YAESU
The radio

FT DX 10

CAT Operation Reference Manual

YAESU MUSEN CO., LTD.

CAT (Computer Aided Transceiver) Operation

Overview

The CAT (Computer Aided Transceiver) System in the **FTDX10** transceiver provides control of frequency, VFO, memory, and other settings such as dual-channel memories and diversity reception using an external personal computer. This allows multiple control operations to be fully automated with single mouse clicks, or keystroke operations on the computer keyboard.

Using the USB Cable
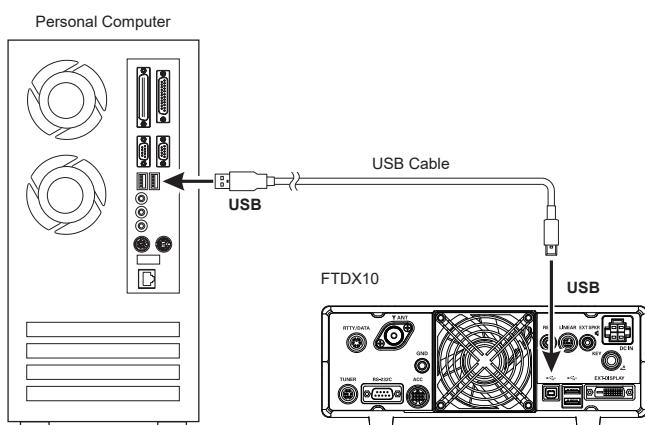
The **FTDX10** transceiver has a built-in USB to Dual UART Bridge, allowing direct connection from the rear-panel USB jack to the USB jack of a computer without the need for an interface device, simply use a USB cable to connect to the USB jack on the computer.

> **!** 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.
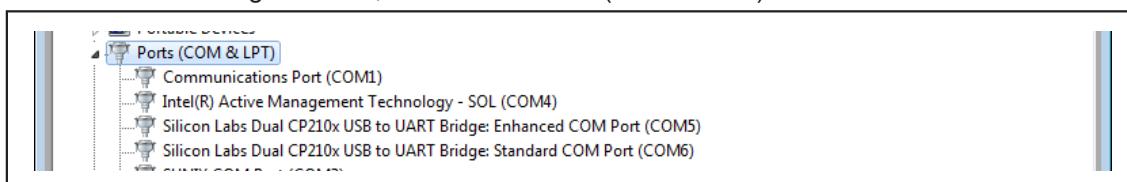
YAESU MUSEN does not produce CAT System operating software due to the wide variety of personal computers and operating systems in use today. However, the information provided in this chapter explains the serial data structure and opcodes used by the CAT system. This information, along with the short 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.

How to Confirm the Installation, and the COM Port Number

After the FTDX10 and computer are connected, confirm that the virtual COM driver has been installed successfully:

1. Press and hold the ON/OFF switch to turn the transceiver ON.
2. Connect the transceiver and PC with a commercially available USB cable (A-B).
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 FTDX10 contains two virtual COM ports, an Enhanced COM Port and a Standard COM Port.
These ports offer the following functions:
· **Enhanced COM Port: CAT Communications (Frequency and Communication Mode Settings)**
· **Standard COM Port: TX Controls (PTT control, CW Keying, Digital Mode Operation)**

The above example indicates that COM5 can be used for CAT communications and firmware updating, while COM6 can be used for TX control (PTT, CW Keying, Digital Mode Operation).

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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.

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.
・ 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
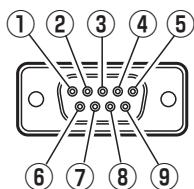
Using the RS-232C Cable
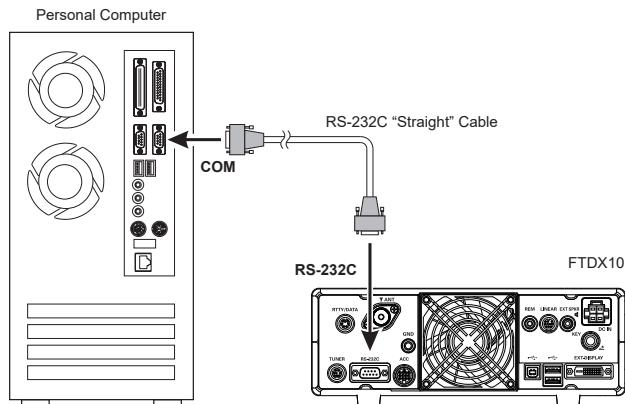
⚠ When using an RS-232C cable, the "PS" command (POWER SWITCH) is not available. Therefore, the transceiver cannot be turned ON with the CAT command.

The **FTDX10** transceiver has a built-in level converter, allowing direct connection from the rear-panel RS-232C 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.

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	---	---
⑧	CTS	---	---
⑨	N/A	---	---

Personal Computer

COM

RS-232C "Straight" Cable

RS-232C

FTDX10

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 VFO-A frequency to 14.250000 MHz.

