

2.7 Control-Head Connector

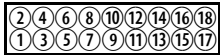
The control-head connector is the standard interface between the radio body and the TM8115 control head or TM8105 blank control head.

You can integrate your own blank control head options board into the cavity between the radio body and the TM8105 blank control head.

For information on how to create your own blank control head options board, refer to “[Blank Control Head Options Board](#)” on page 95.

The TM8115 control head uses all 18 signals of the control-head connector. The programming connector of the TM8105 blank control head uses the signals 1 to 9.

Table 2.19 Control-head connector - pins and signals

Pinout	Pin	Signal	Description	Signal type
 <p>front view</p>	1	RX_AUD	Receive audio output. Post volume control. AC-coupled.	Analogue
	2	+13V8 ^a	Power supply output from radio body power source.	Power
	3	CH_TXD	Asynchronous serial port - Transmit data.	Digital. 3V3 CMOS.
	4	CH_PTT	PTT input from microphone. Also carries the hookswitch signal.	Digital
	5	CH_MIC_AUD	Fist microphone audio input.	Analogue
	6	AGND	Analogue ground.	Ground
	7	CH_RXD	Asynchronous serial port - Receive data.	Digital. 3V3 CMOS.
	8	DGND	Digital ground.	Ground
	9	CH_ON_OFF	Hardware power on/software-controlled power off input. Active low.	Digital
	10	VOL_WIP_DC	DC signal from TM8115 volume pot wiper.	Analogue
	11	CH_SPL_DO	Data output signal to TM8115 control head.	Digital. 3V3 CMOS.
	12	CH_LE	Latch enable output to TM8115 control head.	Digital. 3V3 CMOS.
	13	CH_GPIO1	General purpose digital input/output.	Digital. 3V3 CMOS input. Open collector output with pullup.
	14	+3V3	Power supply to control head digital circuits.	Power
	15	CH_SPL_DI	Data input from TM8115 control head.	Digital. 3V3 CMOS.
	16	CH_SPL_CLK	Clock output to TM8115 control head.	Digital. 3V3 CMOS.
	17	SPK-	Speaker audio output for non-remote control head. Balanced load configuration.	Analogue
	18	SPK+	Speaker audio output for non-remote control head. Balanced load configuration.	Analogue

a. Can be switched or unswitched. For more information refer to “[Connector Power Supply Options](#)” on page 131.

Table 2.20 Control-head connector - DC characteristics

Parameter	Standard				Test method and conditions	Comments
	min.	typ.	max.	units		
Digital signals						
Input low level: CH_SPI_DI CH_RXD CH_GPIO1 CH_PTT CH_ON_OFF			0.7 0.7 0.7 0.7 V_S-4	V V V V V		
Input high level: CH_SPI_DI CH_RXD CH_GPIO1 CH_PTT CH_ON_OFF	1.7 1.7 1.7 1.7 $V_S-1.5$			V V V V V		
Input low current: CH_SPI_DI CH_RXD CH_GPIO1 CH_PTT CH_ON_OFF			10 -1 -120 -800 -13	μ A mA μ A μ A mA	$V_{in}=-8V$ $V_S=13.8V$	
Input high current: CH_SPI_DI CH_RXD CH_GPIO1 CH_PTT CH_ON_OFF			10 1 10 10 10	μ A mA μ A μ A μ A	$V_{in}=3.3V$ $V_{in}=8V$ $V_{in}=3.3V$ $V_{in}=3.3V$ $V_{in}=V_S$	
Output low level: All outputs except CH_GPIO1 CH_GPIO1			200 50 600	mV mV mV	100 μ A sink current 100 μ A sink current 10mA sink current	Current limit occurs at 20mA typ.
Output high level: All outputs except CH_TXD CH_GPIO1	3.1 2.4 3.1				100 μ A source current 3k Ω load No load	33k Ω pullup to 3.3V.
Hookswitch resistance: CH_PTT	5.6		13.2	k Ω		Microphone on hook resistance.
Safe DC input limits: CH_SPI_X CH_LE CH_TXD CH_RXD CH_GPIO1 CH_PTT CH_ON_OFF	-0.5 -0.5 -10 -25 -0.5 -17 -0.5		+4.1 +4.1 $V_S+0.5$ $V_S+0.5$ $V_S+0.5$ +17 $V_S+0.5$	V V V V V V V		I_{in} must not exceed ± 10 mA. I_{in} must not exceed ± 10 mA. I_{in} must not exceed +50/-10mA. I_{in} must not exceed +50mA. I_{in} must not exceed ± 50 mA. I_{in} must not exceed ± 50 mA.

