AT COMMUNICATION

INTER NATIONAL

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# TACTICAL INTERCOM SYSTEM

# SYSTEMS & CONFIGURATION GUIDE


MODULAR
SCALABLE
EASY TO USE
CONFIGURABLE
TACTICAL RADIO INTERFACE

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# 1. INTRODUCTION AND OVERVIEW

## 1.1 Introduction

In mobile operations whether commercial or military, an intercom system is the foundation which enables effective communications between crew members to make tactical decisions with the best available knowledge. End users demand robust communications that works with ease in demanding operating conditions. The AT Communication Tactical Intercom System (TIS) has been developed to provide a layered solution to communications and capability demanded in mobile applications. The primary layer being the audible speech communication layer upon which versatile and configurable Intercom system modules can be added to increase operational capability for other forms of data.

## 1.2 System Overview

The Tactical Intercom System is made up of 6 main modules that provide the building blocks to a scalable system. These system modules can be structured in a flexible arrangement to provide solutions for a wide variety of mobile intercom requirements, e.g. Military and Emergency Services. Using military grade design principles the modules are built to withstand the harshest conditions found in tracked artillery vehicles and due to the compact design are equally deployable in smaller emergency support vehicles.

The system can be deployed as a fixed wired solution or as a combination of wired and wireless system to provide dismounted crew communications back to the host platform. Wireless communication is protected using high grade encryption techniques and ECCM. Range can be extended for wireless personal communicator users with external wireless antennas.

The system can interface with tactical radio transceivers to provide longer haul communications from the mobile platform. The system architecture allows direct control of the transceivers with advanced programmable functionality. This provides installation flexibility where the radios do not need to be in direct reach of the operators.

Due to the scalability of the system it can accommodate between 2 to 20 users which are wired in to the platform with a further expansion to 4 wireless users.

The Tactical Intercom System User Modules are connected to the Base Unit in a star architecture. Connection between the units is achieved by screened wire pairs providing power, audio and redundancy. The User Modules are available as Intercom only or Intercom plus radio control functionality. The Base Unit has ports for interfacing up to four tactical radio systems. Three of these ports can provide advanced radio control functionality and one port for basic radio functionality (Tx, RX and PTT). Advanced radio control is possible by programming control commands using published control protocols by radio transceiver vendors.

A more detailed description of each module and its capabilities follows in this guide.

### 1.3 Glossary of Acronyms and Abbreviations

| | |
|---|---|
| ALE | Automatic Link Establishment |
| ANR | Active Noise Reduction |
| APC | Armoured Personnel Carrier |
| BU | Base Unit |
| IUU | Intercom User Unit |
| LCD | Liquid Crystal Display |
| LED | Light Emitting Diode |
| MCU | Main Control Unit |
| OEM | Original Equipment Manufacturer |
| PMR | Professional Mobile Radio |
| PSU | Power Supply Unit |
| PTT | Push To Talk / Press To Transmit |
| RAU | Radio Access Unit |
| SMS | Short Messaging Service |
| Tx/Rx | Transmit and Receive |
| VHF | Very High Frequency |
| WPC | Wireless Personal Communicator |

## 1.4 System Features and Functions

### *1.4.1 General Features*

- Between 2-24 users depending on module configuration
- Support for up to 4 radio transceivers
- Supports most types of military, commercial and PMR radio transceivers
- Advanced remote control capability for radio transceivers
- Data interface option
- Full duplex communication for wired intercom stations and semi-duplex for radio
- Designed to withstand military grade environmental conditions. Anti-vibration mounting option for tracked vehicles
- Compact design
- User friendly user interface similar to mobile phones
- Night Vision Goggle (NVG) Compatible display
- Minimal training required to operate the system
- Priority over-ride feature for master user
- Simple to maintain using off the shelf components
- Radio frequency suppression circuitry to reduce effects of high power radio transmissions
- Wide operating temperature capability -30°C to +75°C
- Low power consumption
- Input voltage range 9 volts DC to 34 volts DC
- Power is routed via interconnecting cables for simpler installation
- Electret or condensing microphones can be used and wide impedance range for earpieces providing capability of accepting most helmet/headset/throat mic and earpiece combinations
- Quick release snatch connectors are utilised for all headset connections and pressel

### *1.4.2 Intercom Functions*

- Mic mute through keypad on Master Control Unit
- Live mic through keypad on Master Control Unit
- Volume switch on front panel
- Intercom interrupt for master position
- Intercom privacy

### *1.4.3 Standard Radio Functionality*

- Radio PTT (through pressel on helmet assembly)
- Live radio select switch on front panel
- Monitor radio select switch on front panel
- Individual radio volume switches on front panel
- Channel select (through keypad on Master Control Unit)
- Mode select (through keypad on Master Control Unit)
- Radio precedence (through keypad on Master Control Unit)
- Radio privacy
- Radio precedence
- Emergency Interrupt

### *1.4.4 Advanced Access Radio Remote Control and Interfacing Functionality*

- First time log-in to radio transceiver
- Automatic subsequent log-in
- Password entry
- Selective calling (Receive)
- Messaging (Receive)
- Frequency Hopping on/off
- Frequency Hopping selection of hop rate
- Encryption on/off activation and Encryption key select
- Digital Signal Processing on/off
- Scan on/off
- Channel up & Down
- Output power selection
- SWR level display

### *1.4.5 Wireless Personal Communicator –Functionality*

- Full duplex (simultaneous two way) Intercom mode
- Microphone Mute (Listen only for covert operations)
- Battery Indication
- Vibration Buzzer to indicate at range limit
- Automatically re-assigns and reacquires network signal when in range
- Priority Intercom mode to allow for open Intercom

- Covert mode
- Lightweight control unit can be located in Jacket pocket
- Snatch connector for Headset
- 10 hour operation (9:1 Rx:Tx)
- Software upgradable via I/O port
- Secure communication using high grade encryption and ECCM techniques

# 2. TACTICAL INTERCOM SYSTEM MODULES

## 2.1 Master Control Unit (MCU)


### *2.1.1 MCU Overview*

The Master Control Unit (MCU) provides two intercom attachment points as well as remote control of radio transceivers that are connected to the Base Unit. The MCU is also used to customize functionality of the complete system.

