6.0 Accessory Connections

6.1 Accessory Connector Pin Functions

This section gives a description of the accessory connector pin functions.

⚠️ **CAUTION: The accessory connections shown are not compatible to some other models of Motorola radios. Check the appropriate accessory or technical manual for further information.**

Table 1-4 Connector Pin Functions

Pin	Function	Description
1	External Speaker -	Speaker - and Speaker + (Pin 16) are used to connect an external speaker. The audio PA is a bridge amplifier with a minimum load resistance of 3.2 Ω. The internal speaker can be disabled by removing the control head. Disconnect the internal speaker and assemble the control head back to the radio.
2	External Mic Audio	External or Emergency Mic depends on dealer programming. This microphone signal is independent of the microphone signal on the microphone connector. The nominal input level is 80mV for 60% deviation. The DC impedance is 660 Ω and the AC impedance is 560 Ω.
3	Digital In 1	This is a digital input only and the primary use for this pin is external PTT. This pin must be used if fast DATA PTT is required. (See Note 1).
4	Digital Out 2	This is a digital output only and the primary use for this pin is as an external alarm output (See Note 3).
5	Flat_TX_Audio (NPD Data Out)	This input is intended for injecting signals into the transmit path that should not be filtered; for example, the analog output of a modem. The nominal input level is 150mVrms for 60% deviation. The impedance is greater than 25kΩ.
6	Digital In 3	This is a digital input only. Function depends on dealer programming. (See Note 4).
7	Ground	Used as ground for both analog and digital signals
8	Digital In/Out 4	This is a digital input/output depending on dealer programming. (See Notes 1, 2).
9	Digital In 5 with Wakeup Emergency (NPD Call RQS)	This is a digital input only. Emergency can be enabled via the CPS. To activate, this line must be connected to ground; this will turn on the radio. The CPS details which functions may be assigned to this pin by the codeplug.
10	Ignition Detect	Connecting this line to the ignition line of the vehicle will automatically turn the radio on when the ignition of the vehicle is turned on.

Table 1-4   Connector Pin Functions

Pin	Function	Description
11	Receiver Audio (NPD Data In)	There are two possible outputs: (1) Discriminator Audio; and (2) Continuous filtered RX audio. The nominal output level for Discriminator Audio is 330m Vrms at 60% deviation and for Filtered Audio 600m Vrms at 60% deviation at 1kHz. Function depends on dealer programming. For NPD calls, this uses discriminator audio and cannot be configured by the CPS.
12	Digital In/Out 7 (CTS)	This digital input/output function depends on dealer programming.
13	Switched Battery Voltage	This voltage is available when the radio is switched on. The maximum current is 1A.
14	Digital In/Out 8 Hook (Clear)	This is a digital input/output depending on dealer programming. (See Notes 1, 2). This hook line is in parallel to the hook line of the control head microphone connector. This port reads "0" when the microphone is on-hook and "1" when off-hook. It is assumed that the hook is a mechanical switch, so the software will always debounce this input.
15	RSSI	This is an analog output which indicates the strength of the received signal.
16	External Speaker +	Positive output of radio's audio PA (see Pin 1).
17	Bus +	This pin is used for flashing and for programming the radio.
18	Boot Control	To enter Boot Mode this line must be connected to ground when the radio is switched on.
19	Reserved	Reserved.
20	Reserved	Reserved.

Note 1:   **Digital Input**
4.7 kΩ Internal Pull Up Resistor to +5V.
Maximum Input Voltage accepted as Low = 0.6V
Minimum Input Voltage accepted as High = 3.0V

Note 2:   **Digital Output**
4.7kΩ Internal Pull Up Resistor to +5V
Maximum Current when Output Low = 10mA
Maximum Voltage when Output Low = 0.5V @ 10mA

Note 3:   **High Current Digital Output**
4.7kΩ Internal Pull Up Resistor to continuous B+
Maximum Current when Output Low = 200mA
Maximum Voltage when Output Low = 1.7V @200mA

