Background

Made by SELEX Communications (Marconi is on the label) and used mainly in the UK and by U.S. Marines. Also by Australia.

There's a need for a short range radio for individual soldiers (intra squad). There have been a number of different ones (PRC-68 Family, the PRC-25, PRC-77 might be called inter squad) and this is yet another. This radio appears to have been designed starting with a clean sheet of paper, a luxury that's not often available when the new radio needs to be compatible with all the older radios going back to the time of the gladiators. This radio probably will not communicate with any other radio either military or civilian.

Operation

Controls

Chan: 16 Positions (1 shown)

Off/Vol: 5 Positions (Off shown)

Ant: SMAf recessed.

Headset: LEMO 5 pin

Bowman PTT for this radio

Aux PTT: for Combat Radio (CR)

Setting Up

1. OFF/Vol to Off

2. Connect Headset
Push headset connector to seat it

3.Insert 2 AA batteries
(observe polarity markings)

4. Check that Chan is on proper channel

5. connect antenna

6. Switch Vol control on to medium position

Affiliating the Wireless PTT

The work PROGRAM on the wireless PTT is positioned over the bump where the reed switch is located in the PTT module.

1. Start with the OFF/Vol control at OFF.

2. Switch Vol on to a medium volume position. Ascending Tones are heard.

3. Press and hold wireless PTT until ascending tones are heard a second time.

4. Release wireless PTT.

5. Note: decending tones heard of affiliating did not work. If so, repeat steps 1 to 4.

De-Affiliating from the Wireless PTT

1. Switch Off.

2. Switch On to medium volume.

3. Without pressing wireless PTT, remove and return wireless PTT to and from radio 5 times within 5 seconds of turning on radio. Ascending tones heard.

First de-affiliating then Affiliating WPTT.

http://www.youtube.com/watch?v=FzbhupKswmk

Tones

Power on: three short tones if no WPTT is affiliated, or increasing frequency stair step tone if WPTT affiliated.
H4855OnOff.avi
Power off: four medium length tones and one long tone.
Battery Low: four tones alternating in frequency.
Combat Net Radio call waiting: Three medium tones and one long tone repeated every five seconds. (only when a Dual PTT equipped radio)
Wireless PTT affiliation: stair step of eight tones upward in frequency. Repeated if successful. Downward sequence of eight tones if failed.
Volume and Channel changes: one beep per step
Turned off by holding PTT while turning on the radio.

To Disable Tones

1. Switch off the radio.
2. While holding down the radio PTT switch turn power on. Now instead of hearing the tones, the audio will be blanked at the times when the tones would have been heard.

Operation

This is a half duplex radio, i.e. you need to release the PTT switch in order to hear a reply from another station. Do not press the PTT when another station is transmitting as this will cause interference.

At the 2.4 GHz operating frequency the antenna height above ground is the key factor that determines the range.

The microphone is a noise canceling type so it needs to be positioned so that it touches your lips, not off a inch or more.

Antenna

The radio is designed to be worn on the non shooting shoulder and placed so that the antenna is above the top of the shoulder, thus giving it a good field of view. This is why the audio cord on the headset is much shorter than those on older larger radios. The radio uses the very common SMA female panel jack that will mate with SMA male cable ends or the stubby 2.4 GHz antenna. At 2.4 GHz antenna height above ground has more to do with the range than the RF output power. The best place would be on top of the helmet of a standing soldier.

I tried to use the higher gain WiFi antenna that's part of the USB-802.11n adapter for the CF-28 Toughbook, but it will not fit the Bowman radio because the O.D. on the SMA (3.0 mm) connector is too large to fit down into the hole on the Bowman radio.

Frequency

Instead of operating in one of the standard military frequency bands this radio operates (2.4 - 2.483) in the 2.4 Ghz Industrial Scientific & Medical (ISM) bands where no license is needed for secondary users. This particular band has a Wi-Fi specification, IEEE 802.11, that's commonly used for linking laptops and PDAs to a network. The 802.11 protocol is used by this radio. I think that means that no license is required to use this radio in the U.S. If you know one way or the other please let me know.

The 16 position channel knob on top of the radio combines with the 16 position rotary switch on the 12 contact face to allow for a total of 256 channels. No programming of the radio is required.

