



## EMERGENCY MEASURES RADIO GROUP



## OTTAWA ARES

Two Names - One Group - One Purpose

### Revision Summary

|      |            |  |
|------|------------|--|
| V1.0 | xxxx-xx-xx | Create initial document                              |
| V1.1 | 2009-07-02 | Quick review and update, but still draft in progress |

### Purpose Of This Document

Defines the Red Cross radio requirements and the solution implemented by EMRG, including detailed drawings for all wiring.

|                                |             |                        |                  |
|--------------------------------|-------------|------------------------|------------------|
| EMRG-613                       |             | Red Cross Radio System |                  |
| Drawing Title: Front Page      |             | Name: Peter Gamble     | Version: 1.1     |
| Emergency Measures Radio Group | Ottawa ARES | Classification: Public | Date: 2009-07-02 |
|                                |             | Page: 1                |                  |

# INTRODUCTION

Through numerous steps over several years, the Ottawa branch of the Red Cross moved into a new location in 2003, with no Amateur radios and no antennas. In 2004, with money from the Red Cross and the RAC ARES fund, as well as some donated supplies, EMRG set about designing and implementing a radio communications solution.

This document describes the EMRG Red Cross Radio Communications System Project. It starts with the requirements, describes the design and provides detailed drawings for all aspects of the project.

The purpose of this document is to provide a detailed reference for ongoing operation and maintenance of the Red Cross radio communications solution. It also provides a reference document for anyone who has a requirement and wants to learn from the work EMRG has done. The information in this document is available for any Amateur radio group or individual to use. EMRG would appreciate if you identify the original source of the information.

|                                |  |                    |  |                        |                               |         |
|--------------------------------|--|--------------------|--|------------------------|-------------------------------|---------|
|                                |  | <b>EMRG-613</b>    |  |                        | <b>Red Cross Radio System</b> |         |
| Drawing Title:                 |  | Name: Peter Gamble |  |                        | Version: 1.1                  |         |
| Emergency Measures Radio Group |  | Ottawa ARES        |  | Classification: Public | Date: 2009-07-02              | Page: 2 |

# REQUIREMENTS

1. Must support Amateur radio on 144 MHz, 220 MHz and 440 MHz, and each radio must be able to support voice or data (1200 baud packet).
2. Must be easy to use, with any special functions such as battery backup being transparent to the user.
  - The system can not be dependant on the operator to remember to do something, such as switch back to AC power. This should be done automatically.
3. The space available for installing the radios is 14 inches wide, situated between a filing cabinet and a desk.
  - The radios will be installed in an office which is used for normal daily operations, but would be dedicated to radio communications in an emergency.
4. Heavy duty (100AH) battery backup capability is required.
  - There was no generator in the building at the time.
5. Must allow use of the radio from 2 operator desk positions in the same office as the radio equipment, or from more distant locations such as one of two conference rooms on the main floor or even from the second floor.
6. Implement the EMRG Standard Radio Interface (SRI) for all radio, TNC and operator wiring.
  - EMRG SRI (Standard Radio Interface) Specification: EMRG-210
  - EMRG SUI (Standard User Interface) Specification: EMRG-214
7. Must be able to provide radio communications capability between the National Red Cross office on Metcalf Street and the Ottawa Branch, if required in an emergency (in addition to local branch requirements).
8. The radio system must be easily removable, so it could be disconnected and moved to a different location if the Red Cross building had to be abandoned in an emergency.

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|                                |             | <b>EMRG-613</b> <b>Red Cross Radio System</b> |                  |              |
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# DESIGN CONSIDERATIONS

1. The Red Cross branch office is located on Catherine Street in Ottawa, in an area, backed by the Queensway (Just West of the Voyageur bus station). This is not a premium radio operating location, in terms of HF or long range VHF/UHF communications.
  - There will not be any HF radio communications at the Ottawa branch office.
  - For HF communications, an HF relay station in an EMRG members home would be used, with VHF or UHF radio for the local link from the Red Cross offices.
2. The Red Cross branch office is centrally located allowing low power operation into voice and data repeaters, as well as for simplex communications with key sites such as the EOC.
3. The design selected, has all the radios in narrow vertical cabinet, supported by a single DC power supply and battery backup. This design is possible for the following reasons;
  - The decision was made not to operate HF from the Red Cross branch office
  - The proximity to repeaters and simplex access, allows the use low power for voice and data.
  - Not all radios will be transmitting all the time. The main nets will be VHF voice and data, while 220 MHz and 440 MHz will be used for command and control with much lower duty cycles.

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|--------------------------------|--|--------------------|--|-------------------------------|------------------|
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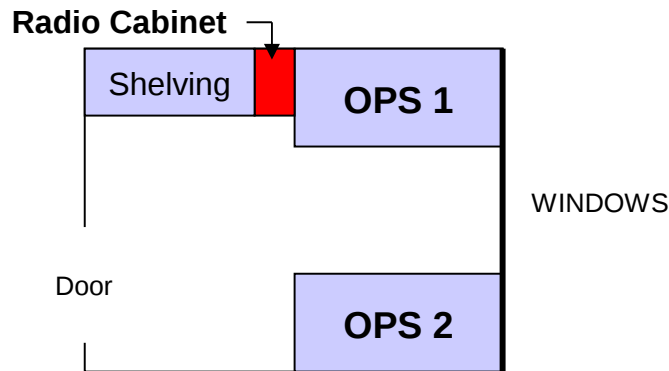
# SYSTEM OVERVIEW

- To maximize flexibility, all equipment and operator positions wire to jacks on a patch panel inside the equipment cabinet. This allows any related equipment to be connected together.
- All cables that exit the back of the radio cabinet, have a connectorized interface point on the back of the cabinet. This allows the cabinet to be disconnected from all exterior wiring, without impacting wiring inside the cabinet. This is important in the event that the cabinet must be re-located to another room, or in an emergency, the whole cabinet can be removed as a functional unit.
- The system overview shows the cables for each type of equipment connectivity. Later drawings show the bundles of cables for each operator position and still other drawings show wiring details such as cable type and connector pinouts.

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# OPERATOR POSITIONS

**OPS1 & OPS2:** The radio equipment is housed in a cabinet, which is located in an office that has 2 built in desks. The office is normally used for other activities, but in an emergency, it becomes the radio room.



**OPS3 :** The main conference room on the front, West side of the building. This is where most activity would take place in a large event.

**OPS4:** The small meeting room near the back of the building. This might be used for special coordination, or to manage a smaller event.

**OPS5:** Optional location that can be wired at a later date, if required.

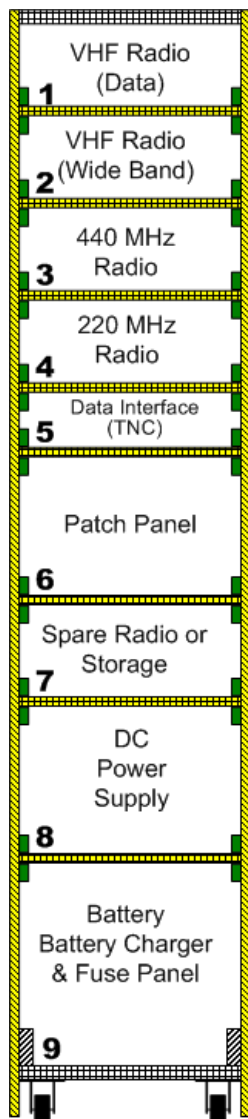
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|                                |  | EMRG-613 Red Cross Radio System |                        |                  |
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# CONNECTIVITY OPTIONS

- The objective is to support Voice or Data, from any Operator Position, using any radio. There are different connectivity options, depending on the distance from the radio cabinet to the operator position.
- OPS1, OPS2 & OPS3 use the EMRG Standard Radio Interface (SRI), which extends the speaker and microphone connections of the radio, as well as providing the option for Auxiliary audio.
  - Auxiliary audio allows a second audio source such as an FM radio or scanner to be monitored at the operator position.
- ALL positions are wired with a computer network connection.
- OPS1 & OPS2 have 12 VDC power as well as a computer serial connection. The DC power can be used to run a laptop, or charge a cell phone, while the computer serial connection allows a laptop at the operator position to connect to a TNC to provide data communications.
- OPS3 & OPS4 are wired with the DC Remote interface connection. This provides radio connectivity over greater distance, but requires the use of a DC Remote interface at the radio end and a Desk Console at the operator position.
- The use of the EMRG Standard Radio Interface allows other options such as adding a repeater controller to create a cross band repeater.
  - This would allow a VHF and UHF radio to be linked, so a UHF portable radio can be used anywhere inside the Red Cross, to communicate with VHF repeaters.

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FRONT VIEW



The Ottawa Red Cross radio cabinet is divided into 9 sections, starting with section 1 at the top and moving down to section 9 at the bottom. Each section from 1 to 8 has a 12" x 12" slide out shelf for installation of equipment. Section 9 is the base of the cabinet and does not slide.

There are 3 possible types of cable used for each section;

- Coax (RF) – PL259
- Red/Black zip cord (DC Power) –Powerpole
- 15 pair cable (Standard Interface) –DA15

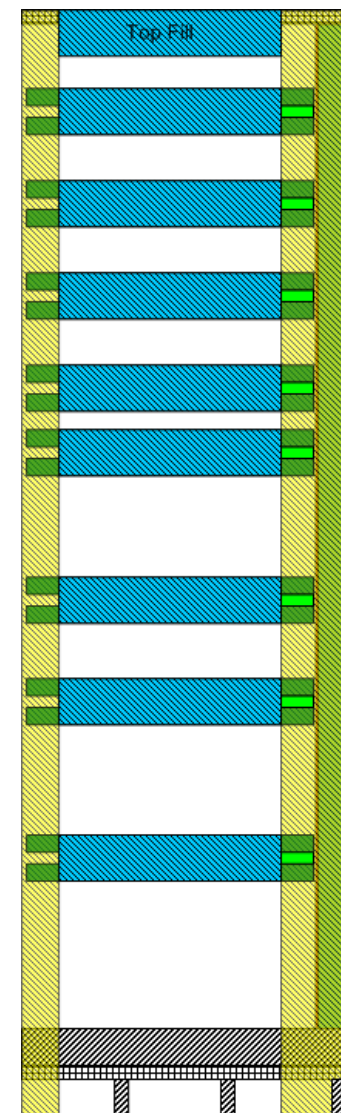
The cables are labelled based on section number, with a letter to designate cables that are used for a common purpose, such as connecting to a radio.

- Example, Section 1:

The radio in section 1 is connected to three cables/ connectors, Coax/PL259, zip cord/Powerpole, 15 pair/DA15. Each cable is labelled 1A and they are differentiated by the type of connector. There is a second DC power cable to section 1, to power an emergency light. This is a zip cord/powerpole, labelled 1B.

Not all sections have the same wiring requirements, so the cables required varies by section.

