Radio Management Products & Applications

Handbook Index No. 62

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Please report any errors or omissions in this manual to BISS Technologies so that they may be corrected in later issues.

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Introduction

The BISS Tech Product Application Document has been written specially for our dealers and enduser customers to assist with understanding the multitude of applications for BISS Tech' wide range of Radio Communications Management products.

This document has been produced to provide information on specific products and market segments in which they are being utilised. This provides an easy and quick reference for readers.

All products are manufactured and supported by an exceptional team of software and hardware engineers dedicated to achieving excellence in product design and technology.

Radio Communications Management

BISS Tech is proud to present its comprehensive range of Radio Management products backed by over 20 years of industry experience. The popularity of these products has enabled BISS Tech to remain a leader in this dynamic field. Products in this section include the BISS Tech range of Handset and Console Systems, Communication Interfaces, Audio Bridges and the 950 Radio Management System.

The DX-64

A recent addition to BISS Tech range of products is the DX-64 Radio management System. The DX-64 is capable of control of 56 radio channels with up to 32 operators. It can be used with a PC or non-computer interface. Channel linking for up to 8 separate groups is provided with each operator controlling up to 8 workgroups. Full Selcal on all channels and Rapid Recall logging are standard features of the DX-64, as are features such as 'Hot Swap' where cards and units can be inserted and removed without disconnection from the power source and 'Hot Standby' operation through a Master/Slave arrangement and 'Heartbeat' function.

Product & System Design Services

Have you ever had an idea that required an electronic solution? Many years of experience, combined with engineering innovation, have enabled BISS Tech to transform ideas into products now distributed throughout Australia and the world. The strength of an idea and specific marketplace knowledge, amalgamated with our comprehensive engineering expertise, has proved to be an impressive combination in producing world class solutions.

Radio Communications Management

Remember the days when an operator had a host of fist-microphones to choose from when responding to a call, and recall when you had just finished installing that base radio and they decided it needed to be elsewhere in the building? Your only option was to move it because of the cost implications of buying another radio. Upgrading used to mean that you had to throw out old equipment and start again. Well, BISS Tech can help you say goodbye to those days forever and we offer you the following benefits when you buy our products.

- No more unsightly base radios in the office. BISS Tech products are both modern and aesthetically pleasing.
- No need for duplication of base radios for added operators. Multiple operators only need one base radio that is interfaced to multiple handsets and/or consoles.
- No need to be concerned about costly upgrades. BISS Tech' products are easily upgraded and in most cases, an upgrade is simply an extension of the older system.

Where would these Products be used?

Put simply, any application where communications operators are required to monitor communications channels. BISS Tech Range of Communications Management products will allow single and multiple operators to access single and multiple communication channels comprising of base stations, 2-wire landline and 4-wire, E&M (microwave) circuits.

Upgrade Paths

BISS Tech radio communications products offer an easy to manage upgrade path that caters for the expanding network operator and his changing requirements, providing a cost effective solution for you when your business expands.



Figure 1: Upgrade Paths

The diagram in figure 1 maps an upgrade path that exists within the BISS Tech product range. Larger radio management systems can make use of modules previously utilised in smaller systems therefore providing a cost-effective solution for you when your business expands. BISS Tech products grow with you.

Where to from here?

There are three different variations within the BISS Tech Radio Communications Management product range, with the key definition being on the number of radio channels to be monitored and the number of operators requiring access to the monitored channels.

- BISS Tech Range of Handset and Console Systems
 Up to 3 Radio Channels to be monitored by an operator or multiple operators
- BISS Tech 950 Communications Management Systems
 4 to 12 Radio Channels to be monitored by an operator or multiple operators
- BISS Tech DX-64 Radio Management System Up to 56 Radio Channels to be monitored by an operator or multiple operators

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900 Series Communication Line & Equipment Interfaces

900 Series Communication Line & Equipment Interfaces

BISS Tech range of reliable, easy-to-use range of Communication Interfaces is designed to give you the flexibility you need in managing your radio communications. This extensive range consists of both line (AUSTEL approved) and equipment interfaces, which allow you to interconnect products within the BISS Tech range as well as interface BISS Tech and OEM products. The range is ever expanding to cover applications that continue to arise. A brief description of each interface follows.

935LRI Local Radio Interface

The 935LRI Local Radio Interface Unit enables single or multiple operator positions to be remotely located from the base or trigger radio. An eight-way interface (TX audio, RX audio, Mute, PTT high & low pulling, power and earth) is provided for connection to the radio. There are three ports for the handset or console connection. It should be noted that these ports are in parallel of each other and handsets or consoles may be paralleled from the one cable run.

935 LOCAL RADIO INTERFACE



Figure 2: 935 Local Radio Interface



Figure 3: Basic Local Radio Interface Configuration

920FR & 920D/NA RCI Remote Control Interface

The 920FR RCI Remote Control Interface unit enables single or multiple operator positions to be remotely positioned from the base or trigger radio via a two wire or landline connection. There are three ports for handset or console connection. It should be noted that these ports are in parallel with each other and handsets or consoles may be paralleled from the one cable run. The two wire or landline port is a balanced 600 ohm, transformer coupled interface and as such, multiple 920 units may be connected to the same two wire or landline facility. Great distances may be achieved between the operator positions and the base or trigger radio. The 920FR unit is a line-approved product and is used when tone keying is a requirement. The 920D/NA unit is used with private internal cabling where DC Keying is suitable in a non-approved environment.

920FR REMOTE CONTROL INTERFACE



Figure 4: 920FR Remote Control Interface



Figure 5: 920FR Remote Control Interface & Peripheral Components

Radio Management Products & Applications

920B Base Busy Decoder Control Interface

Used in conjunction with the 920FR remote control interface the base busy decoder is utilised to show visual indication on the RCI peripheral device that the base radio is receiving an RF signal of sufficient strength to open its mute. This device must be used in conjunction with a 925FR/925E configuration.

925FR & 925D/NA LKI Line Keying Interface

The 925LKI Line Keying Interface unit provides a radio interface to a two-wire or landline connection. An eight-way interface (TX audio, RX audio, Mute, PTT high & low pulling, power and earth) is provided for connection to the radio. The two wire or landline port is a balanced 600 ohm, transformer coupled interface. Great distances may be achieved between the operator positions and the base or trigger radios with the pairing of the 925 and 920 interface products. The 925FR unit is a line-approved product and is used when tone keying is a requirement. The 925D/NA unit is used with private internal cabling where DC Keying is suitable in a non-approved environment.



925FR LINE KEYING INTERFACE









925E Base Busy Encoder Control Interface

Used in conjunction with the 925FR remote control interface the base busy encoder is utilised to show visual indication on the RCI peripheral device that the base radio is receiving an RF signal of sufficient strength to open its mute. This device must be used in conjunction with a 920FR/920B configuration.

920VX Vox Base Busy Detector

Used in conjunction with the 920FR remote control interface the 920VX Vox base busy detector is utilised to provide visual indication on the RCI peripheral device that audio is present from the landline and it replicates the mute or carrier detect signal of the radio.

933 4 Wire Line Isolation Unit

(AUSTEL approved component TS001) The 933 Line Isolation Unit (LIU) allows you to connect equipment that is not approved to Australian Telecommunications Standards to the local private line telecommunications network via a PABX extension.



933 4-WIRE ISOLATION UNIT

Figure 8: 933 4-Wire Isolation Unit

934PI Peripheral Interface

The 934PI Peripheral Interface unit has been developed to facilitate the interfacing of the BISS Tech 960 handsets, consoles or the 950 Radio Management System to 4 wire E & M devices such as the BISS Tech 9412 Audio Management unit or 619 series audio bridge. The application specific interface unit has proved useful in some other applications where out of the ordinary interfacing of the BISS Tech product range is required. (See next page).



Figure 9: 934 Peripheral Interface



Figure 10: 933 Isolation Unit & 934 Peripheral Interface

936MPI Multi Purpose Interface

The 936MPI Multi Purpose Interface unit provides a 4 wire E & M interface for applications such as the direct connection to microwave bearers. The unit also has the standard 3-port interface for the handset and console ranges and an unbalanced radio interface port completes the features. The 936MPI unit is an extremely useful interface as it can provide a multitude of interface combinations. (See the following pages).











Figure 13: 936MPI Interface Combinations 2

937BLI Bridge Line Interface

The 937BLI Bridge Line Interface unit enables four-wire leased lines to be easily interfaced to the 619 Audio Bridge range. The unit combines the inputs and outputs of the 920FR and 925FR products via pin compatible ports to another pin compatible port to the 619 Audio Bridge. The 12VDC to power the units is routed from either the 920FR or the 937 unit. Either of these two units, when powered up, can provide the 12VDC necessary for all three interfaces ensuring a minimum of on-site cabling





Figure 14: 937 Bridge Line Interface



Figure 15: 936 & 937 Link & Multi Repeater Application

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The 900DEN Decoder/Encoder

The 970DD Channel Change Decoder

The 970SM Selcal Encoder/Decoder

900DEN Decoder Encoder

The 900DEN module is a device that has been designed to convert 4-wire + E&M (619 Audio Bridge port) to a 4-wire line with in-band signalling for both mute and PTT.