The top knob is marked with even numbers and dots between them so it can be read as channels 0 to 16 or channels 1 to 15 with no ambiguity. But redundancy if someone says channel 1 and someone else says channel 16 since they are the same knob position.

Low Probability of Intercept (LPI), Low Probability of Detection (LPD)?

When PTT is first pressed a sequence of tones is heard in the earphone and a WFS-1 Wi-Fi detector shows activity. But in a few seconds the activity stops (just one radio being used) and the side tone in the headphone no longer matches the spoken voice. I think this means that the radio was unable to link to another radio and has quit transmitting. It appears that no linking occurs until the PTT is pressed, which is a good way of doing it. That way you are not carrying around a beacon to let others know you are around.

At about 100 feet the WFS-1 is still has one LED on so the actual range is probably much more. The output power is specified as 50 mW. This means that there's a 100% chance of detection at 100 Feet and maybe longer ranges depending on what's between the transmitting PRR and the WFS-1 Wi-Fi detector.

Carry Pouch

The snap that secures the narrow bungie cords over the top of the radio has a projection that's the tool needed to set the Group number 16 position switch when the PTT is removed. But how do you loosen the screw holding the PTT to the radio?

The SELEX marked radio does not have the small screwdriver for setting the internal channel group switch.

DC Power

Instead of using a military battery it uses a couple of the very common "AA" batteries that are available about anywhere in the world. The down side to that is most AA batteries do not work at or near freezing temperatures. Is there a provision for external DC power to the radio? This would be good for retransmission use.

There may be a reverse connected diode across the battery contacts so if both batteries are installed backwards they will get very hot but the radio will be protected. A better way is to use a FET switch (see Analog Troubleshooting by Bob A. Pease of National Semi).

DC power can be supplied to the AUX radio connector and then the two AA batteries can be removed from the radio. This is for the Clansman aux PTT module and might also be the case for the U-229 AUX PTT.

Audio Connection

LEMO I think the 5 pin headset plug is the FGG.1B.305.KLAD62. This plug supports: Ground, Mike input, Headphone output and retransmission. For retransmission all that's needed is a special cable to interconnect the two radios (this is very similar to the PRC-68 family and other mil radios).

Lemo has a USA site. A mating receptacle might be the EGG.1B.305.KLL (rear nut) or EEG.1B.305.KLL (front nut)
A strain relief for the headset plug might be the FFM.1B.130.LC nut plus GMA.1B strain sleeve (both of which are not on the stock headset plug but should be.)

The audio connection is on the PTT switch pack, not on the radio proper. So the 12 contacts on the side carry the aduio connections.

There is a collett on the back of the LEMO connector that needs to match the diameter of the cable. So when making up LEMO plugs you need to know your cable diameter prior to ordering the connectors. I'm working on making an audio test box for the 5 pin connector. I have a query into Belden, but it's being delayed by the Thanksgiving holidays.

Headset

The headset has a single ear piece and attached to it are the 20" cord that connects to the radio and the mike on a flexible boom. The ear piece has open holes surrounding the speaker element so that you can also hear any ambient sounds. The mike is of the noise canceling type and so needs to be placed so it touches your lips. Is is worn with the speaker on the left ear.

Data Connection

One of the PTT switch packs supports data by means of a connector on the attached cable end. But I now think the Dual PTT U-229 connector also supports data coms. The sales brochure implies low data rates, not 802.11 Wi-Fi rates. There's a cable to connect the data port to a PDA. If you know about this please let me know. I'm guessing that it's the standard U-229 Data protocol.

There may be a special cable to interface to a Personal Digital Assistant (PDA).

The Bowman radio can be connected to a PLGR or DAGR GPS receiver using the data interface. A simple

application of this would be to send your position either in absolute coordinates or relative to some bulseye location. A more advanced application would involve sending target or close air support data messages.

Push To Talk

CAUTION WARNING

When the PTT slice is removed from the radio the 12 electrical connections that are exposed go directly to the internal electronics.
If anti static precautions are not used there is a chance that the radio will be permanently damaged.

Instead of just using a common PTT switch there are a number of innovative options. The PTT module screws onto the narrow left side of the radio making contact with a 3x4 (12) contacts array. There are a number of tone signals that let the radio operator know some key status situations. These can be turned off by holding PTT while turning on the radio. See above for the tones.