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

There are three commands for the **FTDX10** as shown below:

> *Set* command: Set a particular condition   (to the **FTDX10**)
> *Read* command: Reads an answer   (from the **FTDX10**)
> *Answer* command: Transmits a condition   (from the **FTDX10**)

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

❐ To set the VFO-A frequency to 14.250000 MHz, the following command is sent from the computer to the transceiver:
> "**FA014250000;**" (Set command)

❐ To read the VFO-A frequency, the following command is sent from the computer to the transceiver:
> "**FA;**" (Read command)

❐ When the Read command above has been sent, the following command is returned to the computer:
> "**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 **FTDX10**, 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

Command	Function	Set	Read	Ans.	AI
AB	VFO-A TO VFO-B	O	X	X	X
AC	ANTENNA TUNER CONTROL	O	O	O	O
AG	AF GAIN	O	O	O	O
AI	AUTO INFORMATION	O	O	O	X
AM	VFO-A TO MEMORY CHANNEL	O	X	X	X
AO	AMC OUTPUT LEVEL	O	O	O	O
AV	ANTI VOX LEVEL	O	O	O	O
BA	VFO-B TO VFO-A	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	VFO-B 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
BY	BUSY	X	O	O	O
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
ED	ENCODER DOWN	O	X	X	X
EM	ENCODE MEMORY	O	O	O	X
EN	ENCODE	O	X	X	X
EU	ENCODER UP	O	X	X	X
EX	MENU	O	O	O	O
FA	FREQUENCY VFO-A	O	O	O	O
FB	FREQUENCY VFO-B	O	O	O	O
FN	FINE TUNING	O	O	O	O
GT	AGC FUNCTION	O	O	O	O
ID	IDENTIFICATION	X	O	O	X
IF	INFORMATION	X	O	O	X
IS	IF-SHIFT	O	O	O	O
KM	KEYER MEMORY	O	O	O	X
KP	KEY PITCH	O	O	O	O
KR	KEYER	O	O	O	O
KS	KEY SPEED	O	O	O	O
KY	CW KEYING	O	X	X	X
LK	LOCK	O	O	O	O
LM	LOAD MESSAGE	O	O	O	X
MA	MEMORY CHANNEL TO VFO-A	O	X	X	X
MB	MEMORY CHANNEL TO VFO-B	O	X	X	X
MC	MEMORY CHANNEL	O	O	O	X
MD	MODE	O	O	O	O
MG	MIC GAIN	O	O	O	O
ML	MONITOR LEVEL	O	O	O	O
MR	MEMORY READ	X	O	O	X
MS	METER SW	O	O	O	O
MT	MEMORY CHANNEL WRITE/TAG	O	O	O	X
MW	MEMORY WRITE	O	X	X	X
MX	MOX SET	O	O	O	O
NA	NARROW	O	O	O	O
NB	NOISE BLANKER	O	O	O	O
NL	NOISE BLANKER LEVEL	O	O	O	O
NR	NOISE REDUCTION (DNR)	O	O	O	O
OI	OPPOSITE BAND (VFO-B) INFORMATION	X	O	O	O

Command	Function	Set	Read	Ans.	AI
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
QS	QUICK SPLIT	O	X	X	X
RA	RF ATTENUATOR	O	O	O	O
RC	CLAR (Clarifier) CLEAR	O	X	X	X
RD	CLAR (Clarifier) DOWN	O	X	X	X
RF	ROOFING FILTER	O	O	O	O
RG	RF GAIN	O	O	O	O
RI	RADIO INFORMATION	X	O	O	O
RL	NOISE REDUCTION (DNR) LEVEL	O	O	O	O
RM	READ METER	X	O	O	O
RS	RADIO STATUS	X	O	O	O
RT	RX CLAR (Clarifier)	O	O	O	O
RU	CLAR (Clarifier) UP	O	X	X	X
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
UL	UNLOCK	X	O	O	O
UP	UP	O	X	X	X
VD	VOX DELAY TIME	O	O	O	O
VG	VOX GAIN	O	O	O	O
VM	[V/M] KEY FUNCTION	O	X	X	X
VS	VFO SELECT	O	O	O	O
VX	VOX	O	O	O	O
XT	TX CLAR	O	O	O	O
ZI	ZERO IN	O	X	X	X

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 / Tuning Stop

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: Fixed
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"

NOTE: The AI command is available only when PC is connected with USB cable.

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										

AO — AMC OUTPUT LEVEL

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

P1 001-100: AMC OUTPUT LEVEL

AV — ANTI VOX LEVEL

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

P1 001-100: ANTI VOX LEVEL

BA — VFO-B TO VFO-A

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

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 BAND
    1: SUB 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"

BM — VFO-B TO MEMORY CHANNEL

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

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 Frequency

P3 P2=0
    000: "OFF"
    001: "ON"
    P2=1
    001 - 320
    (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   12: MW
    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 BAND
    1: SUB BAND

BY — BUSY

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

P1 0: RX BUSY "OFF"
    1: RX BUSY "ON" (SQL OPEN)
P2 0: Fixed

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 BAND
    1: SUB BAND
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									
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 BAND
    1: SUB BAND
P2 0: Fixed
P3 000 - 049: Tone Frequency Number (See Table 1)

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	-	-

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: Fixed
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)

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

P1 0: OFF
    1: ON

CT	CTCSS									
Set	1	2	3	4	5	6	7	8	9	10
	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 BAND
    1: SUB BAND
P2 0: CTCSS "OFF"
    1: CTCSS ENC/DEC
    2: CTCSS ENC

CAT (Computer Aided Transceiver) Operation

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	;

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

ED — ENCODER DOWN

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

P1 0: MAIN ENCODER   5: MAIN CONT ENCODER
1: MPVD knob   6: -
2: -   7: -
3: -   8: MULTI knob
4: MAIN NOTCH ENCODER
P2 01 - 99: Frequency Steps (Frequency only)
P2 01 Fixed (Except Frequency)

EM — ENCODE MEMORY

	1	2	3	4	5	6	7	54	55
Set	E	M	P1	P2	P3	P3	P3	~ P3	;
Read	E	M	P1	P2	;				
Answer	E	M	P1	P2	P3	P3	P3	~ P3	;