Functionally, the unit operates as shown below



Figure 16: (900DEN functionality)

The connectors and pin functions are described below



Figure 17: (Connectors and pin functions)

Converts 4 Wire E & M to 4 Wire



970DD Channel Change Decoder

The 970/3 DTMF Channel Change Decoder provides open-collector outputs that can be controlled via a sequence of numbers sent over a network as DTMF audio. The radio interface uses BISS Tech standard 8-wire radio interface connection, which allows connection to a 925FR LKI or 935 LRI unit and loops the signal through to the radio.

There are two ways the interface would normally be used. The first is with a console connected to the system via a 925FR or 935LRI interface. The second method of operation is for the 970/3 to be connected and controlled directly from radio audio.





Figure 19: 970DD Channel Change Decoder

970SM SELCAL ENCODER - DECODER

970SM Selcal Encoder - Decoder

Figure 20: 970SM Selcal Encoder - Decoder

The 970 Selcal Encoder/Decoder Module or 970SM is a compact, remotely controlled actuator and sensor that takes advantage of the standard radio Selective Calling scheme. It features eight digital inputs, eight digital outputs and a single, dual-pole voltage-free contact relay. All Selcal parameters are configurable via an easy-to-use Windows[™] application.

General Inputs/Outputs

All digital inputs, outputs and relay contacts are accessible via the DB-25 (female) connector, CN1 as shown in the following table.

PIN	FUNCTION	PIN	FUNCTION
1	Relay contact 1 - common	20	Digital Input 7
14	Relay contact 1 - normally open	8	Digital Input 8
2	Relay contact 1 - normally closed	21	Digital Output 1
15	Relay contact 2 - common	9	Digital Output 2
3	Relay contact 2 - normally open	22	Digital Output 3
16	Relay contact 2 - normally closed	10	Digital Output 4
4	0V	23	Digital Output 5
17	Digital Input 1	11	Digital Output 6
5	Digital Input 2	24	Digital Output 7 – LED
18	Digital Input 3	12	Digital Output 8 – Mic Mute
6	Digital Input 4	25	0V
19	Digital Input 5	13	0V
7	Digital Input 6	-	-

Radio Interface

The 8-way, RJ-type connector CN4 provides the radio interface and input power to the 970SM. This interface features the standard PTT and MUTE control signals as well as Tx and Rx audio.

See next page

8-way RJ-type connector

PIN	DESCRIPTION	
1	MUTE	
2	PTT Out Low	
3	PTT Out High	
4	PTT +Vin	
5	Rx Audio	
6	Tx Audio	
7	-Vin	
8	+Vin (+12VDC to +24VDC)	

The DB-9 (male) connector CN3 serves as the serial RS-232 communications interface. In addition this connector features the ALERT tone output line for connection to a piezoelectric driver (eg. Sonalert® audible signalling device).

Note that this is not a standard RS232 DB9 interface.

DB9 connector

PIN	FUNCTON		
1	NC		
2	Rx Data		
3	Tx Data		
4	NC		
5	0V		
6	+Vin		
7	-Vin		
8	ALERT		
9	0V		

System Programming

All 970SM operating parameters that are configurable are stored in non-volatile memory for persistence over power cycles. These operating parameters can be accessed and modified by interfacing the 970SM to an IBM-compatible PC via an RS-232 serial connection and using the *CP970 Selcal Programmer* software provided with the *970SM*.

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960 Series Handsets, Consoles and Plinths

BISS Tech manufactures and supports a high quality range of reliable Radio Communications Handset and Console Systems. The 960 Range of Handsets and Consoles are designed for the simplest of applications and are available in the following models.

Handsets

960HC Handset

This is a basic handset unit with built-in speaker, conference microphone, intercom facility and power/busy LED. The handset comes either as a desk handset or wall-mount. Two press-to-talk switches are provided with one mounted on the cradle and the other ideally positioned for thumb control on the handpiece.



Figure 21: 960HC Handset



Figure 22: Four 960HC Handsets with peripheral components

960HS Handset

In addition to the features available with the 960HC Handset, the 960HS SelCal Handset also includes the following: SelCal tone encoding from the keyboard, three-digit automatic number identification (ANI) and single-digit status displayed on a four digit numeric LED display. Also provided and displayed is a queue facility for storing SelCal & ANI numbers. All this plus the means to fully customise the 960HS handset using the CP960 Programmer, places this product with the very best available today.



Figure 23: 960HS handset



Figure 24: Four 960HS Handsets with peripheral components

Handset Specifications

FEATURE	960HC	960HS
Conference Microphone	Yes	Yes
In-built Speaker	Yes	Yes
Intercom	Yes	Yes
Cradle PTT Switch	Yes	Yes
Handpiece PTT Switch	Yes	Yes
Busy Indication	Yes	Yes
Power Indication	Yes	Yes
SelCal	No	Yes
ANI	No	Yes
Volume Control	Yes	Yes

Consoles

960CC Communications Console

This is a basic console unit with built-in loudspeaker, electret microphone, LED level meter, intercom facility, mute control and rear connections for headset, desk microphone and foot PTT switch.



960CC COMMUNICATIONS CONSOLE

Figure 25: 960CC Communications Console



Figure 26: Four 960CC consoles with peripheral components

960CSD Communications Console

The 960CSD Communications Console represents the latest in the series of 960 Communications Consoles offered in this particular BISS Tech product range. The 960CSD console provides a greater degree of flexibility than previous models by including both SelCal/ANI and DTMF functionality. In addition, the CP960 Console Programmer is provided to allow full customising of the Console's operating parameters. Those already familiar with the BISS Tech 960 Communications Console range will find upgrading to the 960CSD console effectively seamless since it has been developed as an extension of previous consoles.



960CSD Selcall & DTMF CONSOLE

Figure 27: 960CSD Communications Console





Console Specifications

FEATURE	960CC	960CSD
Conference Microphone	Yes	Yes
In-built Speaker	Yes	Yes
Intercom	Yes	Yes
Cradle PTT Switch	Yes	Yes
Handpiece PTT Switch	Yes	Yes
Busy Indication	Yes	Yes
Power Indication	Yes	Yes
SelCal	No	Yes
ANI	No	Yes
Volume Control	Yes	Yes
DTMF Channel Change	No	Yes

960C3 Channel Controller

Offering control of up to three individual channels, the 960C3 Channel Controller is ideally positioned between a single channel 960 series console or handset combination and the multi-channel 950 Radio Management System.







Figure 30: 960C3 and a Three Channel System

Plinths



Figure 31: 960 Plinths

960PE Extension Speaker Plinth

Designed primarily as an extension speaker for the 960 Series of peripheral interfaces, this unit allows for individual volume setting (independent of the connected handset or console) and offers the option of "cross-muting".

960PS basic Plinth

This practical unit provides a mounting base for any of the 960 Handsets and provides the benefits of louder and clearer audio via a larger speaker, which can either be switched through the handset's hook-switch or heard continuously.

960PM Multi-channel Plinth

Ideal for those people who may want more than a simple peripheral/interface set-up, but don't require a full 950 Radio Management System, this unit provides the operator with control of up to three channels.

FEATURE	960PE	960PS	960PM
Solid Steel Construction	Yes	Yes	Yes
Volume Control	No	Yes	No
Cross Muting	Yes	No	No
Radio Channel Control	No	No	Yes
960H Mounting Base	Yes	Yes	Yes
Off Hook / On Hook audio	No	Yes	Yes
Busy / PTT Status	No	No	Yes

Plinth Specifications
Typical Connections for the 960 Series

BISS Tech 960 Series Handsets and Consoles can fit together to suit a wide variety of applications. They suit the most basic requirement of a one-channel, one-operator system through to a myriad of combinations to suit more complicated requirements in both local and remote configurations.

Outlined below are some typical connections for the 960 Series Systems. These connections have been broken down into the following three categories for easy reference.

- Single Operator & Single Radio Configurations
- Multiple Operator & Single Radio Configurations
- Multiple Operator & Multiple Radio Configurations

Single Operator & Single Radio Configurations

Application Description

Single operator control of a base or trigger radio in the local radio configuration. The 960HC Handset may be positioned up to 100 metres from the 935 Local Radio Interface.

960HC	Handset	One
935LRI	Local Radio Interface	One





Radio Management Products & Applications

Application Description

Single operator control of a base or trigger radio in the remote or landline control configuration. The 960HC Handset may be positioned up to 100 metres from the 920FR Remote Control Interface with the 920FR and 925FR combination offering the capability of kilometres of separation. The 920FR and 925FR products have approvals for connection to Austel lines.

960HC	Handset	One
920FR RC	Remote Control Interface	One
925FR LK	Line Keying Interface	One



Figure 33: Basic Remote Radio Configuration

Multiple Operator & Single Radio Configurations

Application Description

This application illustrates the multiple operator control of a base or trigger radio in the local configuration. The 960HC and HS Handsets and the 960CC Console may be positioned up to 100 metres from the 935 Local Radio Interface.

