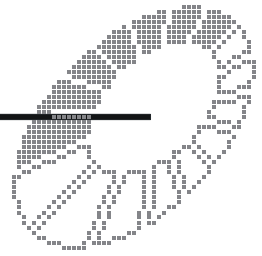
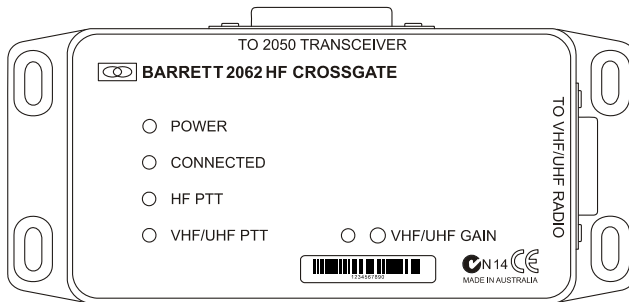




BARRETT 2062
HF to VHF / UHF CROSSGATE



Operating and Installation Manual



BCM20620/12

© Barrett Communications

Head Office:

Barrett Communications Pty Ltd
47 Discovery Drive, Bibra Lake, WA 6163 Australia
Tel: +61 8 9434 1700 Fax: +61 8 9418 6757
Email: information@barrettcommunications.com.au

www.barrettcommunications.com.au

Front Panel.....3

Function4

Operation from the HF network5

Operation from the VHF/UHF network.....5

Installing the Barrett 2062 HF Crossgate.....6

 Setting Vox/Line PTT Control.....7

 Adjusting VHF/UHF Rx Audio Gain.....8

 VHF/UHF Mute.....9

 Speaker Level Audio & VHF/UHF Mute.....9

 Using the External 2062 Power Switch.....10

 Typical Connection to VHF/UHF Diagram11

Additional Control Features.....12

Electrical specifications13

Connectors15

 To 2050 Transceiver (25 pin female "D" connector)15

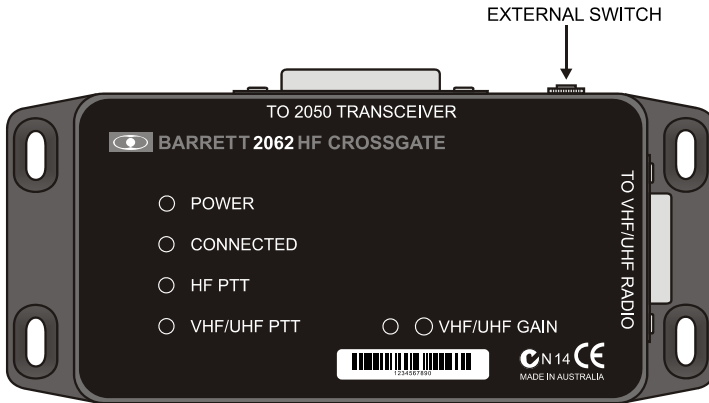
 To VHF/UHF Radio (9 pin female "D" connector).....16

Example: Connecting to a Motorola GM36017

Circuit Diagrams and Overlays.....18

Parts List19

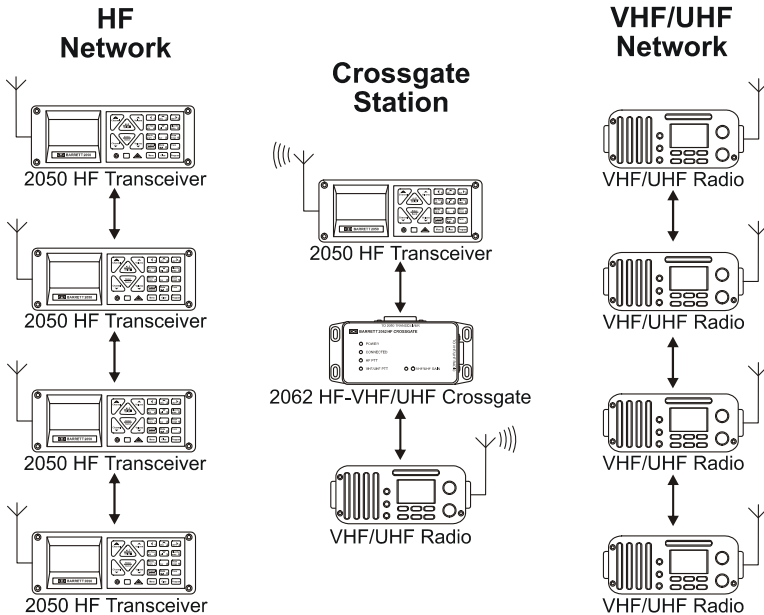
Front Panel



| | | |
|---------------------|---|---|
| POWER | - | The 2062 is powered on. |
| CONNECTED | - | The 2062 is "connected" and to the HF and VHF/UHF networks are linked. |
| HF PTT | - | The HF transceiver is in transmit mode. |
| VHF/UHF PTT | - | The VHF/UHF transceiver is in transmit mode. |
| VHF/UHF GAIN | - | Gain control for the VHF/UHF receive audio input, with clip indication LED. |
| TO 2050 TRANSCEIVER | - | Connection to HF transceiver. |
| TO VHF/UHF RADIO | - | Connection to VHF/UHF radio. |
| EXTERNAL SWITCH | - | Connection for the external power switch kit. |

Function

The Crossgate facilitates voice communication between a Barrett HF radio network and any VHF/UHF radio network as described below:-



The Crossgate station provides a communication link between a Barrett HF Network and a VHF/UHF network.