SIDE VIEW



EMRG-613

Red Cross Radio System

Drawing Title:

Name: Peter Gamble

Version: 1.1

Emergency Measures Radio Group

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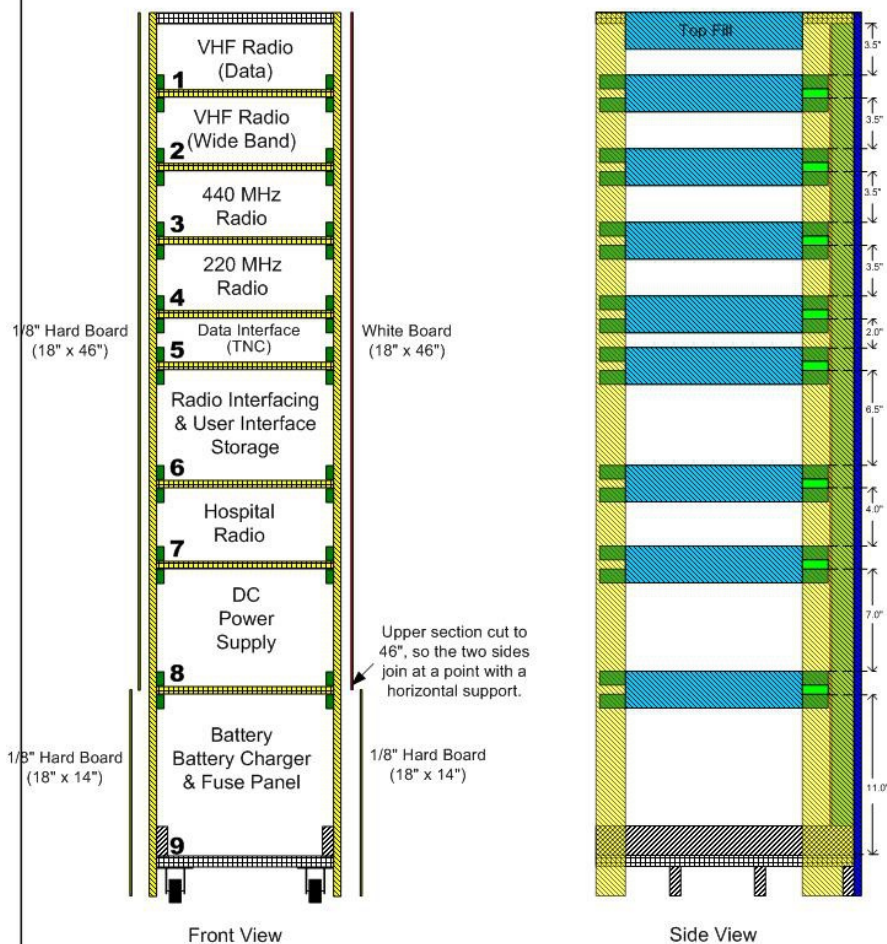
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Glue side panels onto interior frame structure.

#### Front & Side Detail View

Drawn By: Peter Gamble 2007-12-07 V1.2  
Emergency Measures Radio Group - EMRG



Upper part of cabinet, waiting for final cables and radio installation.



Lower part of cabinet showing completed DC installation of pull out fuse panel, batter, power supply and battery charger.

**EMRG-613**

**Red Cross Radio System**

Drawing Title:

Name: Peter Gamble

Version: 1.1

Emergency Measures Radio Group

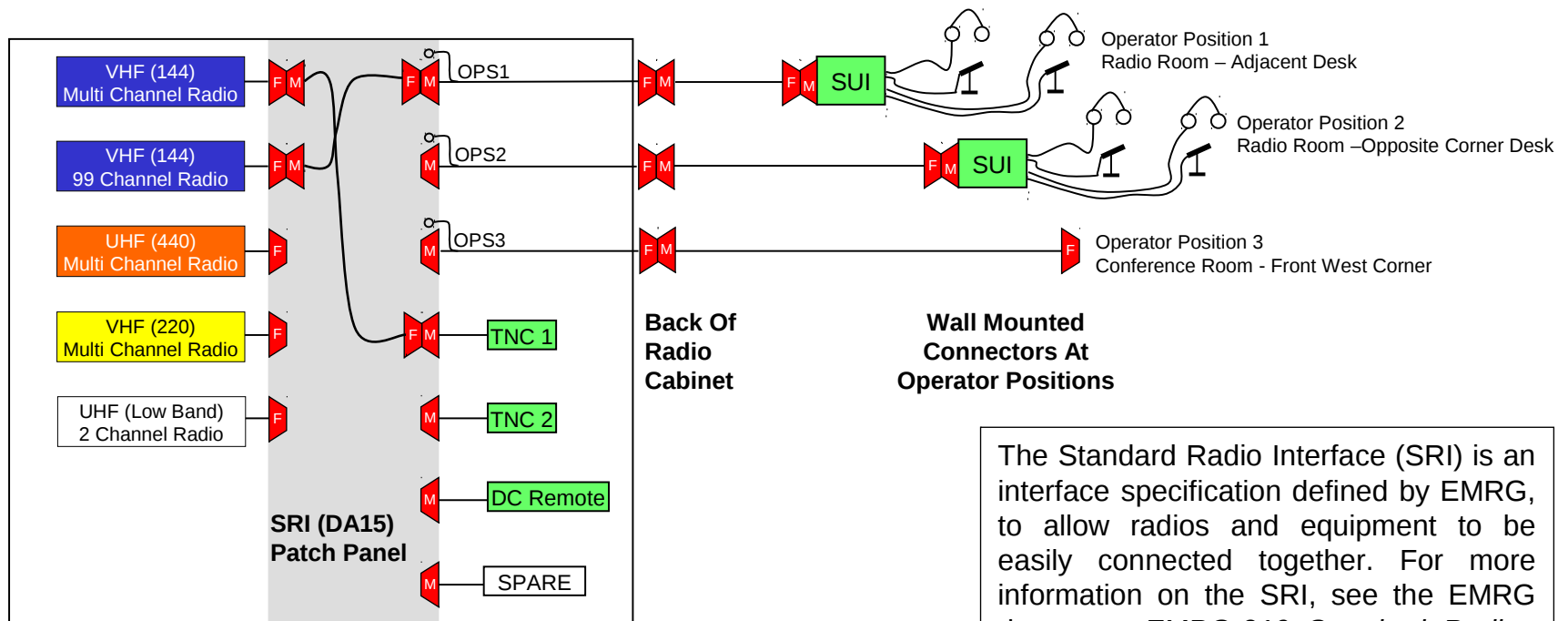
Ottawa ARES

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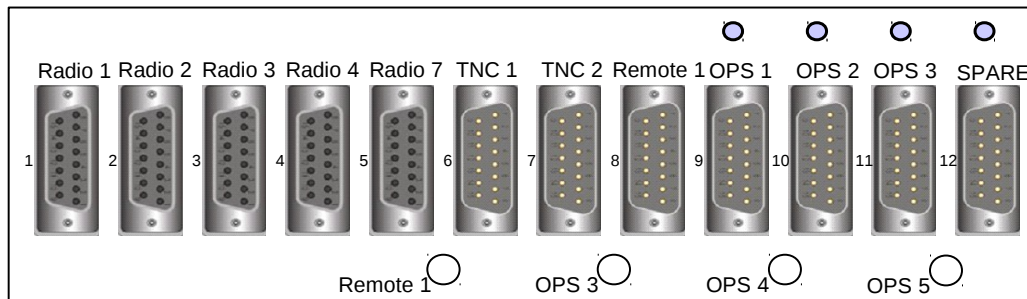
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# Standard Radio Interface (SRI)



The Standard Radio Interface (SRI) is an interface specification defined by EMRG, to allow radios and equipment to be easily connected together. For more information on the SRI, see the EMRG document *EMRG-210 Standard Radio Interface*.



**SRI (DA15) Patch Panel Layout**

Drawing Title:

# Standard Radio Interface (SRI)

## Description

There are two types of Standard Interface extension cables, one for connecting equipment to other equipment or a patch panel and one for connecting the user interface (radio operator connection) to a radio or patch panel.

The Standard Interface cables all go to section 6, where there will be a DA15 patch panel.

| CABLE # | CABLE LENGTH | WIRING DIAGRAM | DESCRIPTION                                     |
|---------|--------------|----------------|---|
| 1A      | 50 in        | EIE-15         | Radio 1 – 2 m data                              |
| 2A      | 46 in        | EIE-15         | Radio 2 - 2 m Wideband Voice                    |
| 3A      | 40 in        | EIE-15         | Radio 3 – 70 cm                                 |
| 4A      | 36 in        | EIE-15         | Radio 4 – 1.35 m                                |
| 5A      | 34 in        | EIE-15         | TNC   |
| 5B      | 34 in        | EIE-15         | Phone patch or Desk Remote                      |
| 7A      | 30 in        | EIE-15         | Radio 6 – Hospital UHF                          |
| 21A     | 36 in        | UIE            | Operator Position 1<br>Desk in Northeast corner |
| 21B     | 36 in        | UIE            | Operator Position 2<br>Desk in Northeast corner |
| 22A     | 30 ft        | UIE            | Operator Position 3<br>Desk in Southeast corner |

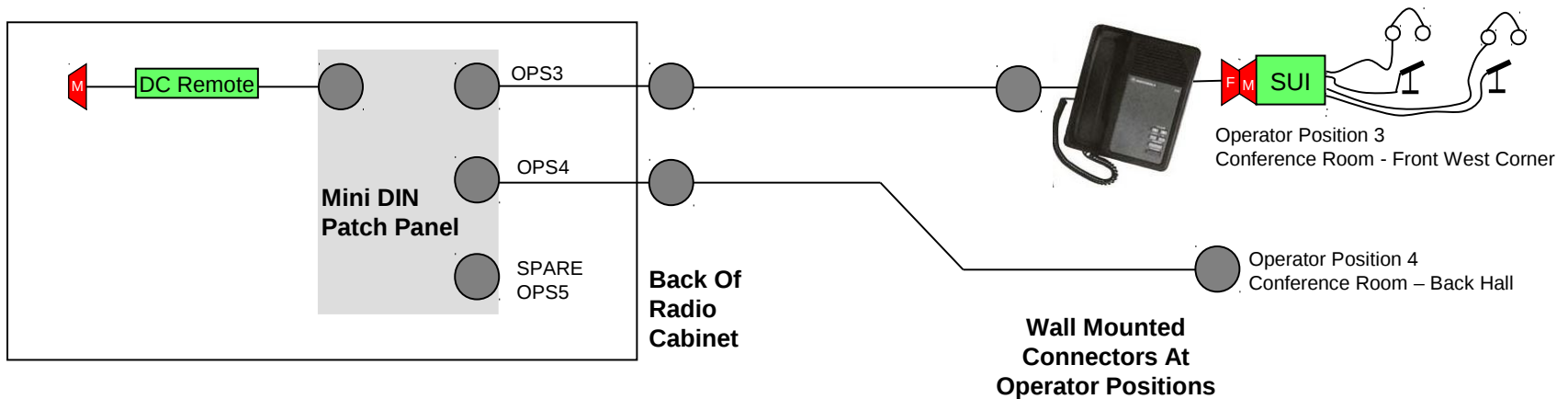
| ITEM | DESCRIPTION                         | QUANTITY |
|------|-------------------------------------|----------|
| 1    | DA15 M Connector & Hood             | 10       |
| 2    | DA15 F Connector & Hood             | 10       |
| 3    | 8 wire shielded cable (Belden 9538) | 30 ft    |
| 4    | 15 wire shielded cable (2464)       | 30 ft    |

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| <b>PIN</b> | <b>Signal</b>    | <b>Description</b>   | <b>Wire Colour</b> |
|------------|------------------|--|--------------------|
| 2          | Microphone Audio | Audio Input to TX -Before Pre-emphasis (Standard microphone connection on radio) |                    |
| 3          | PTT-Microphone   | Microphone PTT   |                    |
| 6          | SG & Ext Spk-    | Signal Ground & External Speaker -   | Shield             |
| 7          | COR/COS          | Squelch Output   |                    |
| 8          | +12 VDC          | Auxiliary DC + (1.3 Amp for TNC or audio amp)                                    |                    |
| 9          | DC GND           | Auxiliary DC Ground  |                    |
| 12         | Aux Input +      | Auxiliary Audio Input (Second Radio)   |                    |
| 13         | Int Spk +        | Internal speaker   |                    |
| 14         | Ext Spk +        | External speaker   |                    |

|  |             |   |                  |              |
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|  |             | <b>EMRG-613</b> <b>Red Cross Radio System</b> |                  |              |
| Drawing Title: Standard Interface Wiring– Enhanced |             | Name: Peter Gamble                            |                  | Version: 1.1 |
| Emergency Measures Radio Group                     | Ottawa ARES | Classification: Public                        | Date: 2009-07-02 | Page: 13     |