P1 0: RTTY
1: DATA
P2 0: -   3: 3 ch
1: 1 ch   4: 4 ch
2: 2 ch   5: 5 ch
P3 Message Characters (up to 50 characters) (ASCII)

EN — ENCODE

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

P1 0: RTTY
1: DATA
P2 0: -   3: 3 ch
1: 1 ch   4: 4 ch
2: 2 ch   5: 5 ch

EU — ENCODER UP

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

P1 0: MAIN ENCODER   5: MAIN CONT ENCODER
1: MPVD knob   6: -
2: -   7: -
3: -   8: MULTI knob
4: MAIN NOTCH ENCODER
P2 01 - 99: Frequency Steps (Frequency only)

EX — MENU

	1	2	3	4	5	6	7	8	9	10	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	;

P1 : 01 - 05
P2 : 01 - 07
P3 : 01 - 23
P4 : Parameter (See Table 2)

CAT (Computer Aided Transceiver) Operation

			Table 2 (MENU Chart)		
P1	P2	P3	Function	P4	Digits
01 (RADIO SETTING)	01 (MODE SSB)	01	AF TREBLE GAIN	−10 ~ +00 ~ +10	3
		02	AF MIDDLE TONE GAIN	−10 ~ +00 ~ +10	3
		03	AF BASS GAIN	−10 ~ +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 SLOP	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	SSB OUT LEVEL	0 ~ 100 (P4 = 000 ~ 100)	3
		12	TX BPF SEL	0: 50 ~ 3050 1: 100 ~ 2900 2: 200 ~ 2800 3: 300 ~ 2700 4: 400 ~ 2600	1
		13	SSB MOD SOURCE	0: MIC 1: REAR	1
		14	REAR SELECT	0: DATA 1: USB	1
		15	RPORT GAIN	0 ~ 100 (P4 = 000 ~ 100)	3
		16	RPTT SELECT	0: DAKY 1: RTS 2: DTR	1
	02 (MODE AM)	01	AF TREBLE GAIN	−10 ~ +00 ~ +10	3
		02	AF MIDDLE TONE GAIN	−10 ~ +00 ~ +10	3
		03	AF BASS GAIN	−10 ~ +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 SLOP	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	AM OUT LEVEL	0 ~ 100 (P4 = 000 ~ 100)	3
		12	TX BPF SEL	0: 50 ~ 3050 1: 100 ~ 2900 2: 200 ~ 2800 3: 300 ~ 2700 4: 400 ~ 2600	1
		13	AM MOD SOURCE	0: MIC 1: REAR	1
		14	MIC GAIN	1000: MCVR 0000 ~ 0100: FIX	4
		15	REAR SELECT	0: DATA 1: USB	1
		16	RPORT GAIN	0 ~ 100 (P4 = 000 ~ 100)	3
		17	RPTT SELECT	0: DAKY 1: RTS 2: DTR	1
	03 (MODE FM)	01	AF TREBLE GAIN	−10 ~ +00 ~ +10	3
		02	AF MIDDLE TONE GAIN	−10 ~ +00 ~ +10	3
		03	AF BASS GAIN	−10 ~ +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 SLOP	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	FM OUT LEVEL	0 ~ 100 (P4 = 000 ~ 100)	3
		12	FM MOD SOURCE	0: MIC 1: REAR	1
		13	MIC GAIN	1000: MCVR 0000 ~ 0100: FIX	4
		14	REAR SELECT	0: DATA 1: USB	1
		15	RPORT GAIN	0 ~ 100 (P4 = 000 ~ 100)	3
		16	RPTT SELECT	0: DAKY 1: RTS 2: DTR	1
		17	RPT SHIFT(28MHz)	0 ~ 1000 kHz (P4 = 0000 ~ 1000, 10 kHz/step)	4
		18	RPT SHIFT(50MHz)	0 ~ 4000 kHz (P4 = 0000 ~ 4000, 10 kHz/step)	4
		19	RPT	0: - 1: SIMPLEX 2: +	1
		20	TONE FREQ	00: 67.0 ~ 49: 254.1Hz	2
		21	ENC/DEC	0: OFF 1: ENC 2: TSQ	1
	04 (MODE PSK/DATA)	01	AF TREBLE GAIN	−10 ~ +00 ~ +10	3
		02	AF MIDDLE TONE GAIN	−10 ~ +00 ~ +10	3
		03	AF BASS GAIN	−10 ~ +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	PSK TONE	0: 1000Hz 1: 1500Hz 2: 2000Hz	1
		08	DATA SHIFT (SSB)	0 ~ 3000 Hz (P4 = 0000 ~ 3000, 10 Hz steps)	4
		09	LCUT FREQ	00: OFF 01: 100 Hz ~ 19: 1000 Hz (50 Hz steps)	2
		10	LCUT SLOP	0: 6 dB/oct 1: 18 dB/oct	1
		11	HCUT FREQ	00: OFF 01: 700 Hz ~ 67: 4000 Hz (50 Hz steps)	2
		12	HCUT SLOPE	0: 6 dB/oct 1: 18 dB/oct	1
		13	DATA OUT LEVEL	0 ~ 100 (P4 = 000 ~ 100)	3
		14	TX BPF SEL	0: 50 ~ 3050 1: 100 ~ 2900 2: 200 ~ 2800 3: 300 ~ 2700 4: 400 ~ 2600	1
		15	DATA MOD SOURCE	0: MIC 1: REAR	1
		16	REAR SELECT	0: DATA 1: USB	1
		17	RPORT GAIN	0 ~ 100 (P4 = 000 ~ 100)	3
		18	RPTT SELECT	0: DAKY 1: RTS 2: DTR	1

