

# **AR2300 command list for terminal software**

Sept.28, 2021

The following are the specifications for the communication protocol used:

Communication speed: 115,200bps (default), 57,600bps, 38,400bps, 19,200bps, 9,600bps

Data: 8 bit

Stop bit: 1

Parity: None

Flow control: None or RTS/CTS

Echo: Off

Return Code: (PC→ AR2300): <CR><0x0d> <LF> ignore

Return Code: (AR2300→ PC): <CR><LF>(0x0d, 0x0a)

## **Command format**

<command><CR>

<command><parameter><CR>

<command><parameter 1><SP><parameter 2><SP><parameter 3><CR>

Each command is completed with a <CR>(0x0d).

## **Response format**

Although there is no local echo, a specified response should come back from the AR2300 after confirming the correct command.

If an invalid command is sent to the AR2300, ? <CR><LF> (0x3f, 0x0d, 0x0a) will be returned as an unrecognized command.

<SP><CR><LF> (0x20, 0x0d, 0x0a) to a valid command (without parameter)

<command><value><CR><LF> to a valid command (with parameter)

## **Table of contents:**

1. Control commands:	2
2. Receive commands:	12
3. Spectrum display commands:	21
4. Video monitor commands:	23
5. Data editor commands:	24
6. Configuration commands of other parameters:	25
7. LAN control commands:	26
8. SD card commands:	29
9. Other control commands:	31

# 1. Control commands

- **Power on the AR2300**

## Wake up

<b>ZP</b>	Power on	Wake up from stand-by mode (QP command) or sleep mode (SP command). <b>ZPnn</b> : 00 ~ 99, wake up ID Note: The power switch must be in the ON position.
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## Wake up ID set up

<b>ZI</b>	Set up wake up ID	<b>ZInn</b> : 00 ~ 99 (default: 00)
To read: <b>ZI</b> <CR>		
Response: ZInn		

- **Power off the AR2300**

## Standby mode

<b>QP</b>	Switches the AR2300 to standby mode	The front power switch must remain in the ON position.
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## Sleep timer

<b>SP</b>	Sleep Timer	<b>SPnn</b> :00 ~ 99 (unit: minute) (default: 00 : Off)
<b>TR</b>	Sleep Timer Display (Displays remaining time)	<b>TR0</b> : display off <b>TR1</b> : display on (default)

- **Audio gain**

<b>AG</b>	<b>AGnnn</b> (nnn: 000 –255) (default: 00)
To read: <b>AG</b> <CR>	
Response: AG nnn	

- **Frequency/memory channel up/down**

<b>ZK</b>	<b>ZK</b>	Change upward
<b>ZJ</b>	<b>ZJ</b>	Change downward

- **Step frequency**

<b>ST</b>	<b>STnnn.nnn</b> (entry in kHz format)	Default: 100.000 (kHz)
To read: <b>ST</b> <CR>		
Response: STnnn.nnn (kHz)		

- **Receive modes, IF bandwidth, AUTO mode**

### Command description

**MD** --- Receive mode setting (default: 21)

**IF** ---- IF bandwidth setting (default: 07)

**AU** --- Auto mode setting (default: 1)

**AZ** --- Destination setting (default: 0)

(Note: Some functions below 25MHz are not available due to its configuration.)

### Simple mode

Command	Description	Mode	IF bandwidth (Hz)	Remarks
MD21	WFM1	FM	100K	N/A below 25MHz
MD22	WFM2	FM	200K	N/A below 25MHz
MD23	FMST	FM Stereo	200K	N/A below 25MHz
MD24	NFM	FM	15K	N/A below 25MHz
MD25	SFM	FM	6K	N/A below 25MHz
MD26	WAM	AM	15K	
MD27	AM	AM	6K	
MD28	NAM	AM	3K	
MD29	SAM	Synchronous AM	6K	
MD30	USB	USB	3K	
MD31	LSB	LSB	3K	
MD32	CW1	CW	500	
MD33	CW2	CW	200	
MD34	ISB	ISB	6K	N/A below 25MHz
MD35	AIQ	AIQ	15K	AF-IQ output
AU0	-	-		AUTO mode off
AU1	-	-		AUTO mode on

### Advanced mode

Command	Description	Mode	IF bandwidth (Hz)	Remarks
MD00	FM	FM		N/A below 25MHz
MD01	FMST	FM Stereo		N/A below 25MHz
MD02	AM	AM		
MD03	SAM	Synchronous AM		
MD04	USB	USB		
MD05	LSB	LSB		
MD06	CW	CW		
MD07	ISB	ISB		N/A below 25MHz
MD08	AIQ	AIQ		AF-IQ output
AU0	-	-		AUTO mode off
AU1	AUTO	AUTO		AUTO mode on
IF00	200		200	N/A below 25MHz
IF01	500		500	N/A below 25MHz
IF02	1K		1K	N/A below 25MHz

<b>IF03</b>	3K		3K	
<b>IF04</b>	6K		6K	
<b>IF05</b>	15K		15K	
<b>IF06</b>	30K		30K	
<b>IF07</b>	100K		100K	N/A below 25MHz
<b>IF08</b>	200K		200K	N/A below 25MHz

**Auto mode**

The following parameters are automatically set in the AUTO mode:

- Step frequency
- Step frequency adjust
- Receive mode
- IF bandwidth
- Offset frequency (for dual frequency receive)

**Region setting**

**AZ0** --- U.S.A.

**AZ1** --- Japan

**AZ2** --- Europe

The frequency band plan and receive mode are properly set according to its set region.

- **Decode assist function**

**Auto notch (notch)**

The auto notch function is effective to suppress cyclic noise.

<b>LS</b>	<b>LSn</b>	n: 0 ~ 3 0: Off (default) 1: Low 2: Medium 3: High
<b>To read: LS &lt;CR&gt;</b>		
<b>Response: LSn</b>		

**Noise reduction (NR)**

The noise reduction function is effective to suppress random noise.

<b>NR</b>	<b>NRn</b>	n: 0, 1 0: Off (default: 0) 1: On
<b>To read: NR &lt;CR&gt;</b>		
<b>Response: NRn</b>		

### Noise blanker (NB)

The noise blanker function is effective to suppress pulse noise.

