMB 02:>/< 03:V/M 04:TUNER 05:VOX/MOX 06:MODE 07:ZIN/SPOT 08:SPLIT 09:FINE 10:NAR 11:NB 12:DNR 13:FREQ UP 14:FREQ DOWN 15:BAND UP 16:BAND DOWN 17 ATT 18:IPO 19:DNF 20:AGC	2
		09	MIC P2		
		10	MIC P3		
		11	MIC P4		
		12	MIC UP		
		13	MIC DOWN		
		14	MIC SCAN	0: OFF 1: ON	1

CAT (Computer Aided Transceiver) Operation

Table 3 (MENU Chart)					
P1	**P2**	**P3**	**Function**	**P4**	**Digits**
03 (OPERATION SETTING)	07 (OPTION)	01	TUNER TYPE SEL ANT1	0: INT 1: INT(FAST) 2: EXT 3: ATAS	1
		02	TUNER TYPE SEL ANT2	0: INT 1: INT(FAST) 2: EXT 3: ATAS	1
		03	ANT2 OPERATION	0: TRX 1: TX-ANT1, RX-ANT2 2: TRX-ANT1, RX-ANT2	1
		04	HF ANT SELECT	0: ANT1 1: ANT2	1
		05	HF MAX POWER	005 - 100 (P4 = 005 - 100)	3
		06	50M MAX POWER	005 - 100 (P4 = 005 - 100)	3
		07	70M MAX POWER	005 - 050 (P4 = 005 - 050)	3
		08	144M MAX POWER	005 - 050 (P4 = 005 - 050)	3
		09	430M MAX POWER	005 - 050 (P4 = 005 - 050)	3
		10	AM MAX POWER	005 - 025 (P4 = 005 - 025)	3
		11	AM V/U MAX POWER	005 - 013 (P4 = 005 - 013)	3
		12	GPS	0: OFF 1: ON	1
		13	GPS PINNING	0: OFF 1: ON	1
		14	GPS BAUDRATE	0: 4800 1: 9600 2: 19200 3: 38400 4: 115200 (bps)	1
		15	BLUETOOTH	—	-
04 (DISPLAY SETTING)	01 (DISPLAY)	01	MY CALL	Up to 10 characters	10
		02	MY CALL TIME	0: OFF 1: 1 2: 2 3: 3 4: 4 5: 5 (sec)	1
		03	POP-UP TIME	0: FAST 1: MID 2: SLOW	1
		04	SCREEN SAVER	0: OFF 1: 1 2: 2 3: 5 4: 15 5: 30 6: 60 (min)	1
		05	SCREEN SAVER(BAT)	0: OFF 1: 1 2: 2 3: 5 4: 15 5: 30 6: 60 (min)	1
		06	SAVER TYPE	0: Logo 1: DIMMER 2: DISP OFF	1
		07	AUTO POWER OFF	0: OFF 1: 0.5 - 24: 12 (hour)	1
		08	LED DIMMER	00 - 20	2
	02 (UNIT)	01	POSITION UNIT	0: dd°MM.mm'. 1: dd°mm'ss''	1
		02	DISTANCE UNIT	0: km 1: mile	1
		03	SPEED UNIT	0: km/h 1: knot 3: mph	1
		04	ALTITUDE UNIT	0: m 1: ft	1
		05	TEMP UNIT	0: °C 1: °F	1
		06	RAIN UNIT	0: mm 1: INCH	1
		07	WIND UNIT	0: m/s 2: mph	1
	03 (SCOPE)	01	RBW	0: HIGH 1: MID 2: LOW	1
		02	SCOPE CTR	0: FILTER 1: CARRIER	1
		03	2D DISP SENSITIVITY	0: NORMAL 1: HI	1
		04	3DSS DISP SENSITIVITY	0: NORMAL 1: HI	1
		05	AVERAGE	0: OFF 1: 2 2: 4 3: 8	1
	04 (VFO IND COLOR)	01	VMI COLOR VFO	0: BLUE 1: GREEN 2: WHITE 3: NONE	1
		02	VMI COLOR MEMORY	0: BLUE 1: GREEN 2: WHITE 3: NONE	1
		03	VMI COLOR CLAR	0: RED 1: NONE	1
05 (EXTENSION SETTING)	01 (DATE&TIME)	01	TIME ZONE	-12 (-120) - 0 - +14 (+140) (h) (0.5h steps)	4
		02	DAY	—	-
		03	MONTH	—	-
		04	YEAR	—	-
		05	HOUR	—	-
		06	MINUTE	—	-
		07	GPS TIME SET	0: AUTO 1: MANUAL	1
	01 (MY POSITION)	08	MY POSITION	0: GPS 1: MANUAL	1
		09	MY POSITION LATITUDE	Latitude: x xx°xx' xx"	-
		10	MY POSITION LONGITUDE	Longitude: x xxx°xx' xx"	-
	02 (SD CARD)	01	MEM LIST LOAD	—	-
		02	MEM LIST SAVE	—	-
		03	MENU LOAD	—	-
		04	MENU SAVE	—	-
		05	INFORMATIONS	—	-
		06	FIRMWARE UPDATE	—	-
		07	FORMAT	—	-
	03 (SOFT VERSION)	01	SOFT VERSION	—	-
	04 (CALIBRATION)	01	CALIBRATION	—	-
	05 (RESET)	01	MEMORY CLEAR	—	-
		02	MENU CLEAR	—	-
		03	ALL RESET	—	-
	05 (CERTIFICATION)	04	CERTIFICATION	—	-