960HC	Handset	One
960HS	Handset	One
960CC	Console	One
935LRI	Local Radio Interface	One



Figure 34: Multiple Local Radio Configuration 1

Radio Management Products & Applications

Application Description

Again this diagram illustrates the multiple operator control of a base or trigger radio in the local configuration. The 960HS Handsets and the 960CSD Console may be positioned up to 100 metres from the 935 Local Radio Interface. <u>This diagram also illustrates that the handsets and console combinations may be paralleled from a single cable run.</u>

960HS	Handset	Two
960CSE	O Console	One
935LRI	Local Radio Interface	One
930EX	Cable Conversion Kits	Two Pairs



Figure 35: Multiple Local Radio Configuration 2

Application Description

This diagram illustrates a multiple operator control of a base or trigger radio in the remote or landline control configuration. The 960 Handsets and 960 Consoles may be positioned up to 100 metres from the 920FR Remote Control Interface with the 920FR and 925FR combination offering the capability of kilometres of separation. The 920FR and 925FR products have approvals for connection to Austel lines.

960HC Handset	One
960HS Handset	One
960CSD Console	One
920FR RCI Remote Control Interface	One
925FR LKI Line Keying Interface	One



Figure 36: Multiple Remote Radio Configuration 1

Radio Management Products & Applications

Application Description

This diagram describes a multiple operator control of a base or trigger radio in the remote or landline control configuration. The 960 Handset and 960 Consoles may be positioned up to 100 metres from the 920 Remote Control Interface with the 920 and 925 combination offering the capability of kilometres of separation. This diagram further illustrates that the consoles and handset combinations may be paralleled from a single cable run. The 920 and 925 products have approvals for connection to Austel lines.

ts List	Parts
ts List	Parts

960HS Handset	One
960CC Consoles	Three
920FR RCI Remote Control Interface	One
925FR LKI Line Keying Interface	One
930EX Cable Conversion Kits	Two Pairs



Figure 37: Multiple Remote Radio Configuration 2

<u>Note:</u> In the configuration shown above it will be necessary to provide power additional to that supplied by the standard plug-pack provided with the 920FR Remote Control Interface (12Vdc at a current of 500mA). This configuration will require a supply of 12Vdc at a current of 1A. It will be necessary to connect this additional power supply at one of the consoles or at the handset. It should not be connected directly to the 920FR, which is fused at 500mA.

Application Description

This diagram illustrates multiple operator control of a base or trigger radio in the remote or landline control configuration. The 960 Handsets and 960 Consoles may be positioned up to 100 metres from the 920FR Remote Control Interface with the 920FR and 925FR combination offering the capability of kilometres of separation. This diagram also shows that multiple 920FR units may parallel from a single 925FR two-wire or landline run. The 920FR and 925FR products have approvals for connection to Austel lines.

Parts I	List
---------	------

960HS Handsets	Two
960CC Consoles	Three
920FR RCI Remote Control Interface	Two
925FR LKI Line Keying Interface	One
930EX Cable Conversion Kits	Three Pairs

960HS 960HS 960CC 960CC 960CC THESE UNITS ARE REMOTE FROM THE RCI 930EX 930EX 930EX 930EX 920FR REMOTE CONTROL INTERFACE 930EX 920FR REMOTE CONTROL INTERFACE 925FR LINE KEYING INTERFACE TRANSCEIVER CN2 TO RADIO $O \cap C$ REMOTE SITE

Figure 38: Multiple Remote Radio Configuration 3

Note: That power additional to that supplied by the standard plug-packs may be required for the configuration shown above. See also the note on the previous page.

Single Operator & Multiple Radio Configurations

Application Description

This diagram illustrates a single operator control of three base or trigger radios in the local control configuration. The 960 Handset or 960 Console may be positioned up to 100 metres from the 935 Local Radio Interfaces. This diagram shows the teaming up of the 960HC Handset and the 960PM Three Channel plinth to provide the operator with the multi channel selection and control.

Parts List		
	1	

960HC Handset	One
960PM Three Channel Plinth	One
935LRI Local Radio Interface	Three



Figure 39: Basic Multiple Local Channel Configuration

Application Description

This diagram illustrates a single operator control of three base or trigger radios in the remote twowire or landline control configuration. The 960 Handset or 960 Console may be positioned up to 100 metres from the 920 Remote Control Interfaces. This diagram shows the teaming up of the 960CC Console and the 960C3 Three-Channel selector to provide the operator with the multiple channel selection and control.

The 920B Base Busy Decoder (installed in the 920FR) and the 925E Base Busy Encoder (installed in the 925FR) are CTCSS sub-audible products that bring the mute or carrier detect of the radio back up the two-wire or landline to provide indication to the operator of the busy channel. The 920VX Vox detector may also be used in place of the sub-audible units.

960CC Console	One
960C3 Three Channel Selector	One
920FR RCI Remote Control Interface	Three
920B Base Busy Decoder	Three
925FR LKI Line Keying Interface	Three
925E Base Busy Encoder	Three



Figure 40: Basic Multiple Remote Channel Configuration

Multiple Operator & Multiple Radio Configurations

Application Description

The diagram on the following page illustrates a multiple operator control of three base or trigger radios in the remote two-wire or landline and local control configuration. The 960 Handset or 960 Console may be positioned up to 100 metres from the 920 Remote Control Interfaces or 935 Local Radio Interfaces. This diagram shows the teaming up of the 960CC Console and the 960C3 Three Channel selector and the 960HC Handset teaming up with the 960PM Three Channel plinth to provide the operators with their multi channel selection and control.

Parts List

960CC Console	Two
960C3 Three Channel Selector	Two
960HC Handset	One
960PM Three Channel Plinth	One
920FR RCI Remote Control Interface	One
920B Base Busy Decoder	One
925FR LKI Line Keying Interface	One
925E Base Busy Encoder	One
935LRI Local Radio Interface	Two

See next page.



Figure 41: Basic Multiple Local and Remote Channel Configuration

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950 Radio Management System

Single Operator & Multiple Radio Configurations

From a small single channel installation through to large multi-channel installations BISS Tech name has become synonymous with Communication Centre control and peripheral equipment. The BISS Tech 950 Radio Management System is an extremely reliable, versatile and cost effective system for small to medium communication centres. It is a modular system that allows for ease of expansion allowing for multiple operators and multiple channels.

Application Description

This diagram illustrates a single operator control of four base or trigger radios in the local or optional remote control configuration. The 960 Console may be positioned up to 100 metres from the 950 Sub-rack. This diagram shows the teaming up of the 960CC Console and the 960SC 6 Channel selector to provide the operator with their multi channel selection and control.

Parts List

960CC Console	One
960SC Channel Selector	One
950DS Dual Selector Interface	One
950CI Channel Interface Card	Four
950SR 3U Sub-rack	One
920B Base Busy Decoder	One
925E Base Busy Encoder	One

Optional (per radio)

920FR Remote Control Interface
925FR Line Keying Interface



Figure 42: Basic 950 Radio Management System

Multiple Operator & Multiple Radio Configurations

Application Description

The diagram on the next page illustrates a multiple operator control of six base or trigger radios in the remote two-wire or landline and local control configuration. The 960 Console may be positioned up to 100 metres from the 950SR sub-rack. This diagram shows the teaming up of the 960CC Console and the 960SC 6 Channel selector to provide the operators with their multi channel selection and control. Radios in local control mode are wired directly to the 950 sub-rack and those radios in remote mode are configured via 920/925 interfaces complete with sub audible base busy encoders and decoders.

Parts List

960CC Console	Three
960SC Channel Selector	Three
950DS Dual Selector Interface	Two
950CI Channel Interface Card	Six
950SR3U Sub-rack	One
920FR Remote Control Interface Tone	Three
920B Base Busy Decoder	Three
925FR Line Keying Interface	Three
925E Base Busy Encoder	Three

See next page.



Figure 43: Multiple Operator System with Local & Remote Control

Radio Management Products & Applications

Application Description

The diagram on the following page illustrates a multiple operator control of twelve base or trigger radios in the local control configuration. The 960 series of consoles may be positioned up to 100 metres from the 950SR sub-rack. This diagram shows the 960CSD, the 960SC12 12-Channel Selector and the 960LC12 Channel Linker – all to provide operators with multi channel selection, control and channel linking capability. Each installed tape monitoring card enables monitoring of up to 6 individual channels of mixed transmit and receive audio, for logging or recording purposes.

Parts List	
960CSD Console	Two
960SC12 Channel Selector 12-Way	Two
960LC12 Link Selector 12-Way	One
950DS Dual Selector Interface	Two
950TM Tape Monitor	Two
950CL Channel Linker	Two
950CI Channel Interface Card	Twelve
950SR 3U Sub-rack	Two

See next page.



