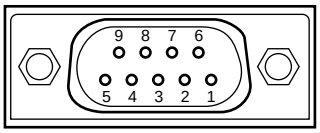
APPENDIX: COM CONNECTOR PROTOCOL

HARDWARE DESCRIPTION

This transceiver uses a full-duplex, asynchronous, serial interface for communicating through the male 9-PIN RS-232C **COM** connector. Bytes are constructed with 1 start bit, 8 data bits, and 1 stop bit (4800 bps can be configured for 1 or 2 stop bits). No parity is used. The pinout and the pin functions of the **COM** connector are as shown below:

COM



Rear panel view

COM Pin No.	COM Pin Name (Ref.: Computer)	Function (Ref.: Transceiver)	I/O
1	NC	—	—
2	$\overline{\text{RXD}}$	Transmit data	Output
3	$\overline{\text{TXD}}$	Receive data	Input
4	NC	—	—
5	GND	Signal ground	
6	NC	—	—
7	RTS	Receive enable	Input
8	CTS	Transmit enable	Output
9	NC	—	—

$\overline{\text{RXD}}$: Transmit data is serial data transferred from the transceiver to the computer.

$\overline{\text{TXD}}$: Receive data is serial data transferred from the computer to the transceiver.

GND: Signal ground pin

RTS: This signal is applied to the transceiver. It is used to inhibit transmit data from the transceiver when the computer is not ready to receive the data. Transmit data is inhibited when the level is low.

CTS: This signal is applied from the transceiver. It is used to inhibit transmit data from the computer when the transceiver is not ready to receive the data. Transmit data is stopped when the level is low.

CONTROL OPERATION

Most computers handle data in the form of “bits” and “bytes”. A bit is the smallest piece of information that the computer can handle. A byte is composed of eight bits. This is the most convenient form for most computer data. This data may be sent in the form of either serial or parallel data strings. The parallel method is faster but more complicated, while the serial method is slower and requires less complicated equipment. The serial form is, therefore, a less expensive alternative.

Serial data transmission uses time-division methods over a single line. Using a single line also offers the advantage of reducing the number of errors due to line noise.

Only 3 lines are required theoretically for control of the transceiver via the computer:

- Transmit data
- Receive data
- Ground

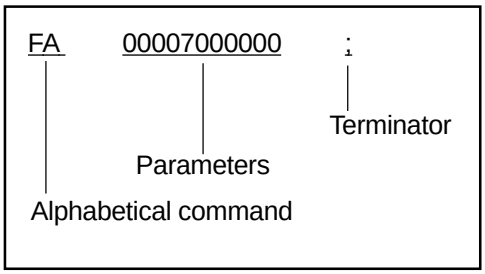
From a practical standpoint, it is also necessary to incorporate some means of controlling when this data transfer will occur. The computer and transceiver cannot be allowed to send data at the same time! The required control is achieved by using the RTS and CTS lines.

For example, the transceiver is placed into the transmit mode whenever the character string “TX;” is sent from the computer. The character string “TX;” is called a computer control command. It tells the transceiver what to do. There are numerous commands available for control of the transceiver. These commands may be incorporated into a computer program written in any high level language. Programming methods vary from computer to computer; therefore, refer to the instruction manuals provided with the terminal program and computer.

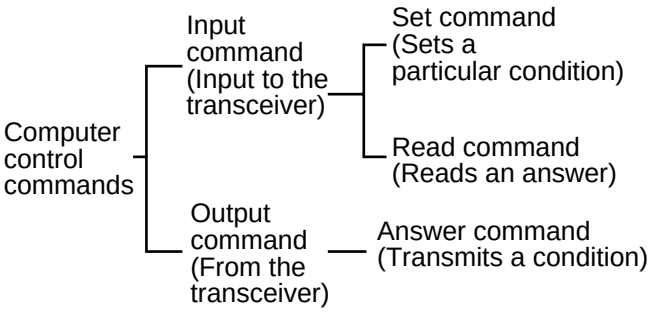
COMPUTER CONTROL COMMANDS

A computer control command is composed of an alphabetical command, various parameters, and the terminator that signals the end of the control command.

EXAMPLE: Command to set VFO A to 7 MHz



Commands can be classified as shown below:



For example, note the following in the case of the FA command (Frequency of VFO A):

- To set the frequency to 7 MHz, the following command is sent from the computer to the transceiver:

  "FA00007000000;" **(Set command)**

- To read the frequency of VFO A, 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:

  "FA00007000000;" **(Answer command)**

Note:

- *Do not use the control characters 00 to 1Fh since they are either ignored or cause a "?" answer.*
- *Program execution may be delayed while turning the **Tuning** control rapidly.*
- *Receive data is not processed if the frequency is entered from the keypad.*

■ 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 Alphabetical Command Table {page 72}.

■ 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 Parameter Table {page 73} and the Computer Control Command Tables {page 75} to configure the appropriate parameters.