CAT (Computer Aided Transceiver) Operation

				Table 2 (MENU Chart)	
P1	**P2**	**P3**	**Function**	**P4**	**Digits**
01 (RADIO SETTING)	05 (MODE RTTY)	01	AF TREBLE GAIN	−10 ~ +00 ~ +10	3
		02	AF MIDDLE TONE GAIN	−10 ~ +00 ~ +10	3
		03	AF BASS GAIN	−10 ~ +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	POLARITY-RX	0: NOR 1: REV	1
		08	POLARITY-TX	0: NOR 1: REV	1
		09	LCUT FREQ	00: OFF 01: 100 Hz ~ 19: 1000 Hz (50 Hz steps)	2
		10	LCUT SLOP	0: 6 dB/oct 1: 18 dB/oct	1
		11	HCUT FREQ	00: OFF 01: 700 Hz ~ 67: 4000 Hz (50 Hz steps)	2
		12	HCUT SLOPE	0: 6 dB/oct 1: 18 dB/oct	1
		13	RTTY OUT LEVEL	0 ~ 100 (P4 = 000 ~ 100)	3
		14	SHIFT PORT	0: SHIFT 1: DTR 2: RTS	1
		15	MARK FREQUENCY	1: 1275 Hz 2: 2125 Hz	1
		16	SHIFT FREQUENCY	1: 170 Hz 1: 200 Hz 2: 425 Hz 3: 850 Hz	1
	06 (ENC/DEC PSK)	01	PSK MODE	0: BPSK 1: QPSK	1
		02	DECODE AFC RANGE	0: 8 1: 1.5 2: 30 Hz	1
		03	QPSK POLARITY RX	0: NOR 1: REV	1
		04	QPSK POLARITY TX	0: NOR 1: REV	1
		05	PSK TX LEVEL	0 ~ 100	3
	07 (ENC/DEC RTTY)	01	RX USOS	0: DISABLE 1: ENABLE	1
		02	TX USOS	0: DISABLE 1: ENABLE	1
		03	RX NEW LINE CODE	0: CR or LF or CR+LF 1: CR,LF,CR+LF	1
		04	TX AUTO CR+LF	0: DISABLE 1: ENABLE	1
		05	TX DIDDLE	0: OFF 1: BLANK 2: LTRS	1
		06	BAUDOT CODE	0: CCIT 1: US	1
02 (CW SETTING)	01 (MODE CW)	01	AF TREBLE GAIN	−10 ~ +00 ~ +10	3
		02	AF MIDDLE TONE GAIN	−10 ~ +00 ~ +10	3
		03	AF BASS GAIN	−10 ~ +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 SLOP	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	CW OUT LEVEL	0 ~ 100 (P4 = 000 ~ 100)	3
		12	CW AUTO MODE	0: OFF 1: 50 MHz 2: ON	1
		13	CW BK-IN TYPE	0: SEMI 1: FULL	1
		14	CW WAVE SHAPE	0: 1 msec 1: 2 msec 2: 4 msec 3: 6 msec	1
		15	CW FREQ DISPLAY	0: DIRECT FREQ 1: PITCH OFFSET	1
		16	PC KEYING	0: OFF 1: DAKY 2: RTS 3: DTR	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
	03 (DECODE CW)	01	CW DECODE BW	0: 25 1: 50 2: 100 3: 250 (Hz)	1
03 (OPERATION SETTING)	01 (GENERAL)	01	NB WIDTH	0: 1 ms 1: 3 ms 2: 10 ms	1
		02	NB REJECTION	0: 10 dB 1: 30 dB 2: 50 dB	1
		03	BEEP LEVEL	0 ~ 100 (P4 = 000 ~ 100)	3
		04	RF/SQL VR	0: RF 1: SQL	1
		05	TUNER SELECT	0: INT 1: EXT1 2: EXT2 3: EXT3	1
		06	232C RATE	0: 4800 bps 1: 9600 bps 2: 19200 bps 3: 38400 bps	1
		07	232C TIME OUT TIMER	0: 10 msec 1: 100 msec 2: 1000 msec 3: 3000 msec	1
		08	CAT RATE	0: 4800 bps 1: 9600 bps 2: 19200 bps 3: 38400 bps	1
		09	CAT TIME OUT TIMER	0: 10 msec 1: 100 msec 2: 1000 msec 3: 3000 msec	1
		10	CAT RTS	0: DISABLE 1: ENABLE	1
		11	QMB CH	0: 5ch 1: 10ch	1
		12	MEM GROUP	0: DISABLE 1: ENABLE	1
		13	QUICK SPLIT INPUT	0: DISABLE 1: ENABLE	1
		14	QUICK SPLIT FREQ	−20 kHz ~ +00 (or −00) ~ +20 kHz (P4= −20 ~ +00 or −00 ~ +20)	3
		15	SPLIT FREQ DISPLAY	0: FREQ 1: DELTA	1
		16	TX TIME OUT TIMER	0 (OFF) ~ 30 min (P4= 00 ~ 30)	2
		17	MIC SCAN	0: DISABLE 1: ENABLE	1
		18	MIC SCAN RESUME	0: PAUSE 1: TIME	1
		19	REF FREQ ADJ	−25 ~ +00 (or −00) ~ +25 (P4= −25 ~ +00 or −00 ~ +25)	3
		20	KEYBOARD LANGUAGE	00: JAPANESE 01: ENGLISH(US) 02: ENGLISH(UK) 03: FRENCH 04: FRENCH(CA) 05: GERMAN 06: PORTUGUESE 07: PORTUGUESE(BR) 08: SPANISH 09: SPANISH(LATAM) 10: ITALIAN 11: LEVEL	2