<b>NB</b>	<b>NBn</b>	n: 0 , 1 0: Off (default) 1: On
<b>To read: NB &lt;CR&gt;</b>		
<b>Response: NBn</b>		

### Voice inversion descrambler (VI)

*\*\*\* NOTE: This function is not available for the US consumer version. \*\*\**

**Available in FM mode.**

<b>SC</b>	<b>SCnnn</b>	n: 0 , 200 ~ 700 (2000Hz ~ 7000Hz) incremental 5 (50Hz) 0: Off (default)
<b>To read: SC &lt;CR&gt;</b>		
<b>Response: SCnnn</b>		

### IF shift

**Not available in FM mode.**

<b>IS</b>	<b>ISxnnn</b>	X: +, - (shift direction) n: -120 ~ +120 (-1200Hz ~ +1200Hz) Incremental 5 (50Hz) n: +0 Off (default)
<b>To read: IS &lt;CR&gt;</b>		
<b>Response: ISxnnn</b>		

### CW pitch frequency

**Available in CW mode only.**

<b>CP</b>	<b>CPnn</b>	nn: 30 ~ 90 (300Hz ~ 900Hz) Incremental 5 (50Hz) (Default: 80)
<b>To read: CP&lt;CR&gt;</b>		
<b>Response: CPnn</b>		

## Automatic gain control (AGC)

**Not available in FM mode.**

<b>AC</b>	<b>ACn</b>	n: 0 ~ 3
		n=0 AGC - FAST
		n=1 AGC – MEDIUM
		n=2 AGC – SLOW (default)
		n=3 AGC – MANUAL
<b>To read: AC &lt;CR&gt;</b>		
<b>Response:</b> Can		

## Automatic frequency control (AFC)

<b>AF</b>	<b>AFn</b>	n: 0, 1 0: Off (default) 1: On
<b>To read: AF&lt;CR&gt;</b>		
<b>Response:</b> AFn		

1) AFC does only work in NFM mode with a filter setting up to 30kHz.  
 2) It does NOT automatically retune the receiver to the nearest strong signal.  
 3) *Real function of AFC:* It tunes the IF filter's frequency automatically when an unstable frequency is received. It does not change the receive frequency. Since only IF is changed, there is no "visual" change on the control program's spectrum or frequency display. The change can only be heard on "audio".  
 4) It only works if the sending station's frequency shifts are within the selected IF filter's bandwidth.  
 Example: IF=15kHz >> +/-7kHz, IF=30kHz >> +/-15kHz

## Tone squelch (CTCSS)

<b>CN</b>	<b>CNnn</b>	nn: 00 ~ 52	00: Off (default)							
Below is a chart of the CTCSS frequencies.										
	n0	n1	n2	n3	n4	n5	n6	n7	n8	N9
0n	-	60.0	67.0	69.3	71.9	74.4	77.0	79.7	82.5	85.4
1n	88.5	91.5	94.8	97.4	100.0	103.5	107.2	110.9	114.8	118.8
2n	120.0	123.0	127.3	131.8	136.5	141.3	146.2	151.4	156.7	159.8
3n	162.2	165.5	167.9	171.3	173.8	177.3	179.9	183.5	186.2	189.9
4n	192.8	196.6	199.5	203.5	209.5	210.7	218.1	225.7	229.1	233.6
5n	241.8	250.3	254.1	-	-	-	-	-	-	-
<b>(Example) nn: 13 → 97.4Hz</b>										
<b>To read: CN &lt;CR&gt;</b>										
<b>Response :</b> CNnn										

**Note:** When the AR2300 is detecting a CTCSS tone, it will display the frequency. If the decoded tone frequency is the same as the set frequency, the AR2300 will display its frequency followed by an asterisk.

**(Example) CN15 103.5\*** The set CTCSS frequency matches the decoded tone frequency.

## Digital code squelch (DCS)

DS	DSnnn									nnn: see below chart	000: Off (default)
Below is a chart of the DCS codes.											
017	023	025	026	031	032	036	043	047	050		
051	053	054	065	071	072	073	074	114	115		
116	122	125	131	132	134	143	145	152	155		
156	162	165	172	174	205	212	223	225	226		
243	244	245	246	251	252	255	261	263	265		
266	271	274	306	311	315	325	331	332	343		
346	351	356	364	365	371	411	412	413	423		
431	432	445	446	452	454	455	462	464	465		
466	503	506	516	523	526	532	546	565	606		
612	624	627	631	632	654	662	664	703	712		
723	731	732	734	743	754	-	-	-	-		
<b>To read: DS &lt;CR&gt;</b>											
<b>Response :</b> DSnnn											

**Note:**When the AR2300 is detecting a DCS code, it will display the code. If the decoded code is the same as the set code, the AR2300 will display its code followed by an asterisk.

**Example:** DS131 131\* The set DCS code matches the decoded DCS code.

## DTMF code

<b>DT</b>	<b>DTn</b>	n: 0, 1 0: Off (default) 1: On
<b>DX</b>	<b>DX</b> <b>DX%</b>	Displays decoded tones Clear displayed decode tones
<b>To read: DT&lt;CR&gt; or DX&lt;CR&gt;</b>		
<b>Response:</b> DTn or DX cccc.....		

## De-emphasis

<b>EN</b>	<b>ENn</b> (n: 0, 1)	0: 50uS (default) 1: 75uS
<b>To read: EN &lt;CR&gt;</b>		
<b>Response:</b> ENn		

- **Squelch**

**Level squelch**

<b>LQ</b>	<b>LQnnn</b>	nnn: 000 ~ 255 (default: 000)
<b>HQ</b>	<b>HQnnn mmm</b>	nnn:000 ~ 255 (for receive frequency above 25MHz) (Default: 000) mmm: 000 ~ 255 (for receive frequency below 25MHz) (Default: 000)
<b>To read: LQ &lt;CR&gt; or HQ&lt;CR&gt;</b>		
<b>Response:</b> LQnnn or HQnnn mmm		

**Voice squelch**

<b>VQ</b>	<b>VQn</b>	n: 0, 1 0: Off (default) 1: On
<b>VT</b>	<b>VTnnn</b>	nnn:000 ~ 255 Delay time (default: 008)
<b>VL</b>	<b>VLnn</b>	nn: 0 ~ 7 Squelch level (default: 3)
<b>To read: VQ &lt;CR&gt; or VT&lt;CR&gt; or VL&lt;CR&gt;</b>		
<b>Response:</b> VQn or VTnnn or VLnn		