When configuring parameters, be careful not to make the following mistakes.

(correct parameter: "IS+1000")

IS1000;	Not enough parameters specified (No direction given for the IF shift)
IS+100;	Not enough digits (Only three frequency digits given)
IS ␣ + ␣ 1000;	Unnecessary characters between parameters
IS+10000;	Too many digits (Five frequency digits given)

Note: *If a particular parameter is not applicable to this transceiver, 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.

■ Error Messages

In addition to the Answer command, the transceiver can send the following error messages.

Error Message	Reason for Error
?;	• Command syntax was incorrect. • Command was not executed due to the current status of the transceiver (even though the command syntax was correct). ***Note:*** *Occasionally this message may not appear due to microprocessor transients in the transceiver.*
E;	A communication error occurred such as an overrun or framing error during a serial data transmission.
O;	Receive data was sent but processing was not completed.

■ Alphabetical Command Table

Command	Function
AC	Antenna Tuner THRU/IN-LINE, and tuning START/CANCEL
AG	Sets or reads AF gain.
AI	Auto information
AN	Selects antenna connector (ANT 1/ANT 2).
BC	Sets or reads Beat Cancel.
BY	Reads busy signals.
CA	Sets or reads CW Auto Zero-beat (OFF/ON).
CN	Sets or reads CTCSS tone number (01~39).
CT	Sets or reads CTCSS (OFF/ON).
DN	MIC DOWN function
EX	Sets or reads Menu.
FA	Sets or reads VFO A frequency.
FB	Sets or reads VFO B frequency.
FR	Sets RX (VFO A/B, memory channel).
FS	Fine function (OFF/ON)
FT	Sets TX (VFO A/B, memory channel).
FW	Sets or reads filter bandwidth.
GT	Sets or reads AGC time constant.
ID	Reads model number of the transceiver.
IF	Reads status of the transceiver.
IS	Sets or reads IF shift.
KS	Sets or reads keying speed while using the KY command or the built-in keyer.
KY	Converts input characters into Morse code.
LK	Sets or reads Frequency Lock (OFF/ON).
LM	DRU or CW message recording
MC	Sets or reads memory channels.
MD	Sets or reads modulation modes.
MG	Sets or reads MIC gain.
MR	Reads memory.
MW	Writes into memory.
NB	Sets or reads Noise Blanker (OFF/ON).
NR	Sets or reads Noise Reduction.
PA	Sets or reads Preamplifier (OFF/ON).

Command	Function
PB	DRU or CW message playback
PC	Sets or reads transmit power.
PR	Sets or reads Speech Processor (OFF/ON).
PS	Sets or reads power (OFF/ON).
PT	Sets or reads CW RX pitch.
RA	Sets or reads RF ATT (attenuator).
RC	Clears RIT frequency.
RD	Lowers RIT frequency.
RG	Sets or reads RF gain.
RM	Selects a meter function or reads meter values.
RT	Sets or reads RIT (OFF/ON).
RU	Raises RIT frequency.
RX	Selects receive mode.
SC	Sets or reads Scan (OFF/ON).
SD	Sets or reads Semi Break-in delay time.
SH	Sets or reads high cut-off frequency.
SL	Sets or reads low cut-off frequency.
SM	Reads S-meter.
SQ	Sets or reads squelch level.
SR	Resets the transceiver.
TN	Sets or reads subtone number (01~39).
TO	Sets or reads Subtone (OFF/ON).
TX	Selects transmit mode.
UP	MIC UP function
VD	Sets or reads VOX delay time.
VG	Sets or reads VOX gain.
VR	Triggers the Voice Synthesizer for message output.
VX	Sets VOX (OFF/ON).
XT	Sets XIT (OFF/ON).