Figure 44: 12 Channel Radio Management System with Linking and Tape Monitor

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DX-64 Radio Management System

Glossary of Acronyms

- AFI- Audio Facilities Interface
- AINFC- Audio IN From Console
- AINFL- Audio IN From Line
- AMU- Audio Management Unit
- AOUTC- Audio OUT to Console
- AOUTL- Audio OUT to Line
- DSP- Digital Signal Processor
- DTMF- Dual Tone Multi Frequency
- DX- Digital Switch
- *E&M- Ear and Mouth*
- GUI- Graphical User Interface
- I/O- Input/Output
- ISDN- Integrated Services Digital Network
- LCU- Link Control Unit
- LED Light Emitting Diode
- LIU- Line Interface Unit
- MTBF- Mean Time Between Failures
- NCU- Network Control Unit
- OPR Operator Interface Unit
- PABX- Private Automatic Branch Exchange
- PC- Personal Computer
- PCM- Pulse Coded Modulation
- PTT- Push To Talk
- SCU- System Controller Unit
- Selcal- Selective Calling
- TDM- Time Division Multiplexing
- WAN- Wide Area Network

Features

- > Can control a total of 56 radios with up to 32 operators.
- > Can be used with a PC or non-computer operator interface.
- The user interface can be run under Windows 98 and XP. While the options available on the PC screen can be selected using a mouse, the user interface is designed primarily for use with an embedded touch screen.
- > The DX-64 system can provide channel linking for up to 8 separate groups.
- Each operator can control up to 8 workgroups.
- > The DX-64 features full SELCAL on all channels.
- > 'Rapid Recall' logging is standard with optional tape monitor interfaces.
- Supports Wide Area Networks using E1 interface cards.
- Simple wiring of operator stations, with 10/100-baseT for data and 2-wire for digitised audio.
- > The DX-64 will continue to operate even after computer failure.
- Cards and units of the DX-64 can be inserted and removed without disconnection from the power source.
- Optional redundancy, with auto changeover from the 'Master' System Controller to the 'Slave' System Controller.
- Very compact hardware installation, ie a system handling 32 channels and 16 operators would take up only 7 RU of 19" rack space.
- ➢ Extremely 'cost competitive'.



A 2-Operator 16-channel DX-64 RMS

Figure 45 (2 Operators - 16 Channels)

The diagram above shows two DX-64 Radio Management System workstations connected to a 10/100-BaseT Hub. Each workstation is comprised of an Audio Facilities Interface, a personal computer terminal and a connection to a Line Interface Unit via an Operator Interface and sub-rack unit. The sub-rack unit connects to two Line Interface Units and contains two System Control Units (Master & Slave), one Operator Interface Unit (supporting two operators) and two Tape Monitor Units (8 channels per unit). This configuration enables communication on 16 channels.

Further expansion is achieved through the addition of another sub-rack (with units) and Line Interface Units. See Page 63.

Overview

Analogue to Digital then back to Analogue

The DX-64 Radio Management System is a digital switch that provides an interface between radio operators and radio or line devices. Under microprocessor control audio, in analogue form, is converted to a digital format that can be manipulated through switching and mixing before being converted back to analogue form and transmitted in the normal way.

Channel Capacity

Although there is a maximum of 64 channels (or time periods) available for use, the number of voice channels is limited to 56. This is because a general-purpose radio management system such as the DX-64 must also provide capacity for a means of control and for information. Therefore, of the available 8 channels remaining, 4 will carry control information (PTT) 2 will carry information related to workstation identification and 2 will carry information related to intercom and PA functions.

ST-Bus (2.048Mb Time Division Multiplex)

The system employed is based on the ST 2.048Mb TDM signalling protocol where the 64 channels are contained within 2 serial buses each of 32 channels (time periods). Each *group* of 32 time periods is synchronised with a frame pulse at a frequency of 8kHz and each *individual* time period contains an 8 bit digitised sample of audio. With 32 time periods multiplied by 8 bits of digitised audio and multiplied again by 8kHz frame-sync pulses, the resultant data stream now becomes 2.048Mb. (32 channels * 8 bits * 8kHz).

TDM Data Streams

The DX-64 Radio Management System utilises four TDM data streams:

- 1. Audio in from the line (AINFL)
- 2. Audio out to the line (AOUTL)
- 3. Audio in from the console (AINFC)
- 4. Audio out to the console (AOUTC)

Two data streams are used for LINE audio

- 1. Audio in from the line (AINFL). This data stream carries the received audio from the line and other auxiliary sources via the Line Interface Unit (LIU). Normally, this data stream would be switched to AOUTC to provide audio to the console. With 'Channel Linking' active, channels carrying AINFL can be switched to provide audio out *to* the line (AOUTL).
- 2. Audio out to the line (AOUTL). This data stream carries the transmitted audio via the Line Interface Unit and other auxiliary devices (such as a PA system) out to the line. Normally, this data stream would be switched from AINFC.

Two data streams are used for CONSOLE audio

- 1. Audio out to the console (AOUTC). This data stream carries the received audio (usually AINFL) to be delivered to the console.
- 2. Audio in from the console (AINFC). This data stream carries the transmitted audio from the console to be delivered to the line. Audio such as voice messages and intercom could also be carried on this data stream.

The Graphical User Interface (GUI)

Full control of the DX-64 Radio Management System is through the use of a purpose-written application for the Microsoft WindowsTM operating system that exploits the interface of the GUI and the power of an IBM-compatible PC. This application, with the DX64 Operator Console, can be further enhanced with the flexibility of a touch-screen monitor.

The four main functions that are controlled in this way and which are available to the user are:

- 1. To select Foreground and Background channels, and adjust volume levels
- 2. To display and generate Selcals
- 3. To set up and edit channel link groups
- 4. To patch in an external phone channel

The DX64 Operator Console can be run under Windows 98 and XP. While selection of the options available on the PC screen can be carried out using a mouse, the user interface is designed primarily for use with an embedded touch screen. Communication between the DX64 Operator Console and the DX-64 is via an Ethernet link.

Audio Facilities Interface (AFI)

The Audio Facilities Interface is a device that is separate from the control and signalling functions of the DX-64. This separation of the operator audio functions from the control functions of the PC allows for the continuation of communications in a situation where an operator's PC has failed. As well as providing for the inclusion of a microphone, headset and foot-switch, the AFI also allows for the option of a PC-based 'Rapid Recall' logging facility, with a connection to the sound card of the PC.

The DX-64 and Wide Area Network Capability (WAN)

The DX-64 Radio Management System also provides for WAN capability. This allows for communication centres to operate as hubs. This option is best achieved using an E1 interface card to parse G.703/704 data, allowing third party equipment such as Cisco or J-tec routers to be used, to convert DX-64 data to some other broadband medium such as ISDN and IP. For direct connection between two nodes, E1 links are available for lease from Telstra.

Simplified Maintenance

For ease of maintenance, each card and unit that is part of the DX-64 system provides up-to-theminute indication of status. LEDs positioned on front panels indicate general RUN status and DATA fail conditions (if applicable). Status conditions are also accessible via software options, allowing the System Control Unit to ascertain the status of each device and to transmit this status condition to other workstations or maintenance terminals.

Hot Swap

Cards and units of the DX-64 system can be inserted and removed without disconnecting the system from the power supply. If the removal or insertion of a card or unit is undertaken, the System Control Unit will detect the change in conditions and update the central database. A device recently activated will be initialised automatically by the System Control Unit.

Hot Standby Operation

Key components of the DX-64 system are supported by a 'Hot Standby' facility. The System Control Unit supports 'Hot Standby' through a Master/Slave arrangement and a heartbeat signal.

System Expansion

The DX-64 Radio Management System is expandable by adding sub-racks and Line Interface Units. All outputs are buffered to prevent loading problems.

System Architecture

Main Components

The main components of the DX-64 system are:

- The Audio Facilities Interface (AFI).
- The System Control Unit (SCU).
- The Operator Interface Unit (OPR).
- The Tape Monitor Unit (TMU).
- The Line Interface Unit (LIU).
- The Operator Console (PC application).

Connection to the Workstation

Each operator workstation (Audio Facilities Interface) is connected to the DX-64 system via a 2wire digital audio link to the OPR Unit. This connection is full-duplex ISDN and provides two Pulse Coded Modulated (PCM) audio channels, plus a control channel. The control channel carries an operator's PTT and intercom/PA data. The maximum distance supported by this type of link is about 800m.

Each workstation is also networked with the DX-64 via the PC and a 10/100-BaseT Ethernet hub (10/100Mbits). This link allows an operator to configure non time-critical functions such as system settings, the sending and receiving of Selcals and to report the status of channel interfaces.

The Audio Facilities Interface (AFI)

This device provides an interface to the headset, microphone, foot-switch and front panel PTT button. The device also provides the foreground and background audio for external speakers and allows for a PABX phone extension to be added via a line isolation unit. The AFI transmits audio from an operator (with PTT) *to* the DX-64, while at the same time, receiving foreground and background audio *from* the DX-64. It is not necessary for a physical connection to exist between the AFI and the operator's PC for transmission over the radio network to take place

To provide a 'Rapid Recall' facility, the AFI can also be interfaced to the sound card of an operator's PC.

The System Control Unit (SCU)

This device performs three main functions:

- 1. It provides the Transmission Control Protocol/Internet Protocol (TCP/IP) interface between the DX-64 and an operator's workstation.
- 2. It performs channel linking and digital 'cross switching'.
- 3. It controls the operation and monitors the status of other DX-64 devices.

The SCU also supports 'Hot Standby' utilising a Master/Slave arrangement. The DX-64 sub-rack contains two System Control Units with the Master SCU as the default controller. However, if the Slave SCU detects that the Master has failed (after a set period of time) it will take control of the DX-64 until the master recovers.