CAT (Computer Aided Transceiver) Operation

Table 2 (MENU Chart)					
P1	P2	P3	Function	P4	Digits
03 (OPERATION SETTING)	02 (RX-DSP)	01	APF WIDTH	0: NARROW 1: MEDIUM 2: WIDE	1
		02	CONTOUR LEVEL	−40 ~ 0 ~ +20 (P4 = −40 ~ −00 or +00 ~ +20)	3
		03	CONTOUR WIDTH	01 ~ 11	2
		04	IF NOTCH WIDTH	0: NARROW 1: WIDE	1
	03 (TX AUDIO)	01	AMC RELEASE TIME	0: FAST 1: MID 2: SLOW	1
		02	PRMTRC EQ1 FREQ	00 : OFF 01: 100 02: 200 03: 300 04: 400 05: 500 06: 600 07: 700 Hz	2
		03	PRMTRC EQ1 LEVEL	−20 ~ 0 ~ +10 (P4 = −20 ~ −00 or +00 ~ +10)	3
		04	PRMTRC EQ1 BWTH	01 ~ 10	2
		05	PRMTRC EQ2 FREQ	00: OFF 01: 700 02: 800 03: 900 04: 1000 05: 1100 06: 1200 07: 1300 08: 1400 09: 1500 Hz	2
		06	PRMTRC EQ2 LEVEL	−20 ~ 0 ~ +10 (P4 = −20 ~ −00 or +00 ~ +10)	3
		07	PRMTRC EQ2 BWTH	01 ~ 10	2
		08	PRMTRC EQ3 FREQ	00 : OFF 01: 1500 02: 1600 03: 1700 04: 1800 05: 1900 06: 2000 ~ 18: 3200 Hz	2
		09	PRMTRC EQ3 LEVEL	−20 ~ 0 ~ +10 (P4 = −20 ~ −00 or +00 ~ +10)	3
		10	PRMTRC EQ3 BWTH	01 ~ 10	2
		11	P PRMTRC EQ1 FREQ	00 : OFF 01: 100 02: 200 03: 300 04: 400 05: 500 06: 600 07: 700 Hz	2
		12	P PRMTRC EQ1 LEVEL	−20 ~ 0 ~ +10 (P4 = −20 ~ −00 or +00 ~ +10)	3
		13	P PRMTRC EQ1 BWTH	01 ~ 10	2
		14	P PRMTRC EQ2 FREQ	00: OFF 01: 700 02: 800 03: 900 04: 1000 05: 1100 06: 1200 07: 1300 08: 1400 09: 1500 Hz	2
		15	P PRMTRC EQ2 LEVEL	−20 ~ 0 ~ +10 (P4 = −20 ~ −00 or +00 ~ +10)	3
		16	P PRMTRC EQ2 BWTH	01 ~ 10	2
		17	P PRMTRC EQ3 FREQ	00 : OFF 01: 1500 02: 1600 03: 1700 04: 1800 05: 1900 06: 2000 ~ 18: 3200 Hz	2
		18	P PRMTRC EQ3 LEVEL	−20 ~ 0 ~ +10 (P4 = −20 ~ −00 or +00 ~ +10)	3
		19	P PRMTRC EQ3 BWTH	01 ~ 10	2
	04 (TX GENERAL)	01	HF MAX POWER	5 ~ 100 (P4 = 005 ~ 100)	3
		02	50M MAX POWER	5 ~ 100 (P4 = 005 ~ 100)	3
		03	70M MAX POWER	5 ~ 50 (P4 = 005 ~ 050)	3
		04	AM MAX POWER	5 ~ 25 (P4 = 005 ~ 025)	3
		05	VOX SELECT	0: MIC 1: DATA	1
		06	DATA VOX GAIN	0 ~ 100 (P4 = 000 ~ 100)	3
		07	EMERGENCY FREQ TX	0: DISABLE 1: ENABLE	1
	05 (TUNING)	01	SSB/CW DIAL STEP	0: 5 1: 10 (Hz)	1
		02	RTTY/PSK DIAL STEP	0: 5 1: 10 (Hz)	1
		03	CH STEP	0: 1 1: 2.5 2: 5 3: 10 (kHz)	1
		04	AM CH STEP	0: 2.5 1: 5 2: 9 3: 10 4: 12.5 5: 25 (kHz)	1
		05	FM CH STEP	0: 5 1: 6.25 2: 10 3: 12.5 4: 20 5: 25 (kHz)	1
		06	MAIN STEPS PER REV.	0: 250 1: 500 2: 1000	1
		07	MPVD STEPS PER REV.	0: 50 1: 250 2: 500	1
04 (DISPLAY SETTING)	01 (DISPLAY)	01	MY CALL.	Up to 12 characters.	12
		02	MY CALL TIME	0: OFF 1: 0.5 2: 1 3: 2 4: 3 5: 5 (sec)	1
		03	SCREEN SAVER	0: OFF 1: 15 2: 30 3: 60 (min)	1
		04	DIMMER LED	00 ~ 20	2
		05	MOUSE POINTER SPEED	00 ~ 20	2
	02 (SCOPE)	01	RBW	0: HIGH 1: MID 2: LOW	1
		02	SCOPE CTR	0: FILTER 1: CAR POINT	1
		03	2D DISP SENSITIVITY	0: NORMAL 1: HI	1
		04	3DSS DISP SENSITIVITY	0: NORMAL 1: HI	1
	03 (EXT-MONITOR)	01	EXT DISPLAY	0: DISABLE 1: ENABLE	1
		02	PIXEL	0: 800x480 1: 800x600	1