# DC REMOTE INTERFACE

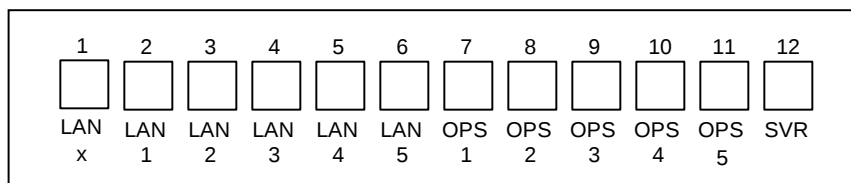
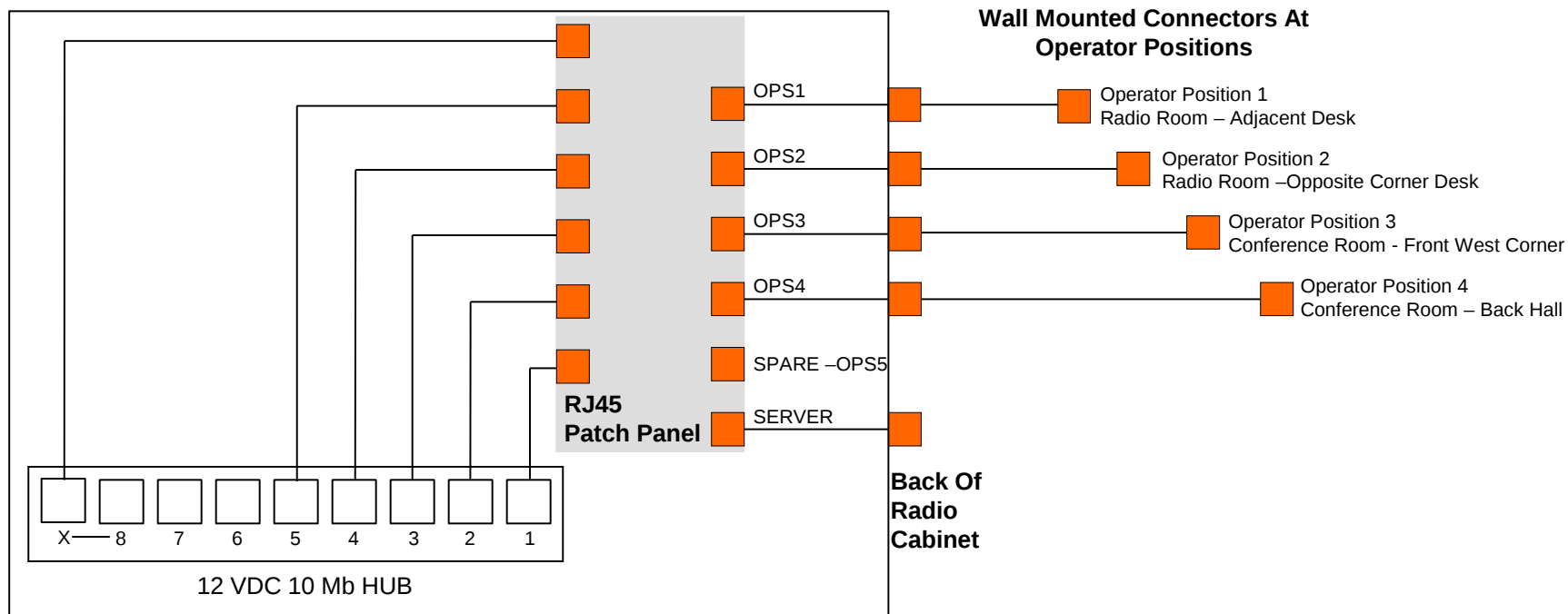


The DC Remote is a commercial radio solution that uses telephone cables to connect a remote desk console (Telephone Desk Unit) to a remote interface unit that is connected to the radio. The telephone cable can be up to several kilometers long, allowing EMRG to provide an operator position in locations that are too far for the Standard Radio Interface.

The desk console can be used with the built in handset, as well as having a SRI wired by EMRG, to allow the multi-operator with headset configuration.

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# LOCAL AREA NETWORK



**LAN RJ45 Patch Panel Layout**

**EMRG-613**

**Red Cross Radio System**

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Name: Peter Gamble

Version: 1.1

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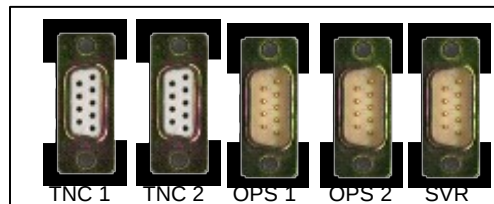
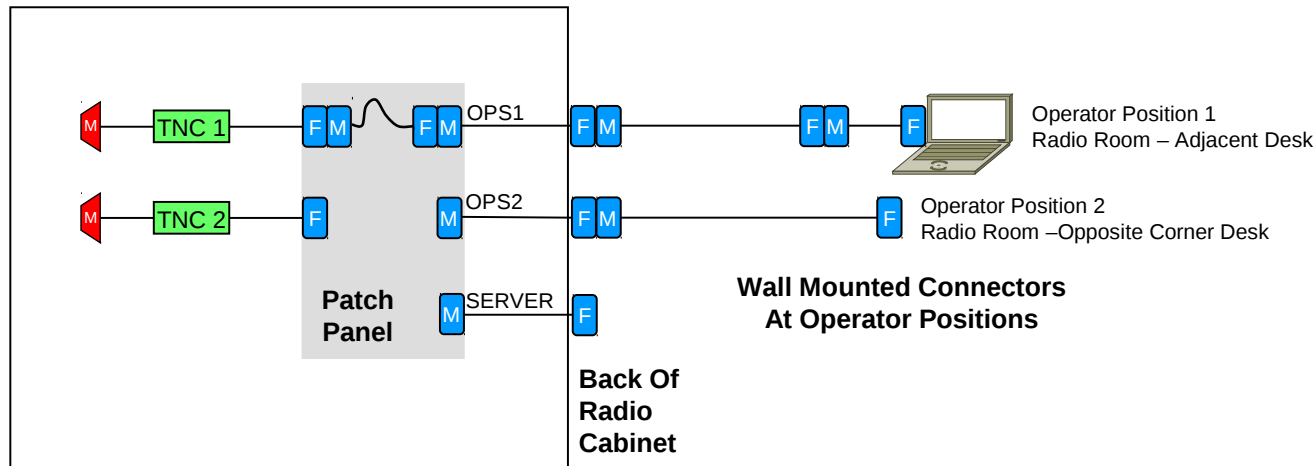
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# COMPUTER SERIAL CABLES



DE9 Serial Patch Panel Layout

Computer serial cables extend the serial interface from a laptop at the operator position, to the TNC for data communications. Serial cables support limited distance, so Operator position 2 may exceed the operating limits.

Server is an optional connection point for a future dedicated computer which would serve as a packet gateway and for information exchange between operator positions in the Red Cross building.

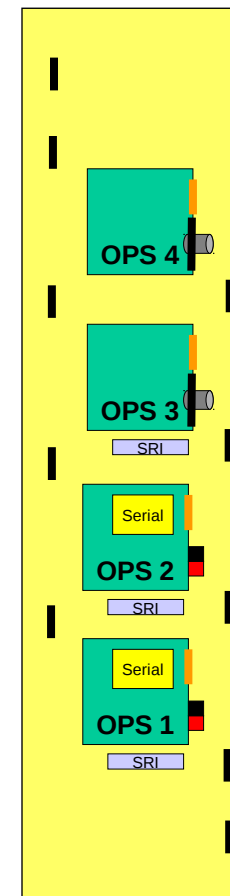
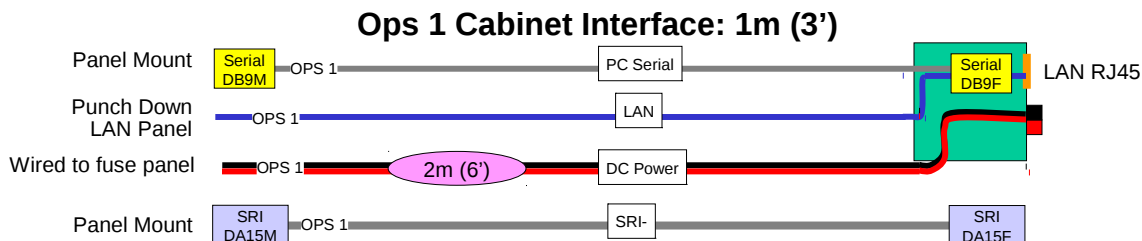
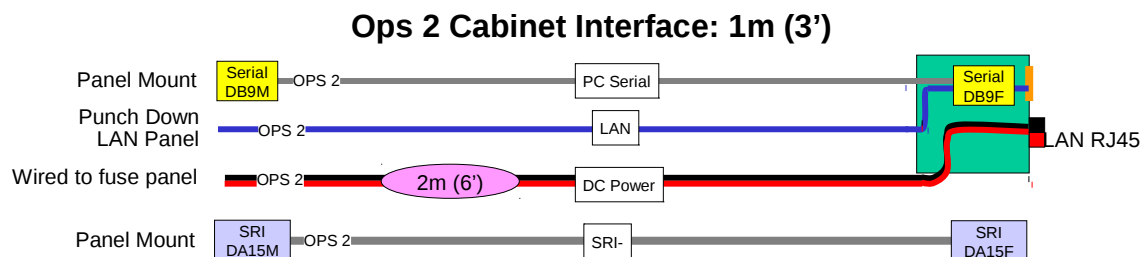
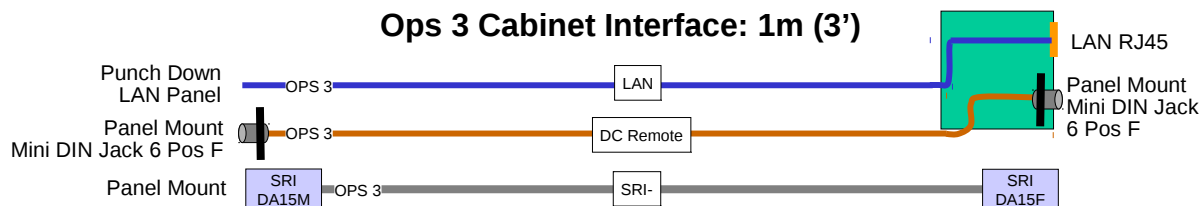
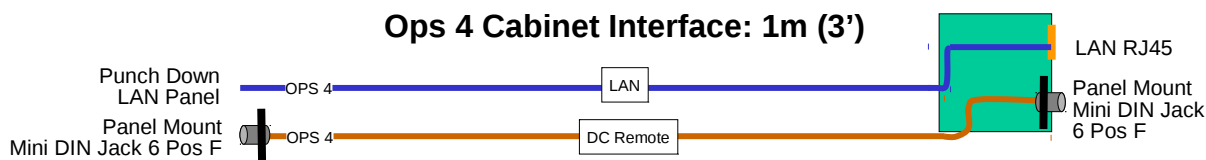
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## Material List:

- 1) 8 2 position jack boxes
- 2) 6 Orange RJ 45 jacks (LAN)
- 3) 2 Blue RJ 45 jacks (Microphone)
- 4) 4 2.5 mm mono Jack
- 5) 2 3.5 mm mono jack
- 6) 4 Powerpole PP30
- 7) 2 Speakers
- 8) 2 PTT Foot switch with 3 meter cable and 2.5 mm mono plug
- 9) 2 PTT Hand switch with 1 meter cable and 2.5 mm mono plug
- 10) 2 Headsets (ex EOC units)
- 11) 2 Headset-Speaker Control units
- 12) 1 ½" Plywood for mounting ops 1 to 4 on back of cabinet
- 13) 1 ¾" Plywood for mounting the speaker and volume control
- 14) 7 DA15M connector & hood with mounting hardware
- 15) 5 DA15F connector & hood
- 16) 4 DB9M connector & hood
- 17) 4 DB9F connector & hood
- 18) 4 F 6 Position round "PC" type connector

|   |  |                    |  |                               |                  |
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Clips for cable ties

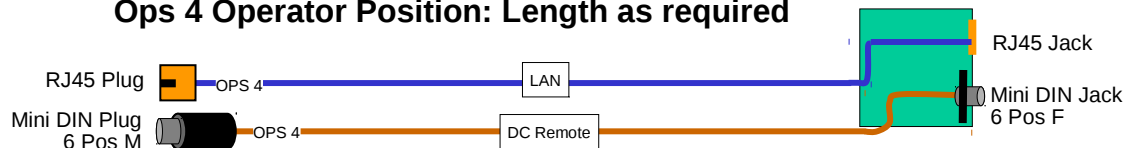
Jacks mounted on 11mm (½") plywood  
(Plywood 50 cm H x 15 cm W)

#### NOTES:

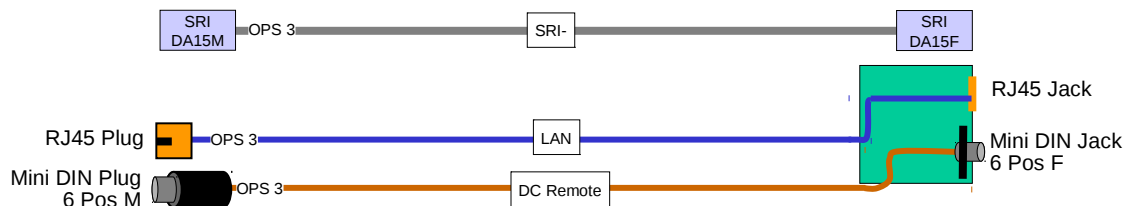
1. These cables run from inside the cabinet, to a panel on the back of the cabinet
2. Detailed cable wiring and part numbers are on the following pages.

| EMRG-613  |             | Red Cross Radio System |                  |
|---|-------------|------------------------|------------------|
| Drawing Title: Operations Positions 1 to 4 –Inside Cabinet to Rear Ops Position Interface |             | Name: Peter Gamble     | Version: 1.1     |
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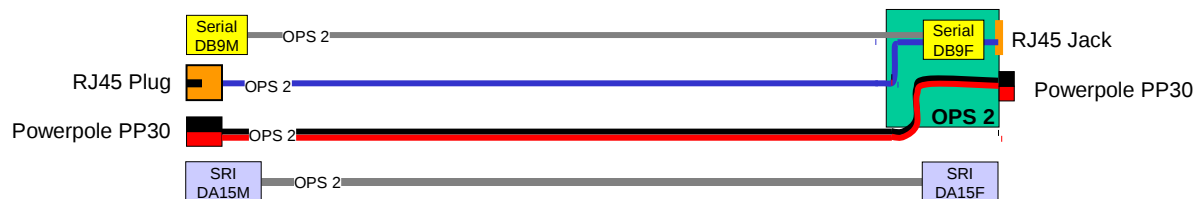
### Ops 4 Operator Position: Length as required



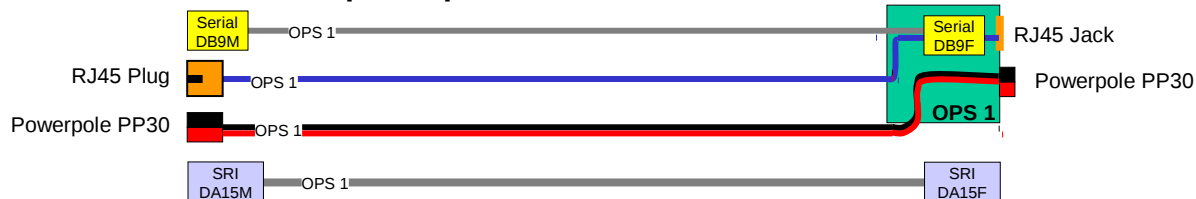
### Ops 3 Operator Position: Length as required



### Ops 2 Operator Position: xx cm



### Ops 1 Operator Position: xx cm



EMRG-613

Red Cross Radio System

Drawing Title: OPS 1 to 4 –Cabinet to Operator Position Cables

Name: Peter Gamble

Version: 1.1

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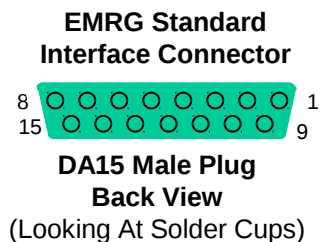
# EMRG Standard Interface Wiring Diagram

## User Interface Extension Cable

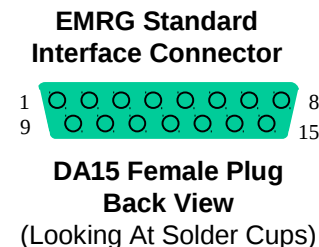
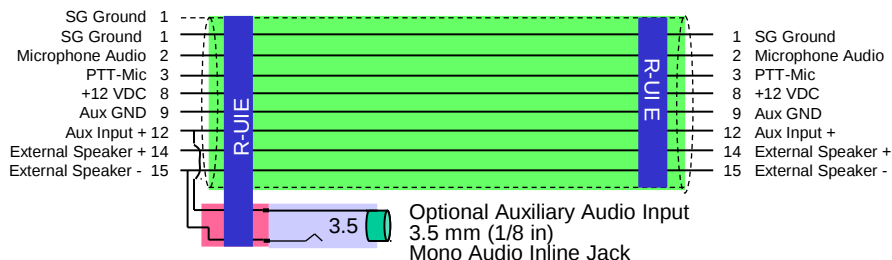
The User Interface extension cable extends signals from a radio (SRI) to a user (radio operator) position. There are two types of SUI extensions; Regular and Long.

- Regular User Interface Extensions (R-UIE) support up to 30 m (100 ft) and are typically used to connect between fixed user positions and the radio equipment.
- Long User Interface Extensions (L-UIE) support up to 200 m (600 ft) [STILL TO BE VERIFIED] and would be used to extend the radio operators (users) over a long distance from the radio. The L-UIE supports only a minimum functionality.

### Regular User Interface Extension (R-UIE)



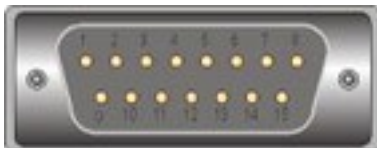
Plugs into radio connector or  
patch panel



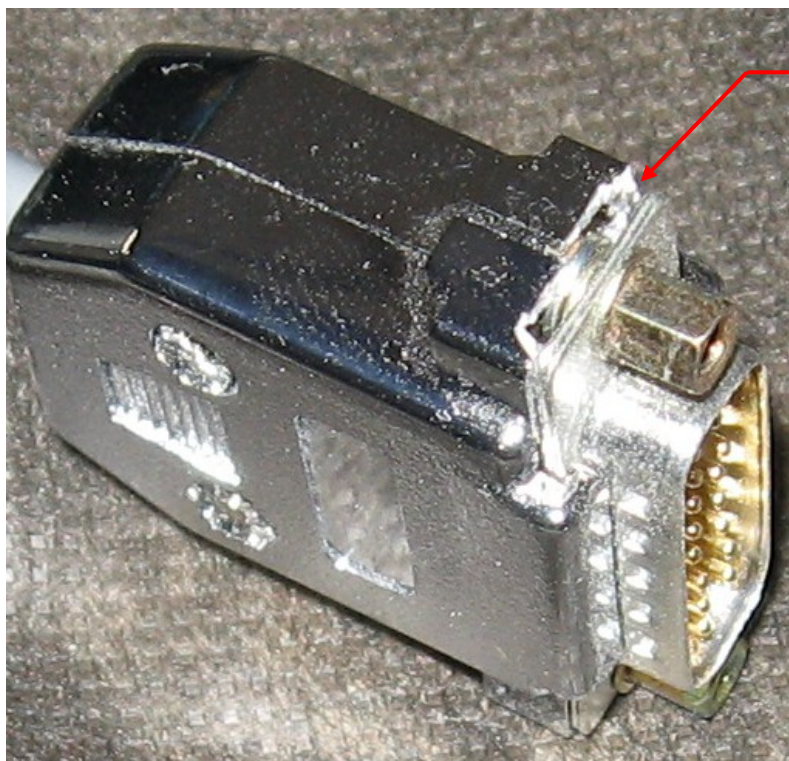
Plugs into User Interface

|                                |  |                                 |                  |              |
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## DA15 Male



Equipment such as Repeater Controllers, TNCs, Remote Interfaces, are wired with a DA15 Male connector. The Male connector is installed with internally threaded locking hardware, sometimes called a Jack Screw.



The plastic housing for the DA15 shell may need to have a bit nibbled away, so the shell will fit over the nut portion.



Install jack screws on the Male Plug, or use long nuts on the screw hardware, so the SRI plug from the radio can be secured to the TNC plug.



|                                |  |                    |  |                        |                               |  |
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| Drawing Title:                 |  | Name: Peter Gamble |  |                        | Version: 1.1                  |  |
| Emergency Measures Radio Group |  | Ottawa ARES        |  | Classification: Public | Date: 2009-07-02              |  |
|                                |  |                    |  | Page: 21               |                               |  |

# Local Area Network (LAN) WIRING

There are 2 standards for wiring LAN connections, T568A and T568B. The difference is the Orange and Green wires are reversed. EMRG uses the T568A wiring scheme to match the donated patch panels. Most new wiring hardware supports both T568A and T568B.

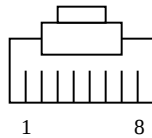
## T568A

|              |                 |        |
|--------------|-----------------|--------|
| white/green  | ■ ■ ■ ■ ■ ■ ■ ■ | 1 TX + |
| green        | ■ ■ ■ ■ ■ ■ ■ ■ | 2 TX - |
| white/orange | ■ ■ ■ ■ ■ ■ ■ ■ | 3 RX + |
| blue         | ■ ■ ■ ■ ■ ■ ■ ■ | 4      |
| white/blue   | ■ ■ ■ ■ ■ ■ ■ ■ | 5      |
| orange       | ■ ■ ■ ■ ■ ■ ■ ■ | 6 RX - |
| white/brown  | ■ ■ ■ ■ ■ ■ ■ ■ | 7      |
| brown        | ■ ■ ■ ■ ■ ■ ■ ■ | 8      |

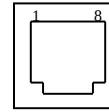
EMRG strategy is to create an independent overlay computer network to support data communications over radio. With this solution, EMRG retains control and is not impacted by failures of the partner network.

|                                |             |   |                  |              |
|--------------------------------|-------------|---|------------------|--------------|
|                                |             | <b>EMRG-613</b> <b>Red Cross Radio System</b> |                  |              |
| Drawing Title:                 |             | Name: Peter Gamble                            |                  | Version: 1.1 |
| Emergency Measures Radio Group | Ottawa ARES | Classification: Public                        | Date: 2009-07-02 | Page: 22     |

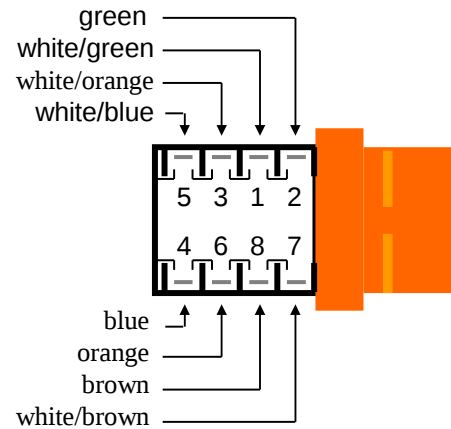
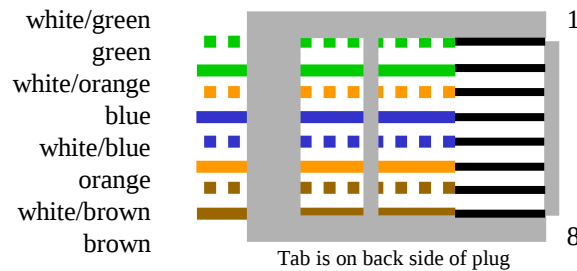
## RJ45 Plug



## RJ45 Jack



### RJ45 Plug (T568A Wiring)



Leviton 41089-2WP,  
"Quickport" 2 port  
surface mount jack box.

