Kenwood TH-G71 Protocol Specification

This document describes the serial commands used to program and control the TH-G71 radio via its serial port. Some of this data was initially based on information for a similar Kenwood radio, TH-D7.
References: http://www.qsl.net/ta1dx/kenwood/thd7kom.htm

Introduction:
The Kenwood TH-G71 radio can be programmed through the serial port using a suitable interface which level-shifts the RS-232 signals to the CMOS levels needed by the radio. This allows memory management (as used by the Kenwood MCP software) as well as software control of the radio's tuning, TX, RX, etc.

Memory Management (Kenwood MCP software)
Many of the commands listed here are used by the Kenwood MCP programming software. Using a serial port trace program made it possible to trace the commands flowing between the serial port and the radio interface. The software uses these commands to verify the identity of the radio (ID command), know whether the extended-receive modification was done and what the band-limits are (using commands TYD and FL). Then it goes through each of the memory, call, VFO, and DTMF channels and reads their contents, using the MR, CR, VR, and DM commands. When writing to the radio memories, it uses the MW, CW, VW, and DM commands. The PC command is used to set / read the power. The MCP software uses the "AI 0" mode, which means that the radio only "sends back" data on the serial port when the MCP asks for it.

Radio Control
The commands provided here can also be used to communicate with the radio using a terminal emulator or other program, with the radio connected to the serial port. When commands are typed in, the radio will output values back to PC. For example, typing "ID" will result in the radio sending back "ID TH-G71". Tuning the radio can be done using the DW and UP commands. And so on.

Sending "AI 1" command to the radio will put it into a mode where it sends out status information as you tune the radio, put into scan mode, or transmit (using the normal buttons and tuning knobs on the radio). For example, if you push the PTT button, the radio sends "TX". Conversely, by typing "TX" through the interface, the radio will go transmit until you type "RX".

Serial Port Parameters: 9600, 8, N, 1

Programming Protocol:
The following codes are returned by the radio when it is sent a serial port command (and optional parameters)

Return code	Description
N	Radio recognized the command but it was used incorrectly or the invalid parameters were specified.
?	Radio does not recognize the command
[command]	Command Accepted by radio. May be followed by additional values or parameters.

For some commands, entering the command by itself or followed by the first parameter will return the present value of the setting related to that command.

Allowed channels: 000-199, L0-L9, U0-U9, Pr

Decoding of fields used in MR, MW, CR, CW, BUF commands:

Field	Values	Meaning
freq	11 digits	11 digit number in Hz
step	0-9	0 = 5, 1=6.25, 2=10, 3=12.5, 4=15, 5=20, 6=25, 7=30, 8=50, 9=100 kHz (#)
shift/offset	0,1,2	0 = none; 1 = + positive; 2 = - negative
Rev	0,1	1 = Reverse on
Tone	0,1	1 = Tone on
Tone Freq *	1-39 skips 2.	See table of tone/CTCSS frequency codes
CTCSS	0,1	1 = CTCSS on
CTCSS freq *	1-39 skips 2	See table of tone/CTCSS frequency codes
offset freq	9 digits	9 digits in Hz
Lockout	0,1	1 = yes

NOTES:
1. The same codes are used in the VFO section of the Kenwood .71 memory format file.
2. #. On the 800-949MHz band, Step values of 5, 6.25, 15 Khz are NOT available, although theKenwood MCP program shows 15Khz as being available.

Band Codes:
1. B: 1=118-135MHz, 2=136-173, 5=320-399, 6=400-469, 8=800-949 MHz (used with VR command)
2. Bands 1 and 2 are considered VHF, others are UHF.

Tone / CTCSS frequency codes:
Note: It is not a typo; there is no "02" code.

#	Tone Freq
01	67.0Hz
03	71.9Hz
04	74.4Hz
05	77.0Hz
06	79.7Hz
07	82.5Hz
08	85.4Hz
09	88.5Hz
10	91.5Hz
11	94.8Hz
12	97.4Hz
13	100.0Hz
14	103.5Hz
15	107.2Hz
16	110.9Hz

#	Tone Freq
17	114.8Hz
18	118.8Hz
19	123.0Hz
20	127.3Hz
21	131.8Hz
22	136.5Hz
23	141.3Hz
24	146.2Hz
25	151.4Hz
26	156.7Hz
27	162.2Hz
28	167.9Hz
29	173.8Hz
30	179.9Hz
31	186.2Hz

#	Tone Freq
32	192.8Hz
33	203.5Hz
34	210.7Hz
35	218.1Hz
36	225.7Hz
37	233.6Hz
38	241.8Hz
39	250.3Hz

TH-G71 Serial Port Command Set.