Data shadowing between the two units is achieved via background serial link that is embedded into the sub-rack.

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The Operator Interface Unit (OPR)

The OPR provides the full-duplex audio connection between the DX-64 and an operator's workstation. Utilising an on-board Digital Signal Processor (DSP) it performs audio mixing and level adjustment for the Foreground and Background audio groups. Each unit supports two operator positions.

The Tape Monitor Unit (TMU)

The Tape Monitor Unit provides outputs for 8 "Line Side" channels. The channels can be selected from any two AINFL and AOUTL data streams. The unit contains a microprocessor for the control of Codec procedure (digital to analogue conversion) and a digital cross-point switch, utilised for the purpose of channel selection and to select between Mute and PTT functions.

The Line Interface Unit (LIU)

The LIU is a special version of the 619 Intelligent Audio Bridge MkII and provides the same signal conditioning and isolation that is provided by that device. It provides also, the multi-channel Selcal decode/encode and DTMF encode functions. The LIU is a separate board within the confines of the unit and provides a 4-wire, plus E (Ear) and M (Mouth) interface between 8 local radios and the DX-64 Radio Management System.

The LIU provides two additional main functions:

- 1. The Conversion between PCM data on the DX-64 TDM bus and analogue audio on the line ports.
- 2. The generation of radio PTT signals from the TDM bus and the insertion of a radio's Mute status onto that bus.

The diagram below shows the Audio Facilities Interface (front and rear panels).



DX-64 Radio Management System (further expansion)

With the addition of a distribution panel, multiple Line Interface Units can be connected in parallel to the DX-64 system.

See the next page for a diagram showing a configuration that enables four operators to communicate on 32 channels.

A 4-Operator 32-channel DX-64 RMS



Figure 46 (4 Operators - 32 Channels)

Operation

Transmitting to Line

When the operator presses the PTT switch (attached to the AFI):

- Audio from the microphone/headset input is enabled onto the first 'B' channel of the ISDN link and the PTT bit is set in the 'D' channel.
- The OPR detects this and generates a transmission request to the SCU by connection the audio from the 'B' channel to a pre-allocated slot in the AINFC stream and setting a PTT flag.
- The LCU in the System Controller Unit, on detecting the PTT request, checks the status of the 'selected' Foreground channels. For the channels that are free, it connects the AINFC PCM audio to each of the voice channel slots in the AOUTL stream and activates the relevant bits in the PTT slots.
- This is detected by the associated LIUs, which convert the PCM data to an analog voice signal that is then sent to the 4-wire E&M ports.

Transmitting to the PABX Extension (local connection to the AFI)

In the absence of PTT and when the telephone line is 'off-hook', the microphone/headset input is always directly connected to the PABX extension.

Receiving 'Radio' Audio

The OPR continuously monitors the Mute slots in the AOUTC stream. When a Mute is detected:

- The OPR checks the status of the 'monitor' and 'selected' settings against the active mutes. For matching channels, it builds a mixing command for the DSP. This tells the DSP which voice channels should be mixed together in the foreground and background groups.
- The DSP mixes the voice channels, according to specified levels, and sends these through the 'B' channels of the ISDN link.
- The mixed foreground and background channels are picked up in the AFI and played through the headset or external speakers.

Receiving 'Telephone' Audio

When the telephone line is 'off-hook', received telephone audio is transmitted to the OPR via the second 'B' channel in the ISDN link. The OPR mixes the telephone audio with other audio sources, taking into account radio/telephone priorities, and re-transmits it to the AFI in the foreground channel. The audio can then be heard in the headset or speakers as normal.

Sending a Selcal

Any operator using the DX64 Operator Console can initiate a Selcal:

- ▶ The operator enters the Selcal string to send and selects the '*Send Call*' button on the display.
- A message is sent to the DX-64 via the network and is decoded by the SCU.
- > The SCU, in turn, issues a command to each LIU that is associated with the 'selected' channels.
- ➢ Each LIU generates the Selcal tone sequence and provides a status report for the SCU. If any channel is busy at the time of the request then that channel is excluded from the transmission.
- Selcals can also be sent using a "speed-dial" facility.

Receiving Selcals

Received Selcals are broadcast to all operators. The LIU delivers received calls to the SCU, which forwards this information to all DX64 Operator Consoles via the network. Each DX64 Operator Console may display or discard the Selcal as required (depending on Selcal settings).

Received Selcals are displayed in an on-screen queue.

Channel Workgroup Settings

An operator may set-up the 'monitored' (Background) audio group and the 'selected' (Foreground) audio group using the DX64 Operator Console. Whenever channels are added to or removed from either of these two groups, a message is sent to the SCU via the network. The SCU updates its database of non-volatile settings and then relays the new information to the operator's OPR.

Up to eight workgroups can be created within the DX64 Operator Console. However, only two workgroups can be set active at any one time: one for Foreground and one for Background.

Linking Operation

An operator may set-up several link groups using the DX64 Operator Console. Whenever a link group is modified, a message is sent to the SCU via the network. The SCU then updates its database of non-volatile settings.

Channel linking between voice channels is performed automatically by the 'Link Control' function of the SCU. When channels are linked, a Mute on one channel will cause a PTT transmission on all other channels in the link group. Linking is done on a "First-in-First-Served" basis. Therefore, all other "linkable" Mutes are ignored until the first Mute deactivates.

Telephone Patching

Using a third party Telephone Interconnect Panel, a communications channel can be established between a telephone line and another voice channel or an operator. It is a requirement that the telephone channel be allocated to one of the LIU ports and physically connected to that port.

To patch a telephone channel to an operator:

- The operator activates the required telephone channel using the DX64 Operator Console. This sends a message to the SCU via the network.
- The SCU commands the appropriate LIU to take the telephone 'off-hook' by sending a DTMF tone sequence.
- Once the line is 'off-hook', an operator can dial the desired telephone number or use a "speed dial" facility.
- The operator is then able to talk to the telephone party using the standard PTT control. Whilst the patch is active, the telephone channel becomes part of the 'selected' audio group.
- > Incoming calls can also be accepted by connecting to the appropriate phone channel.

To patch a telephone channel to another radio channel:

- ➢ First, follow the previous steps for operator patching.
- > Then add the telephone channel to one of the link groups, as in normal linking.

Level Adjustments

The level of the 'monitored' and 'selected' audio groups to an operator can be adjusted using the DX64 Operator Console. When the operator adjusts either level the following occurs:

- A message is sent to the SCU via the network.
- The SCU updates its database of non-volatile settings and then relays the new audio level setting to the operator's OPR.
- > The DSP will automatically use the new level setting when mixing received audio.

The DX-64 Operator console

The DX64 Operator Console enables a user to control and monitor the DX-64 Radio Management System.

Four main functions are provided:

- 1. Select Foreground and Background channels and adjust volume levels
- 2. Display and generate Selcals.
- 3. Set-up and edit channel link groups
- 4. Access external telephone channels.

The program is designed to run under Windows 98 and XP. Communication between the program and the DX-64 is via the network only. Whilst operation with a mouse and keyboard is supported, the user interface is designed primarily for use with a touch-screen.

The option for PC-based 'Rapid Recall' logging requires an audio connection between the AFI and the sound card of the PC workstation.

Additional facilities include the ability to perform AMU-like functions:

- Select TV or AM/FM music.
- Set the audio priority of the local PABX extension relative to the radio.
- Activate 'Rapid Recall' logging.
- Playback a portion of a 'Rapid Recall' recording.

Logging in at 'Operator' level

Touching the 'Key Board' button will activate the touch-screen keyboard. At the prompt type in the operator's user name followed by the operator's PIN number and the AFI identity number, then touch the 'Login' button. Alternatively use the computer's mouse and keyboard to navigate the screen.

	System L Username:	ogin	
Touch the 'Keyboard' button	PIN: ****	AFI ID:	Touch th 'Login' button
	Roy Bount	Login	•

After logging in the following screen will appear. To reveal the buttons hidden by the 'Channel Status' window, touch the 'Minimise Window' Icon (see below).

Note that all screens shown on this page and on the following pages are examples only.

			08:37	:01 07/0	e/2003 O	perator: OPI	RATOR	AFII 5		omation
		Work Groups					Telephone			
	fore	Metro	Metro	Metro	Metro	(INC.	D-MERCE NU	1011000	AN INCOME.	Hold
	Back	North	East	South	West	Line 1	Live 2	Line 3	HOLINE	Park
	Ground	Hills	free	South	North	ne Line S	tine 6	10	Treet	Speed Dial
	F Aboy	s Alert Marst	Channel	Status			Janua Rowrig	Solo	al Cup	Clear Baro
Touch here to minimise this window	Warnek Trebalo	k toka a karina	d	ter			Cost Tek		Down	XIN
	L	_		_	/	×	RoCal	d .	Setoal	Speed Dial

Once the 'Channel Status' window is minimised the 'Audio Levels' and 'System' buttons are revealed.