■ Parameter Table

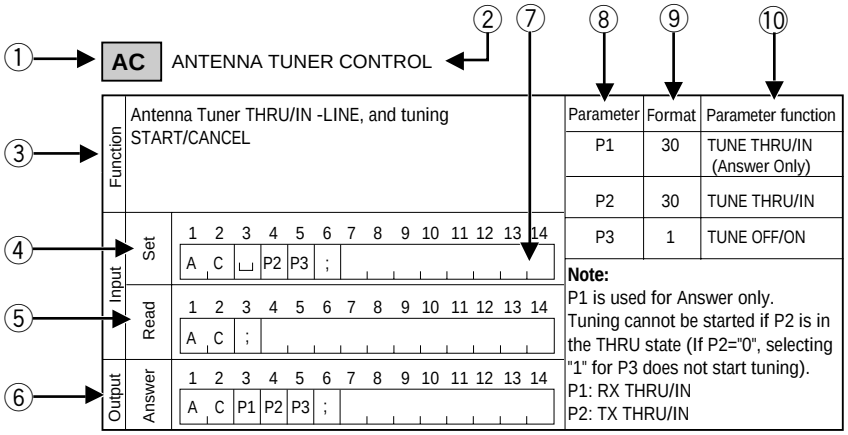
Format No.	Name	No. of Digits	Format
1	SW	1	0: OFF 1: ON
2	MODE	1	0: No selection 5: AM 1: LSB 6: FSK 2: USB 7: CW-R 3: CW 8: No selection 4: FM 9: FSK-R
3	FUNCTION	1	0: VFO A 1: VFO B 2: Memory
4	FREQUENCY	11	Represented in Hz. Ex.: 00014230000 is 14.230 MHz
5	RIT/XIT FREQUENCY	5	The first digit is "+" or "–", and the remaining four digits indicate the frequency in Hz. Ex.: +5320 is +5.32 kHz
7	MEMORY CHANNEL	2	Represented using 00~99.
9	MEMORY CHANNEL SPLIT DATA	1	0: Receive (Start freq.) 1: Transmit (End freq.) (Start/End freq.: Ch.90~99)
10	MEMORY LOCKOUT	1	0: Not locked out 1: Locked out
11	TX/RX	1	0: Receive 1: Transmit
14	TONE NUMBER	2	Represents the tone number (01~39). See the subtone frequency table on page 25.
16	MODEL NUMBER	3	Represents the type of transceiver. TS-570S: 018 TS-570D: 017
22	METER VALUE	4	RM command: 0000~0008 SM command: 0000~0015 Relative values are output.
24	METER SWITCH	1	0: No selection 1: SWR 2: COMP 3: ALC
27	PLAYBACK CHANNEL	1	0: No playback A Set command cancels playback. 1: Channel 1 2: Channel 2 3: Channel 3
30	ANTENNA TUNER	1	0: Antenna tuner thru 1: Antenna tuner in-line
31	GAIN	3	Represented using 000 (min.)~255 (max.). MG command: 000~100
32	AI NUMBER	1	0: AI OFF 1: IF command outputs its Answer command periodically. 2: For parameter changes, the corresponding Answer command is output. 3: Both 1 and 2.
33	ANTENNA NUMBER	1	1: ANT 1 2: ANT 2

Format No.	Name	No. of Digits	Format
35	MENU NUMBER	3	Represented using 000~051.
36	MENU SELECTION	4	See table on page 74.
38	FILTER WIDTH	4	Represented using 0000~9999.
39	AGC TIME CONSTANT	3	002: Fast 004: Slow
40	IF SHIFT DIRECTION	1	"+": Upward freq. shift (or "␣") "–": Downward freq. shift
41	IF SHIFT FREQUENCY	4	Represented in Hz using 0000~1100.
42	KEYER SPEED	3	Represented in words per minute using 010 (min.)~ 060 (max.).
43	KEYER MESSAGE	24	Contains the CW message.
44	KEYER BUFFER	1	0: Buffer space available 1: Buffer space not available
45	LOAD MESSAGE	1	0: Not recording. A Set command cancels recording. 1: Channel 1 2: Channel 2 3: Channel 3
46	LEVEL	3	Represented using 000 (min.)~255 (max.).
47	POWER CONTROL	3	Represented in watts using 005~100, 5 W steps.
49	SEMI BREAK-IN DELAY TIME	4	Represented in msec using 0000~1000, 50 ms steps.
50	SYSTEM RESET	1	1: Partial Reset (**[A/B]+ POWER ON**) 2: Full Reset (**[A=B]+ POWER ON**)
51	VOX DELAY TIME	4	Represented in msec using 0000~3000.
52	CW RX PITCH	2	Represented using 00 (400 Hz min.) ~ 12 (1000 Hz max.).
53	DSP SLOPE	2	Represented using 00~20 High cut-off 00: 5.0 kHz 20: 1.0 kHz Low cut-off 00: 10 Hz 20: 1000 Hz
54	VOX GAIN	3	Represented using 001 (min.) ~ 009 (max.).
55	VOICE RECALL	1	1: Voice 1 2: Voice 2
56	NOISE REDUCTION	1	0: Noise Reduction OFF 1: Noise Reduction 1 2: Noise Reduction 2
57	BEAT CANCEL	1	0: Beat Cancel OFF 1: Beat Cancel ON 2: Enhanced Beat Cancel ON