Note 4:   **Digital Input**
10kΩ Internal Pull Up Resistor to +5V
Maximum Input Voltage accepted as Low = 0.6V
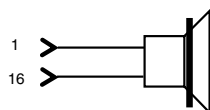Minimum Input Voltage accepted as High = 3V
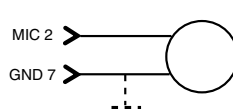
6.2   Accessory Connection Plan

⚠ CAUTION: The accessory connections shown are not compatible to some other models of Motorola radios. Check the appropriate accessory or technical manual for further information. Ensure correct position of the accessory connector.
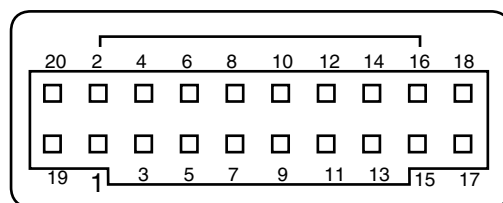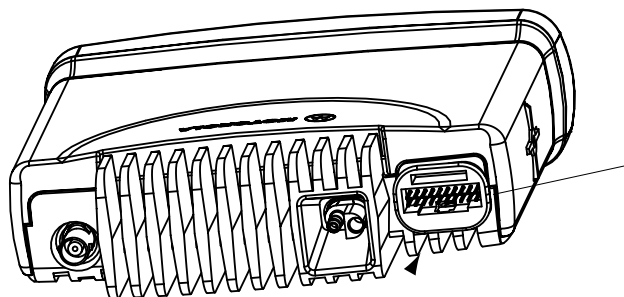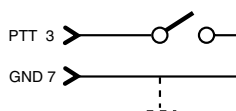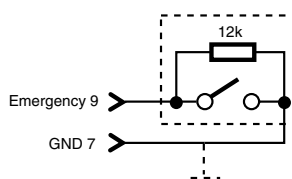

* Note the location of pin 1.
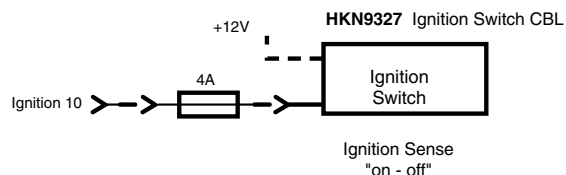
RSN4001 Speaker 13W
HSN8145 Speaker 7,5W

1
16

MIC 2
GND 7

RMN4027 Visor mounted Microphone

PTT 3
GND 7

RLN4856 Footswitch w/Remote PTT
RLN4857 Pushbutton w/Remote PTT
RLN4858 Gooseneck PTT

12k

Emergency 9
GND 7

RLN4836 Tri-State Emergency Footswitch and Cable

HKN9327 Ignition Switch CBL

+12V

Ignition 10   4A

Ignition Switch

Ignition Sense
"on - off"

GKN6272 External Alarm, Relay and Cable

+12V

86   87   Alarm Relay
85   30

Ext. Alarm 4   +12V

+12V

SWB+ 13

86   87   Alarm Relay
85   30   +12V

Ext. Alarm 4
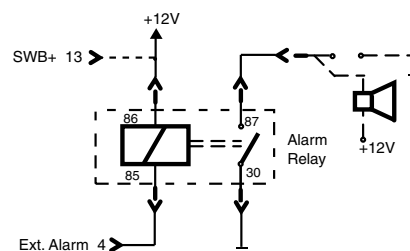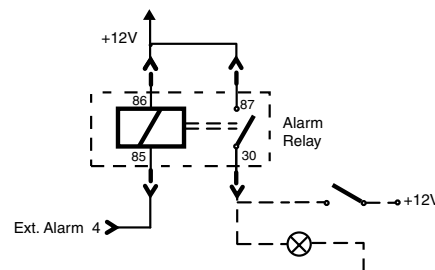
⚠ CAUTION: DO NOT short pin 16 or 1 on the accessory connector to ground; this may damage the radio.