The MCU is normally installed adjacent to the operator responsible for Radio access. Radio remote functions are controlled from the keypad whilst intercom functions are controlled using rotary switches.

The MCU has an LCD which shows the functions chosen, and is capable of displaying SMS text messages (20 characters x 4 lines). The keypad can be configured to the users' requirements. Remote control options for radio transceivers are interfaced via serial commands and are typically as follows;

- Channel up and down
- Selcall on and off
- Frequency hopping (if fitted) on and off
- Scan (if fitted) on and off
- Text messaging (enhanced MCU only)
- ALE (if fitted) on and off
- Network selection and encryption (if fitted) on and off.

### *2.1.2 MCU Functionality*

- Two User Headset connections that can be aligned to Host Nation requirements
- Access to Intercom only for one of the connections (normally Driver)
- Access to both Intercom and installed Radio for Platform leader or senior crewman
- Individual Intercom volume controls

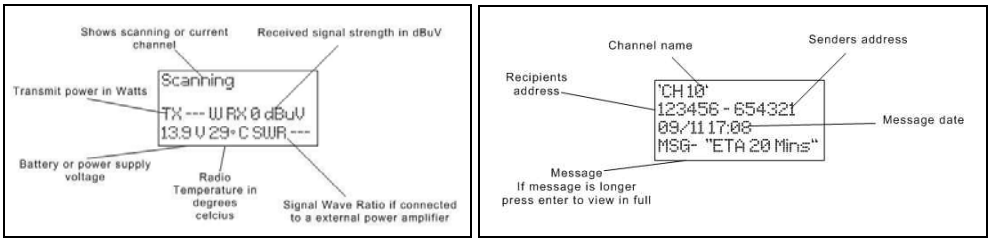
- A Microphone Mute button enables the platform leader to revert to receive only mode for intercom audio.
- Volume controls for both “Live” and “monitor” radios
- Radio selection for both “Live” and “monitor” radios
- Keypad to assist in the selection of radio functionality
- LCD displays radio function selection, and other features
- Connects to the Base Unit

### *2.1.3 MCU User Interface*

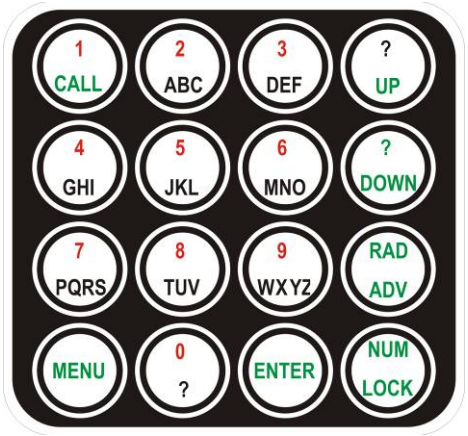
The user interface for control of the system is via a front panel key pad assembly, rotary controls and an LCD display on the front panel. The key pad can have the labels customized to user specific requirements.

Using the keypad and following menu prompts on the LCD display the operators can set the received volume for both radio and intercom, change the radio channel, and, if configured other advanced remote control functions.

### *2.1.4 MCU Screen Layout*




### *2.1.5 MCU Keypad Layout*




1 = Numeric – CALL = Initiate a call
2 = Numeric - ABC = Normal text letters / Scan on from main screen
3 = Numeric – DEF = Normal text letters / Scan off from main screen
▲ UP = Function UP / Channel Up
4 = Numeric – GHI = Normal text letters
5 = Numeric – JKL = Normal text letters
6 = Numeric – MNO = Normal text letters
▼ DOWN = Function DOWN / Channel Down
7 = Numeric – PQRS = Normal text letters
8 = Numeric – TUV = Normal text letters
9 = Numeric – WXYZ = Normal text letters
RAD SEL = Radio Select depress RAD SEL and by using either the UP or DOWN key select the radio required.
MENU = Input to the menu / if a mistake is made press menu to erase the character line
0 = Numeric – ▬ = Space
ENT – Enter button to choose function / Update displayed information from main screen
NUM LOCK = Press for numeric and press again for letters

A typical label format is shown above.

The layout resembles a mobile phone which most operators will be familiar with.

## 2.2 Base Unit (BU)


### *2.2.1 BU Overview*

The Base Unit (BU) is the hub of the intercom system. It provides connection to Master Control Unit, the power supply unit, the Radio Access Unit and the interface to the radio transceivers. The Base Unit also contains the Wireless Personal Communicator option module when required. The interconnect cables provide the highway for data, audio and power to the other units.

### *2.2.2 BU Functionality*

- Accommodates the main processors, wireless system and Radio Cards
- Connects to the PSU and distributes both 12 volts and 30 volts around the system
- Accommodates the Wireless Intercom control module
- Provides interconnectivity to MCU and either RAU or IUU
- Provides interface to installed radio transceivers

## 2.3 Radio Access Unit (RAU)


### *2.3.1 RAU Overview*

The Radio Access Unit (RAU) provides access to two selected radio transceivers per unit (primary and secondary). The RAU has rotary radio selector and volume controls for each assigned Radio. The full duplex intercom port also has rotary volume control as well as microphone mute control. The Radio Access Unit (RAU) is installed when Users are operating from the rear compartment of a platform.