The Crossgate operates by creating an audio and PTT connection between the HF and VHF/UHF transceivers connected at the Crossgate station. When the Crossgate is "Connected", the Crossgate relays all voice transmissions between the two networks.

The Crossgate provides on air voice annunciation of all control changes.

The Crossgate is designed to work with any VHF/UHF transceiver, however it is recommended that it be used with a transceiver that provides balanced line level audio inputs and outputs, and mute logic output.

NB: The VHF/UHF transceiver must have unfiltered audio output, for correct functionality.

Operation from the HF network

Radio operators on the Barrett HF network connect to the VHF/UHF network by sending a specific Selcall to the Crossgate station, instigating the Crossgate to relay voice communications between the two networks. The network connection can be terminated by an HF network station sending a Selcall "Hang-up" sequence to the Crossgate station.

The Crossgate responds to any of the 4 digit OEM, 4 digit international or 6 digit international Selcall Ids of the Crossgate station's Barrett HF radio.

"Connection" initiation and "connection" termination are announced over both networks. When a "connection" is initiated from the HF network, an additional alarm sound is transmitted over the VHF/UHF network, prior to the annunciation.

Operation from the VHF/UHF network

Operation of the Crossgate from the VHF/UHF network is by transmission of Crossgate DTMF control codes.

Radio operators on the VHF/UHF network can connect to the Barrett HF network by transmitting a DTMF control code for the Selcall ID of any of the radios on the HF network. When the DTMF tone sequence for a 4 or 6 digit Selcall ID is received by the VHF/UHF radio of the Crossgate station, a patch is initiated and the Selcall is sent to the HF network. A "connection" may then be cancelled by transmitting the DTMF code: '99'.

When a "connection" is initiated or terminated from the VHF/UHF network, the Crossgate status is enunciated over the VHF/UHF network and the HF radio receiving the Selcall produces a Selcall/ hang-up alarm.

NB: Any DTMF tones received by the Crossgate station's FM transceiver, will be interpreted by the Crossgate as an attempted control code. For this reason, unnecessary DTMF tone transmission is not advised when operating a Crossgate.

During VHF/UHF to HF communication, the Crossgate transmits a beep-after-mute to the VHF/UHF network, to indicate that the Crossgate's HF transceiver is no longer in a mute state. VHF/UHF users must wait for the beep, prior to transmitting a reply.

Installing the Barrett 2062 HF Crossgate

Before connecting the system together ensure that all components to be connected in the system are switched off. For correct installation of the 2050 transceiver please refer to the "Barrett 2050 Operating and Installation Manual" supplied. For correct installation of the VHF/UHF transceiver please refer to the manual supplied with the unit.

Please note that it is recommended that the VHF/UHF antenna and HF antenna are mounted as far apart as possible. This will help keep RF noise out of the VHF/UHF network.

Connect the 25way cable supplied with the 2062 Crossgate from the 2050 transceiver "AUXILIARY CONNECTOR" to the 2062 Crossgate "TO 2050 TRANSCIVER" connector.

Connect the 9way connector supplied with the 2062 Crossgate from the 2062 Crossgate "TO VHF/UHF RADIO" connector to the VHF/UHF transceiver.

Connect the power leads from the 2022 power supply to the 2050 transceiver.

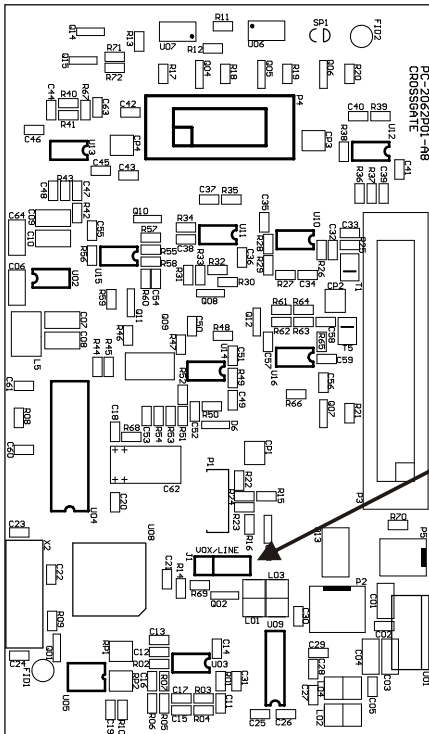
Connect a suitable antenna to the 2050 transceiver "ANTENNA" socket.

Power on the 2050.