- **RF amplifier, attenuator**

<b>AT</b>	<b>ATn</b>	n: 0 ~ 4 (default: 0)
	n=0	RF AMP = On, Attenuator = 0 dB, Auto attenuator = Off
	n=1	RF AMP = Off, Attenuator = 0 dB, Auto attenuator = Off
	n=2	RF AMP = Off, Attenuator = -10 dB, Auto attenuator = Off
	n=3	RF AMP = Off, Attenuator = -20 dB, Auto attenuator = Off
	n=2	Auto attenuator = On
<b>To read: AT &lt;CR&gt;</b>		
<b>Response:</b> ATmn m : 0, 1 0: Auto attenuator OFF 1: Auto attenuator ON n : 0 ~ 3 See above		

- **Antenna select**

<b>AN</b>	<b>ANn</b>	n: 0 ~ 2 (default: 1)
	n=0	Auto select
	n=1	Antenna connector 1
	n=2	Antenna connector 2
<b>To read: AN &lt;CR&gt;</b>		
<b>Response:</b> ANmn m : Antenna select setting n : 1, 2 Antenna connector		

**Note: When the receive frequency is below 25MHz, antenna connector 2 is automatically selected.**



## Antenna Select programming

Up to 10 receive frequency ranges can be programmed and assigned to an antenna input.

If the above programming is not made, antenna 1 is selected.

<b>AP</b>	<p>To <u>add</u> new frequency range, use <b>APn xxxx.xxxxxx yyyy.yyyyyy</b></p> <p>n: 1, 2 (antenna connector)  xxxx.xxxxxx low end frequency (MHz)  yyyy.yyyyyy high end frequency (MHz)</p> <p>To <u>assign</u> new frequency range in a specific location,  use <b>APnmm xxxx.xxxxxx yyyy.yyyyyy</b></p> <p>n: 1, 2 (antenna connector)  mm: memory location (00 ~ 09)  xxxx.xxxxxx low end frequency (MHz)  yyyy.yyyyyy high end frequency (MHz)</p> <p><b>AP%</b> --- Display programmed frequency range for both antenna connectors.  (Frequency below 25MHz cannot be set.)</p>
<b>AD</b>	<p>To <u>delete</u> specific programmed frequency ranges,  use <b>ADnm.</b></p> <p>n: 1, 2 (antenna connector)  m: memory location (0 ~ 9)</p> <p>To delete all programmed frequency ranges on a specific antenna connector,  use <b>ADn%.</b></p> <p>n: 1, 2 (antenna connector)</p> <p>To delete entire programmed memory contents, use <b>AD%%.</b></p>

- **S-meter**

### Signal level

<b>LM</b>	<b>To read: LM &lt;CR&gt;</b>
Response	<p style="text-align: center;"><b>LMnnn.nc</b></p> <p>nnn.n: Relative level in dB  c: Squelch status  no display : squelch closed  P: squelch open  V: voice squelch open  A: APCO25 mode  E: APCO25 (encrypted)  D: CTCSS / CTS squelch</p>

### Auto signal level

<b>LT</b>	<b>LTnnnn</b>	n: 0 or 1 ~ 6000 (in approximately 10 mS) 0: Off (default)
	When n is set to 1 or higher, the AR2300 sends s meter level in above preset interval.	
<b>To read: LT &lt;CR&gt;</b>		
<b>Response:</b>	LTnnnn	

- **Audio recorder control**

### Control relay status

<b>TP</b>	<b>TPn</b>	n: 0 , 1 0: Off (Relay contact open) (default) 1: On (relay contact closed)
	The relay contact is available at the ACC1 connector to control an external audio recorder device. When the squelch is open, the relay contact will close. When squelch is closed, then the relay contact will open.	
<b>To read: TP &lt;CR&gt;</b>		
<b>Response:</b>	TPn	

### Control relay status report

<b>TC</b>	<b>TCn</b>	n: 0 , 1 0: Off (No report) (default) 1: On (Report by the TP command)
	When the control relay opens or close during receive, the relay operation status will be output by the TP command if the TC command is set to on. No report will be made if the TC command is set to 0.	
<b>To read: TC &lt;CR&gt;</b>		
<b>Response:</b>	TCn	

- **Manual RF gain**

This command is available only when the AGC is set to 3 (manual mode).

<b>RG</b>	<b>RGnnn</b>	(nnn: 000 – 110) (in dB) (default::110)
<b>To read: RG &lt;CR&gt;</b>		
<b>Response:</b>	RG nnn	

- **RF filter bandwidth for A/D converter**

<b>AB</b>	<b>ABn</b>	n: 0 , 1 0: 10MHz (recommended) (default) 1: 30kHz
	This command is used to select the bandwidth of analog filter for the A/D converter. Normally, it should be set to 10MHz. However, in case of a strong signal in adjacent frequency, it can be set to 30kHz. This setting does not affect spectrum display function or FFT search.	
<b>To read: AB&lt;CR&gt;</b>		
<b>Response:</b>	ABn	

- **RF band pass filter (for below 25MHz reception)**

<b>HN</b>	<b>HNn</b>	n: 0 , 1 0: Off (No filter) (default) 1: On (Filtered)
	This command is to select to use or not use a Band Pass Filter (BPF) for 25MHz signal.	
<b>To read: HN &lt;CR&gt;</b>		
<b>Response:</b>	HNn	

## 2. Receive commands

- VFO mode

<b>VF</b>	<b>VFm</b>	m: A ~ E (default: A)
<b>RF</b>	<b>RFnnnn.nnnnnn</b>	nnnn.nnnnnn (MHz) Frequency set (Default:0082.500000) (MHz)
<p>The VF command is to select VFO A ~ VFO E. To set the frequency, use the RF command after selecting the VFO. The VFO-E is used to set receive frequency below 25MHz in the duo receive mode.</p>		
<b>To read: VF &lt;CR&gt;, RF&lt;CR&gt;</b>		
<b>Response:</b>	VFm, RFnnnn.nnnnnn (MHz)	

- Search mode (normal search mode)

<b>SS</b>	<b>SS</b>	Start normal search
	<b>SSnn</b>	nn : 00 ~ 39 Search in the selected search bank.
<b>ZJ,</b>	<b>ZJ</b>	Search frequency downward
<b>ZK,</b>	<b>ZK</b>	Search frequency upward
<b>LC</b>	<b>LCn</b>	n: 0, 1 0: Frequency data output disabled (default) 1: Frequency data output enabled
<b>To read: SS&lt;CR&gt;, LC&lt;CR&gt;</b>		
<b>Response:</b>	SSnn, LCn	