The number of RAUs that can be connected in series is defined by the number of radios fitted to the platform and the number of intercom operators. Up to ten RAUs can be installed in the system. The RAU and Intercom User Unit (IUU) can be installed in 'Daisy Chain" from the Base Unit.

The RAU is normally provided with a single interface connector and is optionally available as an enhanced unit with dual interface connectors for expansion.

### *2.3.2 RAU Functionality*

- User box module that provides access to both Intercom and Radio
- Selection capability for two radios (primary and secondary)
- Volume controls for both radios
- Volume control for audio Intercom
- Microphone Mute button to enable User to select either full-duplex or listen only modes for Intercom
- Headset connectivity suitable for most headsets in use
- Enhanced RAU has through interconnection capability to enable "Daisy Chaining"

## 2.4 Intercom User Unit (IUU)


### *2.4.1 IUU Overview*

The Intercom User Unit (IUU) is generally installed in personnel carriers where intercom only connection ports are required. The number of IUUs fitted will depend on the number of personnel being transported who require connection to the intercom system. Up to twenty IUUs can be installed in “Daisy chain” and in combination with RAU and IUU modules.

The IUU provides a volume control for the intercom, a Microphone Mute button and a headset/handset connector. Customisation of the headset/handset connector is possible to suit existing stock of audio accessories if required. A common standard of connectors for platforms is suggested to allow the same handset/headset to be connected to any of the MCU, RAU and IUU units.

### *2.4.2 IUU Functionality*

- User connection module provides access to internal Intercom system
- Volume control for full duplex Intercom
- Microphone Mute button to enable User to select either full duplex or listen only modes for Intercom
- Handset connectivity suitable for most handsets in use
- Expansion via “Daisy Chain” interconnection capability

## 2.5 Power Supply Unit (PSU)


### *2.5.1 PSU Overview*

The PSU provides the main power supply for the complete system. The PSU provides two separate supply voltages; 30 volts DC for the main wired systems and 12 volts DC for the Wireless Personal Communicator Module. The PSU provides clean and stable supply voltages from the vehicle's battery system. The on/off switch has a LED display which illuminates once the output from the power supply is available.

### *2.5.2 PSU Functionality*

- Provides voltage stabilised clean power supply for the system
- Connects to the vehicles main power supply
- Provides 30V DC and 12V DC power output for the Intercoms wired and wireless modules

## 2.6 Wireless Personal Communicator (WPC)

### *2.6.1 WPC Overview*

The Wireless Personal Communicator (WPC) allows dismounted crew members to maintain intercom communications with crew still within the vehicle. The WPC is a compact module which can be attached to the operator's uniform and connected to a headset for hands free operation.

The WPC can be used inside the vehicle and is particularly useful where operators are positioned where wiring may be difficult (eg turret in a tank). The Wireless Personal Communicator can also be used up to 40meters away from the vehicle. With an external antenna fitted this range can be extended up to 400meters.

### *2.6.2 WPC Functionality*

- Connect/Assigns to Base Unit (up to 4 Units)
- Wireless Intercom links are secured with Encryption and Frequency Hopping
- Spatial diversity antennas to improve quality and reliability of wireless link
- Full duplex (simultaneous two way) communications
- 40 metres standard range. 400 metre range with external antennas
- Open intercom allowing full duplex capability
- Microphone Mute (Listen Only) function
- Visual and Audible indications for operating parameters
- Audible and vibrating indications when WPC is at range limit
- Automatic reassignment when within range of Base Unit
- Battery level indication
- Signal strength indication
- Covert mode – all visual indications off
- Minimum 10 hour operation (9:1 Rx:Tx)

## 2.7 Accessories

### *2.7.1 Headsets & Handsets*

Audio communications are available via either a headset, handset, Throat mic, bone conduction mic and covert ear piece unit. AT Communication can supply all options or alternatively the Intercom System can be customised to accommodate an existing supply of audio accessories that a client may have in stock.

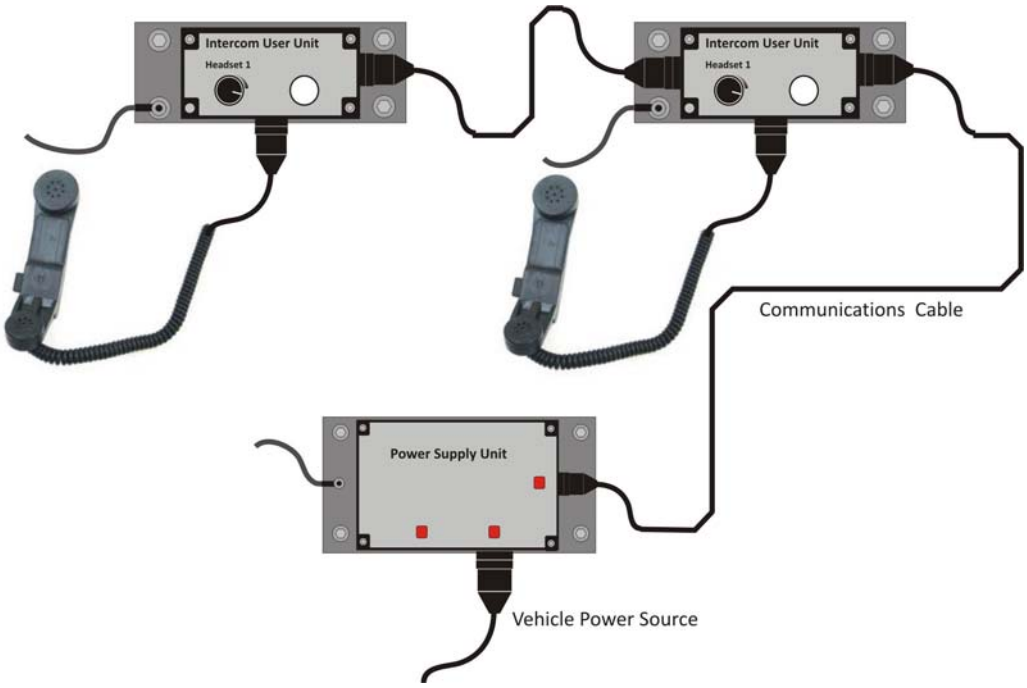
It is recommended that the system is configured with electret noise cancelling microphones. The headsets should be capable of being wired for stereo operation so that separate audio sources can be routed to each earpiece.