Setup the following menu options for the 2050:

- Use of the transmit timeout function is recommended
- RS-232 Out enabled
- Line in level 0dBm
- Line out level adjusted to suit VHF/UHF radio's audio input (2062 has unity HF audio pass through gain or 0dB)
- Line audio follows mute
- Tx configuration to local
- Rx configuration to internal audio
- Scan resume time of at least 3 minutes, or set to scan resume OFF
- The 2062 will automatically set the 2050 of the Crossgate station to Audio (syllabic) mute mode
- Antenna Type – **"Linear Amplifier" Should NOT be selected**

Setting Vox/Line PTT Control



Jumper J1
Vox / Line Select

The 2062 has an internal jumper which sets the PTT function available from the VHF radio. This jumper tells the 2062 to use a fixed mute line input as the PTT signal from the VHF or use the onboard signal level VOX detection circuit to determine PTT. If no jumper is fitted the default is VOX.

Adjusting VHF/UHF Rx Audio Gain

The VHF/UHF receive audio gain must be set to ensure correct operation of the Crossgate.

- 1) Ensure there is no DTMF or Selcall signalling on the networks during setup
- 2) In order to set the gain correctly, a full strength audio signal should be used from the VHF/UHF radio's audio output. If possible, an unsquelched full noise signal is preferable.
- 3) If using speaker level audio, adjust the VHF/UHF radio volume to a setting which can be left constant during operation. This volume setting must remain unchanged for correct operation.*
- 4) Insert a non-conductive flat head adjustment tool into the front panel gain adjustment hole, and rotate the tool until the tip slots into the screw head slot. The Gain is adjusted via a multi-turn screw type potentiometer.
- 5) If the red clip indication LED is illuminated, rotate the gain adjustment anti-clockwise to decrease the gain. If the LED is not illuminated, rotate clockwise to increase the gain.
- 6) Adjust the gain potentiometer in this fashion, until the red clip indication LED is only occasionally illuminated. This is the optimal gain setting for correct Crossgate operation.*
- 7) Reset the VHF/UHF radio to its operational squelched/quieted mode (see section below).
- 8) Appropriate signal level must continue to be used for reliable DTMF decoding, and audio quality.*

***Note:**

The 2062 Crossgate may operate with either line audio, or speaker audio, though it is recommended to operate with balanced line audio. Speaker audio may accidentally be changed on radio volume controls. Appropriate signal levels are necessary for reliable operation. Use of this connection may furthermore be complicated if there is a need for an operator to listen on the Crossgate station's VHF/UHF radio speaker. Additionally, speaker level audio will most likely require trimming to near 0dBm on the VHF/UHF transceiver, and must be unfiltered audio in order to maintain DTMF signal integrity.

VHF/UHF Mute

The 2062 Crossgate has two modes of detecting the mute state of the VHF/UHF radio of the Crossgate station.

- Logic level mute state signal – preferred method
- Onboard VOX mute state detection

When connected, the 2062 uses the mute state of the VHF/UHF radio to determine when to cross key the PTT of the HF radio. A logic signal output from a VHF/UHF radio is the most reliable way to detect this state, though a signal level VOX is also made available on the 2062.

If available, the mute signal of the VHF/UHF radio should be connected to the 9 way cable. The 2062 will then preferentially use the mute signal, and ignore the onboard VOX. Jumper J1 on the 2062 PCB should be set correctly to mirror how the system is being used (See "Setting Vox/Line PTT Control" section of the manual).

If a mute signal is not available, the onboard signal level VOX will be used to determine the mute state of the VHF/UHF radio. For correct operation of the signal level VOX, the 2062 must have a correctly quieted (squelched) receive audio output. If there is no mute signal available, and the VHF/UHF receive audio is unquieted (unsquelched), then the VOX will determine that there is a valid VHF/UHF voice signal being received.

If a mute signal is being used from the VHF/UHF radio, then the VHF/UHF receive audio signal does not need to be normally quieted, as the 2062 will only cross key the HF radio's PTT when the mute signal is asserted.

Speaker Level Audio & VHF/UHF Mute

If both a mute state signal, and line audio are not available from the VHF/UHF radio, such that speaker level VHF/UHF receive audio is being used, then special care must be taken to ensure that both correct signal levels are maintained, and also that correct receive audio quieting (squelch) is maintained.

In this case, when connected, the 2062 will cross key the HF radio's PTT whenever the VHF/UHF radio's receive audio exceeds a threshold signal strength. The risk here, is that a volume control of a VHF/UHF radio may be accidentally changed, which may then affect the VOX triggering onboard the 2062.

Use of this connection may furthermore be complicated if there is a need for an operator to listen on the Crossgate station's VHF/UHF radio speaker, as there may be a the need to alter audio levels for listening.

VHF/UHF transceiver speaker audio out is often a low pass filtered output, which has the potential to interfere with correct DTMF decoding, as filters may attenuate the pass band of the Crossgate's DTMF decoder.

Using the External 2062 Power Switch

The 2062 comes with a power switch kit which allows the operator to power down the Crossgate so that the attached HF and VHF/UHF radios can be used as stand alone transceivers.

The power switch kit comprises a 3.5mm mono plug, 6 metres of unterminated 2 core cable plus a switch.