The PTT modules are:

- Single PTT button switch pack
- Dual PTT button switch pack with cable for second radio. The UK Dual uses the 7 pin Clansman connector and the NATO version uses the 6 pin U-229 type connector commonly for use with the PRC-148 MBITR but would work with about any radio like SINCGARS (RT-1439) radios.
- Data Interface Single button switch pack - supports combined voice and data although at low speeds (PDA cable?)
- Wireless PTT switch - this is a small switch that can be affixed to the forearm of a rifle or anywhere that it would be convenient to have a PTT switch. It has it's own 3.6 V lithium battery that should last more than 10 years. 433 MHz 128 bit operation.

  To affiliate a WPTT power up the radio with the WPTT positioned so that the word "PROGRAM" on the WPPT is on the hump between the two buttons on the DUAL PTT. The magnet in the DUAL PTT tells the radio to look for a signal (like programming a rolling code garage door opener).
  You should hear the first ascending stair step tone.
  Now press and hold the WPTT botton until you hear the second ascending stair step tone. The radio and WPTT are now affiliated and will be until you undo the affiliation.

  To remove the affiliation:
  Turn the radio off and position the WPTT as described above for affiliation,
  Turn on the radio and hear the ascending stair step tone indicating there's a WPTT affiliated, do NOT press the WPTT but instead:
  Move the WPTT a foot or so from the radio to open the magnetic sensor on the radio and return it to the radio 5 times and do all that within 5 seconds of turning the radio on. If done properly you will hear a second ascending stair step tone and after powering down the radio when it's turned on you will hear the three dot power on tones.

~~I wonder if there is a garage door opener that would work? The frequency is the same as used with key fob car remotes and garage door openers and the "learning" process is the same.~~ I've tried two garage door transmitters and a car key fob transmitter and none of them worked.

Unknown Model PTT

This is probably one of the ones listed above, but which one? Photos courtesy of Mark Blair.
If you know more about this PTT please let me know.

14 pin LEMO Dual PTT vs. Single or Dual PTT

Bowman Dual PTT module with 14 pin Plug

marked: 5930998401824
i.e. NSN: 5930-99-840-1824
D3701882B1

Plug mates with: Thomson-CSF (Thales) 9100 handheld and 9200 manpack VHF radios

Green - Mic + - Pin A (on clansman connector)
White - Mic - - Pin B
Red - +24 VDC (used in clansman radio system and therefore N/A in H4855) - Pin C
Yellow - Speaker + - Pin D
Blue - Ground - Pin E
Black - PTT - Pin F

info from Lennart who is

inHi Lennart
Sweden

D7401672A1

6 pins in U-229 type connector

H274485501
S/W STATE 01

Maybe for linking a GPS to the radio?

Vehicle PRR PTT module
The top LEMO is the standard audio conn.
The bottom LEMO is smaller and is probably for DC power to the radio. No batteries are used in the radio.

S5002031A1
5930991319201
(NSN 5930-99-131-9201)

NSNs

NSN	Prod #	Description
5820-99-721-8335	P21050000	PRR Body (Green) Complete – English The PRR body is complete with an antenna and an English user card. Must be used with single or dual push-to-talk (PTT) switch assembly. Requires two AA batteries (included). Infantry use (500m range)

		
5820-99-739-4033 	P08130000	Single PTT Switch Assembly (Green) The single PTT switch assembly is for use with the PRR body.
5820-99-342-4097	P08120000	Remote Wireless PTT (Green)The wireless PTT remotely operates the PRR. Supplied with a black adjustable strap and buckle.

5820-99-127-2911

?

Dual PTT with 7 pin Clansman cable connector

Dual NATO PTT

From Derk: Using with Kenwood amateur radios

PRR wire	signal	Kenwood connection
black	PTT	M/3
green	microphone	M/2
yellow	earth	m/3
blue	speaker	m/1

For kenwood connection:
1=tip,
2=middle,
3=base and
M=mini and
m=micro jack

5820-01-531-1752

AN/PRC-343 personal role radio set with:
Radio P21250100 5820-99-721-8355
Single PTT P08130000 5820-99-739-4033
Wireless PTT P08120000 5820-99-342-4097
Daylight Headset P0814490008 5965-01-533-3341