The system is also capable of being customised to accommodate Active Noise Reduction (ANR) headsets which require a voltage supplied.

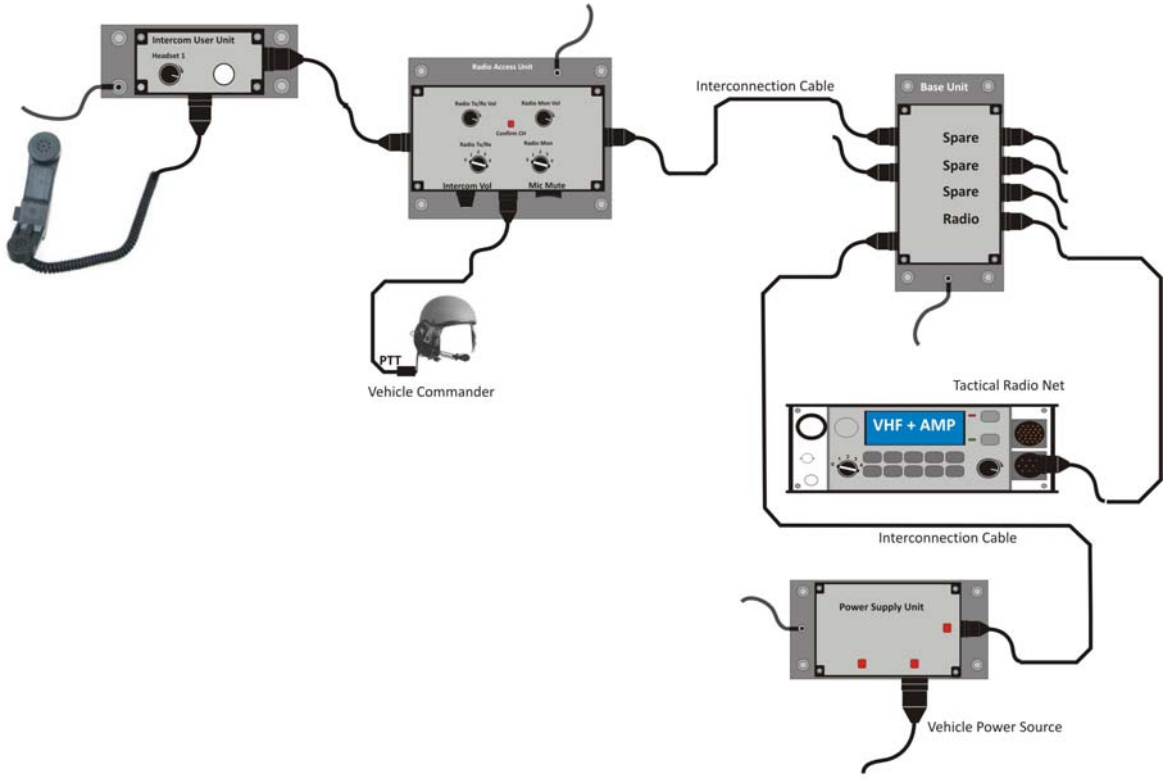
## SYSTEM CONFIGURATIONS

### 2.8 Wired Configurations

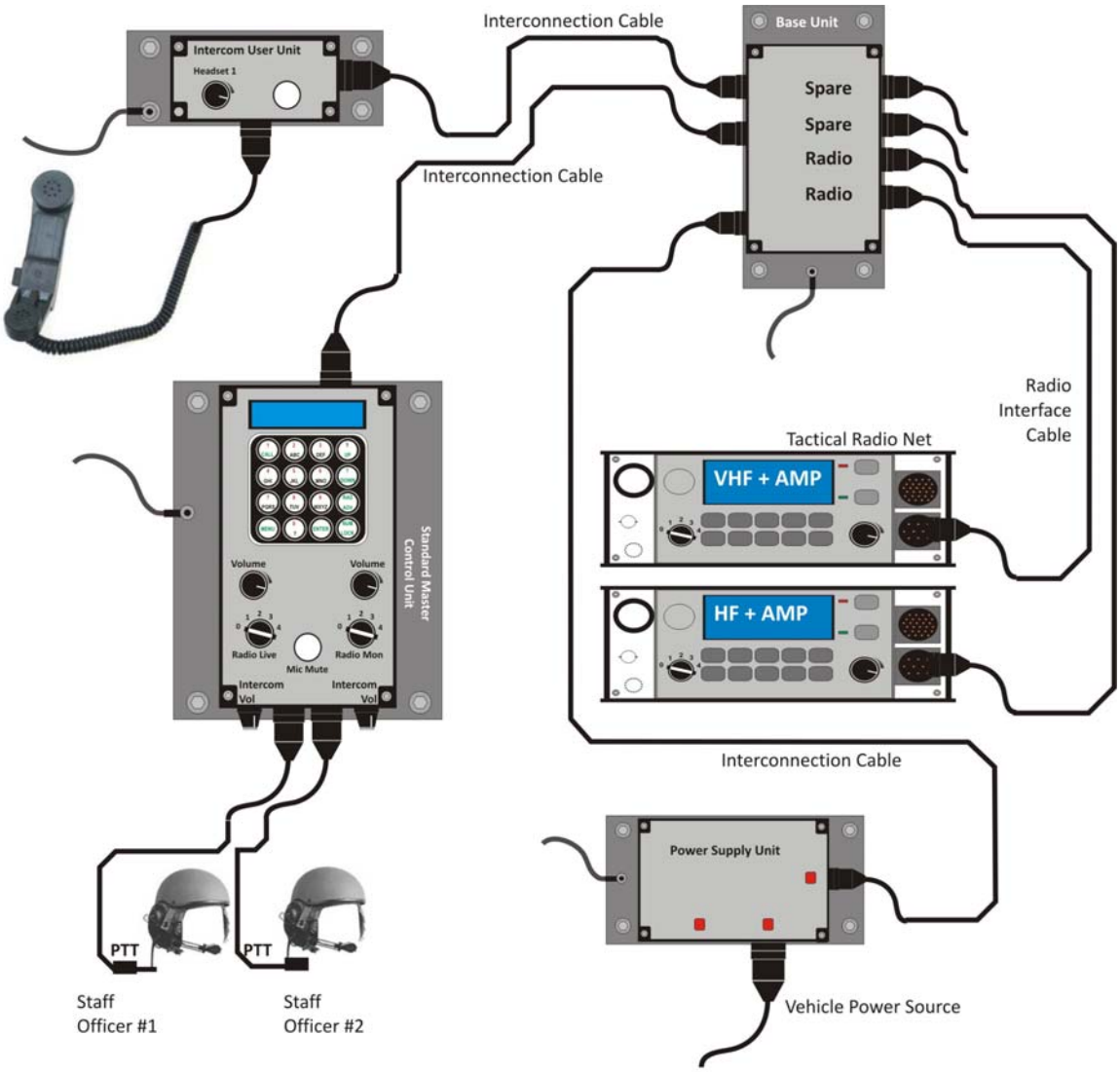
#### *2.8.1 1-2 Users (Intercom audio only)*