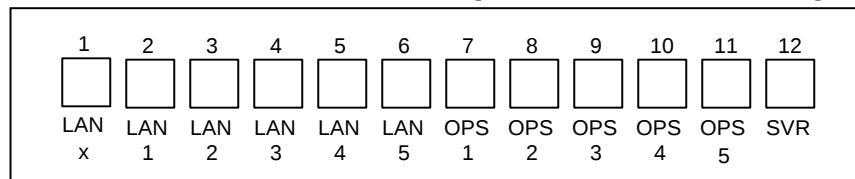
Leviton CAT 5e Jack  
5G108-OR (Orange)

## NOTES:

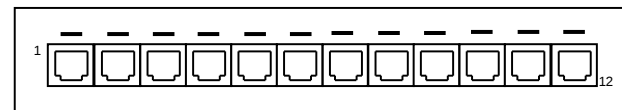
1. EMRG uses orange RJ45 jacks for LAN and blue for microphone connections.
2. The Leviton jack was selected simply because it is available from Home Depot, so it is easy to get.
3. There are 2 color charts on the sides of the Leviton Jack, one with an A (T568A) and one with a B (T568B), to indicate the 2 wiring standards.

|                                |  |                    |  |                               |                  |
|--------------------------------|--|--------------------|--|-------------------------------|------------------|
|                                |  | <b>EMRG-613</b>    |  | <b>Red Cross Radio System</b> |                  |
| Drawing Title:                 |  | Name: Peter Gamble |  | Version: 1.1                  |                  |
| Emergency Measures Radio Group |  | Ottawa ARES        |  | Classification: Public        | Date: 2009-07-02 |
|                                |  |                    |  | Page: 23                      |                  |

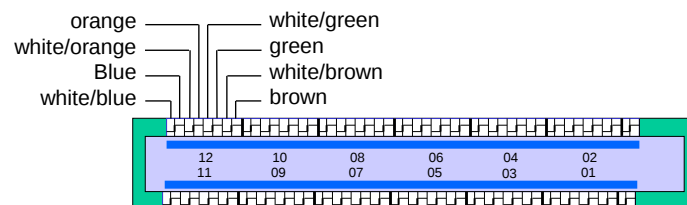
## LAN Patch Panel – Jack Assignment and Numbering



- 1 LAN X -Used to connect additional HUB/Switch
- 2 LAN 1 - HUB Port 1
- 3 LAN 2 - HUB Port 2
- 4 LAN 3 - HUB Port 3
- 5 LAN 4 - HUB Port 4
- 6 LAN 5 - HUB Port 5
- 7 OPS 1 - Operator Position 1
- 8 OPS 2 - Operator Position 2
- 9 OPS 3 - Operator Position 3
- 10 OPS 4 - Operator Position 4
- 11 OPS 5 - Spare (Operator Position 5)
- 12 SVR - Future dedicated computer server/gateway



**LAN Patch Panel – Front View**



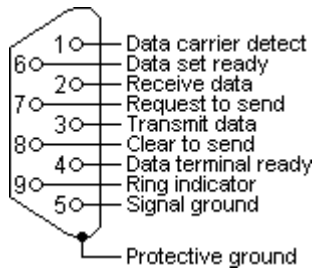
Jacks wired for T568A

**LAN Patch Panel – Back View**

Drawing Title:



# SERIAL COMPUTER INTERFACE WIRING



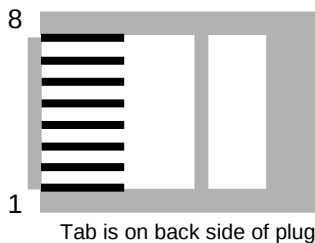
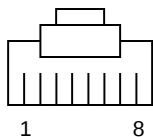
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|  |  |                    |  |                               |                  |
|--|--|--------------------|--|-------------------------------|------------------|
|  |  | <b>EMRG-613</b>    |  | <b>Red Cross Radio System</b> |                  |
| Drawing Title: RS-232 Serial Cable (PC Serial) |  | Name: Peter Gamble |  | Version: 1.1                  |                  |
| Emergency Measures Radio Group                 |  | Ottawa ARES        |  | Classification: Public        | Date: 2009-07-02 |
|  |  |                    |  | Page: 25                      |                  |

# USER INTERFACE WIRING

|                                |  |                    |                        |                               |              |
|--------------------------------|--|--------------------|------------------------|-------------------------------|--------------|
|                                |  | <b>EMRG-613</b>    |                        | <b>Red Cross Radio System</b> |              |
| Drawing Title:                 |  | Name: Peter Gamble |                        |                               | Version: 1.1 |
| Emergency Measures Radio Group |  | Ottawa ARES        | Classification: Public | Date: 2009-07-02              | Page: 26     |

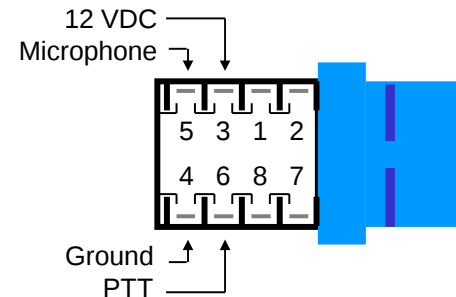
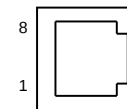
## Mic Plug



## RJ45 Plug Connections

- |   |                          |
|---|--------------------------|
| 1 |                          |
| 2 |                          |
| 3 | - 12 VDC Output..... Red |
| 4 | - Ground..... Black      |
| 5 | - Microphone..... Green  |
| 6 | - PTT..... Blue          |
| 7 |                          |
| 8 |                          |

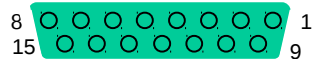
## Mic Jack



HP 1 Output From Control Box  
3.5 mm (1/8) Mono Plug

- |    |                    |
|----|--------------------|
| 1  | SG Ground          |
| 2  | Microphone Audio   |
| 3  | PTT-Mic            |
|    | Not Wired          |
| 8  | Aux Power +        |
| 9  | Aux Power -        |
| 10 | Receive Audio      |
| 14 | External Speaker + |

## EMRG Standard Interface Connector



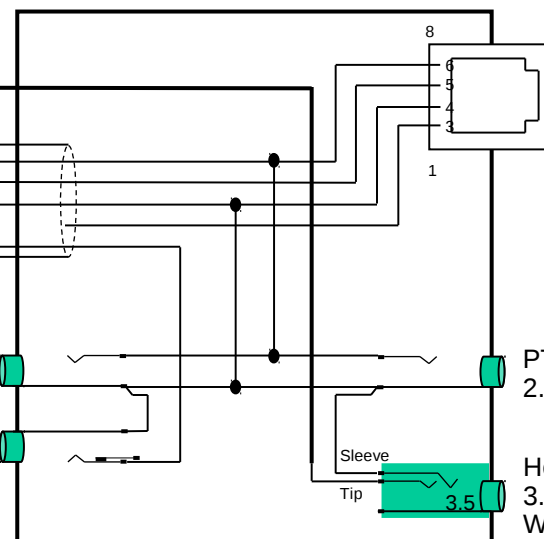
## DA15 Male Plug

### Back View

(Looking At Solder Cups)

PTT Foot Switch  
2.5 mm (3/32) Mono Jack

Radio Speaker Output  
3.5 mm (1/8) Mono Jack



Shield not connected

EMRG-613

Red Cross Radio System

Drawing Title:

Name: Peter Gamble

Version: 1.1

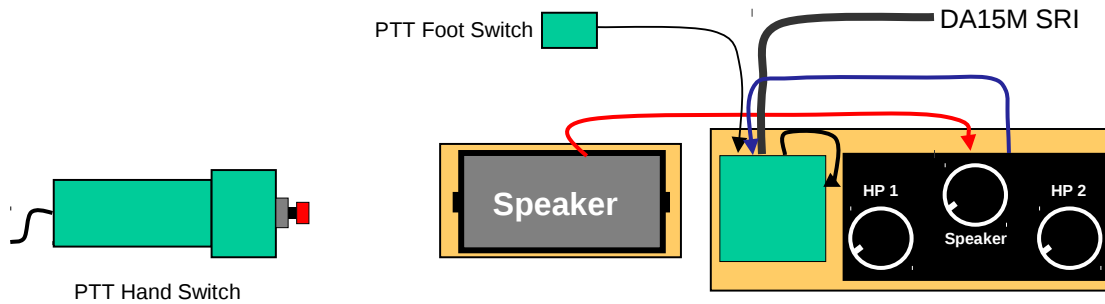
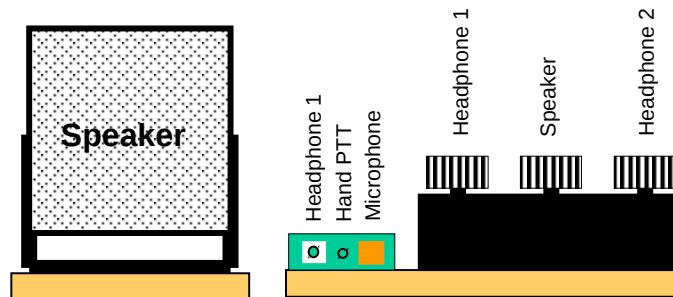
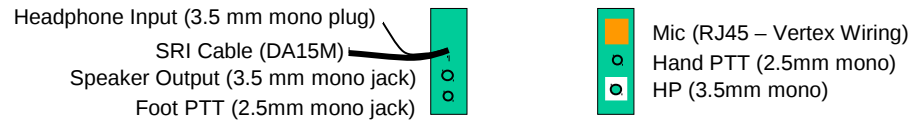
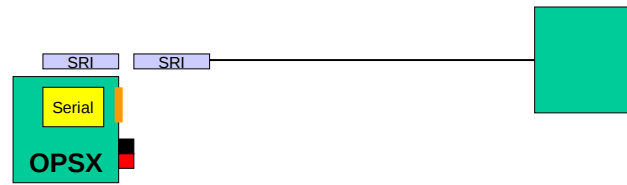
Emergency Measures Radio Group