The 2 core cable supplied should be run from the 2062 to the required switch position. Once the cable has been installed the supplied switch and plug can be connected to the cable and mounted as needed.

The 2062 will remain powered on when connected to the 2050 transceiver if no plug is in the 3.5mm jack. If the mono plug is inserted without the switch fitted the 2062 will power off, once the switch is fitted it can be used to turn the 2062 on or off.

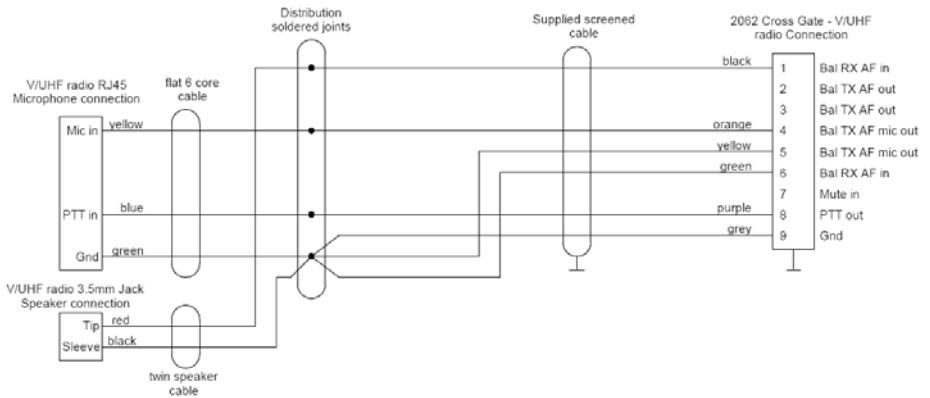
When the 2062 is powered on please allow a few seconds for the unit to initialise and connect to the 2050 transceiver.

Please note that the power switch kit does NOT have to be installed for the 2062 to function correctly.

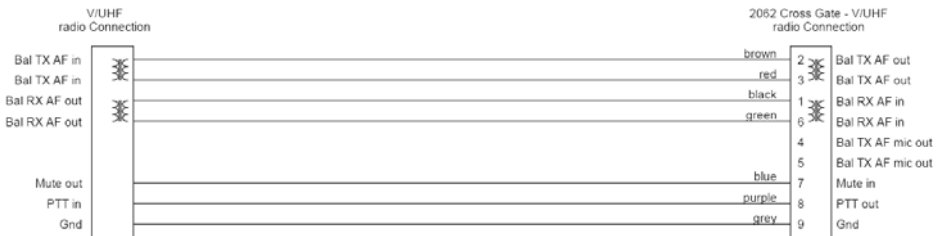
Typical Connection to VHF/UHF Diagram

The 2062 HF Crossgate does require some technical expertise to install. Please be aware that the plugs and connections of most VHF and UHF radio types are proprietary, and will require specific integration design. The following drawings are intended to assist with the design of the integration, and represent connection of a working system based on front panel microphone/speaker connection or via auxiliary line connection where this is available. The latter is preferable as it will allow the use of the V/UHF radio from the microphone, without upsetting the level settings of the Crossgate

Connection for radio with only Microphone and speaker plug



Connection for radio with line connection plug



Additional Control Features

Control features of the Crossgate station's 2050 are accessible from the VHF/UHF network via the DTMF control codes listed below:

| Function | DTMF Code | Notes |
|---------------------------------|-------------|---|
| Initiate patch/transmit Selcall | *XXXX(XX)## | XXXX(XX) is a 4 digit or 6 digit Selcall ID. Voice transmissions are relayed between networks. VHF/UHF Annunciation: "Selcall XXXX(XX) Sending, Patched In" followed by a connection tone. |
| Terminate patch | 99 | Patch terminates. VHF/UHF Annunciation: "DTMF Hangup, Patched Out" |
| Select HF channel | XX | Select channel number of the Crossgate station's HF radio. XX is the HF network channel number, in the range of: 01 to 50 VHF/UHF Annunciation: "Channel XX Selected". |
| Interrogate | 77 | VHF/UHF Annunciation: <ul style="list-style-type: none"> • "Patched in/out" • "Channel XX." • "Tx on f_{Tx} kHz" ¹ • "Rx on f_{Rx} kHz" ² |
| Timer On/Off | 88 | Turn no activity timer on or off. Annunciate as: <ul style="list-style-type: none"> • "Timeout In" – when timeout timer is on • "Timeout Out" – when timeout timer is off |

Notes:

1. f_{Rx} is the Crossgate station's HF receive frequency.
2. f_{Tx} is the Crossgate station's HF transmission frequency.

Electrical specifications

The Crossgate features audio, PTT, and mute connections to each of the radios of the Crossgate station, and a data connection to the HF radio. The data connection is limited to control commands between the Crossgate and the HF radio and does not facilitate data communications between the two networks.