Command	Name	Use
TS	**??**	**TS 1 is returned when the radio is powered on with interface active.**
AI n	**Auto Information**	**0=off, 1=on** **AI 1 enables output of status information to the serial port. Values are output when radio key is pressed, tuned, or signal strength changes.**
ID	**Identity of Radio**	**Returns radio Identification. "ID TH-G71"**
FL	**Freq Limits**	**Returns list of band frequency limits.** **Standard Radio (no extended RX mod) : 3 bands** FL 00118,00135,00136,00173,00400,00469 **Extended RX radio: 5 bands** FL 00118,00135,00136,00173,00320, 00399,00400,00469,00800,00949
TYD	**???**	**Returns radio parameters as follows:** TYD 0,2,00,0,1,, (Std Radio, without extended-receive mod) TYD 0,2,06,0,1,1,2 (Radio with extended-receive mod) **Meaning of these fields is not known.**
CR x, [0,1] **CR x, [0,1] data**	**Read Call Channel**	**Displays call channel status for call channel x [0 or 1] (2 bands) [split]** **data: Freq, Step, Shift, Reverse, Tone,CTCSS, , Tone freq, , CTCSS freq, offset** CR 1,0 CR 1,0,00446000000,6,0,0,0,0,,09,,09,005000000 CR 0,0 CR 0,0,00147405000,0,0,0,0,0,,27,,09,000600000 Using a split channel: (See MR command for more info on Split channels) CR 1,0 CR 1,0,00446050000,8,0,0,1,0,,27,,06 CR 1,1 CR 1,1,00145450000,0
CW x, [0,1] **CW x, [0,1] data**	**Write to Call Channel 0 or 1**	**x = 0 VHF, x = 1 UHF** **Enters data to the Call channel** See CR for format.
MR 0,[0,1], mem, data	**Memory Read**	**Reads the memory channel name "mem".** **data: Freq,Step,Shift,Reverse,Tone,CTCSS, , Tone freq, , CTCSS freq, Offset freq, Lockout** Example: MR 0,0,001 Get: MR 0,0,000,00146980000,0,2,0,1,0,,27,,09,000600000,0 If you get "N" there is no data in that memory **Two MR commands are used to check for Split** For a split channel, after the first MR 0,0,[mem] command, the returned offset frequency field is blank. Send a second MR command with the 2nd parameter set to **1**. The returned data data has only two fields, the **freq** and **freq step** Example: for a split channel with RX on 146.400; TX on 445.000: MR 0,0,000 MR 0,0,000,00146400000,0,0,0,0,0,,27,,09,,0 MR 0,1,000 If you get "N" -> It is not a split channel, otherwise, you get: MR 0,1,000,00445000000,6
MW 0,[0,1], mem, data	**Memory Write**	**Enters data into the memory channel. Refer to MR for format.** **After a successful write, MW is returned.** **Send MW 0,0,000,00146980000,0,2,0,1,0,,27,,09,000600000,0**

		Get MW To **clear a channel** (remove it as a memory number), send no data: MW 0,0,000 **To program a Split Channel: (Display shows +-)** Split frequencies are programmed with two MW commands. The 1st command is as a non-split channel, with any offset (use 0) The 2nd command programs the split. It has its 2nd parameter set to **1**, with 2 data fields, the **Tx frequency** and **Tx freq step** Example: Split channel with RX on 146.400; TX on 445.000: Send MW 0**,0**,000,00146400000,0,0,0,0,0,,27,,09,000000000,0 Get MW Send MW 0,1,000,00445000000,6 Get MW
MNA 0, mem, n	**Memory Name**	**Sets or displays a channel memory name** **n=name, 6 characters from : 0-9 A-Z - / <space>** Send MNA 0, 023 displays name for channel 23 Get MNA 0,023,7MOT12 To program a memory name: Send MNA 0, Pr, XXXXXX Get MNA 0, Pr, XXXXXX To **clear a memory name**, leave Name blank: Send MNA 0,000,
VR [1,2,5,6,8]	**VFO Read**	**Reads VFO settings for specified band** *Note: Band numbers are different than in RBN command:* **B: 1=118-135, 2=136-173, 5=320-399, 6=400-469, 8=800-949** **Band, Freq,Step,Shift,Reverse,Tone,CTCSS, , Tone freq, , CTCSS freq, Offset freq** VR 1 VR 1,00118625000,0,0,0,0,0,,09,,09,000000000
VW	**VFO Write**	**Sets VFO values of specified band. See VR command.**
DM cc DM cc, 0-9,A-F	**DTMF Memory**	**Sets or reads one of 10 DTMF memory channels. (cc = 00 – 09).** **DM cc displays contents of memory cc. (** With data, writes channel cc with data. Up to **16 characters max in memory;** allowed characters: 0-9, A-F (Note: E is user *, F is user #) DM 01,12345 stores 123456 in DTMF memory 01 DM 01,E5558881234 A DTMF channel can be cleared (MCP does it), but not sure how.
CIN	**Call Channel Input**	**Enters the transceiver's displayed frequency into the CALL channel**
MIN mem	**Memory Input**	**Copies the current settings into the selected channel.** **Similar to pressing [F], [M.IN]** send: MIN 199 get MIN
VMC 0, x	**Mode of Band**	**Display or set the mode of the VFO band.** **VMC 0 displays current mode.** **x is mode (0=VFO, 2=MR, 3=Call)** **VMC 0, x sets the mode.**
BUF 0 BUF 0 data	**Buffer**	**Display or change frequency:** **BUF 0,Freq, step, Shift, Reverse,Tone,CTCSS, , Tone Freq, , CTCSS freq, Offset** **BUF 0,00449925000,6,2,0,1,0,,09,,09,005000000** BUF 0,00146980000,0,2,0,1,0,,27,,09,000600000
FQ freq, step	**Frequency**	**Returns or sets current frequency and step size** **FQ used alone displays setting.**