		Boom Mike Adapter P07120000 NSN? Carry Pouch P30180100 5895-99-991-3095
5820-01-531-1758 (see DPRR below)	P21050041	AN/PRC-343 personal role radio set with: Radio P210501000 5820-99-721-8335 Dual PTT P08140341 5820-99-666-0452 (<-???, see below) Wireless PTT P08120000 5820-99-342-4097 Daylight Headset P09255+0009 NSN??? Boom Mike Adapter P07120000 NSN? Carry Pouch P30180100 5895-99-991-3095
?	?	Single PTT with (detachable?) PDA cable
5820-99-280-7276	P14360408	CT/Light Patrol Headset (Green) – Noise-Canceling (NC) Electret Microphone The vented, single-sided headset has an NC Electret microphone fitted to a flexible boom arm. Fitted with an adjustable headband, the headset can be worn underneath most passive ear defenders.
5965-01-533-3341 	P14490008	CT/Light Patrol Headset (Green) – Noise-Canceling (NC) Electret Microphone The vented, single-sided headset has an NC Electret microphone fitted to a flexible boom arm. Fitted with an adjustable headband, the headset can be worn underneath most passive ear defenders and balistics helmets.

5965-99-664-9722 	P071000 00	Nuclear, Biological, or Chemical (NBC) Boom Microphone Adapter The adapter is for use with most Davies headset models. One end fits over theheadset's boom microphone and the other end plugs into the respirator's speech module. See patent 7493899 below
5820-99-425-3999 	C410114	Carry Pouch (Green) – United Kingdom (UK) Pattern Disruptive Pattern Material (DPM) The PRR fits inside a heavy-duty polyurethane, textured nylon pouch that attaches to webbing and helps protect the PRR from harsh conditions/impact.
5895-99-991-3095 		Carry Pouch (Green) - U.S. Molle
5985-99-664-9730 		Antenna
5820-01-533-3406		Battery Door

		The two doors shown are aftermarket made by Dragondark.
5820-01-533-3652		Strap & Buckle for Wireless PTT
5820-99-666-0452 		

12 Contact Radio interface

March 2012

Contact	Function
1	Mircrphone In
2	?
3	Speaker Out
4	+Vout
5	Ground

6	Push To Talk
7	Busy pips (active low)
8	?
9	Reset (Active low)
10	RxD (CMOS 3V URAT In)
11	TxD (CMOS 3V URAT Out)
12	Single/Dual PTT select (0=Single, 1=Dual) or (Open Squelch / PTT)

The mode / SQ pin . On UK MOD sets that have been modified (1) . on a dual ptt you get a hi/low tone on TX in your
headphone that repeats every five seconds ...
it can be stopped by taking the mode pin the ground via a 10k resistor.
This only happens on a later set and with a dual ptt
---Ian---

Oct 2011 - newer pinout info from Eero: H4855 module connector

This 12 contact field contains the signals needed for the headset (mike, speaker and PTT) , for data coms (Tx data, Rx data and maybe Tx clock and Rx clock), for retransmission (PTT and Squelch) and probably some test modes and external DC power. If you have info please let me know.

Summary:

1	2	3	4	5	6	7	8	9	10	11	12
Mike	~~PTT~~	Spkr	+Vout	Gnd	PTT				RxD	TxD	PTTsel

It sure would make it easier to have a pair of working radios.
Looking at the connector the top row (nearest the on-Vol control) is numbered left to right 1, 2, 3, 4 and the center row 5, 6, 7 ,8 and the bottom row 9, 10, 11 & 12.
First probing Voltage all combinations with the radio turned off.
Black test lead on Fluke 87 DMM for left coulmn and Red test leat for top row.

B R-> V	1 M	2 P	3 S	4	5 G	6	7	8	9	10	11	12
1 m**ike**	x											
2 **PTT**	x	x										
3 **Spkr**	x	x	x									
4	x	x	x	x								
5	x	x	x	x	x			.044				

Gnd												
6	x	x	x	x	x	x		.044				
7	x	x	x	x	x	x	x	.044				
8	x	x	x	x	x	x	x	x	.044			
9	x	x	x	x	x	x	x	x	x			
10	x	x	x	x	x	x	x	x	x	x		
11	x	x	x	x	x	x	x	x	x	x	x	
12	x	x	x	x	x	x	x	x	x	x	x	x

x - no point in testing the same thing two times or the same contact.