■ Menu Selection Table for "EX" Command

Menu No.	Menu Item	Parameter												
		0000	0001	0002	0003	0004	0005	0006	0007	0008	0009	0010	0011	0012
00	Display brightness	OFF	d4	d3	d2	d1								
01	Beep output level	OFF	1	2	3	4	5	6	7	8	9			
02	**[UP]/[DOWN]**	100	500	1000										
03	**MULTI/CH** control (SSB/CW/FSK/AM)	1	5	10										
04	**MULTI/CH** control (FM)	1	5	10	12.5	20	25							
05	**MULTI/CH** control (rounds off freq.)	OFF	ON											
06	**MULTI/CH** control (AM broadcast band)	10	9											
07	Memory-VFO split	OFF	ON											
08	Tunable/fixed freq.	OFF	ON											
09	Program Scan Hold	OFF	ON											
10	Scan resume	TO	CO											
11	Antenna tuner in RX mode	OFF	ON											
12	NR2 Time constant	7.5	20											
13	TX filter (SSB/AM)	2.4	2.0											
14	TX equalizer	OFF	HB	FP	BB	C								
15	Speech processor	0	5	10	15	20	25							
16	VOX gain	0	1	2	3	4	5	6	7	8	9			
17	MIC gain (FM)	Low	High											
18	Subtone freq.	Subtone frequency Nos. 01~39: 0001~0039												
19	Subtone type	B	C											
20	CW RX pitch/ TX sidetone	400	450	500	550	600	650	700	750	800	850	900	950	1000
21	TX sidetone volume	OFF	1	2	3	4	5	6	7	8	9			
22	Semi-automatic key	OFF	ON											
23	Playback repeat	OFF	ON											
24	Playback repeat interval	0~60 sec: 0000~0060												
25	Playback volume	OFF	1	2	3	4	5	6	7	8	9			
26	Auto weighting	OFF	ON											
27	Auto weighting reversed	OFF	ON											
28	Keying priority over playback	OFF	ON											
29	FSK shift	170	200	425	850									
30	FSK polarity	OFF	ON											
31	FSK tone freq.	1275	2125											
32	Digital operation filter	OFF	1200	300	PSK									
33	AF input level (MCP/TNC TX)	0	1	2										
34	AF output level (MCP/TNC RX)	0	1	2	3	4	5	6	7	8	9			
35	**COM** communication parameters	12-1	24-1	48-1	48-2	96-1	192-1	384-1	576-1					
36	Data transfer enable	OFF	ON											
37	Data transfer method	OFF	ON											
38	TX inhibit	OFF	ON											
39	Linear amplifier relay	OFF	ON											
40	Transverter	OFF	50	144	430									
41	**[PF]**	Menu Nos. 00~40: 0000~0040 Menu Nos. 48~51: 0080~0083 Function Nos. 50~53: 0050~0053 Function Nos. 60~76: 0060~0076 OFF: 0099												
42	Mic **[PF1]**													
43	Mic **[PF2]**													
44	Mic **[PF3]**													
45	Mic **[PF4]**													
46	IF filter	OFF	1800	500	270									
47	Transmitted-signal monitor volume	OFF	1	2	3	4	5	6	7	8	9			
48	Auto zero-beat with RIT	OFF	ON											
49	Keyer locked-weight change	2.5:1~4.0:1: 0000~0015												
50	RX equalizer	OFF	HB	FP	BB	C								
51	Noise reduction 1 level change	Auto	1	2	3	4	5	6	7	8	9			

READING COMMAND TABLES



① Command

② Name

③ Function of the command

④ The format of the Set command is shown. When oblique lines are drawn in the 1st and 2nd columns, there is no Set command.

⑤ The format of the command for reading the transceiver's current status is shown. When oblique lines are drawn in the 1st and 2nd columns, there is no Read command.

⑥ The format of the command output from the transceiver is shown. When oblique lines are drawn in the 1st and 2nd columns, there is no Answer command.

⑦ The number of command digits is shown.

⑧ Corresponds to the parameter of the command format.

⑨ Corresponds to the Format number in the Parameter Table. For the parameter formats, refer to the Parameter Table {page 73}.

⑩ Indicates the function of the parameter.

COMPUTER CONTROL COMMAND TABLES

Note: *Parameters that have a Parameter Function of "NOT USED" are not supported by this transceiver. Any character except the ASCII control codes (00 to 1Fh) and the terminator (;) may be entered for those parameters.*

AC ANTENNA TUNER CONTROL

			Parameter	Format	Parameter function
Function		Antenna Tuner THRU/IN -LINE, and tuning START/CANCEL	P1	30	TUNE THRU/IN (Answer Only)
			P2	30	TUNE THRU/IN
			P3	1	TUNE OFF/ON
Input	Set	1 2 3 4 5 6 7 8 9 10 11 12 13 14 | A C ␣ P2 P3 ;	**Note:** P1 is used for Answer only. Tuning cannot be started if P2 is in the THRU state (If P2="0", selecting "1" for P3 does not start tuning). P1: RX THRU/IN P2: TX THRU/IN		
	Read	1 2 3 4 5 6 7 8 9 10 11 12 13 14 | A C ;			
Output	Answer	1 2 3 4 5 6 7 8 9 10 11 12 13 14 | A C P1 P2 P3 ;			

AG AF GAIN

			Parameter	Format	Parameter function
Function		Sets or reads AF gain.	P1	31	AF GAIN
Input	Set	1 2 3 4 5 6 7 8 9 10 11 12 13 14 | A G P1 ;			
	Read	1 2 3 4 5 6 7 8 9 10 11 12 13 14 | A G ;			
Output	Answer	1 2 3 4 5 6 7 8 9 10 11 12 13 14 | A G P1 ;			