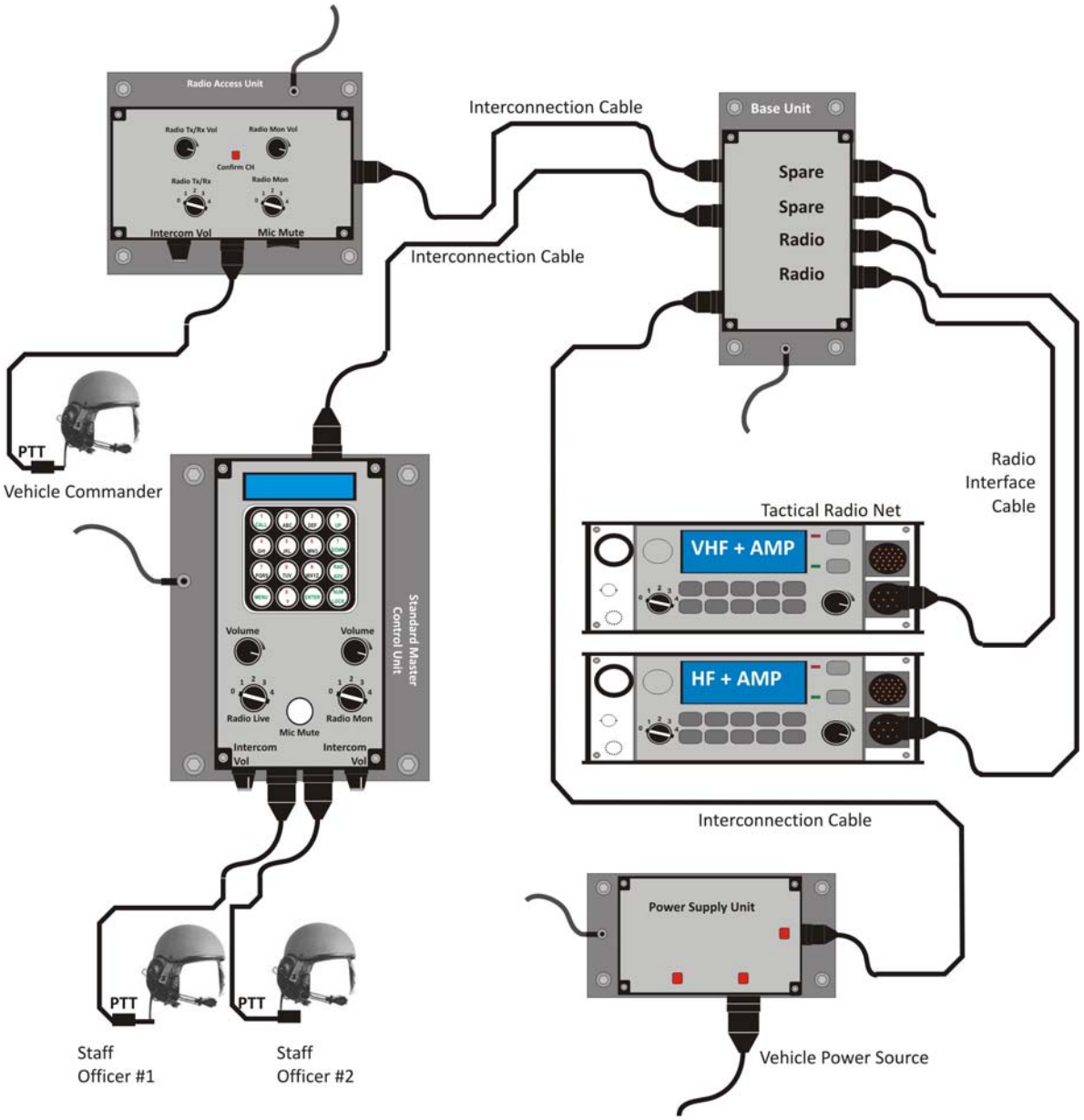
### *2.8.2 2-3 Users (Intercom and Standard Radio remote control)*