Now probing with the On-Vol at full volume:

B R-> V	**1 Mik**	**2 PTT**	**3 Spk**	**4**	**5 Gnd Bat -**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
1 Mike	X									.040	0.3	cap
2 PTT	X	X		.054	.051.	.050	.051		.052	.05	.05	cap
3 Spkr	X	X	X	2.2	.77	2.0	1.96	cap	1.9.	1.8	1.8	cap
4	X	X	X	X	-2.968		-.01	-2.915				-2.967
5 Bat-GND	X	X	X	X	X	+2.594		.05	+2.963	+2.938	+2.963	
6	X	X	X	X	X	X	-.006	-2.907				-2.959
7	X	X	X	X	X	X	X	-2.901				
8	X	X	X	X	X	X	X	X	+2.910	+2.885	+2.91	-.048
9	X	X	X	X	X	X	X	X	X			-2.962
10	X	X	X	X	X	X	X	X	X	X		-2.936
11	X	X	X	X	X	X	X	X	X	X	X	-2.962
12	X	X	X	X	X	X	X	X	X	X	X	X

Note that a voltage of 2.9xxx volts is the full battery voltage from 2 Alkaline batteries or after a FET type switch.

Single PTT interface

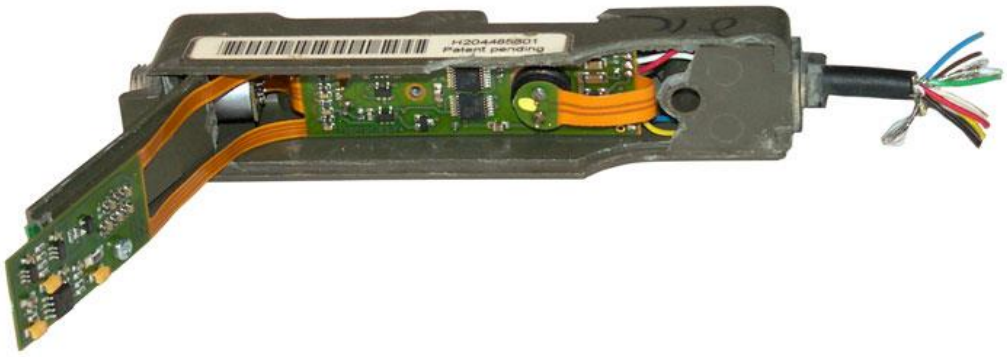
Radio On max vol
Radio Audio Connector numbered 1 to 5 clockwise looking into the PTT jack with 1 at the notch.

The headset only has the noise canceling mike and earphone (no PTT switch)
The PTT button is between contact numbers 2 & 5
Ohms LEMO connector to 12 contacts

B R-> V	**1 Mike**	**2 Gnd**	**3 Gnd**	**4 Spkr**	**5 ?**
1 Mike	**0**				
2 PTT					
3 Spkr				**0**	
4					
5 Gnd		**0**	**0**		
6					
7					
8					
9					
10					
11					
12					

Dual PTT Interface

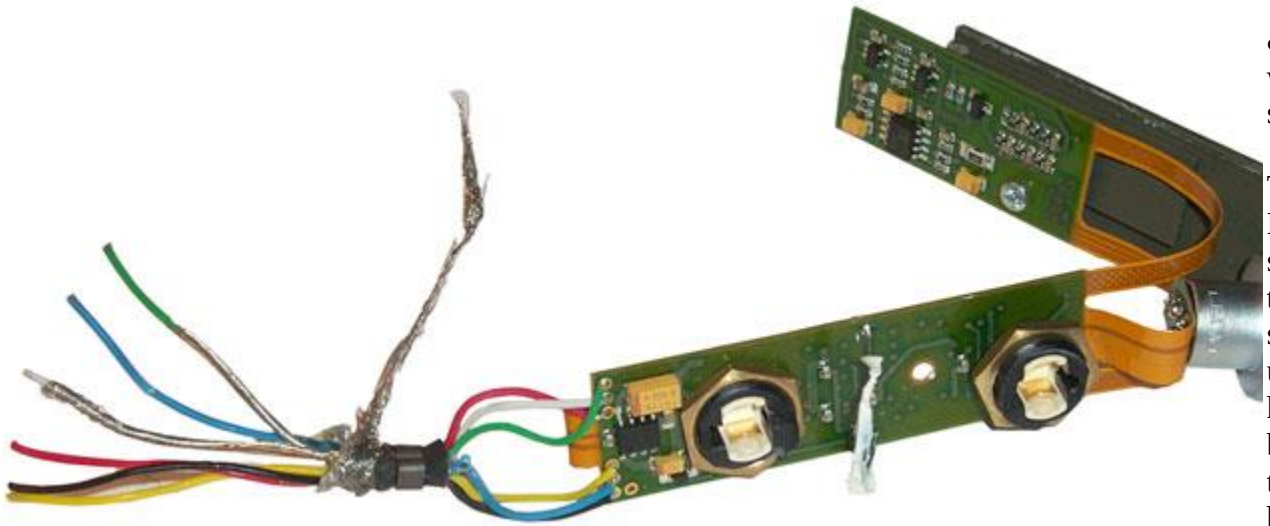
The opened Dual PTT is marked:
D40014201, H204485601, Patent Pending.
It the cut cable has 6 wires (plus ground) colored blue, green, red, yellow, black and a white wire wrapped with bare wire (coax).