Ottawa ARES

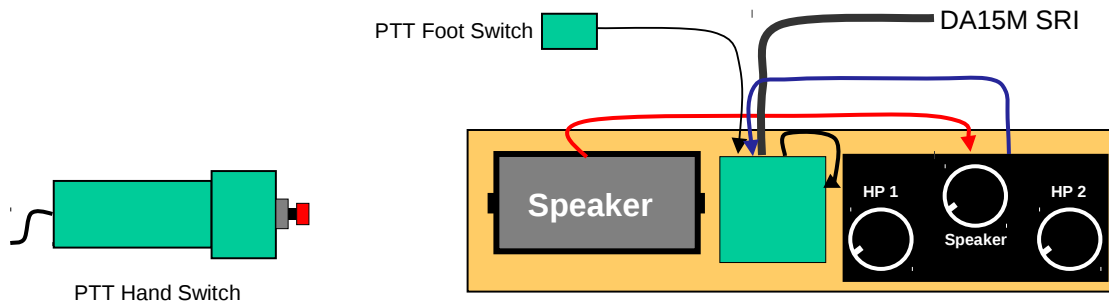
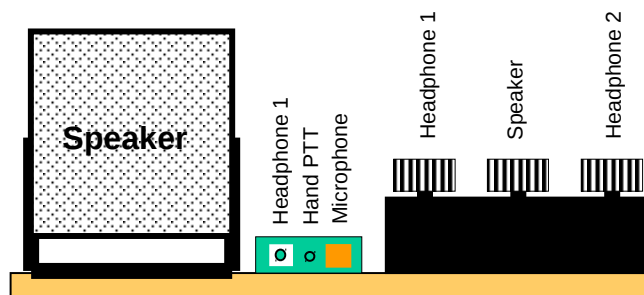
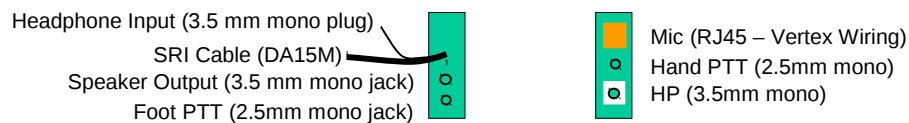
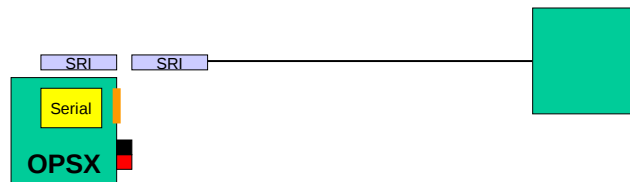
Classification: Public

Date: 2009-07-02

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|  |  |                        |  |                               |              |
|--|--|------------------------|--|-------------------------------|--------------|
| Drawing Title: <b>OPS 1 &amp; OPS 2 User Interface – Separate Speaker Option</b> |  | <b>EMRG-613</b>        |  | <b>Red Cross Radio System</b> |              |
| Emergency Measures Radio Group   |  | Ottawa ARES            |  | Name: Peter Gamble            | Version: 1.1 |
|  |  | Classification: Public |  | Date: 2009-07-02              | Page: 28     |

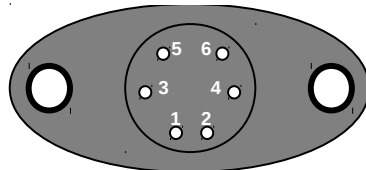
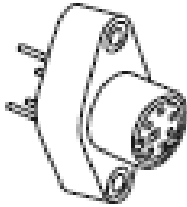


|  |  |                    |  |                               |                  |
|--|--|--------------------|--|-------------------------------|------------------|
|  |  | <b>EMRG-613</b>    |  | <b>Red Cross Radio System</b> |                  |
| Drawing Title: <b>OPS 1 &amp; OPS 2 User Interface - Integrated Speaker Option</b> |  | Name: Peter Gamble |  | Version: 1.1                  |                  |
| Emergency Measures Radio Group   |  | Ottawa ARES        |  | Classification: Public        | Date: 2009-07-02 |
|  |  |                    |  | Page: 29                      |                  |

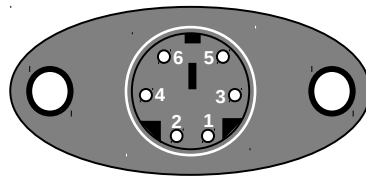
|                                |  |             |                               |                  |
|--------------------------------|--|-------------|-------------------------------|------------------|
|                                |  |             |                               |                  |
|                                |  |             | <b>EMRG-613</b>               |                  |
|                                |  |             | <b>Red Cross Radio System</b> |                  |
| Drawing Title:                 |  |             | Name: Peter Gamble            | Version: 1.1     |
| Emergency Measures Radio Group |  | Ottawa ARES | Classification: Public        | Date: 2009-07-02 |
|                                |  |             |                               | Page: 30         |

# DC REMOTE WIRING

## FEMALE CHASSIS MOUNT JACK



Back View (Solder Cups)

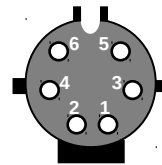


Front View

## MALE INLINE PLUG



Solder  
Wires  
Here



Male Plug  
Back View (Solder Cups)

- 1 White/Blue
- 2 Blue
- 3 White/Orange
- 4 Orange
- 5 White/Green
- 6 Green

## FEMALE INLINE PLUG



### NOTE:

Pins 1 & 2 are closer together than 5 & 6

The holes in the centre of the pins, for soldering, are very small. Using 26 gage solid copper 'Telco' cable, requires the wire to be soldered to the side of the pin. Use small pieces of heatshrink tubing on each pin, with a larger piece that covers all the pins and the end of the cable.

EMRG-613

Red Cross Radio System

Drawing Title:

Name: Peter Gamble

Version: 1.1

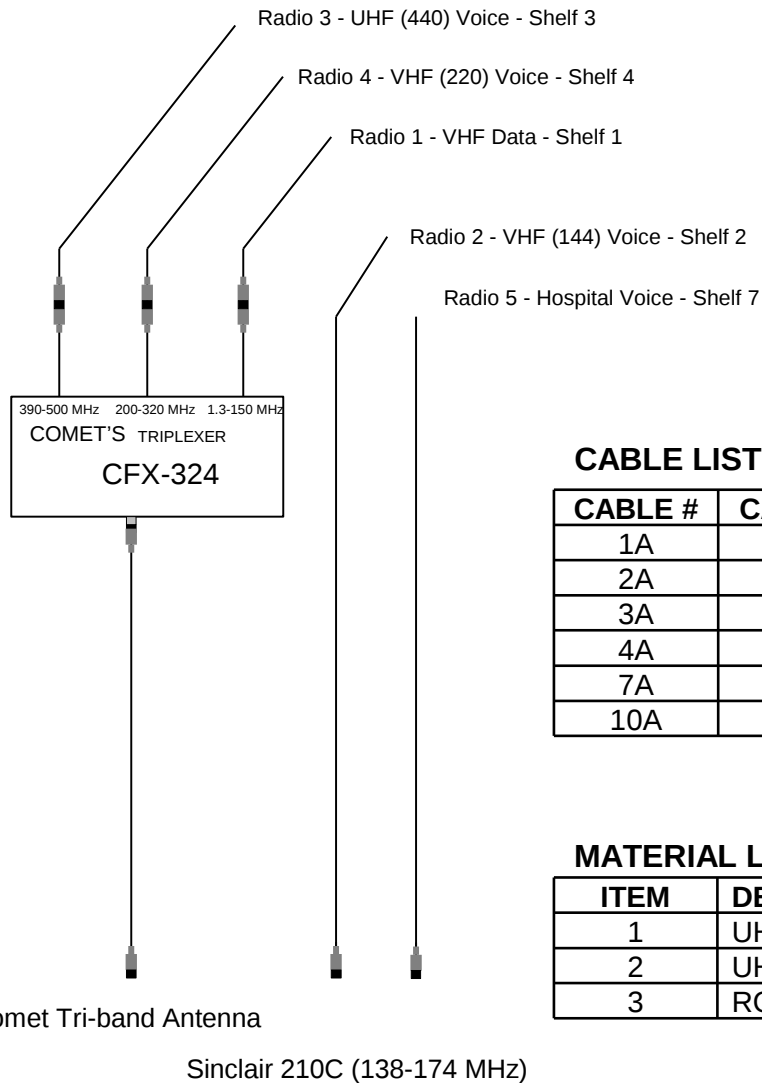
Emergency Measures Radio Group

Ottawa ARES

Classification: Public

Date: 2009-07-02

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The coax cable runs from each radio position to the back of the cabinet, where they connect to the tri-plexer or directly to an antenna cable. Each Coax Cable has a PL-259 connector on both ends.



### CABLE LIST

| CABLE # | CABLE LENGTH (IN) | DESCRIPTION                  |
|---------|-------------------|------------------------------|
| 1A      | 48                | Radio 1 – 2 m data           |
| 2A      | 47                | Radio 2 - 2 m Wideband Voice |
| 3A      | 54                | Radio 3 – 70 cm              |
| 4A      | 58                | Radio 4 – 1.35 m             |
| 7A      | 76                | Radio 6 – Hospital UHF       |
| 10A     | 40                | Tri-Plexer to antenna        |

### MATERIAL LIST

| ITEM | DESCRIPTION                         | QUANTITY |
|------|-------------------------------------|----------|
| 1    | UHF Connectors                      | 12       |
| 2    | UHF Connector Inserts For RG8X Coax | 12       |
| 3    | RG8X Coax                           | 27 ft    |

**EMRG-613**

**Red Cross Radio System**

Drawing Title:

Name: Peter Gamble

Version: 1.1

Emergency Measures Radio Group

Ottawa ARES

Classification: Public

Date: 2009-07-02

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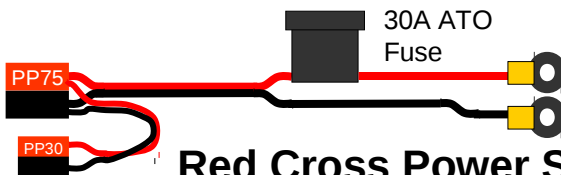
# DC POWER WIRING

The DC Power uses Red/Black zip cord, either #12 or #10. The equipment end of the cable has a powerpole connector and the other end is bare, so it can be wired up to a fuse panel in the bottom of the cabinet.