		Format= FQ 00144410000, 0
MC 0, mem	**Memory Channel**	**Switch to a memory channel number n = 000-199, Pr, U0, L0, U1,L1, etc.** **Must be in MR mode (not VFO or call mode);** **Can use VMC 0,2 to get in MR mode.**
MCL 0,x	**Lock Memory Channel**	**x=0 unlock, x=1 lock** **NOTE: affects the currently selected memory channel on the currently selected band. If you are intending to remotely change this option for a specific memory channel, you MUST change to the specific band and channel remotely before you issue the MCL command.**
MSH	**Memory Shift**	**Transfers the displayed memory channel into the VFO** **Must be in MR (memory) mode.** **After sending the MSH command, the radio returns a VMC command with full parameters.**
PV f1 , f2	**Program VFO limits**	**PV displays the current VCO limits for current band** **PV, f1, f2 sets lower and upper VCO scan limits for a valid band.** **Lower and upper frequencies in Mhz, 5 digits.** **Example: PV 00136,00173** **f1=lower limit, f2=upper limit** **This sets the limits used during VFO scans in the band.** This has the same effect as using Menu 3, PROVFO.
PC b,p	**Power Control**	**Sets the transmit power on band b (0 = VHF 1 = UHF)** **Valid power levels: p: 0=High, 2=Low, 3=EL**
RBN [1,2,4,5,6]	**Set Band**	**RBN displays current band selected, when in VFO mode.** **RBN n sets a VFO band, when in VFO mode.** **1=118-135, 2=136-173, 4=320-399, 5=400-469, 6=800-949** *Note codes are different from the VR command.*
BY 0	**Busy**	**Displays busy status; 0=not busy, 1=busy** **Send BY 0, get BY 0, 1, etc.**
SM 0 **SM 0, s**	**Signal Meter**	**Displays the received signal strength (or battery meter while transmitting).** **s=0-5. Send SM 0, Get SM 0, s.**
CTD a,n	**CTCSS Detection**	**Displays whether the CTCSS tones match, or don't match, when CTCSS is on. When CTCSS is on and signal is received, radio returns whether or not the selected CTCSS tone matches the received tone (which indicates whether or not to open the squelch).** a =band 0/1 n: detected=1/not detected=0 send CT 0 get CT 0,x (x = 1 if CTCSS matches, 0 if not) get N if CTCSS is not enabled.
SQ 0, xx	**Squelch**	**Displays or sets the squelch level** valid range is xx = 00-05 (00=open) **SM 0 displays SM 0, XX** **SM 0, 04 sets to 04 level.**
RX	**Receive**	**Switches the transceiver to receive mode** **Or, when AI = 1, the radio has stopped transmitting.**
TX	**Transmit**	**Starts transmitting on current band – can be stopped by RX command**
DW	**Down (freq)**	**Moves down one memory channel or down one frequency step in VFO mode. See also UP.**
UP	**UP (Freq)**	**Moves up one memory channel or up one frequency step in VFO mode (see DW command for "down")**

RBX	**???**	**RBX -> now get RX (previously got SM 0, 00 ??)**
ULC	**unknown**	**??**
TT	**Transmit Tone**	**Transmits 1750hz tone until RX is entered. NOT SURE. Radio does not return ? when TT is entered, but validity of this command is uncertain.**

DISCLAIMER: This information is provided for reference and "as-is". Much of it was figured out by trial and error. Errors may be present.