From an Airsoft web page, but I think they have it close but there's more to it. For example the Blue wire seems to be the true ground.

Black: Gnd (PTT)
PTT: White (PTT)
Speaker+: Orange

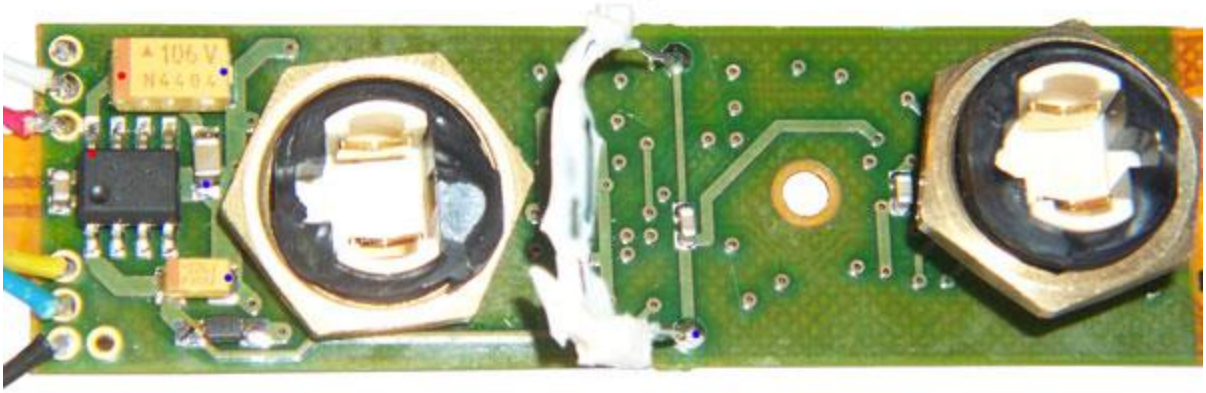
Speaker-: Blue
Mike: Green
Mike (power?): Red



The green & white wires are shielded.

The white RTV is surrounding the reed switch that's under the hump between the two PTT buttons.

There are 12 SMT caps at the top right of the top PCB (next to the notch in the flex circuit) and the center ends of all of them connect to the blue (gnd) wire.



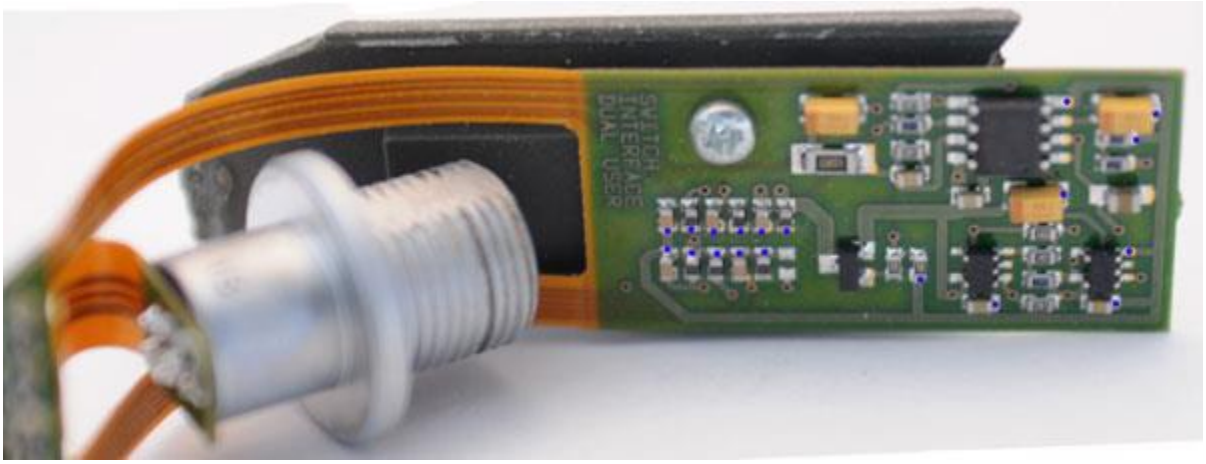
Blue dots are connected to the blue PTT cord wire (looks like ground). R ed dot connected to red PTT cord wire.