8.0   Accessory Connector

8.1   Dealer Programmable I/O Features

All models of the GM300 Series Professional mobile radios incorporate a dealer programmable accessory connector as standard.

There are: 4 input lines,
                            1 output line, and
                            3 input / output (I/O) lines.

Table 2-3   Accessory Connector I/O Features

Pin number	3	4	6	8	9	10	12	14	GM950
External Output Functions:									
Carrier Detect		✓		✓			✓	✓	Yes
PL/DPL Detect		✓		✓			✓	✓	Yes
Radio Busy		✓		✓			✓	✓	Yes
External Alarm		✓							Yes
Per Channel Output		✓		✓			✓	✓	Yes
Car Radio Mute		✓		✓			✓	✓	Yes
PTT Sense		✓		✓			✓	✓	Yes
Decoder Output Control		✓		✓			✓	✓	Yes
External Input Functions:									
Channel Steering	✓		✓	✓			✓	✓	Yes
Hook	✓		✓	✓			✓	✓	Yes
Voice PTT	✓		✓	✓			✓	✓	Yes
Data PTT	✓								Yes
Voice & Data PTT	✓								Yes
Mute Audio PA	✓		✓	✓			✓	✓	Yes
Open RX Audio	✓		✓	✓			✓	✓	Yes
Public Address	✓		✓	✓			✓	✓	Yes
Call 1/2/3/4	✓		✓	✓			✓	✓	Yes
Emergency	✓		✓	✓			✓	✓	Yes
Emergency Wakeup					✓				Yes
Ignition						✓			Yes

Table 2-4 Accessory Connector Pin Out

Pin	Function
1	Speaker -
2	External Mic
3	Digital In 1 (Ext. PTT use External Mic/ Data PTT use Flat TX Audio)
4	Digital Out 2 (External Alarm)
5	Flat TX Audio. Sensitivity 150mV rms to for 60% deviation
6	Digital In 3
7	Ground
8	Digital In/Out 4
9	Digital In 5 with Wakeup (Emergency)
10	Digital In 6 with Wakeup (Ignition)
11	Flat / Filtered RX Audio (Flat RX Audio 330mV rms at 60% deviation Filtered RX Audio 600mV rms at 60%dev at 1kHz) CPS selectable
12	Digital In/Out 7
13	Switched Battery Voltage (max 1A, Dropout Voltage max1V)
14	Digital In/Out 8
15	RSSI (Radio Signal Strength Indicator)
16	Speaker +
17	Bus+ (used for CPS and Flash)
18	Boot Control
19	Reserved
20	Reserved

Each programmable pin can be disabled or programmed to a feature. The active state of each pin can be set as high or low: except

- emergency is active low;
- ignition is active high.

NOTE **Please refer to the Radio Installation Manual for more information.**

Benefits

❏   Enables interface to a wide range of external devices.

❏   Customer specific applications can be catered for.

❏   Gives excellent opportunities for enhanced dealer added value.

❏   Interface to external Mobile Data Modems.

8.2   Output Functions

8.2.1   Carrier Detect

The output is asserted whenever carrier is detected and is de-asserted if no carrier is present.

The output is de-asserted if the radio is in TX mode.

8.2.2   PL/DPL Detect

The output is asserted whenever the correct PL is detected.

If PL override is disabled, the output is de-asserted when the correct PL is lost.

If PL override is enabled, the output remains asserted for the AutoReset time after the correct PL is lost. This is particularly useful when the mobile is used as a base station and needs to remain active during short losses of RF or PL, eg when the signal is lost for a short moment, or a 5 tone sequence is sent (many earlier radios cannot encode PL and 5 tone simultaneously).

The output is de-asserted if the radio is in TX mode.

8.2.3   Radio Busy

This output is asserted whenever carrier is detected, or the radio is in TX mode.

8.2.4   External Alarm

If the radio has external alarm enabled and a telegram is decoded that has external alarm enable, the output is asserted. This output can be used to energise a relay, etc, that will sound the car's horn and, or flash the lights.