Electrical connections and specifications are detailed below:

| HF Signal Connections | Description |
|-----------------------------|---|
| HF ground | 0 Volt HF radio ground |
| +13.8 V | + 13.8 V Power from HF radio |
| RS-232 I/O | RS-232 control signals between HF radio and Crossgate |
| Balanced receive audio in | HF Rx balanced audio in, 600 Ω input impedance, 0dBm recommended |
| Balanced transmit audio out | HF Tx audio out, 0dBm nominal, into 600 Ω load |
| HF PTT out | Active low HF radio external PTT keying |
| HF mute in | Active low HF radio mute state input |

| VHF Signal Connections | Description |
|---|--|
| VHF/UHF Rx audio balanced in ¹ | VHF/UHF Rx audio, balanced in, 600 Ω input impedance, -26dBm to +4dBm adjustable gain, 0dBm recommended, transformer isolated ¹ |
| VHF/UHF mute in ² | VHF/UHF radio mute state input, active low, optically isolated ² |
| VHF/UHF Tx audio balanced line out ¹ | VHF/UHF Tx audio, balanced out, 0dBm nominal into 600 Ω load, level adjustable on 2050, transformer isolated ¹ |
| VHF/UHF Tx audio balanced mic. level out ³ | VHF/UHF Tx audio, balanced out, microphone input level ³ , -40dBm nominal, transformer isolated ³ |
| VHF/UHF PTT out | VHF/UHF radio external PTT keying, active low, optically isolated |
| VHF/UHF ground | VHF/UHF radio 0 volt ground, internally RF isolated in 2062 |
| VHF/UHF Rx audio balanced in ¹ | VHF/UHF Rx audio, balanced in, 600 Ω input impedance, -26dBm to +4dBm adjustable gain, 0dBm recommended, transformer isolated ¹ |

Notes:

1. All VHF/UHF audio connections to and from the 2062 are transformer coupled, and are best used with balanced audio outputs and inputs on the VHF/UHF radio of the Crossgate station. If balanced audio is not available, single ended may be used, with one pin of the audio port connected to the VHF/UHF radio ground.
2. See explanation of VHF/UHF Mute, above
3. Microphone level audio outputs may be used with VHF/UHF radios which do not feature true line level Tx audio input, though use of balanced line level audio is strongly recommended.

Connectors

To 2050 Transceiver (25 pin female "D" connector)

| Pin | Name | Description of function | Level |
|-----|---------------------|--|------------------------|
| 1 | Ground | HF radio ground | 0V |
| 2 | Tx Data | RS-232 data output | True RS-232 |
| 3 | Rx Data | RS-232 data input | True RS-232 |
| 4 | | | |
| 5 | | | |
| 6 | | | |
| 7 | RS-232 Ground | RS-232 Ground | 0V |
| 8 | | | |
| 9 | PTT Out | HF radio external PTT keying | Active low 0V |
| 10 | | | |
| 11 | Bal. Tx Audio Out | Balanced Tx audio output (with pin 24) | 0dBm nominal into 600Ω |
| 12 | Bal. Rx Audio In | Balanced Rx audio input (with pin 25) | 600Ω -6dBm to +9dBm |
| 13 | Ground | HF radio ground | 0V |
| 14 | | | |
| 15 | | | |
| 16 | | | |
| 17 | | | |
| 18 | | | |
| 19 | HF Mute In | Audio mute from the 2050 transceiver | Active low |
| 20 | | | |
| 21 | | | |
| 22 | | | |
| 23 | +13.8 V Fused Input | +13.8V Input (+11VDC to +15VDC) | 13.8V nominal |
| 24 | Bal. Tx Audio Out | Balanced Tx audio output (with pin 11) | 0dBm nominal into 600Ω |
| 25 | Bal. Rx Audio In | Balanced Rx audio input (with pin 12) | 600 Ω -6dBm to +9dBm |

To VHF/UHF Radio (9 pin female "D" connector)

| Pin | Name | Description of function | Level | Supplied Cable Wire Colour |
|-----|------------------------|---|--------------------------|----------------------------|
| 1 | Bal. Rx Audio in | Balanced Rx audio, input, with pin 6 | 0dBm nominal into 600Ω | Black |
| 2 | Bal. Tx audio out | Balanced Tx audio line level output, with pin 3 | 0dBm nominal into 600Ω | Brown |
| 3 | Bal Tx audio out | Balanced Tx audio line level output, with pin 2 | 0dBm nominal into 600Ω | Red |
| 4 | Bal. Tx audio Mic. out | Balanced Tx audio microphone level output, with pin 5 | -40dBm nominal into 600Ω | Orange |
| 5 | Bal. Tx audio Mic. out | Balanced Tx audio microphone level output, with pin 4 | -40dBm nominal into 600Ω | Yellow |
| 6 | Bal. Rx Audio in | Balanced Rx audio input, with pin1 | 0dBm nominal into 600Ω | Green |
| 7 | Mute in | VHF/UHF radio mute state logic input | Active low | Blue |
| 8 | PTT Out | VHF/UHF radio external PTT keying | Active low | Purple |
| 9 | Ground | VHF/UHF radio ground | 0 Volt | Grey |