CAT (Computer Aided Transceiver) Operation

FA	FREQUENCY VFO-A

	1	2	3	4	5	6	7	8	9	10	P1 000030000 - 075000000 (Hz)
Set	F	A	P1	P1	P1	P1	P1	P1	P1	P1	
	11	12	13	14	15	16	17	18	19	20	
	P1	;									
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	
	P1	;									

FB	FREQUENCY VFO-B

	1	2	3	4	5	6	7	8	9	10	P1 000030000 - 075000000 (Hz)
Set	F	B	P1	P1	P1	P1	P1	P1	P1	P1	
	11	12	13	14	15	16	17	18	19	20	
	P1	;									
Read	1	2	3	4	5	6	7	8	9	10	
	F	B	;								
Answer	1	2	3	4	5	6	7	8	9	10	
	F	B	P1	P1	P1	P1	P1	P1	P1	P1	
	11	12	13	14	15	16	17	18	19	20	
	P1	;									

FN	FINE TUNING

	1	2	3	4	5	6	7	8	9	10	P1 0: Fine Tuning "OFF"
Set	F	N	P1	;							1: Fine Tuning "ON"
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	;							

FT	FUNCTION TX

	1	2	3	4	5	6	7	8	9	10	P1 0: -
Set	F	T	P1	;							1: -
Read	1	2	3	4	5	6	7	8	9	10	2: MAIN Band Transmitter: TX
	F	T	;								3: SUB Band Transmitter: TX
Answer	1	2	3	4	5	6	7	8	9	10	P2 0: MAIN Band Transmitter: TX
	F	T	P2	;							1: SUB Band Transmitter: TX

GT	AGC FUNCTION

	1	2	3	4	5	6	7	8	9	10	P1 0: Fixed	P3 0: AGC "OFF"
Set	G	T	P1	P2	;						P2 0: AGC "OFF"	1: AGC "FAST"
Read	1	2	3	4	5	6	7	8	9	10	1: AGC "FAST"	2: AGC "MID"
	G	T	P1	;							2: AGC "MID"	3: AGC "SLOW"
Answer	1	2	3	4	5	6	7	8	9	10	3: AGC "SLOW"	4: AGC "AUTO-FAST"
	G	T	P1	P3	;						4: AGC "AUTO"	5: AGC "AUTO-MID"
												6: AGC "AUTO-SLOW"

ID	IDENTIFICATION

	1	2	3	4	5	6	7	8	9	10	P1 0761
Set											
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	;				

CAT (Computer Aided Transceiver) Operation

IF	INFORMATION									
Set	1	2	3	4	5	6	7	8	9	10
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	P2	P3	P3	P3	P3	P3	P4
	21	22	23	24	25	26	27	28	29	30
	P5	P6	P7	P8	P9	P9	P10	;		

P0 001-099 (Memory Channel), P1L -P9U (PMS), 5xx (5MHz BAND), EMG (EMERGENCY CH)
P2 VFO-A Frequency (Hz)
P3 Clarifier Direction +: Plus Shift, -: Minus Shift
    Clarifier Offset: 0000 - 9990 (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-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
P7 0: VFO 1: Memory   2: Memory Tune   3: Quick Memory Bank (QMB)
    4: -   5: PMS
P8 0: OFF   1: CTCSS ENC/DEC   2: CTCSS ENC
P9 00: (Fixed)
P10 0: Simplex   1: Plus Shift   2: Minus Shift

IS	IF-SHIFT									
Set	1	2	3	4	5	6	7	8	9	10
	I	S	P1	P2	P3	P4	P4	P4	P4	;
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	P3	P4	P4	P4	P4	;

P1 0: (Fixed)
P2 0: (Fixed)
P3 + / -
P4 0 ~ 1200 Hz (20 Hz steps)

KM	KEYER MEMORY									
Set	1	2	3	4	5	6	7	~	n-1	n
	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	~	n-1	n
	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									
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 - 75: 1050 Hz (10Hz steps)

KR	KEYER									
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									
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)

CAT (Computer Aided Transceiver) Operation

KY — CW KEYING

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

P1 1: Keyer Memory "1" Playback 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	L	K	P1	;						
Read	L	K	;							
Answer	L	K	P1	;						

P1 0: Main Dial Lock "OFF"
1: Main Dial Lock "ON"

LM — LOAD MESSAGE

	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 P2 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)

MA — MEMORY CHANNEL TO VFO-A

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

MB — MEMORY CHANNEL TO VFO-B

	1	2	3	4	5	6	7	8	9	10
Set	M	B	;							
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 001-099 (Memory Channel), P1L -P9U (PMS), 5xx (5MHz BAND), EMG (EMERGENCY CH)

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 Band
1: SUB Band
P2 MODE 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

MG — MIC GAIN

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

P1 000 - 100

CAT (Computer Aided Transceiver) Operation

ML — MONITOR LEVEL

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

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

Answer

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

P0 001-099 (Memory Channel), P1L -P9U (PMS), 5xx (5MHz BAND), EMG (EMERGENCY CH)
P2 Frequency (Hz)
P3 Clarifier Direction +: Plus Shift, --: Minus Shift
   Clarifier Offset: 0000 - 9990 (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-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
P7 0: VFO 1: Memory
P8 0: CTCSS "OFF"   1: CTCSS ENC/DEC   2: CTCSS ENC
P9 00: (Fixed)
P10 0: Simplex   1: Plus Shift   2: Minus Shift