IC is marked LM293

Blue dots are connected to the blue PTT cord wire (looks like ground).

Top IC is marked HC02A Bottom IC is marked HC14A

The three 5 lead SOT-23 packages are marked "AAA".



Blue dots are connected to the blue PTT cord wire (looks like ground).

The IC on the back of the 12 contact PCB is

marked
MAX4167.

DPTT Interconnection Table

2nd Radio Cable (PCB order)	**Radio I/F**			
Black		?		
Blue	6, 8	DC Gnd & Speaker Return		
Yellow (orange)		Speaker Audio		
Red		Mike DC power		
White (shielded)		2nd Radio PTT		
Green (shielded)		Mike Audio		
	3	top (Radio) PTT		

Lemo Connectors

These are what's called push on pull off. No rotation of the connector is needed to install or remove the plug.

EGG.1B.305.CLL FGG.1B.305.CLAD62

Headset Interface

Shown above is the 5 pin LEMO headset connector. In normal operation this connector only carries mike and speaker audio. But when the retransmission cable is connected it also needs to carry a PTT signal to key the radio and a squelch signal. In the U-229 type connector this takes a total of 6 wires. So it's still a mystry how the retransmission works using only the 5 pin connector. Most likley pin 5 carries a digital signal as a bus. For example by using a pull up resistor the line is held high and when squelch closes (a signal is being received) that radio puls the line low, but that's just a guess.

The H4855U has a red mark on the LEMO connector and I'm assuming it's pin # 1.

Dual Personal Role Radio Set

Got this from Mike Murphy (8 Apr 2010) new in the box.

The inner box is marked:
5820-01-531-1758
CAGE 37EK0
PN P21060041
DUAL PERDONAL ROLE RADIO SET
1 EA
SPM7A3-07-F-0002
GS35F0348S
M31-7/07

Contents 5 palstic bags:

	SELEX Radio Set 5820-01-531-1758 Radio 5820-99-721-8335 Dual PTT (H204485601, D40883601) w/GC329 connector attached, Antenna, two AA cells, card marked "Integrated Squad Radio Operator's Guide card marked
	red blue

note 1: these two connectors mate with each other. This appears to be a daisy chain DC power system similar to the VIC DC system.
Note 2: the small 6 pin LEMO connector does not fit the PSG-9 Message Terminal external Power jack J2. But the core of this plug does fit J2. What is the correct LEMO plug for J2, let me know.

Documents

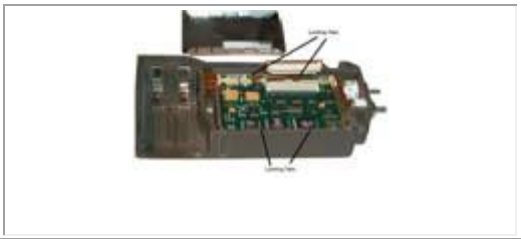
Pocket Card - Vehicle Fit Personal Role Radio (PRR) Operator's Guide 739-0042/01 Issue 2 Jul 05

Operation with US VIC Equipment

In order to do this requires figuring out:
The pin out of the 7 pin 56T10-07SE connector as well as the polarity of the DC input connector. The signal levels may or may not be compatible with the VIC system.
It would be good to know the wiring of the Vech PTT module and the input voltage levels (probably 3.3 VDC from the Traco DC-DC module, i.e. 2 AA Batteries) that it accepts.