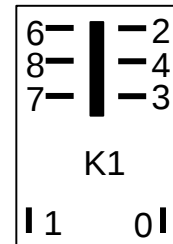
| CABLE # | CABLE LENGTH (IN) | WIRE SIZE | DESCRIPTION                  |
|---------|-------------------|-----------|------------------------------|
| 1A      | 80 (#12)          | #12       | Radio 1 – 2 m data           |
| 1B      | 80 (#12)          | #12       | 12 V Emergency Light         |
| 2A      | 75 (#12)          | #12       | Radio 2 - 2 m Wideband Voice |
| 3A      | 70 (#12)          | #12       | Radio 3 – 70 cm              |
| 4A      | 66 (#12)          | #12       | Radio 4 – 1.35 m             |
| 6A      | 54 (#12)          | #12       | Interface Termination Panel  |
| 7A      | 48 (#12)          | #12       | Radio 6 – Hospital UHF       |
| 8A      | 40 (#10)          | #10       | DC Power Supply              |
| 9A      | 24 (#10)          | #10       | DC Fuse Panel & Battery      |

| ITEM | DESCRIPTION   | QUANTITY |
|------|---|----------|
| 1    | #12 Red/Black DC zip cord                           | 40 ft    |
| 2    | #10 Red/Black DC zip cord                           | 64 in    |
| 3    | Powerpole connector (Red/Black) with 45 A terminals | 2        |
| 4    | Powerpole connector (Red/Black) with 30 A terminals | 7        |

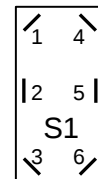


## Red Cross Power Supply

- Lugs are 1/4" hole, yellow insulator (12-10)



Potter & Brumfield Relay  
T92S11D22-12  
DPDT 12VDC Coil 30A  
Digikey: PB490-ND



NKK Toggle Switch  
S-332 DPDT 25A  
Digikey: 360-1192-ND

| EMRG-613               |                  | Red Cross Radio System |  |
|------------------------|------------------|------------------------|--|
| Name: Peter Gamble     |                  | Version: 1.1           |  |
| Classification: Public | Date: 2009-07-02 | Page: 33               |  |

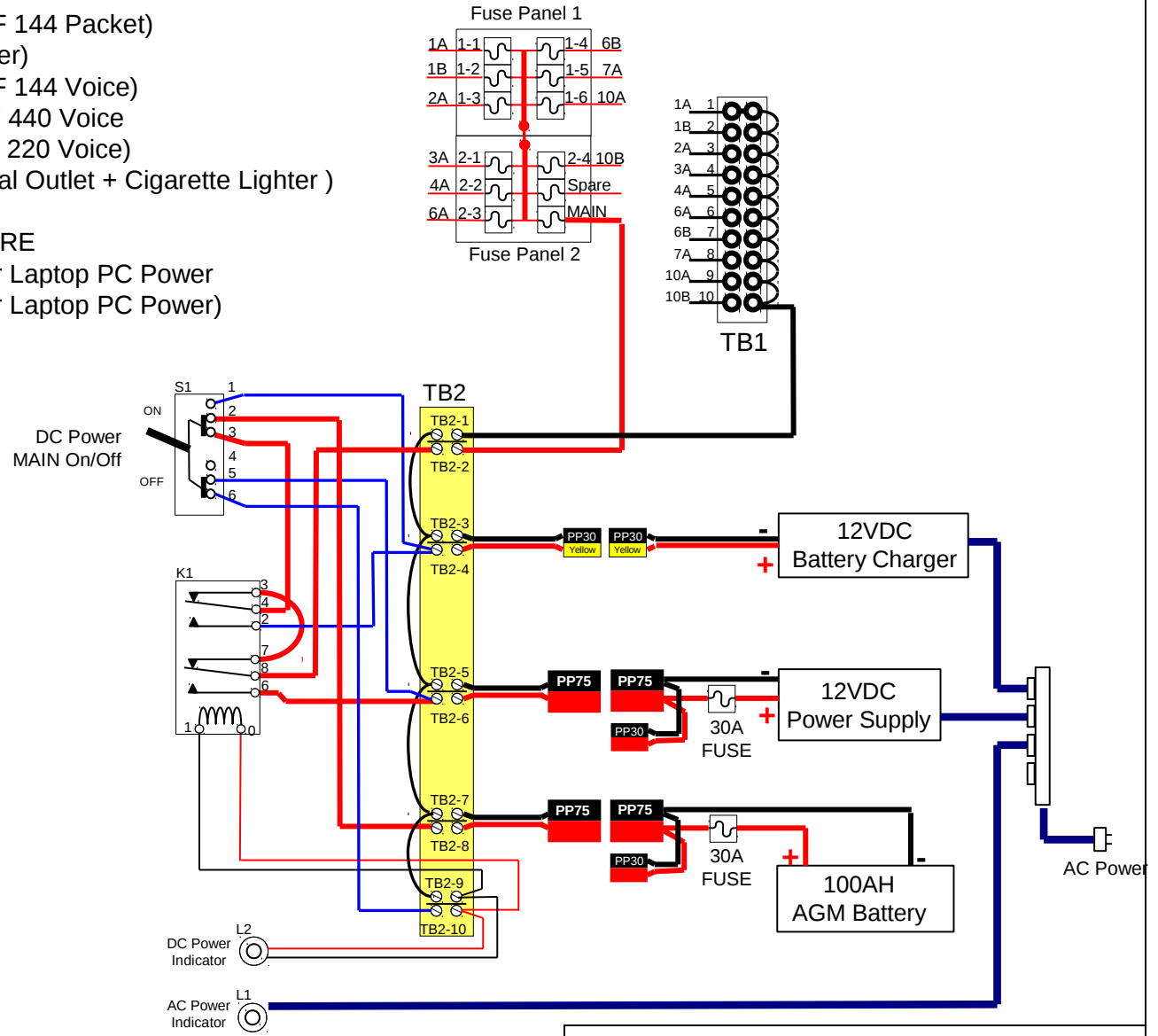
Drawing Title:

Emergency Measures Radio Group

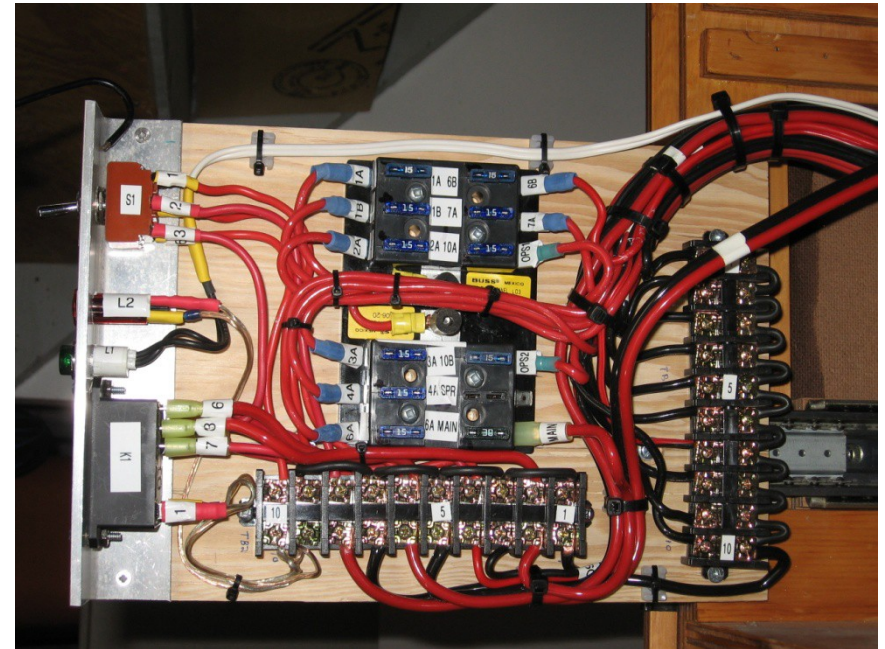
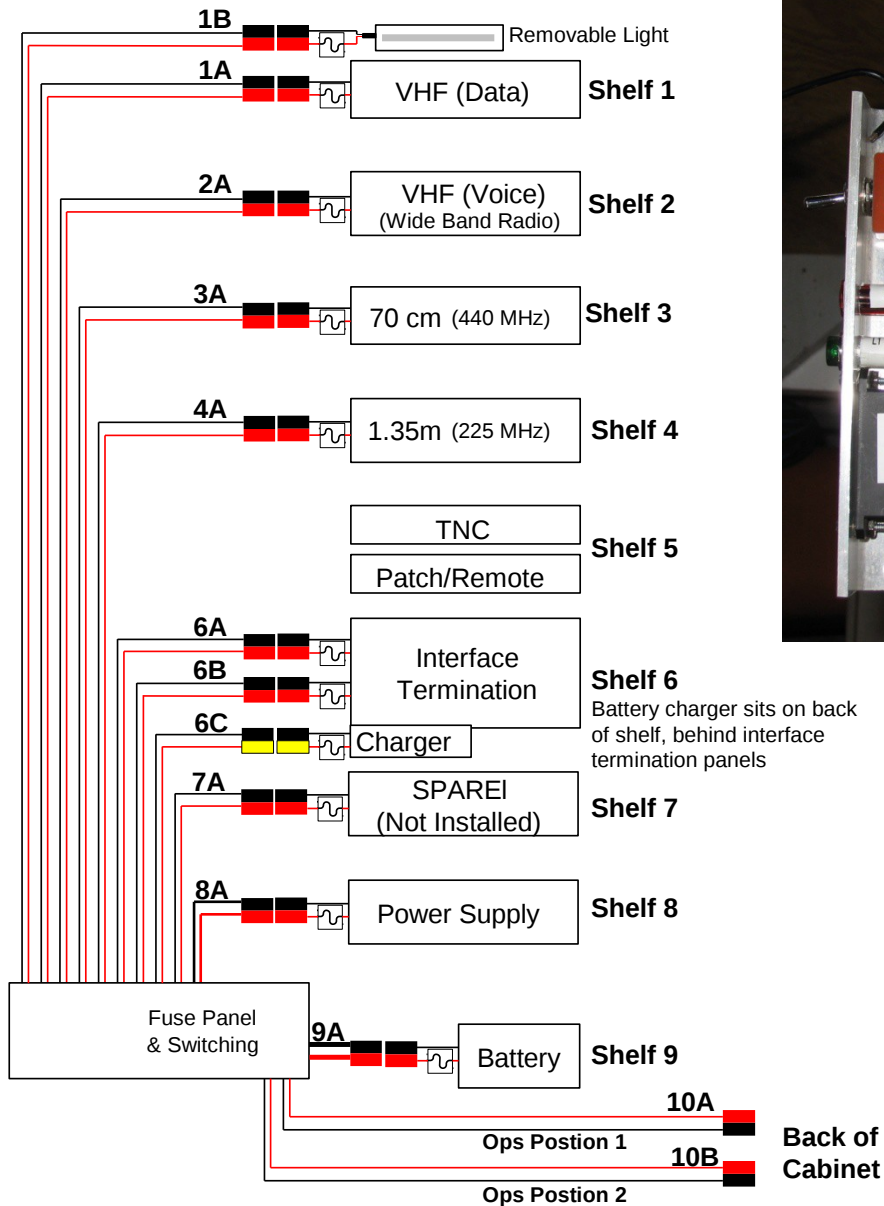
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# FUSE ASSIGNMENT

- 1-1** 15A - Shelf 1 (1A) (Radio 1 - VHF 144 Packet)
- 1-2** 15A - Shelf 1 (1B) (Auxiliary Power)
- 1-3** 15A - Shelf 2 (2A) (Radio 2 - VHF 144 Voice)
- 1-4** 15A - Shelf 3 (3A) (Radio 3 - UHF 440 Voice)
- 1-5** 15A - Shelf 4 (4A) (Radio 4 - VHF 220 Voice)
- 1-6** 7.5A - Shelf 6 (6A) (Powerpole Dual Outlet + Cigarette Lighter )
- 2-1** 7.5A - Shelf 6 (6B) (LAN HUB)
- 2-2** 15A - Shelf 7 (7A) (Radio 5 - SPARE)
- 2-3** 10A - OPS 1 (10A) (Audio Amp or Laptop PC Power
- 2-4** 10A - OPS 2 (10B) (Audio Amp or Laptop PC Power)
- 2-5**
- 2-6** 30A - Master Fuse



|                                |             |                                 |                  |
|--------------------------------|-------------|---------------------------------|------------------|
| Drawing Title:                 |             | EMRG-613 Red Cross Radio System |                  |
| Name: Peter Gamble             |             | Version: 1.1                    |                  |
| Emergency Measures Radio Group | Ottawa ARES | Classification: Public          | Date: 2009-07-02 |
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**Completed Fuse Panel**

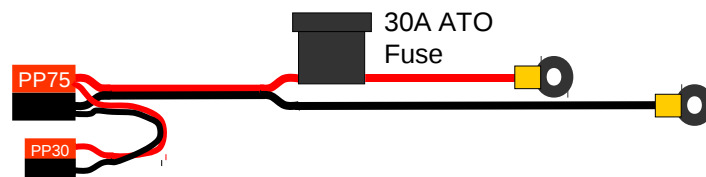
|                                |  |                                 |                  |
|--------------------------------|--|---------------------------------|------------------|
| Drawing Title:                 |  | EMRG-613 Red Cross Radio System |                  |
| Emergency Measures Radio Group |  | Name: Peter Gamble              | Version: 1.1     |
| Ottawa ARES                    |  | Classification: Public          | Date: 2009-07-02 |
|                                |  |                                 | Page: 35         |