MS — METER SW

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

P1 0: PO   P2 0: Fixed
   1: COMP
   2: ALC
   3: VDD
   4: ID
   5: SWR

MT — MEMORY CHANNEL WRITE/TAG

Set

1	2	3	4	5	6	7	8	9	10
M	T	P1	P1	P1	P2	P2	P2	P2	P2
11	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
P2	P2	P2	P2	P3	P3	P3	P3	P3	P4
21	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**
P5	P6	P7	P8	P9	P9	P10	P11	P12	P12
31	**32**	**33**	**34**	**35**	**36**	**37**	**38**	**39**	**40**
P12	P12	P12	P12	P12	P12	P12	P12	P12	P12
41	**42**	**43**	**44**	**45**	**46**	**47**	**48**	**49**	**50**
;									

Read

1	2	3	4	5	6	7	8	9	10
M	T	P0	P0	P0	;				

Answer

1	2	3	4	5	6	7	8	9	10
M	T	P1	P1	P1	P2	P2	P2	P2	P2
11	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
P2	P2	P2	P2	P3	P3	P3	P3	P3	P4
21	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**
P5	P6	P7	P8	P9	P9	P10	P11	P12	P12
31	**32**	**33**	**34**	**35**	**36**	**37**	**38**	**39**	**40**
P12	P12	P12	P12	P12	P12	P12	P12	P12	P12
41	**42**	**43**	**44**	**45**	**46**	**47**	**48**	**49**	**50**
;									

P0/1 001-099 (Memory Channel), P1L -P9U (PMS), 5xx (5MHz BAND), EMG (EMERGENCY CH)
P2 Frequency (Hz)
P3 Clarifier Direction +: Plus Shift, --: Minus Shift
   Clarifier Offset: 0000 - 9990 (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-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
P7 Set: 0: (Fixed) / Read: 0: VFO   1: Memory
P8 0: CTCSS "OFF"   1: CTCSS ENC/DEC   2: CTCSS ENC
P9 00: (Fixed)
P10 0: Simplex   1: Plus Shift   2: Minus Shift
P11 0: (Fixed)
P12 TAG Characters (up to 12 characters) (ASCII)

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	P2	P3	P3	P3	P3	P3	P4
	21	22	23	24	25	26	27	28	29	30
	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

P1 001-099 (Memory Channel), P1L -P9U (PMS)
P2 Frequency (Hz)
P3 Clarifier Direction +: Plus Shift, --: Minus Shift
   Clarifier Offset: 0000 - 9990 (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-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
P7 0: (Fixed)
P8 0: CTCSS "OFF"   1: CTCSS ENC/DEC   2: CTCSS ENC
P9 00: (Fixed)
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	M	X	;							
Answer	M	X	P1	;						

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

NA — NARROW

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

P1 0: Fixed
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: Fixed
P2 0: Noise Blanker "OFF"
   1: Noise Blanker "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: Fixed
P2 000 - 010

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

CAT (Computer Aided Transceiver) Operation

OI — OPPOSITE BAND INFORMATION

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

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

P1 001-099 (Memory Channel), P1L -P9U (PMS), 5xx (5MHz BAND), EMG (EMERGENCY CH)
P2 VFO-B Frequency (Hz)
P3 Clarifier Direction +: Plus Shift, --: Minus Shift
Clarifier Offset: 0000 - 9990 (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-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 E: DATA-FM-N
P7 0: VFO 1: Memory 2: Memory Tune 3: Quick Memory Bank (QMB)
4: - 5: PMS
P8 0: CTCSS "OFF" 1: CTCSS ENC/DEC 2: CTCSS ENC
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 Band
1: SUB Band
P2 0: Simplex
1: Plus Shift
2: Minus Shift
*: This command can be activated only with an FM mode.

PA — PRE-AMP (IPO)

	1	2	3	4	5	6	7	8	9	10
Set	P	A	P1	P2	;					
Read	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: Fixed
P2 0: DVS (Playback Stop)
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)

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 005 - 100

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 -100

PR — SPEECH PROCESSOR

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

P1 0: Speech Processor
1: Parametric Microphone Equalizer
P2 1: "OFF"
2: "ON"

CAT (Computer Aided Transceiver) Operation

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

P1 0: POWER "OFF"
      1: POWER "ON"
This command requires dummy data be initially sent. Then after one second and before two seconds the command is sent. (For example, Send "PS1;" command, wait 1 second, and then Send "PS1;" command again within 2 seconds.)

! When using an RS-232C cable, the PS command (POWER SWITCH) is not available , so the transceiver cannot be turned ON with the CAT command.