AI AUTO INFORMATION

			Parameter	Format	Parameter function
Function		Auto information OFF/ON	P1	32	AI NUMBER
Input	Set	1 2 3 4 5 6 7 8 9 10 11 12 13 14 | A I P1 ;	**Note:** For other commands, controls whether changing a parameter will or will not trigger the corresponding Answer command to be output. **Ex:** For IF, the Answer command is output if the step frequency or RIT/XIT frequency is changed. Switching the transceiver ON restores "0".		
	Read	1 2 3 4 5 6 7 8 9 10 11 12 13 14 | A I ;			
Output	Answer	1 2 3 4 5 6 7 8 9 10 11 12 13 14 | A I P1 ;			

AN ANTENNA NUMBER

			Parameter	Format	Parameter function
Function		Selects antenna connector ANT 1/ ANT 2.	P1	33	ANTENNA NUMBER
Input	Set	1 2 3 4 5 6 7 8 9 10 11 12 13 14 | A N P1 ;			
	Read	1 2 3 4 5 6 7 8 9 10 11 12 13 14 | A N ;			
Output	Answer	1 2 3 4 5 6 7 8 9 10 11 12 13 14 | A N P1 ;			

BC BEAT CANCEL

Function: Sets or reads Beat Cancel.

Parameter	Format	Parameter function
P1	57	BEAT CANCEL

Input Set: `B C P1 ;`
Input Read: `B C ;`
Output Answer: `B C P1 ;`

BY BUSY

Function: Reads busy signals.

Parameter	Format	Parameter function
P1	1	BUSY OFF/ON

Input Set: (no data)
Input Read: `B Y ;`
Output Answer: `B Y P1 ;`

CA CW AUTO ZERO-BEAT

Function: Sets CW Auto Zero-Beat OFF/ON or reads status.

Parameter	Format	Parameter function
P1	1	CW AUTO ZERO-BEAT OFF/ON

Input Set: `C A P1 ;`
Input Read: `C A ;`
Output Answer: `C A P1 ;`

CN CTCSS TONE NUMBER

Function: Sets or reads CTCSS tone number(01~39).

Parameter	Format	Parameter function
P1	14	CTCSS TONE NUMBER

Note:
Selecting No. 39 (1750 Hz) switches OFF the CTCSS.

Input Set: `C N P1 ;`
Input Read: `C N ;`
Output Answer: `C N P1 ;`

CT CTCSS FUNCTION

Function: Sets or reads CTCSS OFF/ON status.

Parameter	Format	Parameter function
P1	1	CTCSS OFF/ON

Input Set: `C T P1 ;`
Input Read: `C T ;`
Output Answer: `C T P1 ;`

DN UP DOWN/UP

Function: Microphone DOWN/UP function.

Input Set: `DN/UP ;`
Input Read: (no data)
Output Answer: (no data)

EX EXTENSION MENU

Function: Sets or reads Menu.

Parameter	Format	Parameter function
P1	35	MENU NUMBER
P2	36	MENU SELECTION

Input Set: `E X P1 P2 ;`
Input Read: `E X ;`
Output Answer: `E X P1 P2 ;`

FA FB FREQUENCY VFO A/ VFO B

Function: Sets or reads VFO A/ VFO B frequency.

Parameter	Format	Parameter function
P1	4	FREQUENCY

Input Set: `F A/B P1 ;`
Input Read: `F A/B ;`
Output Answer: `F A/B P1 ;`

FR FT FUNCTION RX, FUNCTION TX

Function: Sets RX/TX (VFO A/B, memory channel).

Parameter	Format	Parameter function
P1	3	FUNCTION

Note:
Using FR command always places the transceiver to simplex-operation status.

Input Set: `F R/T P1 ;`
Input Read: `F R/T ;`
Output Answer: `F R/T P1 ;`

FS FINE STEP

Function: Fine function OFF/ON

Parameter	Format	Parameter function
P1	1	FINE OFF/ON

Input Set: `F S P1 ;`
Input Read: `F S ;`
Output Answer: `F S P1 ;`

FW FILTER WIDTH

Sets or reads filter bandwidth.

Parameter	Format	Parameter function
P1	38	FILTER WIDTH

Note:

CW	SSB/AM/FM
0000~0079: 50 Hz	0000: Narrow
0080~0099: 80 Hz	0001~: Wide
0100~0149: 100 Hz	
0150~0199: 150 Hz	FSK
0200~0299: 200 Hz	0000~0499: 250 Hz
0300~0399: 300 Hz	0500~0999: 500 Hz
0400~0499: 400 Hz	1000~1499: 1000 Hz
0500~0599: 500 Hz	1500~ : 1500 Hz
0600~0999: 600 Hz	
1000~1999: 1000 Hz	
2000~ : 2000 Hz	

Input Set: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 — F W | P1 | ;

Input Read: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 — F W ;

Output Answer: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 — F W | P1 | ;

GT AUTO GAIN CONTROL TIME CONSTANT

Sets or reads AGC time constant.