Example: Connecting to a Motorola GM360



GM360 to Crossgate Pinouts:

| GM360 Accessory Connector Pin Functions | Name | Description of function | Crossgate 9 pin female "D" connector | Description of function |
|---|----------------|--|--------------------------------------|---|
| 3 | Ptt In | GM360 Digital In 1 - External PTT input. | 8 | VHF/UHF radio external PTT keying |
| 4 | Mute Out | GM360 Digital Out 2 - Pin programmed as Carrier Detect output. | 7 | VHF/UHF radio mute state logic input |
| 5 | Flat_TX_Audio | GM360 - Tx Audio input | 2 | Balanced Tx audio line level output, with pin 3 |
| 7 | GND | GM360 ground | 9 | VHF/UHF radio ground |
| 7 | GND | GM360 ground | 3 | Balanced Tx audio line level output, with pin 2 |
| 7 | GND | GM360 ground | 1 | Balanced Rx audio, input, with pin 6 |
| 11 | Receiver Audio | Rx Audio output | 6 | Balanced Rx audio input, with pin1 |

Circuit Diagrams and Overlays

(Barrett 2062 HF VHF-UHF Crossgate-schematic.pdf)

(Barrett 2062 HF VHF-UHF Crossgate-Overlays-values.pdf)

(Barrett 2062 HF VHF-UHF Crossgate-Overlays-designators.pdf)

Parts List

| PCB P/N: 2062P01-A8-Parts List - Issue A8 | | |
|--|------------------------------|----------------------------|
| Component Designator | Description | Barrett Part Number |
| C01 | Cap 10uF 16v Y5V 1206NB | CP-11710 |
| C02 | Cap 100nF 5% 50V 0603 | CP-11666 |
| C03 | Cap 10uF 16v Y5V 1206NB | CP-11710 |
| C04 | Cap 10uF 16v Y5V 1206NB | CP-11710 |
| C05 | Cap 100nF 5% 50V 0603 | CP-11666 |
| C06 | Cap 10uF 16v Y5V 1206NB | CP-11710 |
| C07 | Cap 10uF 16v Y5V 1206NB | CP-11710 |
| C08 | Cap 10uF 16v Y5V 1206NB | CP-11710 |
| C09 | Cap 10uF 16v Y5V 1206NB | CP-11710 |
| C10 | Cap 10uF 16v Y5V 1206NB | CP-11710 |
| C11 | Cap 100nF 5% 50V 0603 | CP-11666 |
| C12 | Cap 100nF 5% 50V 0603 | CP-11666 |
| C13 | Cap 100nF 5% 50V 0603 | CP-11666 |
| C14 | Cap 1uF 10V +80/-20% | CP-11721 |
| C15 | Cap 1uF 10V +80/-20% | CP-11721 |
| C16 | Cap 10nF 5%-10% 50V 0603 X7R | CP-11667 |
| C17 | Cap 22nF 5% 0603 | CP-11726 |
| C18 | Cap 100nF 5% 50V 0603 | CP-11666 |
| C19 | Cap 100nF 5% 50V 0603 | CP-11666 |
| C20 | Cap 100nF 5% 50V 0603 | CP-11666 |
| C21 | Cap 100nF 5% 50V 0603 | CP-11666 |
| C22 | Cap 100nF 5% 50V 0603 | CP-11666 |
| C23 | Cap 15pF 5% 50V 0603 NPO | CP-11687 |
| C24 | Cap 15pF 5% 50V 0603 NPO | CP-11687 |
| C25 | Cap 100nF 5% 50V 0603 | CP-11666 |
| C26 | Cap 100nF 5% 50V 0603 | CP-11666 |
| C27 | Cap 100nF 5% 50V 0603 | CP-11666 |
| C28 | Cap 100nF 5% 50V 0603 | CP-11666 |
| C29 | Cap 100nF 5% 50V 0603 | CP-11666 |
| C30 | Cap 100pF 5% 50V 0603 | CP-11673 |
| C31 | Cap 100pF 5% 50V 0603 | CP-11673 |
| C32 | Cap 1uF 10V +80/-20% | CP-11721 |