Description of options available at 'Operator' level

		08:50:23 0	7/08/2003	Operators O	OPERATOR	AFI: 5		omnibonic
	Wor	k Groups			1	elephone		
Fon: Ground	Asatro North	Malera Level Stat	ro Metro th West	ia Line	Line 2	m Line 3	United 4	Hold
Beck Ground	HILLS	Freo Sou	th North	Line :	Line G	SC LIPH	NULINE 1 I OLO - SI	Speed
Lev	els		System			Selca		
		Lib Merit	a/6	AL-	Operation	to the	цр	Clase Item
	-	Recall	Recall a	orstine.	i in the s	-	Down	Xfer
	Monitor	Priority	Priority P	thane nority	Const Consta			
ONe Master	Mute	NO MUNIC	TV A	M/FM Nable	ReCall		Selcal	Speed Diel

Button Colours:

Buttons with text that is 'greyed out' are either unavailable at this level of access or do not have 'Work Groups' or 'Telephone' lines allocated to them.

Those that are coloured GREEN have at least one channel that is in receive mode (Mute).

Those Coloured RED have at least one channel that is in transmit mode (PTT).

Buttons coloured ORANGE relate to telephone activity only and indicate that the line is in use by another operator.

Workgroups

Available are: 8 x Radio Groups 8 x Telephone Groups



Touch the 'Fore Ground' button followed by a workgroup button to chose the workgroup required to provide foreground audio. Do likewise to chose a group to provide background audio.

Any workgroup can be made the foreground group using the 'Fore Ground' button. PTT occurs only on the foreground group. Any other group can be set for background monitoring using the 'Back Ground' button. All other enabled groups are removed from the foreground and background audio monitoring. If a group is already selected then it becomes de-selected (toggles). Selecting a particular workgroup will display a pop-up window similar to the one shown below.

Note that pop-up windows can be moved to all parts of the main screen by touching any point in the window (except on a command button and the 'Close Window' Icon (X)) and moving the window to the desired spot on the main screen. Certain windows can also be re-sized in the same way.

To set up a workgroup choose the required channels for the group and touch the 'Apply' button. Note: If (after making changes to a workgroup selection) this window is closed before the 'Apply' button is touched the selection will not be saved.



To remove a channel (or a group of channels) from the workgroup select the channel or channels to be removed and touch the 'Apply' button. To remove all channels from the group, touch the 'Clear All' button. Repeatedly touching on a channel button will toggle channel selection.

The 'Over Write' button

The 'Over Write' button is available in the 'Foreground Monitor' window only (it is 'greyed out' in the 'Background Monitor' window).



To chose a channel (or channels) to overwrite the original channels chosen in the 'Foreground Monitor' window, touch the 'Over Write' button followed by the channels to be in use in the 'Overwrite' window and touch the 'Apply' button.

This feature allows for a <u>temporary</u> setup of channels in use without affecting the channels setup in the 'Foreground Monitor' window.

Radio Management Products & Applications

If a channel is reserved and therefore unavailable for selection the following warning will be displayed. A channel can be reserved for a telephone line or for entertainment audio.



Audio Levels



Foreground and background audio levels can be set to the levels desired (or muted) by the action of moving the slider controls to the required positions in the 'Audio Levels' pop-up window.

The 'Master' slider control in the 'Levels' window has overall control of all levels set in the 'Audio Levels' pop-up window (as does the 'Mute' button). In the example above the 'Master' control is set at 75% of maximum audio level, therefore the levels set in the pop-up window will be adjusted to 75% of the levels set in that window. Touch the 'Mute' button to mute all audio.

System Window



The 'System' window contains three buttons that are 'greyed out' at operator level. These are the 'Links Menu', System Control' and 'System Setup' buttons.

Rapid Recall Audio

Audio is recorded whenever it is being sent and received (for the period set in 'System Setup'). If audio is present and the period for recording is set at 45 seconds, but the audio continues for longer, only the last 45 seconds of that transmission will be recorded. For messages that are shorter than the period set in 'System Setup' the complete message will be recorded.

To listen to a recorded message touch the 'Recall' button. To resume recording of audio at any time (even while listening to audio recorded earlier) touch the 'Recall Resume' button.

The Selcal window



Sending Selcals

Type the Selcal number in the 'Selective Call' window and touch the 'Send' button. Or select the location to call from the list in the 'Selcal Speed Dial' window.

The Telephone Window



The 'Telephone Speed Dial' Window



Making a Telephone call

Type the telephone number in the 'Line' window and touch the 'Send' button. Or select the location to call from the list in the 'Telephone Speed Dial' window.

Hold

Touch the 'Hold' button followed by a 'Line' button to hold a call. To take a call off hold, touch the 'Line' button only. A call that is put on hold by an operator can be taken by that operator only - another operator cannot take that call. Music may be played to a caller on hold.

Park

Touch the 'Park' button to park a call. A call that is 'parked' may be taken by any operator that is available to take the call.
Logging in at 'Supervisor' level

For a complete understanding of the options available at Supervisor level it is essential that before reading this section, the section titled 'Logging in at 'Operator' level' is read.

There are two extra control buttons available at 'Supervisor' level



The 'Linker' Menu

Touching a "Group" button will show the channels that are linked in that group.

To Add/Remove Channels

- Select the linker group.
- Touch the 'Clear' button to remove all channels from a link group.
- Touching each channel will toggle the selection.
- Touch the 'Apply' button to complete the operation and save the channel allocation of the link group.

The 'System Control' Menu

Enables a supervisor to disconnect a line that may be locked to a particular console user. For example, in a situation where a line was in use when a system crashed the line would be unavailable for use again unless it was manually disconnected in this way.

Logging in at 'Administrator' level

For a complete understanding of the options available at Administrator level it is essential that before reading this section, the section titled 'Logging in at 'Operator' level' and at 'Supervisor level is read.

There is one extra control button available at 'Administrator' level



The 'System Setup' Menu

The 'CFG' Button

To locate the 'System Configuration File' touch the 'CFG' button to reveal the familiar WindowsTM 'File Open' pop-up window and select the file to be loaded.

The 'Query' Button

Touch the 'Query' button to reveal information about current users and PIN numbers.

Add & Remove Users

To add users, first <u>select the user 'Access Rights'</u>. In the 'Username' box type the user name and (in the PIN box) the PIN number to be added to the user list and touch the 'Add' button. To remove a user, first touch the 'Query' button to reveal the list of current users and note the user name and PIN number to be removed. Type the user name and PIN number in the boxes provided and touch the 'Del' button.

Rapid Recall Audio Source

The PC's 'Line In' is the preferred recording source for rapid recall logging, however not all systems have a 'Line In' (eg. some laptops). In this case there would typically be a 'Microphone' input. Select the recording source that is appropriate for the system.

Rapid Recall Recording

The 'Rapid Recall' recording period can be set between 15 and 60 seconds.

The 'Rapid Recall' slider controls set the level of record and playback audio saved to the PC sound card.

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619 Series of Audio Bridges

BISS Tech customers have commented that the 619 Series of Audio Bridges has been one of our most creative and useful products. The applications are endless however its primary function is for the combining and linking of repeaters, links and other audio sources at remote sites. Three versions are available from the 619GI with four ports, the 619EI with six ports to the 619IAB with six ports and a fully configurable intelligent matrix controller.

Each of the bridge ports is provided with four-wire plus E & M to meet industry standards. Each four-wire port is balanced 600-ohm transformer coupled. The E & M facilities can be configured for relay or opto isolated input and output or link selectable pull up or pull down for easy connection to the particular brand of product being interfaced.

The 619IAB with the intelligent matrix controller, allows network operators many features such as DTMF encode and decode, CTCSS encode and decode, fast key-up of multi-hop repeater links and heartbeat pulses for voting networks. The list of features goes on.

Each model of the 619 Bridge is housed in a 1RU 19" rack-mounting format. The front of the bridge has channel activity indicators, level indicator and level adjustment. The level adjustment controls are behind a security panel to deter unauthorised and accidental changes to a network setup.

FEATURES	619GI	619EI	619IAB
Balanced Inputs / Outputs	Yes	Yes	Yes
Front Panel Audio Adjustments	Yes	Yes	Yes
Diagnostic / Set up LED's	Yes	Yes	Yes
Mute Disable Facility	Yes	Yes	Yes
Number of Independent Ports	4	6	6
Remote Controllable	No	Yes	Yes
Wide Input / Output Level Range	Yes	Yes	Yes
E&M Options	Yes	Yes	Yes
E&M Status LED's	Yes	Yes	Yes
On Board V23 Modem	No	No	Yes
Remote Programmable Software	No	No	Yes
CTCSS Decode Encode Function	No	No	Yes
RS232/485 DTE Communications	No	No	Yes
DTMF Capability	No	No	Yes
Opto Isolated Digital Inputs	No	No	Yes
Real Time Clock	No	No	Yes
8 Bit Processor	No	No	Yes
Flash Memory	No	No	Yes
Heartbeat Voting	No	No	Yes
On Board Tone Generator	No	No	Yes

Application Description

The system below illustrates a typical repeater site with one repeater and a link connected via a 619GI Audio Bridge. This simple configuration is the bread and butter of the audio bridge.