CAT (Computer Aided Transceiver) Operation

Table 3 (MENU Chart)					
P1	**P2**	**P3**	**Function**	**P4**	**Digits**
06 (APRS SETTING)	01 (GENERAL)	01	MODEM SELECT	0: OFF 1: AUTO 2: MAIN 3: SUB	1
		02	MODEM TYPE	0: 1200bps 1: 9600bps	1
		03	APRS AF MUTE	0: OFF 1: ON	1
		04	APRS TX DELAY	0: 100ms 1: 200ms 2: 300ms 3: 400ms 4: 500ms 5: 750ms 6: 1000ms	1
		05	CALLSIGN(APRS)	xxxxxx-xx	8
		09	APRS DESTINATION	APYX01 (fix)	6
	02 (MSG TEMPLATE)	01	MESSAGE TEXT1	Up to 16 characters (ASCII)	16
		02	MESSAGE TEXT2	Up to 16 characters (ASCII)	16
		03	MESSAGE TEXT3	Up to 16 characters (ASCII)	16
		04	MESSAGE TEXT4	Up to 16 characters (ASCII)	16
		05	MESSAGE TEXT5	Up to 16 characters (ASCII)	16
		06	MESSAGE TEXT6	Up to 16 characters (ASCII)	16
		07	MESSAGE TEXT7	Up to 16 characters (ASCII)	16
		08	MESSAGE TEXT8	Up to 16 characters (ASCII)	16
	03 (MY SYMBOL)	01	MY SYNBOL	0: ICON1 1: ICON2 2: ICON3 3: USER	1
		02	ICON1	See Table 4 (see page 16)	2
		03	ICON2	See Table 4 (see page 16)	2
		04	ICON3	See Table 4 (see page 16)	2
		05	USER	See Table 4 (see page 16)	2
	04 (DIGI PATH)	01	PATH SELECT	0: OFF 1: WIDE1-1 2: WIDE1-1.WIDE2-1	1
07 (APRS BEACON)	01 (BEACON SET.)	01	BEACON TYPE	0: OFF 1: AUTO 2: SMART	1
		02	INFO AMBIGUITY	0: OFF 1: 1dig 2: 2dig 3: 3dig 4: 4dig	1
		03	INFO SPEED/COURSE	0: OFF 1: ON	1
		04	INFO ALTITUDE	0: OFF 1: ON	1
		05	POSITION COMMENT	00: Off duty 01: En Route 02: In Service 03: Returning 04: Committed 05: Special 06: Priority 07: Custom 0 08: Custom 1 09: Custom 2 10: Custom 3 11: Custom 4 12: Custom 5 13: Custom 6 14: EMERGENCY!	2
		06	EMERGENCY BEACON	0: OFF 1: ON	1
	02 (AUTO BEACON)	01	INTERVAL TIME	0:30sec / 1:1min / 2:2min / 3:3min / 4:5min / 5:10min / 6:15min / 7:20min / 8:30min / 9:60min	1
		02	PROPORTIONAL	0: OFF 1: ON	1
		03	DECAY	0: OFF 1:ON	1
		04	AUTO LOW SPEED	01 - 99 (km/h or mph (1km or 1mph/Step)	2
		05	BEACON DELAY	005 - 180 (sec)	3
	03 (SmartBeac.)	01	SMART LOW SPEED	02 - 30 (km/h or mph (1km or 1mph/Step)	2
		02	SMART HIGH SPEED	03 - 90 (km/h or mph (1km or 1mph/Step)	2
		03	SMART SLOW RATE	001 - 100 (min) (1min/step)	3
		04	SMART FAST RATE	010 - 180 (sec) (1sec/step)	3
		05	SMART TURN ANGLE	05 - 90 (degree) (1degree/step)	2
		06	SMART TURN SLOPE	001 - 255 (1/step)	3
		07	SMART TURN TIME	005 - 180 (sec) (1sec/step)	3
	04 (BEACON TEXT)	01	STATUS TEXT SELECT	0: OFF 1: TEXT1 2: TEXT2 3: TEXT3 4: TEXT4 5: TEXT5	1
		02	TX RATE	0: 1/1 1: 1/2 2: 1/3 3: 1/4 4: 1/5 5: 1/6 6: 1/7 7: 1/8	1
		03	BEACON FREQUENCY	0: None 1: FREQUENCY 2: FREQ & SQL & SHIFT	1
		04	STATUS TEXT1	Up to 60 characters (ASCII)	60
		05	STATUS TEXT2	Up to 60 characters (ASCII)	60
		06	STATUS TEXT3	Up to 60 characters (ASCII)	60
		07	STATUS TEXT4	Up to 60 characters (ASCII)	60
		08	STATUS TEXT5	Up to 60 characters (ASCII)	60
08 (APRS FILTER)	01 (LIST SETTING)	01	STATION LIST SORT	0: TIME 1: CALLSIGN 2: DISTANCE	1
	02 (STATION LIST)	01	Mic-E	0: OFF 1: ON	1
		02	POSITION	0: OFF 1: ON	1
		03	WEATHER	0: OFF 1: ON	1
		04	OBJECT	0: OFF 1: ON	1
		05	ITEM	0: OFF 1: ON	1
		06	STATUS	0: OFF 1: ON	1
		07	OTHER	0: OFF 1: ON	1
		08	ALTNET	0: OFF 1: ON	1
	03 (POPUP)	01	BEACON	0: OFF 1: 3sec 2: 5sec 3: 10sec 4: HOLD	1
		02	MESSAGE	0: OFF 1: 3sec 2: 5sec 3: 10sec 4: HOLD	1
		03	MY PACKET	0: OFF 1: ON	1
	04 (RINGER)	01	TX BEACON	0: OFF 1: ON	1
		02	RX BEACON	0: OFF 1: ON	1
		03	TX MESSAGE	0: OFF 1: ON	1
		04	RX MESSAGE	0: OFF 1: ON	1
		07	MY PACKET	0: OFF 1: ON	1
	06 (MSG FIL.)	01	MESSAGE GROUP1	Up to 9 characters (ASCII)	9
		02	MESSAGE GROUP2	Up to 9 characters (ASCII)	9
		03	MESSAGE GROUP3	Up to 9 characters (ASCII)	9
		04	MESSAGE GROUP4	Up to 9 characters (ASCII)	9
		05	MESSAGE GROUP5	Up to 9 characters (ASCII)	9
		06	MESSAGE GROUP6	Up to 9 characters (ASCII)	9
		07	BULLETIN 1	Up to 9 characters (ASCII)	9
		08	BULLETIN 2	Up to 9 characters (ASCII)	9
		09	BULLETIN 3	Up to 9 characters (ASCII)	9