### Search bank

<b>SE</b>	<b>SEnn</b>	(nn: 00 ~ 39) Search Bank number
<b>SR</b>	<b>SLnnnn.nnnnnn</b>	(Lower Frequency, MHz)
	<b>SUnnnn.nnnnnn</b>	(Upper Frequency, MHz)
	<b>STnnn.nnn</b>	(Search frequency step, kHz)
	<b>AUn</b>	(n: 0, 1) 0: Auto mode Off 1: Auto mode On
	<b>MDnn</b>	Receive mode
	<b>ATn</b>	RF amplifier, attenuator
	<b>TTxxxxxxxxxxxx</b>	(Enter text as needed, up to 12 characters)
<b>Format:</b> SEnn SLnnnn.nnnnnn SUnnnn.nnnnnn STnnn.nnn AUn MDnn ATn TTxxxxxxxxxxxx		
<b>Note: Refer to individual command for details of each field</b>		
<b>To read: SRnn&lt;CR&gt;</b>		
<b>Response:</b>	SEnn SLnnnn.nnnnnn SUnnnn.nnnnnn STnnn.nnn AUn MDnn ATn TTxxxxxxxxxxxx	

## Pass frequency

<b>PW</b>	1. Send <b>PW</b> command while search stops during search mode. → Register a current frequency to the current Pass bank.
	2. Send <b>PWnn</b> command while search stops during search mode. → Register a current frequency to the specified (nn) Pass bank.
	3. Send <b>PW:mmmm.mmmmmm</b> (MHz) command during search mode. → Register the above frequency to the current Pass bank. Send <b>PW:mmmm.mmmmmm nnnn.nnnnnn</b> (MHz) command during search mode. → Register above frequency range to the current Pass bank.
	4. Send <b>PWnn mmmmm.mmmmmm</b> command in normal receive mode. → Register above frequency to the specified (nn) Pass bank.
	5. Send <b>PW%%</b> command while search stops during search mode. → Register a current frequency to all Pass banks.
	6. Send <b>PW%% mmmmm.mmmmmm</b> (MHz) command <b>PWnnnnnnnnnnnn</b> in normal receive mode. → Register above frequency to all Pass banks. Send <b>PW:mmmm.mmmmmm nnnn.nnnnnn</b> (MHz) command during search mode. → Register above frequency range to all Pass banks.
<b>After PW command is sent, search function will resume.</b>	
<b>PR</b>	Displays a list of pass frequencies
<b>PRnnxx mmmmm.mmmmmm (MHz) (nn: search bank number)</b> Or, <b>PRnnxx mmmmm.mmmmmm nnnn.nnnnnn (MHz)</b> <b>(If the pass frequency range is known.)</b> <b>(xx: the number from the top of the search bank)</b>	
<b>PD</b>	<b>PDnnxx</b> (nn: 00 ~ 39) (xx: number from the top of the search bank) Delete search data and pass frequency on designated search bank
	<b>PD%%</b> Delete all search data and pass frequencies on all search banks

## Normal search setting format

<b>SG</b>	<b>SGnn DLnn FRnn ASn BKxxxxxx...xx</b>
	1. <b>SGnn</b> nn: 00 ~ 19 (Search group number) (00: default) <i>(Note: The SG00 is not available for search link.)</i>
	2. <b>DLnn</b> nn: 01 ~ 99 (Search delay time, in 0.1 sec.) (Default: 20) When a signal is lost, it will resume search after the preset delay time.
	3. <b>FRnn</b> nn: 00 ~ 60 (Timer search, in 1 sec.) (Default: 00 → Off) When a signal is received, it will resume search after the preset time.

	<p>4. <b>ASn</b> n: 0, 1</p> <p style="padding-left: 40px;">0: Auto store Off (default)</p> <p style="padding-left: 40px;">1: Auto store On</p> <p>When Auto store is set to On, the received frequency will be registered to Search bank #40.</p>
	<p>5. <b>BKxxxxxx...xx</b> Search bank link</p> <p>(Example) To link 02→ 05 → 11, then <b>BK020511</b></p> <p>To delete search bank link, <b>BK&lt;CR&gt;</b>.</p>
<p><b>(Note: The DL, FR, AS, and BK commands cannot be used alone independently. They must always be used in conjunction with the SG command.)</b></p>	
<p><b>To read: SGnn&lt;CR&gt;</b></p>	
<b>Response:</b>	SGnn DLnn FRnn ASn BKxxxxxx...xx

### Search frequency list

<b>FL</b>	<p>There are 1024 channels of search memory in the AR2300. By executing the FL command, 40 channel data can be displayed.</p>
	<p><b>FLn</b> n: 0 ~ 4</p> <p style="padding-left: 40px;">n: 0 Displays the latest 40 channels (frequencies may duplicate.)</p> <p style="padding-left: 40px;">1 Displays the latest 40 channels (frequency not duplicated)</p> <p style="padding-left: 40px;">2 Displays 40 channels with the strongest signal (Frequency may duplicate).</p> <p style="padding-left: 40px;">3 Displays 40 channels with the strongest signal (Frequency not duplicated.)</p> <p style="padding-left: 40px;">4 Displays most frequently detected signals.</p> <p><b>FL%</b> Clear search list</p>

- **FFT search**

FFT search differs from regular scanning methods (one frequency / step after the other) in that it provides a spectrum [image] up to 10MHz wide, sampled 15 times per second. Although the search bank basic settings for normal search and FFT search are done the same way (for Low Frequency, High Frequency, and text settings), in FFT search the following parameters must also be set.

### FFT frequency step

#### Threshold level (signal detection level)

<b>FF</b>	<p><b>FFnn FSnn FT-<u>nnn</u></b></p> <p><b>FFnn</b> Search bank (two digits) select to access. nn: 00 ~ 39 (default: 00)</p> <p><b>FSnn</b> Frequency step select nn: 00 ~ 10</p> <p style="padding-left: 40px;">00: 5kHz</p> <p style="padding-left: 40px;">01: 6.25kHz</p> <p style="padding-left: 40px;">02: 8.33kHz</p>
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<b>LC</b>	03: 9kHz
	04: 10kHz
	05: 12.5kHz
	06: 20kHz (default)
	07: 25kHz
	08: 30kHz
	09: 50kHz
	10: 100kHz
	<b>FT-<i>nnn</i></b> Set the threshold level. Once set, only signals over this level will be detected by the FFT search.
	- <i>nnn</i> : (dB) (default: -80) (dB)
	<b>LC<i>n</i></b> n: 0, 1
	0: Disable search result frequency report
	1: Enable search result frequency report
<p><b>(Note: The FS, FT commands cannot be used alone. They must always be used in conjunction with the FF command.)</b></p>	

- **Memory channel**

The AR2300 features 2,000 memory channels (50 channels in each of the 40 banks).