H4860 Rebroadcast Unit

The rebroadcst unit is configured in a saddlebag arrangement with a radio system in each of the two bags and with an interconnecting cable. The interconnecting cable carries digital Tx and digital Rx audio, not analog audio. Although the details are not really clear RF filters are used, one passes channels 1 to 4 and the other passes channels 13 to 16 (channels 5 through 12 are not used providing for the filter skirts). Any group number

can be used. It would seem that one of the saddle bags would be for the low channel numbers and the other for the high channel numbers. The filters have a little less than 3 dB attenuation in their pass bands.

There are "switch packs" which may be in the form of PTT units that connect to stock radios. The LEMO connector on the switch packs are interconnected with a cross over cable the interconnects the Tx digital audio of one ratio to the Rx digital audio input of the other radio.

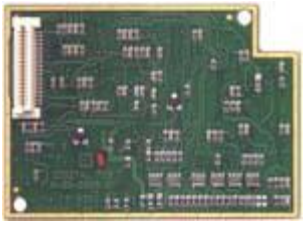
Maintenance Info

There are a number of surplus radios being sold by the MOD in the UK. These have been stripped of the knobs antenna and PTT switch and maybe even the battery compartment door, i.e. just a very raw radio. They probably do not work and being sealed have been rejected rather than repaired. It's probable that you could saw them open and with a number of them make one good radio.

Coming shortly. For now you can use the above tables of resistnace and voltage.

Opening Radio Case

1. The part line is clearly visable. The two case halves are glued toghther, but not by fusing the plastic. So using a few light blows from a 2.5 pound Dead Blow Hammer (Harbor Freight 33905) a "crack" is heard then with a screw driver the lid can be seperated from the main radio body. DO NOT hit or set the radio on the PTT interface during this process as that will damage the interface PCB (guess how I know this).
2. Disconnect the connector then remove the RF can top lid.
3. Bend the 4 tabs to allow the digital board to be lifted. Note there are two holes in the board that can be used to lift it.
4. Use a 5/16" socket or nut driver with an OD less than 0.447". The 5/16" Craftsman deep 1/4" drive socket (set 934421) has an OD of 0.445'. This unit has double sided tape on the bottom of the can, but it was not sticking. You may need to use pliers to pull the can up after taking off the nut and lock washer. Remove the RF shield can bottom lid. The RF board is soldered to the shield can.
5. The remaining chassis contains the battery contacts, flex circiut and plug ans well as the two switches.

1. Lid Removed	2. Connector lifted & Shield removed. Lines to tabs.	3. Tabs bent & Digital board top removed from radio	4. Remove SMA & can from chas
			
4. Top of RF board	4. Bottom of RF board	3. Digital board bottom	5. Box & flex ckt w/ s

ICs

Atmel AT90S8515 - 8 bit Micro Controller w/ 8K bytes of flash memory, 32 IO lines, 44 pin TQFP
AMI WavePlex 0034LQM SX043T - ?
WavePlex 0108LDH SX061T - ?
CML CMX639E2 43265 - CVSD Digital Voice Codec
4168 EUB - Maxim High-Output-Drive, Precision, Low-Power, Single-Supply, Rail-to-Rail I/O Op Amps with Shutdown (speaker driver)
HC74 E1052 - ?
EM09AB LMV824 MT - Shantou stars Electronics Co Ltd SOP-20 - ?
DS1844 100 9939A1 134AA - Maxium Quad Digital Pot 100k Ohm
P12AF LCX125 - 14 pins - Low Voltage Quad Buffer with 5V Tolerant Inputs and Outputs
P14AJ LCX257 - 16 pins - Low Voltage Quad 2-Input Multiplexer with 5V Tolerant Inputs and Outputs
P14AJ LCX257 - 16 pins - Low Voltage Quad 2-Input Multiplexer with 5V Tolerant Inputs and Outputs
MAX1705 EEE 0124 - high-efficiency, low-noise, step-up DC-DC converters with an auxiliary linear-regulator output (3v in - 5V out)
LMV822 - NSC Low Voltage, Low Power, RRO, 5 MHz Dual Op Amps

Board Connectors

AMP Fine Pitch SMT Stacking Connectors (Parallel Board-to-Board) 0.8 mm pitch

2x30 connector - Digital board to Chassis via flex circuit (many grounds)
2x20 connector Digital board to Analog board.
Right Angle SMA-f on Analog board