The output is de-asserted when any button is pressed, the radio is stunned or the external alarm timer expires. The timer is reset each time the output is asserted. For instance, if the external alarm duration is 5 seconds, and two decodes are received 1 second apart, the alarm starts on receipt of the first decode, and stop 6 seconds later (i.e., 5 seconds after the second decode).

External Alarm cannot be enabled on decoders set for Stun, Ack1 ringing, Ack1 Answer or Silent Interrogate.

NOTE   **This feature is not legal in all countries.**

Benefits

❑   Enables the radio user to be aware of an incoming call when out of, but near to, the vehicle.

8.2.5   **Per Channel Output**

The output is asserted when the radio is on a channel that has 'Per Channel Output' enabled, otherwise the output is de-asserted.

This is used to drive any device which is channel usage specific.

8.2.6   **Car Radio Mute**

This option is used to mute the audio on a car's hi-fi system when the two way radio is in use.

The output is asserted if the radio's loudspeaker is open or the radio is transmitting.

The output is de-asserted if the radio's loudspeaker has been closed and the radio has not transmitted during the preceding 5 seconds.

8.2.7   **PTT Sense**

PTT sense is an output line that follows the internal PTT input line. It is used to give full control of the transmit function to an external device, eg a computer sending data, so that it can control a user's attempts to transmit voice messages.

If PTT sense is programmed, when the internal PTT is pressed, the PTT sense line is asserted. Note that pressing the mic PTT does not make the radio go into transmit. If the external device is not transmitting, it asserts the Voice PTT line. It is this that causes the radio to transmit and the audio to be transmitted.

If the external device is already transmitting, it does not assert the Voice PTT line and the voice will not be transmitted. When the external device finishes transmitting, it accepts the next internal mic PTT.

In this application, the audio source must be set to the front microphone, with external voice PTT.

The data source is input on the flat Tx audio line (pin 5), with external data PTT.

If Voice and Data PTT is used (instead of separate Voice PTT and Data PTT), the external device will not transmit it's data whilst the audio is transmitting. However, if data is being transmitted, and the internal PTT is pressed, voice and data will be transmitted simultaneously. This set up will reduce but not eliminate the possibility of voice and data being transmitted simultaneously, and hence the data being corrupted.

Benefits

❏   Allows an external device to take control of the transmit function of the radio.
❏   Allows data and audio to be sent from the same radio without clashing.

8.2.8   Decoder Output Control

The output is asserted by the successful decode of a decoder that has 'Assert Output Control' enabled.

It is de-asserted by the successful decode of a decoder that has 'De-assert Output Control' enabled. This option is enabled/disabled per personality. This function can be useful for simple telemetry applications.

Benefits

❏   Allows remote control of external device.

❏   When used in conjunction with external call switch, gives simple telemetry.

8.3   Input Functions

8.3.1   Channel Steering

Channel steering allows an external device to select a channel, using a parallel interface.

The CPS can configure up to 5 input pins in channel steering mode. On the GM340 there are only 3 pins available and six channels selectable.

The radio software takes the state of these inputs and brings them together to form an N bit value, where N is the number of pins assigned to channel steering by the CPS and the channel selected is a result of the binary count obtained from these pins; the least significant bit is assigned to the lowest pin number that has channel steering assigned to it.
This value is the Channel Steering Index.

If the Channel Steering Index is zero, channel steering has no affect and channels are selected by normal user inputs.

If the Channel Steering Index is not zero, then the channel is set to the channel that corresponds to the Channel Steering Index value. If the selected channel index refers to a channel higher than the number of channels programmed in the radio, the highest available channel is selected.

Any attempts to change channel via user button action are ignored if the Channel Steering Index is not zero, and the Button Error Alert is sounded instead. This includes the following button actions:

●   Up/Down.

●   Memory Channel.

●   Entering channel numbers via the keypad.

If the Channel Steering Index is reset to zero the radio returns to the last 'user selected' channel.

If the radio goes into any Emergency Mode for which an Emergency Revert Channel is defined, the Emergency Revert Channel takes precedence over Channel Steering.