## Battery Wiring: 100 AH Battery for backup power.

### NOTES:

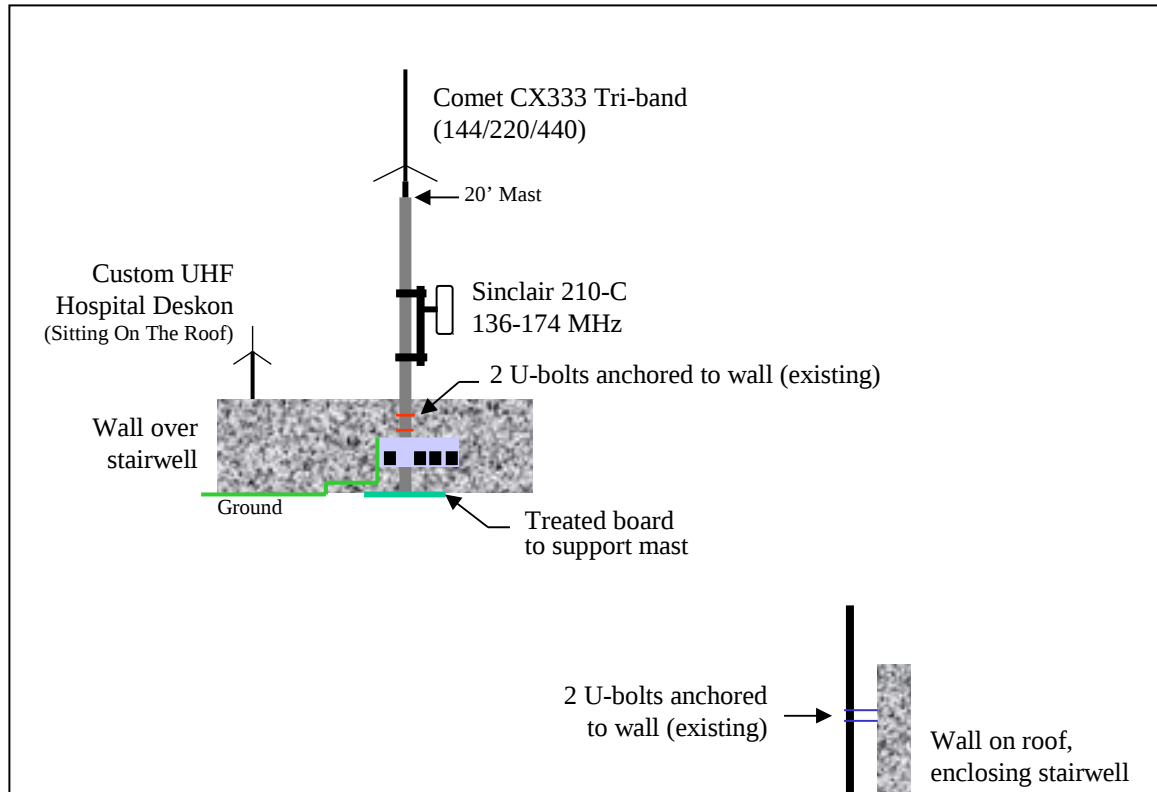
- Both PP30 and PP75 powerpole connectors installed. PP75 is preferred for use with #10 wire or above, plus it has a much stronger mating force. PP75 are used in all permanent installations, while PP30 are used for direct end user applications, such as a radio directly connected to the battery.
- PP30 and PP75 Powerpole connectors are wired in series, so they share the same fuse. This prevents two loads being connected to a battery, where the sum of the loads exceeds the battery limit.
- The wire from the battery to the PP75 connector is #10, while the wire from the PP75 connector to the PP30 connector is #12. Crimp and solder the wire at the PP75 terminal. Use the #8 wire terminal to install the two wires.
- The black (negative) wire is about 30 cm long. The red (positive) wire is whatever length comes attached to the fuse.
- Use ring lugs for connecting wire to the battery terminals. Yellow (12-10). Check bolt size for battery. Powersonic have 5/16 centre hole, while some others have 1/4" and still others have 3/8".
- Fuse should be 30A ATO type, preferably with the rubber cover on the fuse holder.

Battery 10.5" h x 12" d x 6.75" w (100AH)



|                                |  |                                 |                        |                  |
|--------------------------------|--|---------------------------------|------------------------|------------------|
| Drawing Title:                 |  | EMRG-613 Red Cross Radio System |                        |                  |
|                                |  | Name: Peter Gamble              |                        | Version: 1.1     |
| Emergency Measures Radio Group |  | Ottawa ARES                     | Classification: Public | Date: 2009-07-02 |
|                                |  |                                 |                        | Page: 36         |

Tri-band 146-220-446 MHz base antenna, 6.5-7.8-9.0 db, 10'4"



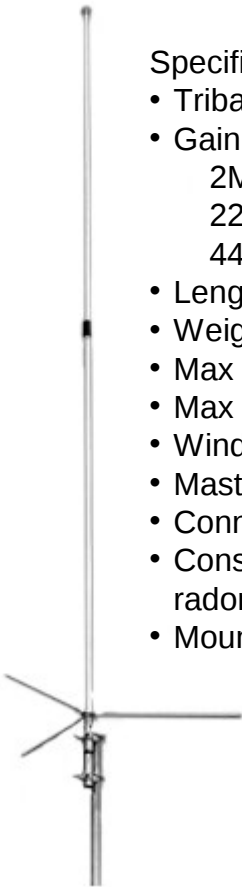
### Measured Distances

- 14 ft - Main floor, front just inside the door, where cables go up to second floor (Above alarm control)
- 46 ft - Second floor, from front of building to where cable turns to go up to the roof
- 28 ft - Roof, from access hole to end of conduit by antennas
- 88 ft - Total [add appx 25 ft more to get to the room with the radios]

Total end to end length = 120 ft if buying cable to pull in

|                                |  |                    |  |                               |                  |
|--------------------------------|--|--------------------|--|-------------------------------|------------------|
|                                |  | <b>EMRG-613</b>    |  | <b>Red Cross Radio System</b> |                  |
| Drawing Title:                 |  | Name: Peter Gamble |  | Version: 1.1                  |                  |
| Emergency Measures Radio Group |  | Ottawa ARES        |  | Classification: Public        | Date: 2009-07-02 |
|                                |  |                    |  | Page: 37                      |                  |

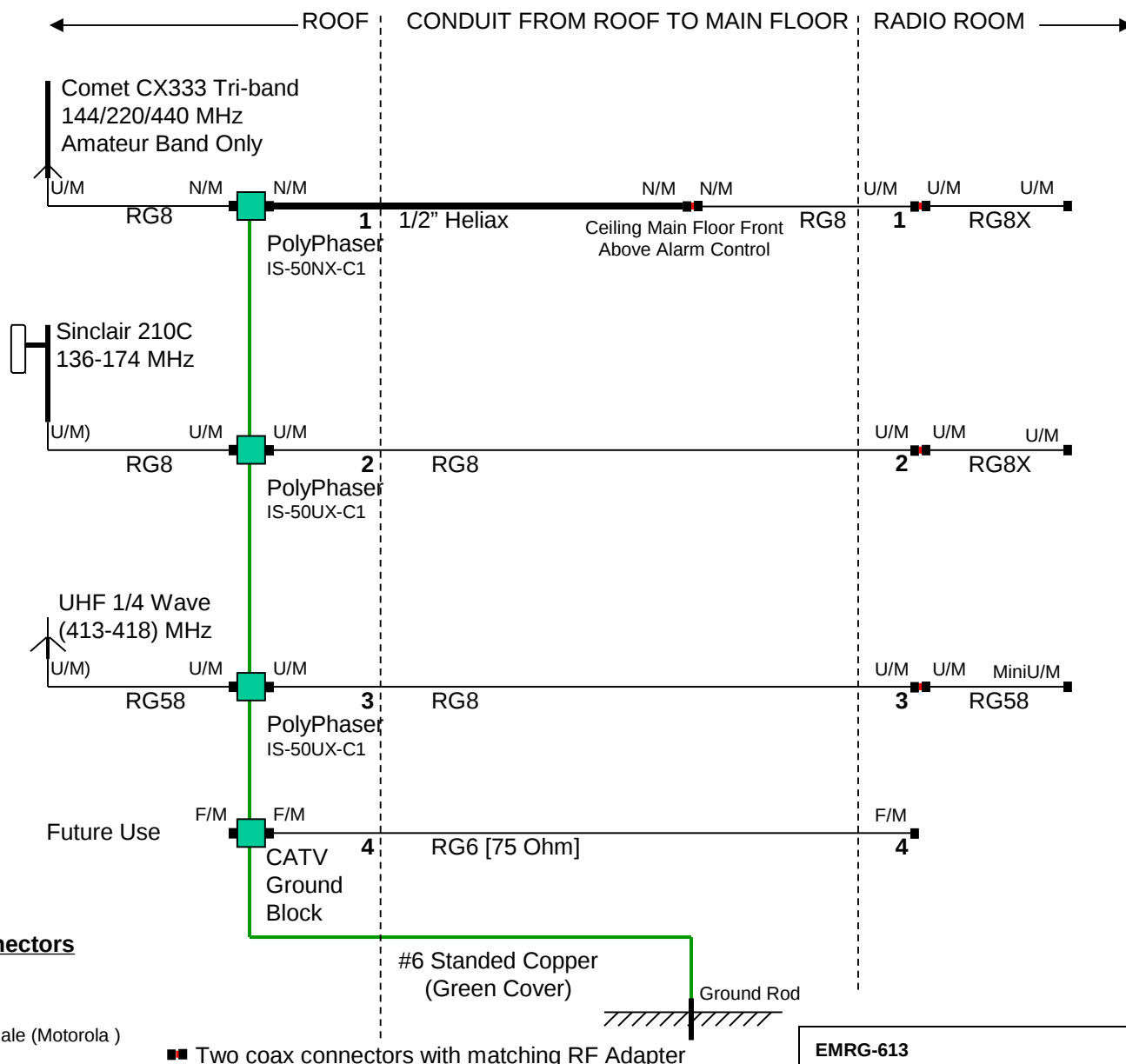
CX-333 Tri-Band 2m/220/440MHz Base Station Antenna



Specifications

- Triband, simultaneous TX/RX possible
- Gain:
  - 2M: 6.5dBi
  - 220: 7.8dBi
  - 440: 9.0dBi
- Length: 10'4"
- Weight:: 3lb 8ozs
- Max Power: 120 watts
- Max Wind Survival: 110MPH
- Wind Load: 66 sq inches (.46sq ft)
- Mast Required: 1.25-2.5 inches
- Connector: Integral SO-239
- Construction: Two piece white fiberglass radome, copper radiating element.
- Mounting hardware included.

|                                |  |                    |  |                        |                  |
|--------------------------------|--|--------------------|--|------------------------|------------------|
|                                |  | EMRG-613           |  | Red Cross Radio System |                  |
| Drawing Title:                 |  | Name: Peter Gamble |  | Version: 1.1           |                  |
| Emergency Measures Radio Group |  | Ottawa ARES        |  | Classification: Public | Date: 2009-07-02 |
|                                |  |                    |  | Page: 38               |                  |



### Coax Cable Connectors

F/M = Type F Male

N/M = Type N Male

U/M = UHF Male

MiniU/M = Mini UHF Male (Motorola)

■ Two coax connectors with matching RF Adapter

EMRG-613

Red Cross Radio System

Drawing Title:

Name: Peter Gamble

Version: 1.1

Emergency Measures Radio Group

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