Table 3 (MENU Chart)					
P1	P2	P3	Function	P4	Digits
09 (PRESET)	01 (PRESET1)	01	PRESET NAME	Up to 12 characters	12
		02	CAT-1 RATE	0: 4800 bps 1: 9600 bps 2: 19200 bps 3: 38400 bps 4:115200 bps	1
		03	CAT-1 TIME OUT TIMER	0: 10 msec 1: 100 msec 2: 1000 msec 3: 3000 msec	1
		04	CAT-1 CAT-3 STOP BIT	0: 1 bit 1: 2 bit	1
		05	AGC FAST DELAY	20 - 4000 (P4 = 0020 - 4000, 20 msec steps)	4
		06	AGC MID DELAY	20 - 4000 (P4 = 0020 - 4000, 20 msec steps)	4
		07	AGC SLOW DELAY	20 - 4000 (P4 = 0020 - 4000, 20 msec steps)	4
		08	LCUT FREQ	00: OFF 01: 100 Hz - 19: 1000 Hz (50 Hz steps)	2
		09	LCUT SLOPE	0: 6dB/oct 1: 18dB/oct	1
		10	HCUT FREQ	00: OFF 01:700Hz - 67:4000Hz (50 Hz steps)	2
		11	HCUT SLOPE	0: 6dB/oct 1: 18dB/oct	1
		12	USB OUT LEVEL	000 - 100	3
		13	TX BPF SEL	0: 50 - 3050 1: 100 - 2900 2: 200 - 2800 3: 300 - 2700 4: 400 - 2600 Hz	1
		14	MOD SOURCE	0: MIC 1: USB 2: REAR (RTTY/DATA Jack) 3: AUTO	1
		15	USB MOD GAIN	000 - 100	3
		16	RPTT SELECT	0: OFF 1: RTS 2:DTR 3:DAKY (RTTY/DATA Jack)	1
	02 (PRESET2)	01	PRESET NAME	Up to 12 characters	12
		02	CAT-1 RATE	0: 4800 bps 1: 9600 bps 2: 19200 bps 3: 38400 bps 4:115200 bps	1
		03	CAT-1 TIME OUT TIMER	0: 10 msec 1: 100 msec 2: 1000 msec 3: 3000 msec	1
		04	CAT-1 CAT-3 STOP BIT	0: 1 bit 1: 2 bit	1
		05	AGC FAST DELAY	20 - 4000 (P4 = 0020 - 4000, 20 msec steps)	4
		06	AGC MID DELAY	20 - 4000 (P4 = 0020 - 4000, 20 msec steps)	4
		07	AGC SLOW DELAY	20 - 4000 (P4 = 0020 - 4000, 20 msec steps)	4
		08	LCUT FREQ	00: OFF 01: 100 Hz - 19: 1000 Hz (50 Hz steps)	2
		09	LCUT SLOPE	0: 6dB/oct 1: 18dB/oct	1
		10	HCUT FREQ	00: OFF 01:700Hz - 67:4000Hz (50 Hz steps)	2
		11	HCUT SLOPE	0: 6dB/oct 1: 18dB/oct	1
		12	USB OUT LEVEL	000 - 100	3
		13	TX BPF SEL	0: 50 - 3050 1: 100 - 2900 2: 200 - 2800 3: 300 - 2700 4: 400 - 2600 Hz	1
		14	MOD SOURCE	0: MIC 1: USB 2: REAR (RTTY/DATA Jack) 3: AUTO	1
		15	USB MOD GAIN	000 - 100	3
		16	RPTT SELECT	0: OFF 1: RTS 2:DTR 3:DAKY (RTTY/DATA Jack)	1
	03 (PRESET3)	01	PRESET NAME	Up to 12 characters	12
		02	CAT-1 RATE	0: 4800 bps 1: 9600 bps 2: 19200 bps 3: 38400 bps 4:115200 bps	1
		03	CAT-1 TIME OUT TIMER	0: 10 msec 1: 100 msec 2: 1000 msec 3: 3000 msec	1
		04	CAT-1 CAT-3 STOP BIT	0: 1 bit 1: 2 bit	1
		05	AGC FAST DELAY	20 - 4000 (P4 = 0020 - 4000, 20 msec steps)	4
		06	AGC MID DELAY	20 - 4000 (P4 = 0020 - 4000, 20 msec steps)	4
		07	AGC SLOW DELAY	20 - 4000 (P4 = 0020 - 4000, 20 msec steps)	4
		08	LCUT FREQ	00: OFF 01: 100 Hz - 19: 1000 Hz (50 Hz steps)	2
		09	LCUT SLOPE	0: 6dB/oct 1: 18dB/oct	1
		10	HCUT FREQ	00: OFF 01:700Hz - 67:4000Hz (50 Hz steps)	2
		11	HCUT SLOPE	0: 6dB/oct 1: 18dB/oct	1
		12	USB OUT LEVEL	000 - 100	3
		13	TX BPF SEL	0: 50 - 3050 1: 100 - 2900 2: 200 - 2800 3: 300 - 2700 4: 400 - 2600 Hz	1
		14	MOD SOURCE	0: MIC 1: USB 2: REAR (RTTY/DATA Jack) 3: AUTO	1
		15	USB MOD GAIN	000 - 100	3
		16	RPTT SELECT	0: OFF 1: RTS 2:DTR 3:DAKY (RTTY/DATA Jack)	1
	04 (PRESET4)	01	PRESET NAME	Up to 12 characters	12
		02	CAT-1 RATE	0: 4800 bps 1: 9600 bps 2: 19200 bps 3: 38400 bps 4:115200 bps	1
		03	CAT-1 TIME OUT TIMER	0: 10 msec 1: 100 msec 2: 1000 msec 3: 3000 msec	1
		04	CAT-1 CAT-3 STOP BIT	0: 1 bit 1: 2 bit	1
		05	AGC FAST DELAY	20 - 4000 (P4 = 0020 - 4000, 20 msec steps)	4
		06	AGC MID DELAY	20 - 4000 (P4 = 0020 - 4000, 20 msec steps)	4
		07	AGC SLOW DELAY	20 - 4000 (P4 = 0020 - 4000, 20 msec steps)	4
		08	LCUT FREQ	00: OFF 01: 100 Hz - 19: 1000 Hz (50 Hz steps)	2
		09	LCUT SLOPE	0: 6dB/oct 1: 18dB/oct	1
		10	HCUT FREQ	00: OFF 01:700Hz - 67:4000Hz (50 Hz steps)	2
		11	HCUT SLOPE	0: 6dB/oct 1: 18dB/oct	1
		12	USB OUT LEVEL	000 - 100	3
		13	TX BPF SEL	0: 50 - 3050 1: 100 - 2900 2: 200 - 2800 3: 300 - 2700 4: 400 - 2600 Hz	1
		14	MOD SOURCE	0: MIC 1: USB 2: REAR (RTTY/DATA Jack) 3: AUTO	1
		15	USB MOD GAIN	000 - 100	3
		16	RPTT SELECT	0: OFF 1: RTS 2:DTR 3:DAKY (RTTY/DATA Jack)	1
	05 (PRESET5)	01	PRESET NAME	Up to 12 characters	12
		02	CAT-1 RATE	0: 4800 bps 1: 9600 bps 2: 19200 bps 3: 38400 bps 4:115200 bps	1
		03	CAT-1 TIME OUT TIMER	0: 10 msec 1: 100 msec 2: 1000 msec 3: 3000 msec	1
		04	CAT-1 CAT-3 STOP BIT	0: 1 bit 1: 2 bit	1
		05	AGC FAST DELAY	20 - 4000 (P4 = 0020 - 4000, 20 msec steps)	4
		06	AGC MID DELAY	20 - 4000 (P4 = 0020 - 4000, 20 msec steps)	4
		07	AGC SLOW DELAY	20 - 4000 (P4 = 0020 - 4000, 20 msec steps)	4
		08	LCUT FREQ	00: OFF 01: 100 Hz - 19: 1000 Hz (50 Hz steps)	2
		09	LCUT SLOPE	0: 6dB/oct 1: 18dB/oct	1
		10	HCUT FREQ	00: OFF 01:700Hz - 67:4000Hz (50 Hz steps)	2
		11	HCUT SLOPE	0: 6dB/oct 1: 18dB/oct	1
		12	USB OUT LEVEL	000 - 100	3
		13	TX BPF SEL	0: 50 - 3050 1: 100 - 2900 2: 200 - 2800 3: 300 - 2700 4: 400 - 2600 Hz	1
		14	MOD SOURCE	0: MIC 1: USB 2: REAR (RTTY/DATA Jack) 3: AUTO	1
		15	USB MOD GAIN	000 - 100	3
		16	RPTT SELECT	0: OFF 1: RTS 2:DTR 3:DAKY (RTTY/DATA Jack)	1