Parts List

619GI Audio Bridge 4-Way	One
Repeater	One
Link	One



619GI Audio Bridge DIP switch settings

Project Description	Audio Bridge Input port No.				
Linker	I/P Port 1		On		
Repeater	I/P port 2	On	On		
	I/P Port 3				
	I/P Port 4				
		O/P Port 1	O/P Port 2	O/P Port 3	O/P Port 4

Figure 47: Basic Link & Repeater Site Installation using a 619GI audio Bridge

Application Description

The system below illustrates a typical repeater site with three repeaters and one link connected via a 619 EI Audio Bridge. The site has a local handset connected to the system.

Parts List





See the next page for Audio Bridge DIP switch settings

Project Description	Audio Bridge Input port No.						
Link	I/P Port 1		On	On	On	On	
Repeater	I/P Port 2	On	On				
Handset	I/P Port 3	On					
Repeater	I/P Port 4	On			On		
Repeater	I/P Port 5	On				On	
	I/P Port 6						
		O/P Port					
		1	2	3	4	5	6

619EI Audio Bridge DIP switch settings

Figure 48: 619EI Link & Multiple Repeater Combination with Local Handset Control

Application Description

The system below illustrates a typical repeater site with two repeaters and two links connected via a 619GI Audio Bridge.

Parts List

619GI Audio Bridge 4-WayOneRepeaterTwoLinkTwo



619GI Audio Bridge DIP switch settings

Project Description	Audio Bridge Input port No.				
Link 1	I/P Port 1				On
Link 2	I/P port 2			On	
Repeater 1	I/P Port 3			On	
Repeater 2	I/P Port 4				On
		O/P Port 1	O/P Port 2	O/P Port 3	O/P Port 4

Figure 49: 619GI Multiple Link & Repeater Combination

Application Description

The system below illustrates a typical repeater site with four repeaters and one link connected via a 619EI Audio Bridge c/w remote.

Parts List

619EI Audio Bridge 6-Way	One
Repeater	Four
Link	One
External Decoder	One



619EI Audio Bridge DIP switch settings

Project Description	Audio Bridge Input port No.						
Link 1	I/P Port 1		On	On	On	On	
Repeater (East)	I/P Port 2	On	On				
Repeater (North)	I/P Port 3	On					
Repeater (West)	I/P Port 4	On			On		
Repeater (South)	I/P Port 5	On				On	
	I/P Port 6						
		O/P Port					
		1	2	3	4	5	6

Figure 50: 619EI Link & Multiple Repeater Combination

619 Intelligent Audio Bridge

The configuration of the 619 Intelligent Audio Bridge can be changed even while the system is operational. This is done through software control via a Windows based programming utility.

Up to eight software configurations are programmable by the user. Once configured, six of these 'maps' can be selected dynamically on reception of a digital input, or on reception of a CTCSS tone, or when instructed to by an operator using DTMF signalling.

Fast CTCSS keying is a function that allows for immediate PTT on reception of a Mute signal. Fast CTCSS mode provides a level of protection against the effects of unwanted and spurious signals.

Using DTMF transmission the 'System Split' function allows for a change in the default set-up, from a 'Primary' to a 'Secondary' configuration. Changes to configuration settings 1 to 4 can also be made via DTMF remote transmission.

The 'Heartbeat/Voting' facility allows for the scheduling of specific periods of the day (24Hr clock) together with configurable parameters such as frequency, duration and repeat interval.

Each port has fully adjustable PTT out 'hold' periods.

Each port has fully adjustable PTT 'lead-in' delay periods.

CTCSS is easily generated on port outputs according to the configurations that are set – or with reference to an incoming CTCSS signal.

By selecting any one of three modes available, each of the two relays located within the Bridge may be configured by the user.

DTMF commands can control various functions within the Bridge.

The Intelligent Audio Bridge also provides for telemetry protocol based communications. This ability to 'talk' directly with the BISS Tech range of Argus telemetry products offers the option of using a single Bridge or group of bridges to be integrated into a telemetry system of great complexity.

All local and remote configuration of 619 Intelligent Audio bridges is easily achieved using a Windows application. All bridge 'mapping', setting of time periods and tone processing can be read, modified and re-written to a selected bridge and settings saved to disk and retrieved in the usual way.

Programming the 619 Intelligent audio Bridge can be carried out, either directly via a RS232 connection between a laptop or desktop PC and the bridge, or by remote programming via a GSM or radio modem.



Features

The 619 Intelligent Audio Bridge is a six-port audio-switching matrix, which incorporates a variety of signal processing and control techniques, and is user configurable through software control. This document describes how to install and set up the device, and how to perform remote control and monitoring operations.

Key Hardware Features

- # A CTCSS (Continuous Tone Controlled Squelch System) decoder supporting 42 commonly used frequencies.
- # Separate CTCSS inputs to each port.
- # Dual CTCSS encoders supporting 42 commonly used frequencies.
- # Separate CTCSS outputs from each port.
- # RS-232 / 485 DTE (Data Terminal Equipment) communications.
- # V23 modem for data communications over the radio.
- # DTMF (Dual Tone Multi Frequency) remote control capability.
- # Opto-isolated digital inputs.
- # Dual analogue inputs.
- # Dual relay outputs with changeover contacts.
- # Real-time clock.
- # 8-bit low power microprocessor with Flash memory.
- # Tone generator.

Key Software features

The configuration of the 619 Intelligent Audio Bridge can be changed even while the system is operational. This is done through software control, via a Windows based programming utility.

- Up to 8 software configurations are programmable by the user. Once configured, six of these maps can be selected dynamically on reception of a digital input, or on reception of a CTCSS tone, or when instructed to by an operator using DTMF signalling
- Fast CTCSS keying is a facility that allows for immediate PTT on reception of a Mute signal. Fast CTCSS mode provides a level of protection against the effects of unwanted and spurious signals.
- Using DTMF transmission the "System Split" function allows for a change in the default set-up, from a Primary to a Secondary configuration. Changes to the configuration settings 1 to 4 can also be made via DTMF remote transmission.
- The Heartbeat/Voting facility allows for the scheduling for specific periods of the day (24Hr clock) together with configurable parameters such as frequency, duration and repeat interval.
- Each port has fully adjustable PTT-Out "hold" periods.
- > Each port has fully adjustable PTT Lead-in "delay" periods.
- CTCSS can easily be generated on port outputs according to the configurations set, or with reference to an incoming CTCSS signal.
- The user can configure each of the two relays located within the Audio Bridge, by selecting any one of the three modes available.
- > DTMF commands can be used to control various functions within the Audio Bridge.
- The Intelligent Audio Bridge provides for telemetry protocol based communications. This ability to "talk" directly to the BISS Tech Argus telemetry system offers the option of using a single bridge or a group of bridges to be integrated into a telemetry system, thus providing for the monitoring of a base station and remote control of sites and equipment.
- All local or remote Audio Bridge configuration is easily achieved using a Windows application, with a familiar Windows screen presentation. All Audio Bridge "mapping", the setting of time periods and tone processing can be read, modified and re-written to the selected bridge. The resultant data can also be saved and retrieved as a file in the usual way.
- Programming of the Audio Bridge can be carried out either directly using a RS-232 connection between a laptop or desktop computer and the Bridge, or by remote programming using a GSM modem or a radio modem.

Operation overview

Micro-controller

The 619IAB combines the versatility of the 619 series 6-way audio bridge, with on-board Motorola Microprocessor control. The block diagram best illustrates the essential elements of the bridge. The embedded micro-controller now allows for dynamic configuration of the 6x6 matrix and is therefore able to generate PTTs according to certain criteria.



The micro-controller makes use of data and signals from several sources

- # Mute inputs from the line audio ports.
- # DTMF and V.23 tones, also from the line audio ports.
- # Digital and analog CTCSS signals from separate sources.
- # RS-232 or RS-485 connection for control and monitoring.
- # Time of day from a real-time clock (with battery backup).

In addition to having the capability to generate separate CTCSS output tones, the micro-controller can also generate the following signals back into the matrix.

- # DTMF response tones.
- # V.23 telemetry tones.
- # Heartbeat/Voting tones.
- # PTT control for the line audio ports.

By routing the Mute inputs via the micro-controller, rather than directly to the Bridge matrix, the PTT outputs at each port are set according to the software configuration.

CTCSS encode/decode

Encode/decode

As shown in the diagram below, the CTCSS decode and encode functions are supported using separate input and output signals.



The micro-controller can accept and work with both digital and audio CTCSS signals. The selection of the type of signal to be processed is made through a combination of on-board links and software set-up. *See 'Hardware Set-up' for information on the positioning of on-board links*.

Received CTCSS audio is summed from switched input sources and fed into a predictive decoder. Transmitted CTCSS audio is generated by two separate encoders. Each decoder output can be selected during a PTT output cycle.

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9412 Audio Management Unit

9412 Audio Management Unit

The BISS Tech 9412 Audio Management Unit is a versatile audio operator interface. It is intuitive in operation and significantly contributes to operator efficiency and comfort. Audio sources from both the mobile radio(s) and PABX are integrated into the system and can be selected individually by the operator.