Parameter	Format	Parameter function
P1	39	AGC TIME CONSTANT

Note:
When in FM mode, the transceiver returns "␣␣␣".

Input Set: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 — G T | P1 | ;

Input Read: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 — G T ;

Output Answer: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 — G T | P1 | ;

ID IDENTIFICATION

Reads Model number of the transceiver.

Parameter	Format	Parameter function
P1	16	MODEL NUMBER

Input Set: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 — /

Input Read: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 — I D ;

Output Answer: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 — I D | P1 | ;

IF INFORMATION

Reads status of the transceiver.

Parameter	Format	Parameter function
P1	4	FREQUENCY
P2	–	NOT USED
P3	5	RIT/XIT FREQUENCY
P4	1	RIT OFF/ON
P5	1	XIT OFF/ON
P6	–	NOT USED
P7	7	MEMORY CHANNEL
P8	11	TX/RX
P9	2	MODE
P10	3	FUNCTION
P11	1	SCAN OFF/ON
P12	1	SPLIT OFF/ON
P13	1	TONE OFF/ON
P14	14	TONE NUMBER
P15	–	NOT USED

Input Set: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 — /

Input Read: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 — I F ;

Output Answer:
1 2 3 4 5 6 7 8 9 10 11 12 13 14 — I F | P1 | ␣
15 16 17 18 19 20 21 22 23 24 25 26 27 28 — ␣ ␣ ␣ ␣ | P3 | P4 | P5 | ␣ | P7
29 30 31 32 33 34 35 36 37 38 39 40 41 42 — P8 | P9 | P10 | P11 | P12 | P13 | P14 | ␣ | ;

IS IF SHIFT

Sets or reads IF shift.

Parameter	Format	Parameter function
P1	40	IF SHIFT DIRECTION
P2	41	IF SHIFT FREQUENCY

Note:
If P2 is positive or zero, P1 can be "+" or "␣".

Input Set: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 — I S | P1 | P2 | ;

Input Read: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 — I S ;

Output Answer: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 — I S | P1 | P2 | ;

KS KEYER SPEED

Sets or reads keying speed while using the KY command.

Parameter	Format	Parameter function
P1	42	KEYER SPEED

Input Set: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 — K S | P1 | ;

Input Read: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 — K S ;

Output Answer: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 — K S | P1 | ;

KY CW KEYING

Converts input characters into Morse code.

Parameter	Format	Parameter function
P1	43	KEYER MESSAGE
P2	44	KEYER BUFFER

Note: The Set command requires a "␣" (ASCII code 20h) in the third byte position. Insert "␣" for bytes that have no characters to make a 28-byte fixed length command.
The "␣" bytes will not send any character.
Supported characters include:
Letters, numbers, " ' (( )) ( ) * + ,– . / : = ?
Up to 24 characters can be converted as one sentence at one time. The subsequent sentence must be keyed after the current conversion is completed.

Input Set:
1 2 3 4 5 6 7 8 9 10 11 12 13 14 — K Y | ␣ | P1
15 16 17 18 19 20 21 22 23 24 25 26 27 28 — | ;

Input Read: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 — K Y ;

Output Answer:
1 2 3 4 5 6 7 8 9 10 11 12 13 14 — K Y | P2 | ;
15 16 17 18 19 20 21 22 23 24 25 26 27 28
29 30 31 32 33 34 35 36 37 38 39 40 41 42

LK FREQUENCY LOCK

Sets Frequency Lock OFF/ON or reads status.

Parameter	Format	Parameter function
P1	1	LOCK OFF/ON

Input Set: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 — L K | P1 | ;

Input Read: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 — L K ;

Output Answer: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 — L K | P1 | ;

LM LOAD MESSAGE

DRU or CW message recording

Parameter	Format	Parameter function
P1	45	LOAD MESSAGE

Input Set: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 — L M | P1 | ;

Input Read: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 — L M ;

Output Answer: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 — L M | P1 | ;

MC MEMORY CHANNEL

Function: Sets or reads memory channels.

Parameter	Format	Parameter function
P1	–	NOT USED
P2	7	MEMORY CHANNEL

Input / Set: `M C ␣ P2 ;`

Input / Read: `M C ;`

Output / Answer: `M C ␣ P2 ;`

MD MODE

Function: Sets or reads modulation modes.

Parameter	Format	Parameter function
P1	2	MODE

Input / Set: `M D P1 ;`

Input / Read: `M D ;`

Output / Answer: `M D P1 ;`

MG MIC GAIN

Function: Sets or reads MIC gain.

Parameter	Format	Parameter function
P1	31	MIC GAIN

Input / Set: `M G P1 ;`

Input / Read: `M G ;`

Output / Answer: `M G P1 ;`

MR MEMORY READ

Function: Reads memory.