CAT (Computer Aided Transceiver) Operation

Table 3 (MENU Chart)					
P1	P2	P3	Function	P4	Digits
11 (BLUETOOTH)	01 (Bluetooth)	01	Bluetooth	0: OFF 1: ON	1
		02	Device Name : Status	–	1
		03	DEVICE LIST	–	-
		04	AUDIO	0: AUTO 1: FIX	1

Table 4 (MY SYMBOL Chart)											
P4	ICON	P4	ICON	P4	ICON	P4	ICON	P4	ICON	P4	ICON
/ 0	Circle	/ _	Weather Station	/ j	Jeep	/ u	Bus	\ .	Ambiguous	\ u	Overlayed Truck
/ '	Small Aircraft	/ <	Motorcycle	/ K	School	/ V	ATV	\ ;	Park/Picnic Area	\ v	Overlayed Van
/ -	House QTH (VHF)	/ =	Railroad Engine	/ k	School	/ v	ATV	\ ^	Aircraft	\ W	NWS Site
/ #	DIGI	/ >	Car	/ m	Mic-E Repeater	/ W	NWS Site	\ _	WX Site	\ x	Obstruction
/ &	HF Gateway	/ a	Ambulance	/ O	Balloon	/ X	Helicopter	\ =	APRStt	\ Y	Radios & Devices
/ .	X	/ b	Bycycle	/ P	Police	/ Y	Yacht(sailboat)	\ >	Overlayed Car	E 0	EchoLink
/ :	Fire	/ C	Canoe	/ R	REC.Vehicle	/ y	Yacht(sailboat)	\ A	APRStt	I 0	IRLP
/ ;	Campground	/ E	Eyeball	/ r	REC.Vehicle	\ 0	Circle	\ K	Kenwood HT	K Y	Kenwood Radios
/ [	Human/Person	/ f	Fire Truck	/ s	Ship(powerboat)	\ -	House (HF)	\ m	Value Signpost	W 0	WIRES
/ \	Triangle(DF)	/ g	Glider	/ T	SSTV	\ #	Overlay DIGI	\ n	Overlay Triangle	Y Y	Yaesu Radios
/ ^	Large Aircraft	/ I	TCP/IP	/ U	Bus	\ &	Overlay Gate	\ s	Overlayed Ship	–	–

FA	**FREQUENCY VFO MAIN-SIDE**												
Set	1	2	3	4	5	6	7	8	9	10	11	12	P1 000030000 - 470000000 (Hz)
	F	**A**	P1	P1	P1	P1	P1	P1	P1	P1	P1	;	
Read	1	2	3	4	5	6	7	8	9	10	11	12	
	F	**A**	;										
Answer	1	2	3	4	5	6	7	8	9	10	11	12	
	F	**A**	P1	P1	P1	P1	P1	P1	P1	P1	P1	;	

FB	**FREQUENCY VFO SUB-SIDE**												
Set	1	2	3	4	5	6	7	8	9	10	11	12	P1 000030000 - 470000000 (Hz)
	F	**B**	P1	P1	P1	P1	P1	P1	P1	P1	P1	;	
Read	1	2	3	4	5	6	7	8	9	10	11	12	
	F	**B**	;										
Answer	1	2	3	4	5	6	7	8	9	10	11	12	
	F	**B**	P1	P1	P1	P1	P1	P1	P1	P1	P1	;	

FN	**FINE TUNING**										
Set	1	2	3	4	5	6	7	8	9	10	P1 0: "OFF" 1: Fine Tuning "ON" 2: Fast Tuning "ON"
	F	**N**	P1	;							
Read	1	2	3	4	5	6	7	8	9	10	
	F	**N**	;								
Answer	1	2	3	4	5	6	7	8	9	10	
	F	**N**	P1	;							

FR	**FUNCTION RX**										
Set	1	2	3	4	5	6	7	8	9	10	P1 00: Dual receive 01: Single receive
	F	**R**	P1	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	P1	;						

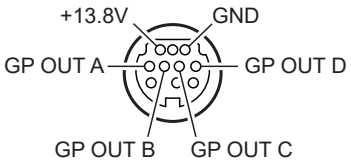
FT	**FUNCTION TX**										
Set	1	2	3	4	5	6	7	8	9	10	P1 0: MAIN-side Transmitter 1: SUB-side Transmitter
	F	**T**	P1	;							
Read	1	2	3	4	5	6	7	8	9	10	
	F	**T**	;								
Answer	1	2	3	4	5	6	7	8	9	10	
	F	**T**	P1	;							

CAT (Computer Aided Transceiver) Operation

GP GP OUT

	1	2	3	4	5	6	7	8	9	10
Set	**G**	**P**	P1	P2	P3	P4	;			
Read	**G**	**P**	;							
Answer	**G**	**P**	P1	P2	P3	P4	;			

P1 0: GP OUT A "LOW"
1: GP OUT A "HIGH"
P2 0: GP OUT B "LOW"
1: GP OUT B "HIGH"
P3 0: GP OUT C "LOW"
1: GP OUT C "HIGH"
P4 0: GP OUT D "LOW"
1: GP OUT D "HIGH"
*5V CMOS Level, Max. 3 mA



Set to "**GPO**" in the setting menu [**OPERATION SETTING**] → [**GENERAL**] → → [**TUN/LIN PORT SELECT**].
(Factory setting: "**OPTION**")

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: MAIN-side
1: SUB-side
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"