| | | |
|-----|------------------------------|----------|
| C33 | Cap 1uF 10V +80/-20% | CP-11721 |
| C34 | Cap 100nF 5% 50V 0603 | CP-11666 |
| C35 | Cap 100nF 5% 50V 0603 | CP-11666 |
| C36 | Cap 100nF 5% 50V 0603 | CP-11666 |
| C37 | Cap 100nF 5% 50V 0603 | CP-11666 |
| C38 | Cap 1uF 10V +80/-20% | CP-11721 |
| C39 | Cap 100nF 5% 50V 0603 | CP-11666 |
| C40 | Cap 100nF 5% 50V 0603 | CP-11666 |
| C41 | Cap 1uF 10V +80/-20% | CP-11721 |
| C42 | Cap 1uF 10V +80/-20% | CP-11721 |
| C43 | Cap 1uF 10V +80/-20% | CP-11721 |
| C44 | Cap 330nF 0603 20V | CP-11731 |
| C45 | Cap 100nF 5% 50V 0603 | CP-11666 |
| C46 | Cap 100nF 5% 50V 0603 | CP-11666 |
| C47 | Cap 10nF 5%-10% 50V 0603 X7R | CP-11667 |
| C48 | Cap 5n6 0603 | CP-11732 |
| C49 | Cap 100nF 5% 50V 0603 | CP-11666 |
| C50 | Cap 100nF 5% 50V 0603 | CP-11666 |
| C51 | Cap 100nF 5% 50V 0603 | CP-11666 |
| C52 | Cap 100nF 5% 50V 0603 | CP-11666 |
| C53 | Cap 1uF 10V +80/-20% | CP-11721 |
| C54 | Cap 100nF 5% 50V 0603 | CP-11666 |
| C55 | Cap 100nF 5% 50V 0603 | CP-11666 |
| C56 | Cap 100nF 5% 50V 0603 | CP-11666 |
| C57 | Cap 100nF 5% 50V 0603 | CP-11666 |
| C58 | Cap 1uF 10V +80/-20% | CP-11721 |
| C59 | Cap 1uF 10V +80/-20% | CP-11721 |
| C60 | Cap 22pF 5% 50V 0603 NPO | CP-11675 |
| C61 | Cap 22pF 5% 50V 0603 NPO | CP-11675 |
| C62 | Cap 100uF Tant 16v | CP-11670 |
| C63 | NF | |
| C64 | Cap 10uF 16v Y5V 1206NB | CP-11710 |
| CP1 | Cap Net 1nF 50V NPO 5% | CP-11703 |
| CP2 | Cap Net 1nF 50V NPO 5% | CP-11703 |
| CP3 | Cap Net 1nF 50V NPO 5% | CP-11703 |
| CP4 | Cap Net 1nF 50V NPO 5% | CP-11703 |
| D1 | Led Green 3mm Round | LE-02913 |

| | | |
|-----|--------------------------|----------|
| D2 | Led Green 3mm Round | LE-02913 |
| D3 | Led Green 3mm Round | LE-02913 |
| D4 | Led Green 3mm Round | LE-02913 |
| D5 | Led Red 3mm Hi/intensity | LE-02915 |
| D6 | Di BAV70 SMD | DI-03316 |
| J1 | Plug 3 pin | CN-04102 |
| L01 | Ind 100uH 1210 10% 10R | IN-03601 |
| L02 | Ind 100uH 1210 10% 10R | IN-03601 |
| L03 | Ind 100uH 1210 10% 10R | IN-03601 |
| L04 | Ind 100uH 1210 10% 10R | IN-03601 |
| L5 | Ind 1mH SMD 1812 | IN-03585 |
| P1 | 8W PCB ST Header | CN-00016 |
| P2 | Plug 3 pin Polarised | CN-14102 |
| P3 | Header 26W Box | CN-04134 |
| P4 | Header 10W Box | CN-04138 |
| P5 | Plug 2 pin Polarised | CN-14101 |
| Q01 | Trans 2N7002 LT-1 Fet | TR-02282 |
| Q02 | Trans 2N7002 LT-1 Fet | TR-02282 |
| Q03 | Trans 2N7002 LT-1 Fet | TR-02282 |
| Q04 | Trans 2N7002 LT-1 Fet | TR-02282 |
| Q05 | Trans 2N7002 LT-1 Fet | TR-02282 |
| Q06 | Trans 2N7002 LT-1 Fet | TR-02282 |
| Q07 | Trans 2N7002 LT-1 Fet | TR-02282 |
| Q08 | Trans 2N7002 LT-1 Fet | TR-02282 |
| Q09 | Trans BSP17 SOT223 | TR-02207 |
| Q10 | Trans 2N7002 LT-1 Fet | TR-02282 |
| Q11 | Trans 2N7002 LT-1 Fet | TR-02282 |
| Q12 | Trans 2N7002 LT-1 Fet | TR-02282 |
| Q13 | Trans NDT456 SOT-223 P | TR-02292 |
| Q14 | Trans 2N7002 LT-1 Fet | TR-02282 |
| Q15 | Trans 2N7002 LT-1 Fet | TR-02282 |
| R01 | Res 10k 5% 0.063W 0603 | RE-10277 |
| R02 | Res 22k 0.063W 5% 0603 | RE-10311 |
| R03 | Res 10k 5% 0.063W 0603 | RE-10277 |
| R04 | Res 10k 5% 0.063W 0603 | RE-10277 |
| R05 | Res 10k 5% 0.063W 0603 | RE-10277 |
| R06 | Res 100k 5% 0.063W 0603 | RE-10291 |