Parameter	Format	Parameter function
P1	9	SPLIT DATA
P2	–	NOT USED
P3	7	MEMORY CHANNEL
P4	4	FREQUENCY
P5	2	MODE
P6	10	MEMORY LOCKOUT
P7	1	TONE OFF/ON
P8	14	TONE NUMBER
P9	–	NOT USED

Input / Set: `?`

Input / Read: `M R P1 ␣ P3 ;`

Output / Answer: `M R P1 ␣ P3 P4 P5 P6 P7 P8 ␣ ;`

Note: For a vacant channel, the Answer command sends "0" for all parameters except the memory channel number. P1 must be "0" to read the CH 90 ~ 99 Start frequency and "1" to read the End frequency.

MW MEMORY WRITE

Function: Writes into memory.

Parameter	Format	Parameter function
P1	9	SPLIT DATA
P2	–	NOT USED
P3	7	MEMORY CHANNEL
P4	4	FREQUENCY
P5	2	MODE
P6	10	MEMORY LOCKOUT
P7	1	TONE OFF/ON
P8	14	TONE NUMBER
P9	–	NOT USED

Input / Set: `M W P1 ␣ P3 P4 P5 P6 P7 P8 ␣ ;`

Output / Read: `?`

Output / Answer: `?`

Note: All parameters must be entered. The memory channel becomes a vacant channel if all frequency digits are "0". Other parameters are ignored. P1 must be "0" to store a Start frequency and "1" to store an End frequency.

NB NOISE BLANKER

Function: Sets Noise Blanker OFF/ON or reads status.

Parameter	Format	Parameter function
P1	1	NOISE BLANKER OFF/ON

Input / Set: `N B P1 ;`

Input / Read: `N B ;`

Output / Answer: `N B P1 ;`

NR NOISE REDUCTION

Function: Sets Noise Reduction OFF/ON or reads status.

Parameter	Format	Parameter function
P1	56	NOISE REDUCTION

Input / Set: `N R P1 ;`

Input / Read: `N R ;`

Output / Answer: `N R P1 ;`

PA PREAMPLIFIER

Function: Sets Preamplifier OFF/ON or reads status.

Parameter	Format	Parameter function
P1	1	PREAMPLIFIER OFF/ON

Input / Set: `P A P1 ;`

Input / Read: `P A ;`

Output / Answer: `P A P1 ;`

PB PLAY BACK

Function: DRU or CW message playback.

Parameter	Format	Parameter function
P1	27	PLAYBACK

Input / Set: `P B P1 ;`

Input / Read: `P B ;`

Output / Answer: `P B P1 ;`

PC POWER CONTROL

Function: Sets or reads transmit power.

Parameter	Format	Parameter function
P1	47	POWER CONTROL

Input / Set: `P C P1 ;`

Input / Read: `P C ;`

Output / Answer: `P C P1 ;`

RC RIT CLEAR

Function: Sets the RIT frequency shift to 0.

Input / Set: `R C ;`

Input / Read:

Output / Answer:

Note:
This command also clears the XIT frequency (same as RIT shift). The command functions independently from the RIT/XIT control.

PR SPEECH PROCESSOR

Function: Sets Speech Processor OFF/ON or reads status.

Parameter	Format	Parameter function
P1	1	SPEECH PROCESSOR OFF/ON

Input / Set: `P R P1 ;`

Input / Read: `P R ;`

Output / Answer: `P R P1 ;`

RD RU RIT DOWN/UP

Function: Lowers/raises RIT frequency.

Input / Set: `R D/U ;`

Input / Read:

Output / Answer:

Note:
This command also affects the XIT frequency (same as RIT shift). The command functions independently from the RIT/XIT control.

PS POWER SWITCH

Function: Sets Power OFF/ON or reads status.

Parameter	Format	Parameter function
P1	1	POWER OFF/ON

Input / Set: `P S P1 ;`

Input / Read: `P S ;`

Output / Answer: `P S P1 ;`

RG RF GAIN

Function: Sets or reads RF gain.

Parameter	Format	Parameter function
P1	31	RF GAIN

Input / Set: `R G P1 ;`

Input / Read: `R G ;`

Output / Answer: `R G P1 ;`

PT CW RX PITCH

Function: Sets or reads CW RX pitch.

Parameter	Format	Parameter function
P1	52	CW RX PITCH

Input / Set: `P T P1 ;`

Input / Read: `P T ;`

Output / Answer: `P T P1 ;`

RM READ METER

Function: Selects a meter function or reads meter values.

Parameter	Format	Parameter function
P1	24	METER SWITCH
P2	22	METER VALUE

Input / Set: `R M P1 ;`

Input / Read: `R M ;`

Output / Answer: `R M P1 P2 ;`

RA RF ATTENUATOR

Function: Sets or reads RF ATT(attenuator).

Parameter	Format	Parameter function
P1	–	ATTENUATOR

00: OFF
01: ON

Input / Set: `R A P1 ;`

Input / Read: `R A ;`

Output / Answer: `R A P1 ;`

RT RIT

Function: Sets RIT OFF/ON or reads status.