ID IDENTIFICATION

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

P1 0840 (Fixed)

IF INFORMATION VFO MAIN-SIDE

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

P1 00000: VFO or MT or QMB (5 Bytes)
00001 - 00999: (Memory Channel)
P-01L - P-50U: (PMS)
50001 - 50020: (5MHz BAND)
EMGCH: (EMERGENCY CH)
P2 VFO Frequency (Hz) (9 Bytes)
P3 Clarifier Direction +: Plus Shift, -: Minus Shift (1 Bytes)
Clarifier Offset: 0000 - 9990 (Hz) (4 Bytes)
P4 0: RX CLAR "OFF" 1: RX CLAR "ON"
P5 0: TX CLAR "OFF" 1: TX CLAR "ON"
P6 MODE 0:- 1: LSB 2: USB 3: CW-U 4: FM
5: AM 6: RTTY-L 7: CW-L 8: DATA-L 9: RTTY-U
A: DATA-FM B: FM-N C: DATA-U D: AM-N E: PSK
F: DATA-FM-N G: - H: C4FM-DN I: C4FM-VW J: -
P7 0: VFO 1: Memory Channel 2: Memory Tune 3: Quick Memory Bank (QMB)
4: - 5: PMS
P8 0: OFF 1: CTCSS ENC/DEC 2: CTCSS ENC 3: DCS 4: PR FREQ
5: REV TONE
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	P3	P4	P4	P4	P4	;
Read	**I**	**S**	P1	;						
Answer	**I**	**S**	P1	P2	P3	P4	P4	P4	P4	;

P1 0: MAIN-side
1: SUB-side
P2 0: (Fixed)
P3 + / -
P4 0000 - 1200 Hz (20 Hz steps)

KM KEYING MEMORY

	1	2	3	4	5	6	7	~	n-1	n
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)

CAT (Computer Aided Transceiver) Operation

KP	**KEY PITCH FREQUENCY**										
Set	1	2	3	4	5	6	7	8	9	10	P1 00: 300 Hz - 75: 1050 Hz (10Hz steps)
	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	;						

KR	**KEYER**										
Set	1	2	3	4	5	6	7	8	9	10	P1 0: CW KEYER "OFF" 1: CW KEYER "ON"
	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	;							

KS	**KEYER SPEED**										
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	;					

KY	**CW KEYING MEMORY PLAY**										
Set	1	2	3	4	5	6	7	8	9	10	P1 0: CW TEXT Memory 1: CW MESSAGE Memory P2 0: STOP 1: CW TEXT/MESSAGE Memory "1" Playback 2: CW TEXT/MESSAGE Memory "2" Playback 3: CW TEXT/MESSAGE Memory "3" Playback 4: CW TEXT/MESSAGE Memory "4" Playback 5: CW TEXT/MESSAGE Memory "5" Playback
	K	**Y**	P1	P2	;						
Read	1	2	3	4	5	6	7	8	9	10	
Answer	1	2	3	4	5	6	7	8	9	10	

LK	**LOCK**										
Set	1	2	3	4	5	6	7	8	9	10	P1 0: Lock "OFF" 1: 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	;							

LM	**LOAD MESSAGE**										
Set	1	2	3	4	5	6	7	8	9	10	P1 0: MESSAGE (DVS) 1: RECORD P2 P1=0 (MESSAGE) 0: Play Stop/ Recording Stop 1: Select CH "1" 2: Select CH "2" 3: Select CH "3" 4: Select CH "4" 5: Select CH "5" P1=1 (RECORD) 0: Recording Stop 1: Recording Start
	L	**M**	P1	P2	;						
Read	1	2	3	4	5	6	7	8	9	10	
	L	**M**	P1	;							
Answer	1	2	3	4	5	6	7	8	9	10	
	L	**M**	P1	P2	;						

MA	**MEMORY CHANNEL to VFO MAIN-SIDE**										
Set	1	2	3	4	5	6	7	8	9	10	
	M	**A**	;								
Read	1	2	3	4	5	6	7	8	9	10	
Answer	1	2	3	4	5	6	7	8	9	10	

CAT (Computer Aided Transceiver) Operation

MB	MEMORY CHANNEL to VFO SUB-SIDE									
Set	1	2	3	4	5	6	7	8	9	10
	M	**B**	;							
Read	1	2	3	4	5	6	7	8	9	10
Answer	1	2	3	4	5	6	7	8	9	10

MC	MEMORY CHANNEL									
Set	1	2	3	4	5	6	7	8	9	10
	M	**C**	P1	P2	P2	P2	P2	P2	;	
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	P2	P2	P2	P2	P2	;	

P1 0: MAIN-side
1: SUB-side
P2 00001 - 00099: (Memory Channel)
P-01L - P-50U: (PMS)
50000 - 50020: (5MHz BAND)
EMGCH: (EMERGENCY CH)

MD	OPERATING MODE									
Set	1	2	3	4	5	6	7	8	9	10
	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-side
1: SUB-side
P2 MODE 0:- 1: LSB 2: USB 3: CW-U 4: FM
5: AM 6: RTTY-L 7: CW-L 8: DATA-L 9: RTTY-U
A: DATA-FM B: FM-N C: DATA-U D: AM-N E: PSK
F: DATA-FM-N G: - H: C4FM-DN I: C4FM-VW J: -

MG	MIC GAIN									
Set	1	2	3	4	5	6	7	8	9	10
	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 - 100

ML	MONITOR LEVEL									
Set	1	2	3	4	5	6	7	8	9	10
	M	**L**	P1	P2	P2	P2	;			
Read	1	2	3	4	5	6	7	8	9	10
	M	**L**	P1	;						
Answer	1	2	3	4	5	6	7	8	9	10
	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
000 - 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**	P0	P0	P0	P0	P0	;		
Answer	1	2	3	4	5	6	7	8	9	10
	M	**R**	P1	P1	P1	P1	P1	P2	P2	P2
	11	12	13	14	15	16	17	18	19	20
	P2	P2	P2	P2	P2	P2	P3	P3	P3	P3
	21	22	23	24	25	26	27	28	29	30
	P3	P4	P5	P6	P7	P8	P9	P9	P10	;