Table 2.20 Control-head connector - DC characteristics (continued)

Parameter	Standard				Test method and conditions	Comments
	min.	typ.	max.	units		
Analogue signals (for signals not listed here refer to the Auxiliary interface specification)						
DC input range: VOL_WIP_DC	0 0		0.6 10	V kΩ	Voltage/resistance for min/ max volume respectively.	This line is used for control-head detection. An open-circuit input is considered as no head fitted.
DC bias: SPK+/- CH_MIC_AUD	2.9	0.5Vs	3.1	V V	Audio PA on. Via 2.2 kΩ	Bias for electret microphone.
Input resistance: CH_MIC_AUD	2.1	2.2	2.3	kΩ		
Output resistance: SPK+/-		0.5		Ω	Audio PA on.	
Output load: +3V3 +13V8			100 1	mA A		Specification must be derated by load amount from internal options and auxiliary interfaces.
Safe DC input limits: VOL_WIP_DC RX_AUD SPK+/- CH_MIC_AUD	-7 -17 0 -17		+17 +7 +17 +17	V V V V		Short circuit-safe.

Table 2.21 Control-head connector - AC characteristics

Parameter	Standard				Test method and conditions	Comments
	min.	typ.	max.	units		
RX_AUD	refer to Table 2.16					
CH_MIC_AUD	refer to AUX_MIC_AUD in Table 2.7					
SPK+/-	refer to Table 2.22					

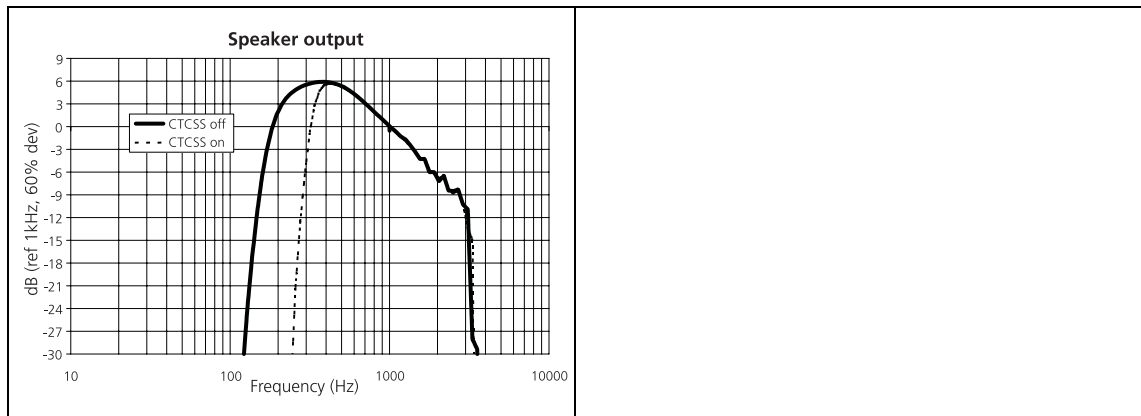
Table 2.22 Control-head connector - speaker output characteristics

Parameter	Standard				Test method and conditions	Comments
	min.	typ.	max.	units		
Mute ratio	70	75		dB	With respect to maximum output power. Noise measured in 0.3-3kHz bandwidth.	Signal path muted. Audio PA on.
Receive audio frequency response	Refer to plot in Table 2.24 .				EIA-603B	
Internal speaker output:						
Load configuration	Balanced					
Load	12.8	16	19.2	Ω	At 1 kHz.	
Maximum power	3			W	Into 16Ω.	
Rated duty cycle			100	%	At maximum power.	
Concurrent speaker output:						
Rated duty cycle			33	%	1 min at maximum power 2min Rx standby	The internal and external speaker loads are connected in parallel (not switched).

Table 2.23 Control-head connector - data characteristics

Parameter	Standard				Test method and conditions	Comments
	min.	typ.	max.	units		
Serial port						
Baud rate:	1200, 2400, 4800, 9600, 14400, 19200			bit/s		All UART parameters are fixed and common to all UARTs except for the baud rate which is configurable and different for different modes/applications
Data bits:	8					
Start bit:	1					
Stop bit:	1					
Parity:	None					
Protocol:	RPI CCDI2					
Flow control: Software	XON/XOFF					
GPIO						
Delays: I/O mirror to IOP UI key delay			500 50	μ s ms		

Table 2.24 Speaker frequency response plot



Detection of Control Head

When the TM8115 control head is not installed, the radio body will receive no volume control level or power on/off signal from the control head. In order for the volume control default to work properly, the absence of a control head is detected by detecting the absence of the volume potentiometer.

For operation with the TM8105 blank control head, the radio must be programmed always to power up when power is applied and the ignition-sense hardware link LK1 must be fitted. For more information on hardware links refer to [“Power Sense Options” on page 121](#).