The number of memory banks can be reconfigured between 5 ~ 95 (in 5 incremental).

#### Memory read mode

<b>MR</b>	<b>MR<i>nnmm</i></b> nn: 00 ~ 39 (Memory bank) (default: 00) mm: 00 ~ 49 (Memory channel) (default: 00)
<b>ZK</b>	Go to next memory channel
<b>ZJ</b>	Go to previous memory channel
<b>To read: MR<i>nnmm</i>&lt;CR&gt;</b>	

#### Memory data setting

<b>MX</b>	<b>MX<i>nnmm</i> GAn MPn MF<i>nnnnn.nnnnnn</i> MD<i>nn</i> AT<i>n</i> ANn MTxxxxxxxxxxxx</b>
	<b>MX<i>nnmm</i></b> : nn: 00 ~ 39 (Memory bank) mm: 00 ~ 49 (Memory channel)
	<b>GAn</b> : n: 0, 1 (Memory select, de-select) 0: de-select 1: select (default)
	<b>MPn</b> : n: 0, 1 (Memory pass) 0: no 1: yes
	<b>MF<i>nnnnn.nnnnnn</i></b> Frequency (MHz)
	<b>MD<i>nn</i></b> : receive mode
	<b>AT<i>n</i></b> : RF attenuator / amplifier

	<b>ANn:</b> Antenna select <b>MTxxxxxxxxxxxx:</b> Memory tag (up to 12 characters)
	<b>Note: Refer to individual command for details of each field.</b> <b>The MF, MT commands cannot be used alone.</b> <b>They must always be used in conjunction with the MX command.</b>
	<b>To read: MAnnnmm&lt;CR&gt;</b>
	<b>Response:</b> MFnnnn.nnnnnn MTxxxxxxxxxxxx

### Memory bank resizing

The AR2300 features 2,000 memory channels (50 channels in each of the 40 banks). If you resize a memory which currently contains 50 channels to a new size of 10 channels, the last 40 channels will be deleted and data will be lost. Therefore, it is suggested that you need to carefully organize your memory data before resizing memory channels.

<b>MW</b>	<b>MWnn MCnn TT xxxxxxxxxxxx</b> <b>MWnn:</b> Select memory bank <b>MCnn:</b> Resizing value nn: 05 ~ 95 (5 incremental) <b>TT xxxxxxxxxxxx:</b> Memory tag (up to 12 characters)
	<b>To read: MWnn&lt;CR&gt;</b>
	<b>Response:</b> MWnn MCnn TT xxxxxxxxxxxx
	<b>Note: The MC, TT commands cannot be used alone.</b> <b>They must always be used in conjunction with the MW command.</b>

### Delete memory channel

<b>MQ</b>	<b>MQnnmm:</b> nn: Bank number mm: Memory channel
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### Delete memory bank

<b>MB</b>	<b>MBnn:</b> nn: Bank number
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- **SCAN**

#### Start scan

<b>MS</b>	<b>MSnn</b> nn: Memory channel If the memory frequency is registered to pass frequency lit, it will be skipped.
<b>LC</b>	<b>LCn:</b> n : 0, 1 0: No report (default) 1: Output detected frequency information



## Memory data setting

<b>MG</b>	<p><b>MGnn DLnn FRnn BKxxxxxx...xxxx</b></p> <p>The AR2300 features 20 scan groups.</p> <p><b>MGnn:</b> nn: 00 ~ 19 (Scan bank number) (default: 00)</p> <p><b>DLnn:</b> nn: 01 ~ 99 (Squelch delay time) (in 0.1 sec.) (Between squelch closing and scan restart) (default: 20)</p> <p><b>FRnn:</b> nn: 00 ~ 60 (Free scan) (in 1 second) (Default: 00 → Off)</p> <p>(Duration is how long the AR2300 will remain on active frequency before resuming scan even when the frequency is still active).</p>
<b>BK</b>	<p><b>BKxxxxxx...xxxx:</b> Linked bank number (Example: Link 02 → 05 → 11, then BK020511.) (Note: Scan bank 00 cannot be linked.)</p> <p>To delete bank, enter <b>BK&lt;CR&gt;</b>.</p>
<p><b>Note: The DL, FR, BK commands cannot be used alone. They must always be used in conjunction with the MG command.</b></p>	
<p><b>To read: MGnn&lt;CR&gt;</b></p>	
<p><b>Response: MGnn DLnn FRnn BKxxxxxx...xxxx</b></p>	

## Memory pass

<b>MP</b>	<p><b>MPn:</b> n: 0, 1</p> <p>0: Pass Off 1: Pass</p> <p><b>MPnn:</b> nn: 00 ~ 39 (memory bank) Memory pass cancel on the selected bank</p>
<p><b>To read: MP&lt;CR&gt;</b></p>	
<p><b>Response: MPn</b></p>	

- **Select scan**

### Start select scan

The Select scan function allows you to scan only a selection of the frequencies that were previously saved as memory channels. A maximum of 100 channels within a bank can be scanned.

<b>SM</b>	<p><b>SM</b> (direct command)</p>
<b>LC</b>	<p><b>LCn:</b> n: 0, 1</p> <p>0: No report (default) 1: Output detected frequency information</p>

## Select scan setting

<b>GA</b>	<b>GA</b> n: n: 0, 1 0: Select scan Off 1: Select scan On (default)
<b>GD</b>	<b>GD</b> Clear select memory (direct command)
<b>To read: GR&lt;CR&gt;</b>	
<b>Response:</b> GRnnnn (Displays select scan memory list)	

- **Dual frequency / triple frequency receive**

This function allows you to monitor two or three separate frequencies simultaneously.

### Dual frequency receive (dual band receive mode)

With this function, one frequency below 25MHz set on the VFO-E (as a sub band) and another frequency above 25MHz set on the VFO (other than VFO-E, as a main band) can be received simultaneously. The received audio for both frequencies are available at the headphone jack independently. Mixed audio for both signals is available at the external speaker jack. Below are the requirements for Dual frequency receive function:

#### (For main band)

- Frequency must be above 25MHz.
- The FM stereo mode is not available in this mode.
- The receiver must be in the VFO mode and it must be set other than VFO-E.
- The antenna input must use number 1.