P0 00000: VFO or MT or QMB (5 Bytes)
00001 - 00999: (Memory Channel)
P-01L - P-50U: (PMS)
50001 - 50020: (5MHz BAND)
EMGCH: (EMERGENCY CH)
P1 00000: VFO or MT or QMB (5 Bytes)
00001 - 00999: (Memory Channel)
P-01L - P-50U: (PMS)
50001 - 50020: (5MHz BAND)
EMGCH: (EMERGENCY CH)
P2 VFO Frequency (Hz) (9 Bytes)
P3 Clarifier Direction +: Plus Shift, -: Minus Shift (1 Bytes)
Clarifier Offset: 0000 - 9990 (Hz) (4 Bytes)
P4 0: RX CLAR “OFF” 1: RX CLAR “ON”
P5 0: TX CLAR “OFF” 1: TX CLAR “ON”
P6 MODE 0:- 1: LSB 2: USB 3: CW-U 4: FM
5: AM 6: RTTY-L 7: CW-L 8: DATA-L 9: RTTY-U
A: DATA-FM B: FM-N C: DATA-U D: AM-N E: PSK
F: DATA-FM-N G: - H: C4FM-DN I: C4FM-VW J: -
P7 0: VFO 1: Memory Channel 2: Memory Tune 3: Quick Memory Bank (QMB)
4: - 5: PMS
P8 0: OFF 1: CTCSS ENC/DEC 2: CTCSS ENC 3: DCS 4: PR FREQ
5: REV TONE
P9 00: (Fixed)
P10 0: Simplex 1: Plus Shift 2: Minus Shift

CAT (Computer Aided Transceiver) Operation

MS — METER SW

Set	1	2	3	4	5	6	7	8	9	10	P1 MAIN-side 0: PO 1: COMP 2: ALC 3: VDD 4: ID 5: SWR P2 SUB-side 0: PO 1: COMP 2: ALC 3: VDD 4: ID 5: SWR
	M	**S**	P1	P2	;						
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	P2	;						

MT — MEMORY CHANNEL TAG WRITE

Set	1	2	3	4	5	6	7	8	9	10	P0 00001 - 00099: (Memory Channel) P-01L - P-50U: (PMS) 50001 - 50009: (5MHz BAND) EMGCH: (EMERGENCY CH) P1 TAG Characters (up to 12 characters) (ASCII)
	M	**T**	P0	P0	P0	P0	P0	P1	P1	P1	
	11	12	13	14	15	16	17	18	19	20	
	P1	P1	P1	P1	P1	P1	P1	P1	P1	;	
Read	1	2	3	4	5	6	7	8	9	10	
	M	**T**	P0	P0	P0	P0	P0	;			
Answer	1	2	3	4	5	6	7	8	9	10	
	M	**T**	P0	P0	P0	P0	P0	P1	P1	P1	
	11	12	13	14	15	16	17	18	19	20	
	P1	P1	P1	P1	P1	P1	P1	P1	P1	;	

MW — MEMORY CHANNEL WRITE

Set	1	2	3	4	5	6	7	8	9	10	P1 00000: - 00001 - 00999: (Memory Channel) P-01L - P-50U: (PMS) P2 VFO Frequency (Hz) (9 Bytes) P3 Clarifier Direction +: Plus Shift, -: Minus Shift (1 Bytes) Clarifier Offset: 0000 - 9990 (Hz) (4 Bytes) P4 0: RX CLAR "OFF" 1: RX CLAR "ON" P5 0: TX CLAR "OFF" 1: TX CLAR "ON" P6 MODE 0:- 1: LSB 2: USB 3: CW-U 4: FM 5: AM 6: RTTY-L 7: CW-L 8: DATA-L 9: RTTY-U A: DATA-FM B: FM-N C: DATA-U D: AM-N E: PSK F: DATA-FM-N G: - H: C4FM-DN I: C4FM-VW J: - P7 0: VFO 1: Memory Channel 2: Memory Tune 3: Quick Memory Bank (QMB) 4: - 5: PMS P8 0: OFF 1: CTCSS ENC/DEC 2: CTCSS ENC 3: DCS 4: PR FREQ 5: REV TONE P9 00: (Fixed) P10 0: Simplex 1: Plus Shift 2: Minus Shift
	M	**W**	P1	P1	P1	P1	P1	P2	P2	P2	
	11	12	13	14	15	16	17	18	19	20	
	P2	P2	P2	P2	P2	P2	P3	P3	P3	P3	
	21	22	23	24	25	26	27	28	29	30	
	P3	P4	P5	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	

MX — MOX

Set	1	2	3	4	5	6	7	8	9	10	P1 0: MOX "OFF" 1: MOX "ON"
	M	**X**	P1	;							
Read	1	2	3	4	5	6	7	8	9	10	
	M	**X**	;								
Answer	1	2	3	4	5	6	7	8	9	10	
	M	**X**	P1	;							

MZ — SPLIT MEMORY

Set	1	2	3	4	5	6	7	8	9	10	P1 00000: VFO, MT, QMB mode 00001 - 00999: Memory channel P-01L - P-50U: PMS channel (P-01L, P-01U, P-02L, P-02U ------ P-50L, P50U) P2 0: SPLIT memory "OFF" 1: SPLIT memory "ON" P3 000030000 - 470000000 Hz
	M	**Z**	P1	P1	P1	P1	P1	P2	P3	P3	
	11	12	13	14	15	16	17	18	19	20	
	P3	P3	P3	P3	P3	P3	P3	;			
Read	1	2	3	4	5	6	7	8	9	10	
	M	**Z**	P1	P1	P1	P1	P1	;			
Answer	1	2	3	4	5	6	7	8	9	10	
	M	**Z**	P1	P1	P1	P1	P1	P2	P3	P3	
	11	12	13	14	15	16	17	18	19	20	
	P3	P3	P3	P3	P3	P3	P3	;			

NA — NARROW

Set	1	2	3	4	5	6	7	8	9	10	P1 0: MAIN-side 1: SUB-side P2 0: NARROW "OFF" 1: NARROW "ON"
	N	**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	;						

CAT (Computer Aided Transceiver) Operation

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-side
1: SUB-side
P2 000: OFF
001 - 010: (NB Level)

OI — OPPOSITE BAND INFORMATION (SUB-SIDE)

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

P1 00000: VFO or MT or QMB (5 Bytes)
00001 - 00999: (Memory Channel)
P-01L - P-50U: (PMS)
50001 - 50020: (5MHz BAND)
EMGCH: (EMERGENCY CH)
P2 VFO Frequency (Hz) (9 Bytes)
P3 Clarifier Direction +: Plus Shift, -: Minus Shift (1 Bytes)
Clarifier Offset: 0000 - 9990 (Hz) (4 Bytes)
P4 0: RX CLAR "OFF" 1: RX CLAR "ON"
P5 0: TX CLAR "OFF" 1: TX CLAR "ON"
P6 MODE 0:- 1: LSB 2: USB 3: CW-U 4: FM
5: AM 6: RTTY-L 7: CW-L 8: DATA-L 9: RTTY-U
A: DATA-FM B: FM-N C: DATA-U D: AM-N E: PSK
F: DATA-FM-N G: - H: C4FM-DN I: C4FM-VW J: -
P7 0: VFO 1: Memory Channel 2: Memory Tune 3: Quick Memory Bank (QMB)
4: - 5: PMS
P8 0: OFF 1: CTCSS ENC/DEC 2: CTCSS ENC 3: DCS 4: PR FREQ
5: REV TONE
P9 00: (Fixed)
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	**O**	**S**	P1	;						
Answer	**O**	**S**	P1	P2	;					