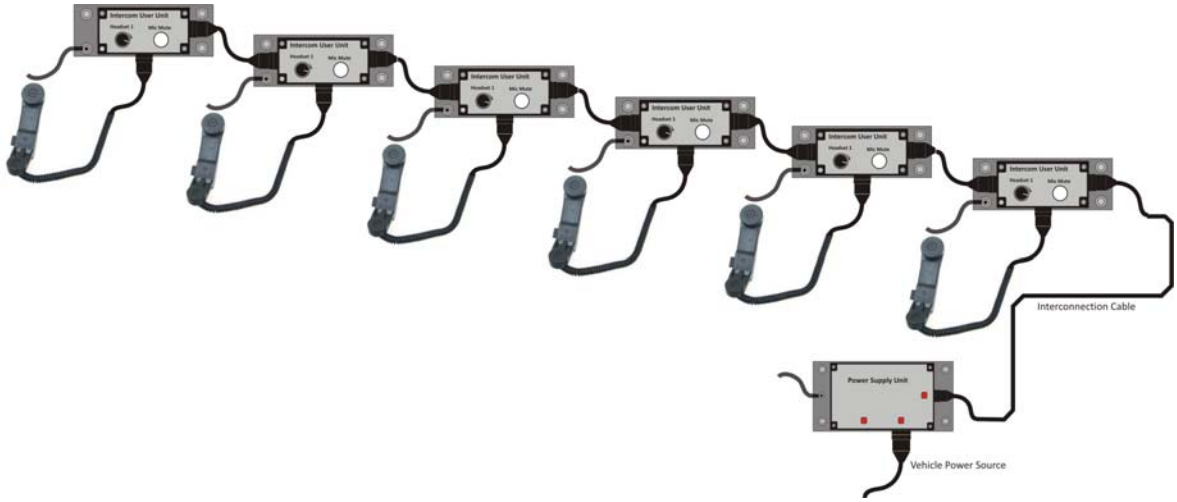
### *2.8.3 2-3 Users (Intercom and Advanced Radio remote control)*



### *2.8.4 2-3 Users (Intercom and Standard & Advanced Radio remote control)*



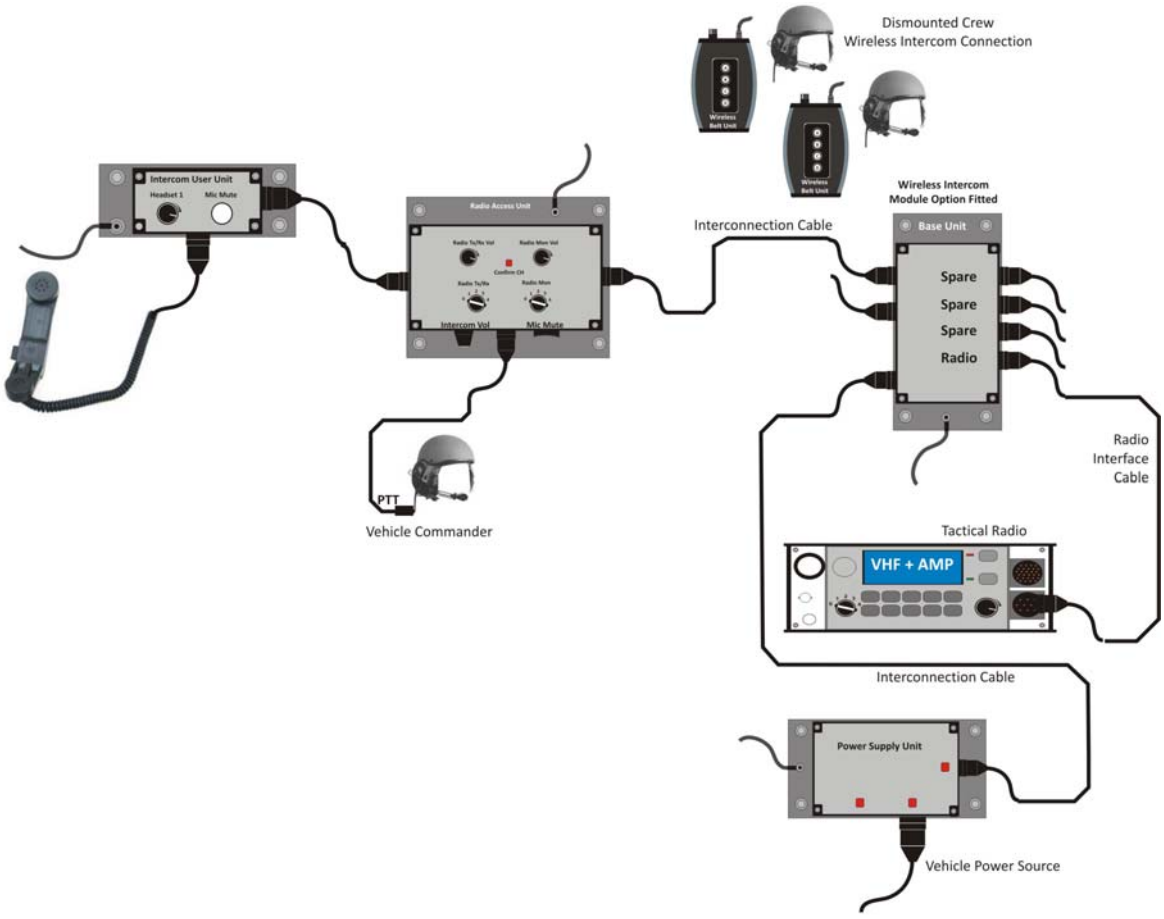
### *2.8.5 Wired Configuration Up to 20 Users (Intercom audio only)*