8.3.2   Hook

External hook performs the same function as microphone hook. This can be a mechanical hang-up or electrical switch.

8.3.3   Voice PTT

If Voice PTT is asserted, the TX audio is routed from one of the microphone paths. CPS programming defines whether the external voice PTT uses the internal or external (pin 2) microphone audio path.

8.3.4   Data PTT

If data PTT is asserted, it is assumed that the external PTT is an electronic switch (e.g. a modem) and that it requires the fastest possible radio response. When this pin is asserted the microphone path is muted and the TX audio is routed from the Flat TX audio input (pin 5).

8.3.5   Voice & Data PTT

If voice and data PTT is asserted, it is assumed that the external PTT is an electronic switch that requires the fastest possible radio response. The microphone path and the Flat TX audio input are both enabled and the two signals are summed to form the TX signal. CPS programming defines whether the external PTT uses the internal or external (pin 2) microphone audio path.

8.3.6   Mute Audio PA

When this input is asserted the audio PA (and speaker) is muted. When it is de-asserted, the audio PA operates under normal software control and follow programmed squelch requirements.

8.3.7   Open RX Audio

When this input is asserted the received audio, or option board audio (if fitted), is routed through to the audio PA (and speaker) independent of the normal squelch criteria.

8.3.8   Public Address Enable

When enabled, this feature allows the radio to act as a 'Public Address' system. An external switch is connected to this pin. When this pin is asserted, the radio routes the internal or external mic audio through to the Rx Audio (pins 7 and 11). A public address kit must be connected to the Rx audio pins; this provides extra audio amplification and connection to an external speaker (eg mounted on the roof of the car).

When the public Address pin is asserted and the mic PTT is pressed, the radio cannot receive calls. When the Public Address pin is asserted but the mic PTT is not pressed, the radio can receive calls. However, the Public Address pin must be de-asserted (ie the external Public Address switch moved to OFF) before the user can reply to the call.

8.3.9   Call 1, Call 2, Call 3, Call 4

If one of call 1, call 2, call 3 or call 4 inputs is asserted, then its associated telegram is transmitted.

It provides the same functionality that is assigned to a call programmed on a button.

8.3.10   Emergency

If an emergency switch is assigned, asserting the input causes the radio to go into emergency mode.

Emergency switch assigned to pin 9 is a special case. In addition to normal emergency mode, asserting the input when the radio is turned off will invoke Emergency with Wake Up. This causes the radio to power up and immediately enter Emergency mode.

8.3.11   Ignition

Ignition sense is programmable per radio. Connecting the vehicle ignition to this line causes the radio to turn on automatically when the ignition is turned on, and turn the radio off when the ignition is turned off. This feature is particularly useful where the radio must always be on when the vehicle is in use, for example, a fire engine.

Benefits

❑   The radio turns on automatically when the vehicle is started.

8.4   Data Transmissions

Mobile data systems are increasing in popularity. The GM300 Series mobiles have been designed with this is mind. They have:

- flat transmit and receive audio available on the accessory connector;
- special programmable digital lines on the accessory connector;
- the ability to connect an internal or external data modem to the radio.

An external data modem can be connected to the mobile via the rear accessory connector.

An internal data modem can be fitted neatly inside the DataPro accessory. The mobile's control head is put into the remote mount configuration and then the DataPro is connected to the front of the transceiver. The audio and digital signals that are normally routed via the rear accessory connector are taken out via 2 D-type connectors on the front of the box. This gives easy connection with standard connectors to other external devices, such as computers.

Motorola has selected Application Partners who have specially designed modems to fit inside the GM300 Series mobiles. Several different signalling formats and speeds of modem are available to meet the many different application requirements. Most have RS232 signalling via the D-type connectors.

8.5   Accessory Packages

Several common accessories are listed in the **Accessory Package**.

Choosing one of these automatically sets up the GPIO interface in the required configuration. Changes of, and additions to, the standard configuration can be made.

Benefits

❑   Reduces time to set up the radio.