P1 0: MAIN-side
1: SUB-side
P2 0: Simplex
1: Plus Shift (+ Offset)
2: Minus Shift (- Offset)
3: ARS (Automatic Repeater 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	**P**	**A**	P1	;						
Answer	**P**	**A**	P1	P2	;					

P1 0: HF/50MHz band
1: VHF band
2: UHF band
P2 P1=0 0: IPO (HF/50)
1: AMP1 (HF/50)
2: AMP2 (HF/50)
P1=1 0: VHF Pre AMP "OFF"
1: VHF Pre AMP "ON"
P1=2 0: UHF Pre AMP "OFF"
1: UHF Pre AMP "ON"

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: (Fixed)
P2 0: MESSAGE Playback / Recording Stop
1: MESSAGE CH "1" Playback Start
2: MESSAGE CH "2" Playback Start
3: MESSAGE CH "3" Playback Start
4: MESSAGE CH "4" Playback Start
5: MESSAGE CH "5" Playback Start

PC — POWER CONTROL

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

P1 1: FTX-1 field head
2: SPA-1
P2 P1=1: 005 - 010 (W)
P1=2: 005 - 100 (W)

CAT (Computer Aided Transceiver) Operation

PL	**SPEECH PROCESSOR LEVEL**										
Set	1	2	3	4	5	6	7	8	9	10	P1 000: “OFF”, 001 -100
	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	**SPEECH PROCESSOR**										
Set	1	2	3	4	5	6	7	8	9	10	P1 0: Speech Processor 1: Parametric Microphone Equalizer P2 1: “OFF” 2: “ON”
	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	;						

PS	**POWER SWITCH**										
Set	1	2	3	4	5	6	7	8	9	10	P1 0: POWER “OFF”
	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	;							

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	

RA	**RF ATTENUATOR**										
Set	1	2	3	4	5	6	7	8	9	10	P1 0: (Fixed) P2 0: “OFF” 1: “ON”
	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	;						

RG	**RF GAIN**										
Set	1	2	3	4	5	6	7	8	9	10	P1 0: MAIN-side 1: SUB-side 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	;				

RI	**RADIO INFORMATION**											
Set	1	2	3	4	5	6	7	8	9	10	11	P1 0: (Fixed) P2 0: Normal 1: Hi-SWR P3 0: Stop 1: Recording 2: Playing P4 0: RX 1: TX 2: TX INHIBIT P5 0: (Fixed) P6: 0: Antenna tuner: Tuning stopped 1:Antenna tuner: Tuning P7: 0: Scan Stop 1:Scanning 2:Scan Pause P8: 0: SQL Closed 1: SQL Open (BUSY)
Read	1	2	3	4	5	6	7	8	9	10	11	
	R	**I**	P1	;								
Answer	1	2	3	4	5	6	7	8	9	10	11	
	R	**I**	P1	P2	P3	P4	P5	P6	P7	P8	;	

CAT (Computer Aided Transceiver) Operation

RL	NOISE REDUCTION LEVEL (DNR)										
Set	1	2	3	4	5	6	7	8	9	10	P1 0: MAIN-side 1: SUB-side P2 00: "OFF", 01 -10
	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	;					

RM	READ METER										
Set	1	2	3	4	5	6	7	8	9	10	P1=0 P2: Meter 000 - 255 (MAIN-side) P3: Meter 000 - 255 (SUB-side) P1= 1: S (Main-side) 2: S (SUB-side) 3: COMP 4: ALC 5: PO 6: SWR 7: IDD 8: VDD P2: 000 - 255 P3: 000 (Fixed)
Read	1	2	3	4	5	6	7	8	9	10	
	R	**M**	P1	;							
Answer	1	2	3	4	5	6	7	8	9	10	
	R	**M**	P1	P2	P2	P2	P3	P3	P3	;	

SC	SCAN										
Set	1	2	3	4	5	6	7	8	9	10	P1 0: MAIN-side 1: SUB-side P2 0: Scan "OFF" 1: Scan "ON" (UP ward) 2: Scan "ON" (DOWN ward)
	S	**C**	P1	P2	;						
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	P2	;						

SD	CW BREAK-IN DELAY TIME										
Set	1	2	3	4	5	6	7	8	9	10	00: 30 01: 50 02: 100 03: 150 04: 200 05: 250 06: 300 - 33: 3000 (msec) ***NOTE:*** 06 to 33: 100 msec steps
	S	**D**	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	;						

SF	FUNC KNOB FUNCTION										
Set	1	2	3	4	5	6	7	8	9	10	P1 0: FUNC knob P2 0: - 1: SCOPE LEVEL 2: PEAK 3: COLOR 4: CONTRAST 5: DIMMER 6: - 7: MIC GAIN 8: PROC LEVEL 9: AMC LEVEL A: VOX GAIN B: VOX DELAY C: - D: RF POWER E: MONI LEVEL F: CW SPEED G: CW PITCH H: BK-DELAY
	S	**F**	P1	P2	;						
Read	1	2	3	4	5	6	7	8	9	10	
	S	**F**	P1	;							
Answer	1	2	3	4	5	6	7	8	9	10	
	S	**F**	P1	P2	;						

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SH	WIDTH										
Set	1	2	3	4	5	6	7	8	9	10	P1 0: MAIN-side 1: SUB-side P2 0: (Fixed) P3 00 - 23 (See Table 5)
	S	**H**	P1	P2	P3	P3	;				
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	P3	P3	;				

Table 5 (Bandwidth Chart)