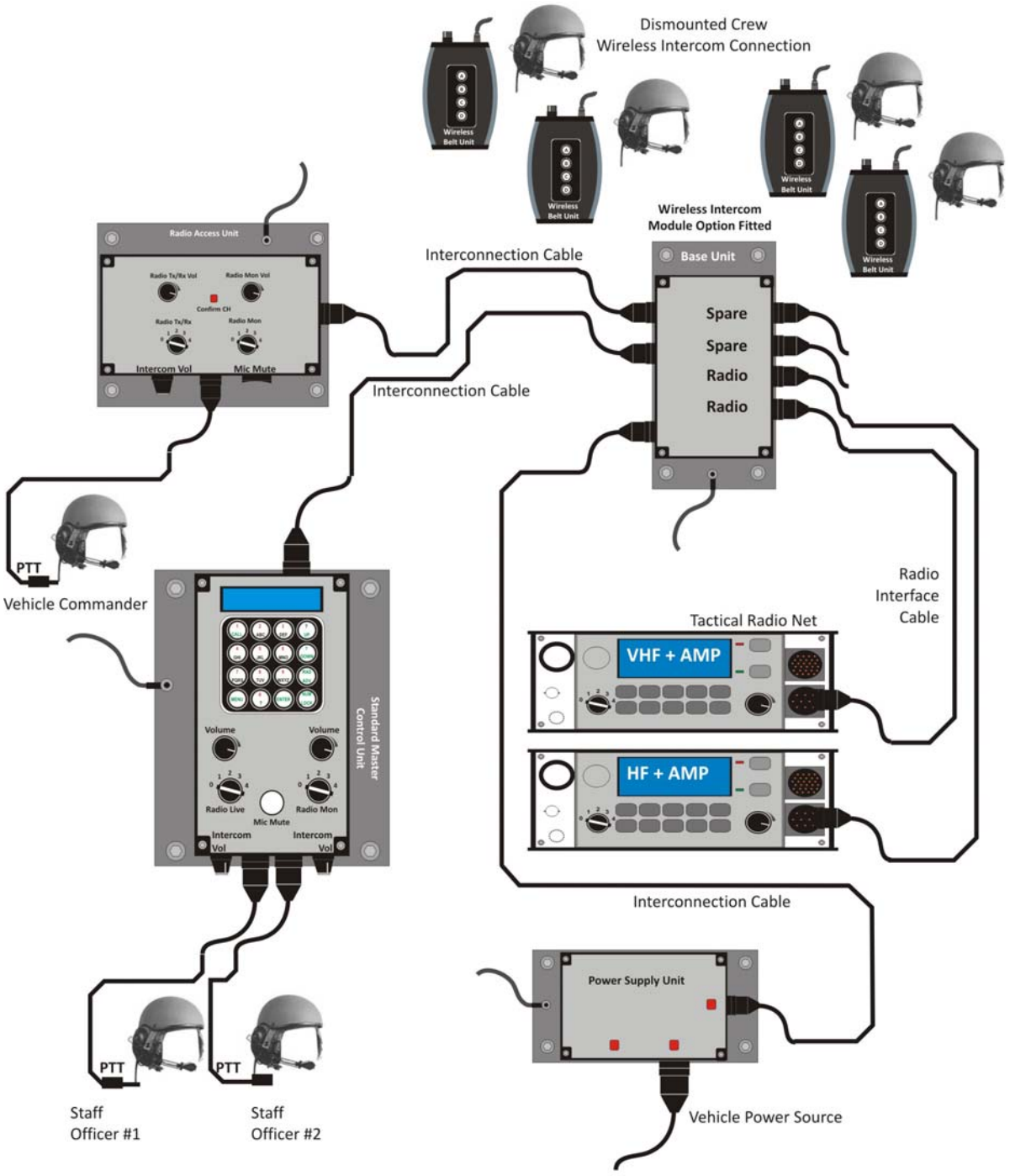

The system can accommodate up to 20 Intercom User Unit modules.

## 2.9 Wired & Wireless Configuration

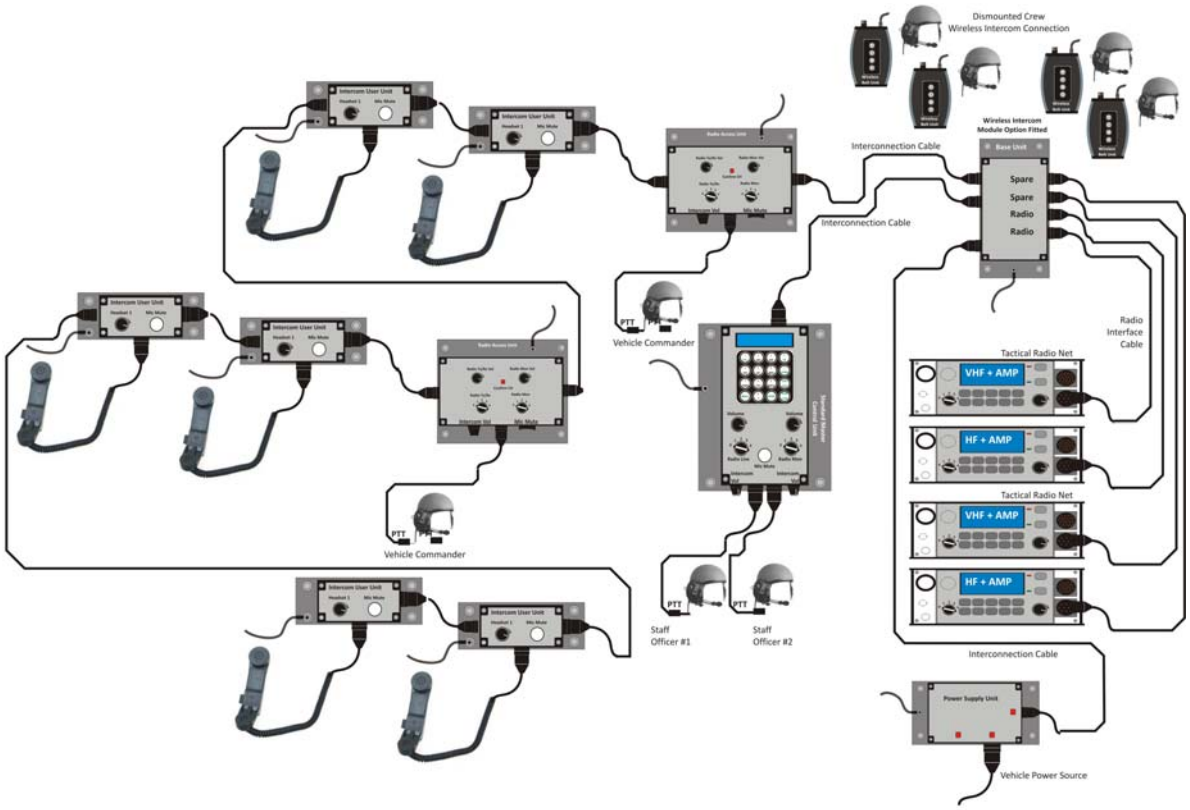
### *2.9.1 2-4 User (Intercom and Standard Radio remote control)*