#### (For sub band)

- Frequency must be below 25MHz.
- The VFO must be set to VFO-E.

## Starting dual frequency receive

<b>VW</b>	<b>VW</b> nm: n: @, A ~ D (VFO mode) @: Duo receive off (default) m: 0, 1 0: VFO-n (main band) (default) 1: VFO-E (sub band)
<b>To read: VW&lt;CR&gt;</b>	
<b>Response:</b> VWnm	

## Audio output balance

<b>VH</b>	<b>VH</b> nnn: n: 000 ~ 255 128: default (equal balance between main band audio and sub band audio) (Note: 000 --- Main band only, 255 --- Sub band only)
<b>To read: VH&lt;CR&gt;</b>	
<b>Response:</b> VHnnn	

### Dual frequency receive (frequency offset receive mode)

With this function, one frequency above 25MHz is set as a main frequency and another frequency which is within +/- 5MHz from the main frequency set as an offset frequency can be received simultaneously. The received audio for both frequencies is available at the headphone jack independently. Mixed audio for both signals is available at the external speaker jack. Either VFO mode or Memory mode can be used in the function.

Below are the requirements for Dual frequency receive function:

- The main frequency must be above 25MHz.
- The offset frequency must be within +/- 5MHz from the main frequency.
- Both frequencies must be in the same receive modes.
- FM stereo is not available in this mode.

### Frequency offset

<b>WF</b>	<b>WFpnnnnn.nnnnnn:</b> (MHz) p: +, - (Offset direction) nnnn.nnnnnn: 0 ~ 5MHz (default: 0)
<b>To read: WF&lt;CR&gt;</b>	
<b>Response:</b> WFpnnnn.nnnnnn	

### Starting dual frequency receive

<b>WR</b>	<b>WRn:</b> n: 0, 1 0: Duo receive Off (default) 1: Duo receive On
<b>To read: WR&lt;CR&gt;</b>	
<b>Response:</b> WRn	

### Audio output balance

<b>WV</b>	<b>WVnnn:</b> n: 000 ~ 255 128: default (equal balance between main frequency audio and offset frequency audio) (Note: 000 --- Main frequency only, 255 --- Offset frequency only)
<b>To read: WV&lt;CR&gt;</b>	
<b>Response:</b> WVnnn	

### Triple frequency receive

Below is the procedure to activate the triple frequency receive function:

- Set two separate frequencies as the main band according to the instructions of "Dual frequency receive" (Frequency offset receive)
- Set another frequency below 25MHz as a sub band.

- **Priority receive**

**Priority setup**

<b>PP</b>	<b>PPnmm</b>	n: 00 ~ 39 (Memory bank) (default: 00) mm: 00 ~ 49 (Memory channel) (default:00)
<b>TI</b>	<b>TInn</b>	nn: 01 ~ 99 (second) (Time interval) (Default: 10)
<b>To read: PP&lt;CR&gt;, TI&lt;CR&gt;</b>		
<b>Response: PPnmm, TInn</b>		

**Starting priority**

<b>PO</b>	<b>POn:</b>	n: 0, 1 0: Priority Off (default) 1: Priority On
<b>To read: PO&lt;CR&gt;</b>		
<b>Response: POn</b>		

- **Step adjust**

<b>SH</b>	<b>SHnnn.nnn:</b>	nnn.nnn: (kHz) (default: 000.000)
<b>To read: SH&lt;CR&gt;</b>		
<b>Response: SHnnn.nnn</b>		

### 3. Spectrum display commands

- Start frequency

<b>TF</b>	<b>TFnnnn.nnnnnn:</b> nnnn.nnnnnn (MHz) (Default: 0077.500000) (MHz)
<b>To read: TF&lt;CR&gt;</b>	
<b>Response:</b> TFnnnn.nnnnnn	

- End frequency

<b>EF</b>	<b>EFnnnn.nnnnnn:</b> nnnn.nnnnnn (MHz) (Default: 0087.500000) (MHz)
<b>To read: EF&lt;CR&gt;</b>	
<b>Response:</b> EFnnnn.nnnnnn	

- Center frequency

<b>CF</b>	<b>CFnnnn.nnnnnn:</b> nnnn.nnnnnn (MHz) (Default: 0082.500000) (MHz)
<b>To read: CF&lt;CR&gt;</b>	
<b>Response:</b> CFnnnn.nnnnnn	

- Span frequency

<b>FP</b>	<b>FPnnnn.nnnnnn:</b> nnnn.nnnnnn (MHz) (Default: 0010.000000) (MHz)
<b>To read: FP&lt;CR&gt;</b>	
<b>Response:</b> FPnnnn.nnnnnn	

- Spectrum step frequency

<b>FE</b>	<b>FEenn.nnn:</b> nnn.nnn (kHz) (Default: 062.500) (kHz)  The value is equal to 1/160 of the frequency span.
<b>To read: FE&lt;CR&gt;</b>	
<b>Response:</b> FEenn.nnn	

- Marker frequency

#### Marker frequency setup

<b>KF</b>	<b>KFnnnn.nnnnnn:</b> nnnn.nnnmmm (MHz) (Default: 0082.500000) (MHz)  The entered value may be changed according to the frequency span and frequency range.
<b>To read: KF&lt;CR&gt;</b>	
<b>Response:</b> KFnnnn.nnnnnn -mmm -mmm: signal level (in dB)	

### Marker frequency/ level auto output

<b>KC</b>	<b>KCn</b>	n: 0, 1 0: Disable data output (default) 1: Enable data output
<b>To read: KC&lt;CR&gt;</b>		
<b>Response:</b> MKnnnnn.nnnnnn -mmm -mmm: signal level (in dB)		

### Transfer the marker frequency to receive frequency

<b>KG</b>	<b>KG</b> (Direct command)
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- **Spectrum data output**

<b>GL</b>	Output the level data of each frequency on the screen. <b>GL&lt;CR&gt;&lt;LF&gt;/&lt;SP&gt;&lt;CR&gt;&lt;LF&gt;</b> (Note: The separator (/<CR><LF>) has 160 lines.)
<b>To read: GL&lt;CR&gt;</b>	
<b>Response:</b> GL<CR><LF>/<SP><CR><LF>	