Command	Bandwidth				
P3	LSB / USB	CW-L / CW-U / DATA-L / DATA-U / RTTY-L / RTTY-U PSK	AM-N	AM / FM-N / DATA-FM-N	FM / DATA-FM
00 (Default)	(Default)*	(Default)*	-	-	-
01	300 Hz	50 Hz	6000 Hz (Fixed)	-	-
02	400 Hz	100 Hz	-	9000 Hz (Fixed)	-
03	600 Hz	150 Hz	-	-	16000 Hz (Fixed)
04	850 Hz	200 Hz	-	-	-
05	1100 Hz	250 Hz	-	-	-
06	1200 Hz	300 Hz	-	-	-
07	1500 Hz	350 Hz	-	-	-
08	1650 Hz	400 Hz	-	-	-
09	1800 Hz	450 Hz	-	-	-
10	1950 Hz	500 Hz	-	-	-
11	2100 Hz	600 Hz	-	-	-
12	2250 Hz	800 Hz	-	-	-
13	2400 Hz	1200 Hz	-	-	-
14	2450 Hz	1400 Hz	-	-	-
15	2500 Hz	1700 Hz	-	-	-
16	2600 Hz	2000 Hz	-	-	-
17	2700 Hz	2400 Hz	-	-	-
18	2800 Hz	3000 Hz	-	-	-
19	2900 Hz	3200 Hz	-	-	-
20	3000 Hz	3500 Hz	-	-	-
21	3200 Hz	4000 Hz	-	-	-
22	3500 Hz	-	-	-	-
23	4000 Hz	-	-	-	-

*(The default bandwidth varies depending on the selected mode.)

SM	S-METER READING										
Set	1	2	3	4	5	6	7	8	9	10	P1 0: MAIN-side 1: SUB-side 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-side 1: SUB-side 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	;				

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SS	SPECTRUM SCOPE									
Set	1	2	3	4	5	6	7	8	9	10
	S	**S**	P1	P2	P3	P4	P5	P6	P7	;
Read	1	2	3	4	5	6	7	8	9	10
	S	**S**	P1	P2	;					
Answer	1	2	3	4	5	6	7	8	9	10
	S	**S**	P1	P2	P3	P4	P5	P6	P7	;

P1 0: (Fixed)

P2 0: SPEED 1: PEAK 2: MARKER 3: COLOR 4: LEVEL 5: SPAN
6: MODE 7: AF-FFT/OSCILLOSCOPE

P2=0 (SPEED):
P3 0: SLOW1 1: SLOW2 2: FAST1 3: FAST2 4: FAST3 5: STOP
P4 - P7: 0: (Fixed)

P2=1 (PEAK):
P3 0: LV1 1: LV2 2: LV3 3: LV4 4: LV5
P4 - P7: 0: (Fixed)

P2=2 (MARKER):
P3 0: MARKER "OFF" 1: MARKER "ON"
P4 - P7: 0: (Fixed)

P2=3 (COLOR):
P3 0: COLOR-1 - A: COLOR-11
P4 - P7: 0: (Fixed)

P2=4 (LEVEL):
P3 - P7: -30.0 - -00.0 or +00.0 - +30.0 (0.5 dB steps, 5 bytes)

P2=5 (SPAN):
P3 0: - 1: - 2: 5 kHz 3: 10 kHz 4: 20 kHz 5: 50 kHz
6: 100 kHz 7: 200 kHz 8: 500 kHz 9: 1 MHz
P4 - P7: 0: (Fixed)

P2=6 (MODE):
P3 0: 3DSS CENTER 1: 3DSS CURSOR 2: 3DSS FIX
3: - 4: W/F CENTER (NORMAL) 5: -
6: - 7: W/F CURSOR (NORMAL) 8: -
9: - A: W/F FIX (NORMAL) B: -
P4 - P7: 0: (Fixed)

P2=7 (AF-FFT/OSCILLOSCOPE):
P3 0: AF-FFT (ATT=0dB) 1: AF-FFT (ATT=10dB) 2: AF-FFT (ATT=20dB)
P4 0: OSC Level RX (0dB) 1: OSC Level RX (10dB) 2: OSC Level RX (20dB)
P5 0: OSC Time (1 msec) 1: OSC Time (3 msec) 2: OSC Time (10 msec)
3: OSC Time (30 msec) 4: OSC Time (100 msec) 5: OSC Time (300 msec)
P6 0: OSC Level TX (0dB) 1: OSC Level TX (10dB) 2: OSC Level TX (20dB)
P7 0: (Fixed)

ST	SPLIT									
Set	1	2	3	4	5	6	7	8	9	10
	S	**T**	P1	;						
Read	1	2	3	4	5	6	7	8	9	10
	S	**T**	;							
Answer	1	2	3	4	5	6	7	8	9	10
	S	**T**	P1	;						

P1 0: SPLIT "OFF"
1: SPLIT "ON"

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

Changes the MAIN-side and SUB-side

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

P1 0: TXW "OFF"
1: TXW "ON"

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

P1 0: RADIO TX "OFF", CAT TX "OFF"
1: RADIO TX "OFF", CAT TX "ON"
2: RADIO TX "ON", CAT TX "OFF" (Answer)

CAT (Computer Aided Transceiver) Operation

UP	MIC 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 / DATA VOX DELAY TIME									
Set	1	2	3	4	5	6	7	8	9	10
	V	**D**	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 00: 30 msec 01: 50 msec 02: 100 msec 03: 150 msec 04: 200 msec
05: 250 msec 06: 300 msec - 33: 3000 msec (06 - 33: 10 msec multiples)

NOTE: VD command sets individual parameter values with the setting values “MIC” and “USB or BLUETOOTH” in the menu items [OPERATION SETTING] → [TX GNRL] → → [VOX SELECT].

VE	FIRMWARE VERSION									
Set	1	2	3	4	5	6	7	8	9	10
Read	1	2	3	4	5	6	7	8	9	10
	V	**E**	P1	;						
Answer	1	2	3	4	5	6	7	8	9	10
	V	**E**	P1	P2	P2	P2	P2	;		

P1 0: MAIN CPU 1: DISPLAY CPU 2: SDR 3: DSP 4: SPA-1 5: FC-80
P2 XX-XX (Binary Coded Decimal)

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	MAIN-SIDE 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

VM	VFO / MEMORY CHANNEL									
Set	1	2	3	4	5	6	7	8	9	10
	V	**M**	P1	P2	P2	;				
Read	1	2	3	4	5	6	7	8	9	10
	V	**M**	P1	;						
Answer	1	2	3	4	5	6	7	8	9	10
	V	**M**	P1	P2	P2	;				

P1 0: MAIN-side
1: SUB-side
P2 00: VFO 10: MT 11: Memory 20: PMS
21: P-01L - P-50U 51: 5MHz Band Memory 91: EMG

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: MAIN-side TX/RX, SUB-side RX
1: MAIN-side RX, SUB-side TX/RX

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”

ZI	ZERO IN										
Set	1	2	3	4	5	6	7	8	9	10	(CW AUTO ZERO IN Function) P1 0: MAIN-side 1: SUB-side
	Z	**I**	P1	;							
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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