| | | |
|-----|--------------------------|----------|
| R07 | Res 10k 5% 0.063W 0603 | RE-10277 |
| R08 | Res 1M 0.063W 5% 0603 NB | RE-10350 |
| R09 | Res 5k6 0.063W 5% 0603 | RE-10328 |
| R10 | Res 5k6 0.063W 5% 0603 | RE-10328 |
| R11 | Res 100R 5% 0.063W 0603 | RE-10283 |
| R12 | Res 100R 5% 0.063W 0603 | RE-10283 |
| R13 | Res 4k7 5% 0.063W 0603 | RE-10288 |
| R14 | Res 5k6 0.063W 5% 0603 | RE-10328 |
| R15 | Res 5k6 0.063W 5% 0603 | RE-10328 |
| R16 | Res 5k6 0.063W 5% 0603 | RE-10328 |
| R17 | Res 220R 5% 0.063W 0603 | RE-10279 |
| R18 | Res 220R 5% 0.063W 0603 | RE-10279 |
| R19 | Res 220R 5% 0.063W 0603 | RE-10279 |
| R20 | Res 220R 5% 0.063W 0603 | RE-10279 |
| R21 | Res 220R 5% 0.063W 0603 | RE-10279 |
| R22 | Res 5k6 0.063W 5% 0603 | RE-10328 |
| R23 | Res 10k 5% 0.063W 0603 | RE-10277 |
| R24 | Res 10k 5% 0.063W 0603 | RE-10277 |
| R25 | Res 680R 0.063W 5% 0603 | RE-10329 |
| R26 | Res 5k6 0.063W 5% 0603 | RE-10328 |
| R27 | Res 5k6 0.063W 5% 0603 | RE-10328 |
| R28 | Res 5k6 0.063W 5% 0603 | RE-10328 |
| R29 | Res 5k6 0.063W 5% 0603 | RE-10328 |
| R30 | Res 5k6 0.063W 5% 0603 | RE-10328 |
| R31 | Res 27k 0.063W 5% 0603 | RE-10342 |
| R32 | Res 5k6 0.063W 5% 0603 | RE-10328 |
| R33 | Res 5k6 0.063W 5% 0603 | RE-10328 |
| R34 | Res 5k6 0.063W 5% 0603 | RE-10328 |
| R35 | Res 5k6 0.063W 5% 0603 | RE-10328 |
| R36 | Res 5k6 0.063W 5% 0603 | RE-10328 |
| R37 | Res 27R 1% 0.063W 0603 | RE-00031 |
| R38 | Res 5k6 0.063W 5% 0603 | RE-10328 |
| R39 | Res 5k6 0.063W 5% 0603 | RE-10328 |
| R40 | Res 1k2 0.063W 0603 | RE-00030 |
| R41 | Res 1k2 0.063W 0603 | RE-00030 |
| R42 | Res 10k 5% 0.063W 0603 | RE-10277 |
| R43 | Res 10k 5% 0.063W 0603 | RE-10277 |

| | | |
|-----|------------------------------|----------|
| R44 | Res 15k 0.063W 5% 0603 | RE-10307 |
| R45 | Res 5k6 0.063W 5% 0603 | RE-10328 |
| R46 | Res 1k 5% 0.063W 0603 NB | RE-10287 |
| R47 | Res 10R 5% 0.063W 0603 | RE-10278 |
| R48 | Res 4k7 5% 0.063W 0603 | RE-10288 |
| R49 | Res 15k 0.063W 5% 0603 | RE-10307 |
| R50 | Res 47k 0.063W 5% 0603 | RE-10326 |
| R51 | Res 150k 5% 0.063W 0603 | RE-10367 |
| R52 | Res 15k 0.063W 5% 0603 | RE-10307 |
| R53 | Res 5k6 0.063W 5% 0603 | RE-10328 |
| R54 | Res 2M2 0.063W 5% 0603 | RE-10314 |
| R55 | Res 15k 0.063W 5% 0603 | RE-10307 |
| R56 | Res 3k3 0.063W 5% 0603 | RE-10323 |
| R57 | Res 5k6 0.063W 5% 0603 | RE-10328 |
| R58 | Res 56k 0.063W 5% 0603 | RE-10327 |
| R59 | Res 6k8 0.063W 5% 0603 | RE-10332 |
| R60 | Res 5k6 0.063W 5% 0603 | RE-10328 |
| R61 | Res 5k6 0.063W 5% 0603 | RE-10328 |
| R62 | Res 5k6 0.063W 5% 0603 | RE-10328 |
| R63 | Res 5k6 0.063W 5% 0603 | RE-10328 |
| R64 | Res 27k 0.063W 5% 0603 | RE-10342 |
| R65 | Res 5k6 0.063W 5% 0603 | RE-10328 |
| R66 | Res 5k6 0.063W 5% 0603 | RE-10328 |
| R67 | Res 56R 5% 0.063W 0603 | RE-10286 |
| R68 | Res 10R 5% 0.063W 0603 | RE-10278 |
| R69 | Res 10k 5% 0.063W 0603 | RE-10277 |
| R70 | Res 10k 5% 0.063W 0603 | RE-10277 |
| R71 | Res 10k 5% 0.063W 0603 | RE-10277 |
| R72 | Res 10k 5% 0.063W 0603 | RE-10277 |
| RP1 | Res array 1k5 5% 0.063W 1206 | RE-10368 |
| RP2 | Res array 3k3 5% 1206 4 pack | RE-10366 |
| SP1 | Solder pad | |
| T1 | T/Former NT2520 956DP-1010 | TF-30678 |
| T2 | T/Form Midcom | TF-05130 |
| T3 | T/Form Midcom | TF-05130 |
| T4 | T/Form Midcom | TF-05130 |
| T5 | T/Former NT2520 956DP-1010 | TF-30678 |