Parameter	Format	Parameter function
P1	1	RIT OFF/ON

Input / Set: `R T P1 ;`

Input / Read: `R T ;`

Output / Answer: `R T P1 ;`

● APPENDIX

RX TX RX, TX

Selects receive/transmit mode.

Parameter	Format	Parameter function

		1 2 3 4 5 6 7 8 9 10 11 12 13 14
Input	Set	RX/TX ;
Input	Read	
Output	Answer	RX/TX ;

SM S-METER

S-meter reading.

Parameter	Format	Parameter function
P1	22	S-METER VALUE

Note:
In transmit mode:
power meter reading

		1 2 3 4 5 6 7 8 9 10 11 12 13 14
Input	Set	
Input	Read	S M ;
Output	Answer	S M P1 ;

SC SCAN

Sets Scan OFF/ON or reads status.

Parameter	Format	Parameter function
P1	1	SCAN OFF/ON

		1 2 3 4 5 6 7 8 9 10 11 12 13 14
Input	Set	S C P1 ;
Input	Read	S C ;
Output	Answer	S C P1 ;

SQ SQUELCH LEVEL

Sets or reads squelch level.

Parameter	Format	Parameter function
P1	46	SQUELCH LEVEL

		1 2 3 4 5 6 7 8 9 10 11 12 13 14
Input	Set	S Q P1 ;
Input	Read	S Q ;
Output	Answer	S Q P1 ;

SD SEMI BREAK-IN DELAY TIME

Sets or reads Semi Break-in delay time.

Parameter	Format	Parameter function
P1	49	SEMI BREAK-IN DELAY TIME

		1 2 3 4 5 6 7 8 9 10 11 12 13 14
Input	Set	S D P1 ;
Input	Read	S D ;
Output	Answer	S D P1 ;

SR SYSTEM RESET

Resets the transceiver.

Parameter	Format	Parameter function
P1	50	SYSTEM RESET

		1 2 3 4 5 6 7 8 9 10 11 12 13 14
Input	Set	S R P1 ;
Input	Read	
Output	Answer	

SH DSP SLOPE (HIGH CUT-OFF)

Sets or reads high cut-off frequency.

Parameter	Format	Parameter function
P1	53	DSP SLOPE (HIGH CUT-OFF)

		1 2 3 4 5 6 7 8 9 10 11 12 13 14
Input	Set	S H P1 ;
Input	Read	S H ;
Output	Answer	S H P1 ;

TN TONE NUMBER

Sets or reads subtone number (01~39).

Parameter	Format	Parameter function
P1	14	TONE NUMBER

Note:
Selecting No. 39 (1750 Hz) switches OFF the CTCSS.

		1 2 3 4 5 6 7 8 9 10 11 12 13 14
Input	Set	T N P1 ;
Input	Read	T N ;
Output	Answer	T N P1 ;

SL DSP SLOPE (LOW CUT-OFF)

Sets or reads low cut-off frequency.

Parameter	Format	Parameter function
P1	53	DSP SLOPE (LOW CUT-OFF)

		1 2 3 4 5 6 7 8 9 10 11 12 13 14
Input	Set	S L P1 ;
Input	Read	S L ;
Output	Answer	S L P1 ;

TO TONE

Sets Subtone OFF/ON or reads status.

Parameter	Format	Parameter function
P1	1	TONE OFF/ON

		1 2 3 4 5 6 7 8 9 10 11 12 13 14
Input	Set	T O P1 ;
Input	Read	T O ;
Output	Answer	T O P1 ;

VD VOX DELAY TIME

Function: Sets or reads VOX delay time.

Parameter	Format	Parameter function
P1	51	VOX DELAY TIME

Input / Set: `V D P1 ;`

Input / Read: `V D ;`

Output / Answer: `V D P1 ;`

VG VOX GAIN

Function: Sets or reads VOX gain.

Parameter	Format	Parameter function
P1	54	VOX GAIN

Input / Set: `V G P1 ;`

Input / Read: `V G ;`

Output / Answer: `V G P1 ;`

VR VOICE RECALL

Function: Triggers the Voice Synthesizer for message output.

Parameter	Format	Parameter function
P1	55	VOICE RECALL

Input / Set: `V R P1 ;`

Input / Read: (no parameters)

Output / Answer: (no parameters)

VX VOX FUNCTION

Function: Sets VOX OFF/ON.

Parameter	Format	Parameter function
P1	1	VOX OFF/ON

Input / Set: `V X P1 ;`

Input / Read: `V X ;`

Output / Answer: `V X P1 ;`

XT XIT

Function: Sets XIT OFF/ON.

Parameter	Format	Parameter function
P1	1	XIT OFF/ON

Input / Set: `X T P1 ;`

Input / Read: `X T ;`

Output / Answer: `X T P1 ;`