- **High speed spectrum data output**

<b>FD</b>	Output the level data of each frequency on the screen in high speed. Convert the signal strength data of one horizontal dot into 1 byte character. Then repeat this step for a total of 160 characters and output these data followed by the OK response (<SP><CR><LF>). To convert the output data to a signal strength level, subtract 0x20 (in hexadecimal), then add -100dB. <b>FD&lt;SP&gt;&lt;CR&gt;&lt;LF&gt;</b>
<b>To read: FD&lt;CR&gt;</b>	
<b>Response:</b> FD<SP><CR><LF>	

## 4. Video monitor commands

- **Activate the video monitor function**

<b>VS</b>	<b>VS<sub>n</sub></b> n: 0, 1 0: Deactivate video monitor function (default) 1: Activate video monitor function  (Note: Video output signal is only available at the video output connector on the front panel.)
<b>To read: VS&lt;CR&gt;</b>	
<b>Response:</b> VS <sub>n</sub>	

- **Frequency shift reverse**

<b>VD</b>	Some video transmitters utilize reversed frequency shift modulation in order to scramble the signal. <b>VD<sub>n</sub></b> n: 0, 1 0: Normal shift (default) 1: Reverse shift direction
<b>To read: VD&lt;CR&gt;</b>	
<b>Response:</b> VD <sub>n</sub>	

## 5. Data editor commands

<b>DE</b>	<b>DEnn xxxx yyyy</b>	
	nn: Process number (see below) xxxx: Channel origin (see below) yyyy: Channel destination (see below)	
	<b>nn</b>	<b>Process</b>
	00	Transfer contents of memory bank xx to memory bank yy.
	02	Copy contents of memory bank xx to memory bank yy.
	04	Transfer contents of search bank xx to search bank yy.
	06	Copy contents of search bank xx to search bank yy.
	08	Transfer contents of memory channel xxxx to memory channel yyyy.
	10	Copy contents of memory channel xxxx to memory channel yyyy.
	12	Transfer contents of scan group xx to scan group yy.
	14	Copy contents of scan group xx to scan group yy.
	16	Transfer contents of search group xx to search group yy.
	18	Copy contents of search group xx to search group yy.
	21	Delete contents of memory bank xx.
	22	Delete contents of search bank xx.
	23	Delete contents of memory channel xxxx.
	(24)	Cancel Pass setting of all channels on memory bank xx. (Note: Recommend use of MPnn command.)
	(25)	Cancel Pass setting of all channels on search bank xx. (Note: Recommended use of PDnn%% command.)
	26	Delete all contents of memory banks.
	27	Delete all contents of search banks.



## 6. Configuration commands of other parameters

- **Selecting interface**

<b>CL</b>	<b>CLn</b>	n: 0 ~ 3 0: USB 1: AUX (optional LAN box) 2: USB or AUX (AUX will be selected if USB is not connected) (default) 3: AUX or USB (USB will be selected if AUX is not connected.)
<b>To read: CL&lt;CR&gt;</b>		
<b>Response:</b>	CLmn	m: 0, 1 0: USB 1: AUX n: 0 ~ 3 (see above)

- **Communication speed**

<b>SB</b>	<b>SBn</b>	n: 0 ~ 4 0: 115,200 bps (default) 1: 57,600 bps 2: 38,400 bps 3: 19,200 bps 4: 9,600 bps
<b>To read: SB&lt;CR&gt;</b>		
<b>Response:</b>	SBn	

- **Flow control**

<b>SF</b>	<b>SFn</b>	n: 0, 1 0: None 1: Hardware
<b>To read: SF&lt;CR&gt;</b>		
<b>Response:</b>	SFn	

## 7. LAN control commands

### IP sub command parameters

(Note: No space must be inserted between the sub command and parameter.)

- **Readout settings from the optional ARL2300 Ethernet Controller**

<b>IP RED</b>	<b>IP RED</b>
	(Note: Each sub command will display all its stored data value on the AR2300 until data readout is completed. Therefore, it is recommended to use this command before changing / displaying the LAN settings. )

- **Write settings to the Ethernet Controller**

<b>IP WRT</b>	<b>IP WRT</b>
	(Note: This command is to write parameters to the Ethernet Controller. Beware that using this command will write all parameters stored on the AR2300 to the Ethernet Controller before executing the IP RED command. This may result in the loss of parameters on the Ethernet Controller.)

- **IPv4 address**

<b>IP IPF</b>	<b>IP IPF<math>x.x.x.x</math></b> x: 0 ~ 255 (IP address) (default: 192.168.0.234)
<b>To read: IP IPF&lt;CR&gt;</b>	
<b>Response:</b> IP IPF $x.x.x.x$	

- **Mask address**

<b>IP MSK</b>	<b>IP MSK<math>x.x.x.x</math></b> x: 0 ~ 255 (Mask address) (default: 255.255.255.0)
<b>To read: IP MSK&lt;CR&gt;</b>	
<b>Response:</b> IP MSK $x.x.x.x$	

- **Gateway address**

<b>IP GAT</b>	<b>IP GAT<math>x.x.x.x</math></b> x: 0 ~ 255 (Gateway address) (default: 192.168.0.1)
<b>To read: IP GAT&lt;CR&gt;</b>	
<b>Response:</b> IP GAT $x.x.x.x$	

- **DHCP client function**

<b>IP DHC</b>	<b>IP DHCn</b>	n: 0, 1 0: Disable (default) 1: Enable
<b>To read: IP DHC&lt;CR&gt;</b>		
<b>Response:</b> IP DHCn		

- **Ping response**

<b>IP PIN</b>	<b>IP PINn</b>	n: 0, 1 0: Disable 1: Enable (default)
<b>To read: IP PIN&lt;CR&gt;</b>		
<b>Response:</b> IP PINn		

- **TCP port number**

<b>IP TCP</b>	<b>IP TCPnnnnn</b>	nnnnn: 10000 ~ 65535 (Default: 50002)
<b>To read: IP TCP&lt;CR&gt;</b>		
<b>Response:</b> IP TCPnnnnn		

- **UDP port number**

<b>IP UDP</b>	<b>IP UDPnnnnn</b>	nnnnn: 10000 ~ 65535 (Default: 10002)
<b>To read: IP UDP&lt;CR&gt;</b>		
<b>Response:</b> IP UDPnnnnn		