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

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

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

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

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

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

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

P1 0000 - 9990 (Hz)

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

P1 0: Fixed
P2 1: 12 kHz   P3: 6: 12 kHz
     2: 3 kHz   7: 3 kHz
     3: -   8: -
     4: 500 Hz   9: 500 Hz
     5: 300 Hz (option) A: 300 Hz

CAT (Computer Aided Transceiver) Operation

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: Fixed
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   P2 0: OFF
1: -   1: ON
2: -
3: REC
4: PLAY
5 - C: -
D: Unable to transmission

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	P3	P3	P3	;

P1=0
P2: Meter 0 - 255
P3: 000 (Fixed)
P1= 1: S   2: -   3: COMP   4: ALC   5: PO
6: SWR   7: IDD   8: VDD   9: -
P2: 0 - 255
P3: 000 (Fixed)

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 - 9990 (Hz)

SC — SCAN

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

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

SD	CW BREAK-IN DELAY TIME											
Set	1	2	3	4	5	6	7	8	9	10	00: 30 01: 50 02: 100 03: 150 04: 200 05: 250	
	S	D	P1	P1	;						06: 300 07: 400 - 32: 2900 33: 3000 (msec) (06 to 33: 100 msec steps)	
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	SUB DIAL FUNCTION										
Set	1	2	3	4	5	6	7	8	9	10	P1 0: MPVD
	S	F	P1	P2	;						1: FUNC knob

P1   0: MPVD
       1: FUNC knob
P2   P1=0
       1: CLAR   2: -   3: SUB   4: CS
       5:-   6: -   7: -   8: STEP
       9: MCH

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

P1=1
0: RF POWER   1: MONI LEVEL   2: -   3: -   4: VOX GAIN
5: VOX DELAY   6: ANTI VOX   7: -   8: -   9: GROUP
A: -   B: -   C: PEAK   D: COLOR   E: S.LEVEL
F: PROC LEVEL   G: MIC GAIN   H: CW SPEED   I: CW PITCH   J: BK-IN DELAY
K: AMC LEVEL   L: -   M: CONTRAST   N: DIMMER

SF Answer	1	2	3	4	5	6	7	8	9	10
	S	F	P1	P2	;					

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

Table 3 (Bandwidth Chart)				
Command	Bandwidth			
P3	SSB	CW	RTTY	PSK
00 (Default)	(Default)*	(Default)*	(Default)*	(Default)*
01	300 Hz	50 Hz	50 Hz	50 Hz
02	400 Hz	100 Hz	100 Hz	100 Hz
03	600 Hz	150 Hz	150 Hz	150 Hz
04	850 Hz	200 Hz	200 Hz	200 Hz
05	1100 Hz	250 Hz	250 Hz	250 Hz
06	1200 Hz	300 Hz	300 Hz	300 Hz
07	1500 Hz	350 Hz	350 Hz	350 Hz
08	1650 Hz	400 Hz	400 Hz	400 Hz
09	1800 Hz	450 Hz	450 Hz	450 Hz
10	1950 Hz	500 Hz	500 Hz	500 Hz
11	2100 Hz	600 Hz	600 Hz	600 Hz
12	2250 Hz	800 Hz	800 Hz	800 Hz
13	2400 Hz	1200 Hz	1200 Hz	1200 Hz
14	2450 Hz	1400 Hz	1400 Hz	1400 Hz
15	2500 Hz	1700 Hz	1700 Hz	1700 Hz
16	2600 Hz	2000 Hz	2000 Hz	2000 Hz
17	2700 Hz	2400 Hz	2400 Hz	2400 Hz
18	2800 Hz	3000 Hz	3000 Hz	3000 Hz
19	2900 Hz	3200 Hz	3200 Hz	3200 Hz
20	3000 Hz	3500 Hz	3500 Hz	3500 Hz
21	3200 Hz	4000 Hz-	4000 Hz-	4000 Hz-
22	3500 Hz	-	-	-
23	4000 Hz	-	-	-

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

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

SQ	SQUELCH LEVEL										
Set	1	2	3	4	5	6	7	8	9	10	P1 0: Fixed
	S	Q	P1	P2	P2	P2	;				P2 000 - 100
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	;				

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   8: HOLD

P2=0 (SPEED):
   P3   0: SLOW1   1: SLOW2   2: FAST1   3: FAST2   4: FAST3
   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 (DIRECT SAMPLING)
   P4 - P7:   0: Fixed
P2=4 (LEVEL):
   P3 - P7: -30.0 - +30.0 (0.5 dB step)
P2=5 (SPAN):
   P3   0: 1 kHz   1: 2 kHz   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: W/F CENTER (L)   4: W/F CENTER (N)   5: W/F CENTER (S)
           6: W/F CURSOR (L)   7: W/F CURSOR (N)   8: W/F CURSOR (S)
           9: W/F FIX (L)   A: W/F FIX (N)   B: W/F FIX (S)
   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 (ATT=0dB)   1: OSC Level (ATT=10dB)
           2: OSC Level (ATT=20dB)
   P5   0: OSC Time (1msec)   1: OSC Time (3msec)   2: OSC Time (10msec)
           3: OSC Time (30msec)   4: OSC Time (100msec)   5: OSC Time (300msec)
   P6 - P7:   0: Fixed
P2=8 (HOLD):
   P3   0: HOLD "OFF"   1: HOLD "ON"
   P4 - 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"
     2: SPLIT "ON" + 5 kHz Up

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 VFO-A and VFO-B

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

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

VD — VOX DELAY TIME / DATA VOX DELAY TIME

	1	2	3	4	5	6	7	8	9	10
Set	V	D	P1	P1	P1	P1	;			
Read	V	D	;							
Answer	V	D	P1	P1	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)
VD command has different parameters to be changed according to the setting of Menu item [OPERATION SETTING] → [TX GENERAL] → [VOX SELECT].
"MIC": VOX DELAY
"DATA": DATA VOX DELAY

VG — VOX GAIN

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

P1 000 - 100

VM — MAIN BAND TO MEMORY CHANNEL

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

VS — VFO SELECT

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

P1 0: VFO-A Operation
1: VFO-B Operation

VX — VOX STATUS

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

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

XT — TX CLAR

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

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

ZI — ZERO IN

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

(CW AUTO ZERO IN Function)
P1 0: Fixed

YAESU
The radio

2308-F