### *2.9.2 3-7 User (Intercom and Standard & Advanced Radio remote control)*



### *2.9.3 Complex System 14 User (Intercom and Standard & Advanced Radio remote control)*



# 3. TACTICAL INTERCOM SYSTEM MODULE SPECIFICATIONS

## 3.1 Master Control Unit Specifications

| | |
|---|---|
| Weight | 1.7 Kg |
| Dimensions | 225x145x55 mm |
| Temperature Range | -30° C to +70° C |
| Functionality | Provides User Interface for control of radio transceivers and configuration user interface for system |
| Power Consumption | 300mA when LCD in operation ≤40mA when in normal operation |
| Mechanical Construction | Ruggedised die cast enclosure with military grade connectors and internal shock proofing. Switch guards are provided to prevent damage to controls. |
| External environment | The box is rain shower proof, resistant to condensation and is resistant to ingress of small particles. Certified to IP 65 (NEMA 4) |
| Headset Interface | Provides connectivity for a wide range of Headsets/Helmet headsets |

## 3.2 Base Unit Specifications

| | |
|---|---|
| Weight | 1.8 Kg |
| Dimensions | 225x145x90 mm |
| Temperature Range | -30° C to +70° C |
| Functionality | Central base for wireless system and interface to installed radio transceivers. Distributes power to all units . |
| Mechanical Construction | Ruggedised die cast enclosure with military grade connectors and internal shock proofing. Switch guards are provided to prevent damage to controls. |
| External environmental | The box is rain shower proof, resistant to condensation and is resistant to ingress of small particles. Certified to IP 65 (NEMA 4) |
| Model Variations | Standard and Wireless Option Variations. 1-4 Radio Transceiver Interfaces. |

### 3.3 Radio Access Unit Specifications

| | |
|---|---|
| Weight | 0.8 Kg |
| Dimensions | 148x108x75 mm |
| Temperature Range | -30° C to +70° C |
| Functionality | Provides RX, TX and PTT access to installed radio transcievers and Intercom for Users in rear compartments of Platforms |
| Mechanical Construction | Ruggedised die cast box with heavy duty military grade connectors and internal shock proofing |
| External environmental | The box is rain shower proof, resistant to condensation and is resistant to ingress of small particles. Certified to IP 65 (NEMA 4) |
| Model Variations | Standard Single Interface Connection or Enhanced Daisy Change Interface for expansion |

### 3.4 Intercom User Unit Specifications

| | |
|---|---|
| Weight | 0.55 Kg |
| Functionality | Provides intercom only interface for handset/headsets |
| Dimensions | 115x90x55 mm |
| Temperature Range | -30° C to +70° C |
| Mechanical Construction | Ruggedised die cast box with heavy duty military connectors and internal shock proofing |
| External environmental | The box is rain shower proof, resistant to condensation and is resistant to ingress of small particles. Certified to IP 65 (NEMA 4) |
| Model Variations | Standard Single Interface Connection or Enhanced Daisy Change Interface for expansion |

### 3.5 Power Supply Unit

| | |
|---|---|
| Weight | 2.04 Kg |
| Dimensions | 225x145x55 mm |
| Temperature Range | -30° C to +70° C |
| Mechanical Construction | Ruggedised die cast box with heavy duty cable grommets and internal shock proofing |
| External environmental | The box is rain shower proof, resistant to condensation and is resistant to ingress of small particles. Certified to IP 65 (NEMA 4) |

### 3.6 Personal Wireless Communicator

| | |
|---|---|
| Weight | 0.24 Kg |
| Dimensions | 117x79x33 mm |
| Temperature Range | -30° C to +70° C |
| Mechanical Construction | Handheld injection moulded enclosure |
| External environmental | Shower proof rain, ingress of small particles and accidental abuse rated to IP 65 |
| Display | Four panel LED shows battery power, range |
| Battery Life | Minimum of 10 hours 9:1 Tx/Rx ratio |

# 4. FURTHER INFORMATION

## 4.1 Tactical Intercom System – Capacity Matrix

| | Wired Mode – No Radio Transceivers | Wired Mode – Radio Transceivers |
|---|---|---|
| **Wired Users** | 2-20 | 2-10 |
| **Wireless User** | 1-4 | 1-4 |
| **No of Radio Transceivers** | 0 | 4 |

## 4.2 System Documentation

Documentation will be customised for each system dependant on the exact system configuration. Documentation will include user manual, configuration information, system wiring information, user interface instructions and system testing instructions.

## 4.3 Intellectual Property

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