A single interface manages the foot-switch; telephone (PABX line); radio control systems such as the BISS Tech 950 Series or a stand alone mobile radio; auxiliary audio channel (turnout); public address system; AM/FM radio audio (music); television audio (music); continuous loggers and rapid recall loggers.

The 9412 supports standard 4W, E&M audio channels and 4W PABX line extensions via a line isolation unit. The 9412 Audio Management Unit is fully compatible with the BISS Tech 950 Radio Management System.

9412AMU Specifications

FEATURES	9412 AMU
Automatic Foreground / Background Audio Switching	Yes
Automatic Connection of Background Music	Yes
Dual Headset & Headset Disconnection Safety Mode	Yes
Common Footswitch Facility	Yes
Supports Rapid & Continuous Loggers	Yes
Audio Compressors on Telephone & Microphone Inputs	Yes
Vox capability on Telephone & Radio Inputs	Yes
Bar Graph Audio Level Meter	Yes

Application Description

Typically the 9412AMU is utilised in the busy communications centre. Originally designed for the busy Emergency Services call centre it is now found a home wherever telephone audio and radio audio integration is a key requirement. The 9412AMU is available as either a stand alone unit or is easily added to a number of our expanding range of radio communication consoles.





PS915 24 to 12 Volt Isolated Converter

PS915 24 to 12 Volt Isolated Converter

The unique PS915 24 to 12 Volt Isolated Converter is the perfect solution for hard electrical and physical environments encountered in vehicles and radio huts. Unlike linear supplies, the output of the PS915 'Switched Mode' power supply is completely isolated from the input via a transformer and opto-isolator. This ensures that under no circumstance is it possible to have the 24Vdc input connected directly to the output.



Figure 52: PS915 DC/DC Converter Basic Application

Common Industry User Groups

The following list outlines common user groups of the BISS Tech range of simple radio peripherals to the large communication centre control systems. This list, although quite comprehensive, is in no way complete. Many thousands of the applications that have been outlined in this document are currently operating worldwide.

Aviation

- Aviation Authorities
- Airline Companies

Broadcast Media

- Television & Radio Stations
- Radio Network Providers
- Telephony Network Providers

Education

Schools of Distance Education

Emergency Services

- > Ambulance
- Bush Fire Services
- Country Fire Authorities
- Fire Brigades
- Police Services
- Emergency Services Authorities
- State Emergency Services
- Civil Defence
- Air Ambulance
- Surf Lifesaving

Event Management

- > Major events
- Motor Racing
- Major Sporting Events

Government

- State Forestry
- Local Councils
- Justice Departments
- Correctional Services
- Natural Resources & Environment
- > Departments for Education & Children Services
- Departments of Transport
- Marine Services Departments
- ➢ Railways
- > Defence
- Health Authorities
- Postal Services

Manufacturing

- Sugar Mills
- Industrial Automation
- Plastics Manufacturing
- Dairy Processors

Marine

- Ports Corporations
- Charter Operators
- Trawler Fleet Operators

Mining

- Diamond Mines
- ➢ Goal Mines
- ➢ Iron Ore Mines
- ➢ Gold Mines
- Copper Mines
- Flow Measurement Controllers

Petroleum

- ➢ Refineries
- Drilling Platforms
- Process Control

Primary Industry

- > Irrigation
- ➤ Farming

Security Services

- Major Command Centres
- Remote Site Alarm Monitoring

Transport

- Taxi Communications Centres
- Courier Company Communication Centres
- Bus Companies
- Tram Companies
- Railways
- Major Transport Companies
- Limousines

Utilities

- Electricity Generating Authorities
- Electricity Distribution Authorities
- Gas Generating Authorities
- Gas Distribution Authorities
- Water & Sewerage Authorities

Radio Communication

There are three different variations within the BISS Tech Radio Communications Management product range, with the key definition being on the number of radio channels to be monitored and the number of operators requiring access to the monitored channels.

→ BISS Tech Range of Handset and Console Systems ≤ 3 Radio Channels to be monitored by an operator or multiple operators

- Regional Airlines
- Bush Fire Units
- Small Manufacturing Facilities
- > Farming
- \succ Hospitals
- Local Councils
- Regional Ambulance Services
- Small Transport Companies

- Surf Life Saving Clubs
- Television & Radio Stations
- Charter Operators
- Trawler Operators
- > Timber Mills
- Small Regional Taxi Operators
- Small Regional Courier Companies

→ BISS Tech 950 Radio Management System ≥ 4 Radio Channels to be monitored by an operator or multiple operators

- Aviation Authorities
- Medium sized Airlines
- Civil Defence
- Country Fire Authorities
- State Emergency Services
- Air Ambulance Services
- Local Councils
- Major Sporting Events
- Motor Racing Events
- Government Buildings
- State Forestry Departments
- Natural Resources & Environment
- Marine Services Departments
- Railways

- Regional Police Services
- > Defence
- Postal Services
- Smaller Port Authorities
- Taxi Companies
- Security Command Centres
- Courier Companies
- Limousines
- Regional Electricity Authorities
- > Sugar Mills
- Timber Mills
- ➢ Gas Generating Authorities
- Gas Distribution Authorities

DX-64 Radio Management System

A recent addition to BISS Tech range of products is the DX-64 Radio management System. The DX-64 is an extremely versatile radio management system that is proving to be the flagship of BISS Tech products.

The DX-64 is capable of control of 56 radio channels with up to 32 operators. It can be used with a PC or non-computer interface. Channel linking for up to 8 separate groups is provided with each operator controlling up to 8 workgroups. Full Selcal on all channels and Rapid Recall logging are standard features of the DX-64, as are features such as 'Hot Swap' where cards and units can be inserted and removed without disconnection from the power source and 'Hot Standby' operation through a Master/Slave arrangement and 'Heartbeat' function

The versatility of the DX-64 lies in the abundant variations of software configurations possible with this product. In short, the DX-64 will do whatever you want it to do.

619 Series of Audio Bridges

BISS Tech customers have commented that the 619 Series of Audio Bridges has been one of our most creative and useful products. The applications are endless however its primary function is for the combining and linking of repeaters, links and other audio sources at remote sites. Three versions are available from the 619GI with four ports, the 619EI with six ports to the 619IAB with six ports and a fully configurable intelligent matrix controller.

- Aviation Authorities
- Broadcasters
- Telephony Network Providers
- PMR Radio Network Providers
- Trunk Radio Network Providers
- Emergency Services Authorities
- Police Radio Network Providers
- Defence
- Railways
- Marine Services
- Ports Corporations
- Mining Companies
- Electricity Generating Authorities
- Electricity Distribution Authorities
- Gas Generating Authorities
- Gas distribution Authorities
- Paging Networks

9412 Audio Management Unit

The BISS Tech Audio Management is a versatile audio operator interface. It is intuitive in operation and significantly contributes to operator efficiency and comfort. Audio sources from both the mobile radio(s) and PABX are integrated into the system and can be selected individually by the operator.

- Ambulance Services
- ➢ Fire Services
- Police Services
- Civil Defence
- State Emergency Services
- Local Councils
- Railways
- Security Major Command Centres
- Taxi Communications Centres

Telemetry

BISS Tech and telemetry go back to the very early eighties when BISS Tech pioneered the development of radio telemetry and computer aided dispatch (CAD) systems for other companies. Today we have hundreds of operating systems in diverse applications throughout Australia and overseas. Telemetry is continuing to have major focus within BISS Tech and the development of the Argus range is another step reflecting our support and direction with this line.

- ➢ Aviation Authorities
- ➢ Television & Radio Stations
- > Telephony Network Providers
- Radio Network Providers
- Emergency Services Authorities
- ≻ Forestry
- ► Natural Resources & Environment
- Marine Services Departments
- ➢ Railways
- ► Local Councils
- ≻ Sugar Mills
- Manufacturing Automation
- Ports Corporations
- ≻ Mining
- ➢ Refineries
- Drilling Platforms
- Process Control
- Flow Measurement Controllers
- ➤ Irrigation
- > Agriculture
- ► Remote Site Alarm Monitoring
- Electricity Generating Authorities
- Electricity Distribution Authorities
- ➢ Gas Generating Authorities
- Gas Distribution Authorities
- ➢ Water & Sewerage Authorities

Innovative Electronic Solutions

Many years of experience, combined with engineering innovation, have enabled BISS Tech to transform ideas into products now distributed throughout Australia and the world. The strength of an idea and specific marketplace knowledge, amalgamated with our own comprehensive engineering expertise, has proved to be an impressive combination in producing world class solutions. Below are just some of the many ideas that have been designed, developed and manufactured by BISS Tech on behalf of a growing list of satisfied clients into commercial products.

- Chemical Fume Head Controllers
- Remote Control of Underground Mining Machinery
- Hub Controllers for Paging Networks
- Suburban Train Door Monitoring & Control Systems
- Ambulance Control Panels
- Amusement Arcade Laser Tag Game
- Railway Maintenance Rail Alignment Wagons
- Crane Collision Detection System

BISS Tech continues to manufacture a wide variety of products, from simple printed circuit board units to ready to sell packaged systems. We are committed to the continual improvement of both our products and our operations. Customer feedback on any aspect of our operation is always appreciated and listened to. Please take the time to make contact and comment on our range of products and services.