- **MAC address**

<b>IP MAC</b>	<b>IP MAC</b>	<b>(Read only)</b> (Default: 0.0.0.0.0.0)
<b>To read: IP MAC&lt;CR&gt;</b>		
<b>Response:</b> IP MACx.x.x.x.x.x		

- **Username**

<b>IP USR</b>	<b>IP USRcccccccc</b>	cccccccc:username (Up to 8 characters including numbers, underscores) (Default: username)
<b>To read: IP USR&lt;CR&gt;</b>		
<b>Response:</b> IP USRcccccccc		

- Password

IP PAS	<p style="text-align: center;"><b>IP PAScccccccccccccc</b></p> <p style="text-align: center;">cccccccccccccc: Password</p> <p style="text-align: center;">(6 ~ 15 characters including ! # \$ % &amp; - = ^ : @ + * ? _)</p> <p style="text-align: center;">(Default: password)</p> <p style="text-align: center;">(Note: Password MUST be set.)</p>
<b>To read: IP PAS&lt;CR&gt;</b>	
<b>Response:</b> IP PAScccccccccccccc	

## 8. SD card commands

### SD sub command parameters

- Property of SD card

<b>SD INF</b>	<b>SD INF (Direct command)</b> Displays the card's total size and its usage. Note: After deleting files, remove the SD card from the slot once. Then re-insert the card to display the free space.
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- Display file directory

<b>SD DIR</b>	<b>SD DIR (Direct command)</b> Displays the card's file directory, recorded time and file size.
<b>To read: SD DIR&lt;CR&gt;</b>	

- Delete data file

<b>SD DEL</b>	<b>SD DEL xxxxxxxx      xxxxxxxx:file name</b>
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- Format card

<b>SD FMT</b>	Format the card
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- Write data to SD card

<b>SD MMW (for debug only)</b>	<b>SD MMW (file name) (Direct command)</b> Saves the receivers current state & settings (internal memory content only) File name: up to 8 characters. The file extension will be automatically set to .mmd.
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- Read data from SD card

<b>SD MMR (for debug only)</b>	<b>SD MMR (file name) (Direct command)</b> Loads a receiver's current state & settings (internal memory only)
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- Squelch skip

<b>SD RSQ</b>	<b>SD RSQ n    n:0, 1</b> 0: recording audio even while squelch is closed. 1: recording audio only while squelch is open. (Default: 0)
<b>To read: SD RSQ&lt;CR&gt;</b>	
<b>Response:    SD RSQ n</b>	

- **Start/stop recording**

<b>SD REC</b>	<b>SD REC (file name) (Direct command)</b>
	<p>Execute the command to start/stop recording audio onto the designated file.</p> <p>(Note: 1. File name: up to 8 characters. English letters (capital) and some selected characters can be used as a file name. The file extension will be automatically set to .wav. If the file name already exists, it will be automatically overwritten.</p> <p>2. To stop recording, use the "/" as a file name.</p> <p>3. If the file size exceeds 2GB, it will stop recording.</p>

- **Start/stop playback**

<b>SD PLY</b>	<b>SD PLY (file name) (Direct command)</b>
	<p>Execute the command to start/stop playback audio from the designated file.</p> <p>(Note: 1. File name: up to 8 characters. English letters (capital) and some selected characters can be used as a file name. The file extension will be automatically set to .wav.</p> <p>2. To stop playback, use the "/" as a file name.</p>

Note: Following characters cannot be used for a file name:

¥ / , ; : \* ? " < > | .

- **Recording status**

<b>SD PST</b>	<b>SD PST</b>
(Commands can be sent even during playback or recording)	
<b>Response:</b>	<p>0: stand-by mode</p> <p>1: recording audio even while squelch is closed.</p> <p>2: Playback mode</p> <p>3. recording audio while squelch is open or stand-by mode.</p>

## 9. Other control commands

- Receiver status

### Receiver status

RX	<b>RX&lt;CR&gt;</b>
<b>Response:</b>	
<b>In VFO mode:</b>	
VX RFnnnn.nnnnnn STnnn.nnnn(+) AUh MDnn ATnm ANnn	
<b>In Memory receive mode:</b>	
MXnnmm GAn MPn RFnnnn.nnnnnn STnnn.nnnn(+) AUh MDnn ATnm ANnn TMxxxxxxxxxxxx	
<b>In Memory scan mode:</b>	
MS MXnnmm GAn MPn RFnnnn.nnnnnn STnnn.nnnn(+) AUh MDnn ATnm ANnn TMxxxxxxxxxxxx	
<b>In Select scan mode:</b>	
SM MXnnmm GAn MPn RFnnnn.nnnnnn STnnn.nnnn(+) AUh MDnn ATnm ANnn TMxxxxxxxxxxxx	
<b>In Normal search mode:</b>	
SRnn RFnnnn.nnnnnn STnnn.nnnn(+) AUh MDnn ATnm ANnn TMxxxxxxxxxxxx	
<b>In FFT search mode:</b>	
FFnn FSnn FT- nnn	
(Note: The (+) sign for the ST command will appear when the step adjust function is activated.)	

### Receiver status auto report

RT	<b>RTnnnn</b> n: 0, 1~ 6000 (in 10 mS) 0: Disabled
<b>To read: RT&lt;CR&gt;</b>	
<b>Response:</b> RTnnnn	

- Product version

VR	<b>VR (Direct command)</b>
<b>To read: VR&lt;CR&gt;</b>	
<b>Response:</b> Cxxxxxxxxxxx Dxxxxxxxxxxx C: Main board D: Decoder board	
VRF	<b>VRF (Direct command)</b>
<b>To read: VRF&lt;CR&gt;</b>	
<b>Response:</b> F:xxxxxxxxxxx D:xxxxxxxxxxx F: FPGA version D:DSP version	

- **Reset**

<b>RS</b>	<b>RS (Direct command)</b>
<b>Response:</b>	This command reinitializes the system configuration, however, contents of VFO and/or memory channels will be saved.
<b>RS2</b>	<b>RS2 (Direct command)</b>
<b>Response:</b>	This command reinitializes the system configuration and VFO data, however, contents of memory channels will be saved.
<b>RS!</b>	<b>RS! (Direct command)</b>
<b>Response:</b>	This command reinitializes the receiver and returns it to factory's default settings.

- **Flash memory**

<b>MM</b>	<b>MM (Direct command)</b>
<b>Response:</b>	Save current settings to flash memory.