
A. W. Communication Systems Limited

DRCip (DRAFT)

Desktop Radio Controller for use with Analogue and IP Radio Systems

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Summary:

This document contains the specification for, and describes configuration and usage of, the *DRCip* desktop radio controller.

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1. Introduction

The DRCip desktop radio controller is housed within an ergonomically designed compact and robust case with a vertically oriented 7-inch LCD touch screen, complete with a telephone-style handset and external power supply unit.

Based on a Linux operating system the DRCip is a powerful and unique communications controller. The unit will act as a desktop controller to the AWCSL TRICX IP-based communications switch, or directly control radio systems via 4-wire line or connected to a TRip unit.

Interface to the DRCip is via connectors found in a single row at the back of the case, thus permitting tidy and concealed wiring using the designed cable strain relief to the back of the unit. The front panel has five tactile push buttons and a touch screen interface.

All of these features are only possible with the DSP technology employed within the DRCip, which can accommodate customer-specific requirements with the minimum of disruption.

1.1. Features

- LCD colour touch screen
- IP connectivity
- Handset, Headset and Desk microphone options
- Auxiliary port
- Analogue conventional port

1.2. Usage Scenarios

1.2.1. Connected To TRICX server

The DRCip is designed to integrate fully with TRICX integrated radio/telephony switch systems. In this mode of operation, multiple DRCip consoles have shared access to system radio and telephony resources. Console operators can make and receive radio and telephone calls via the TRICX server, which handles audio routing to the DRCip controllers and manages call setup, radio protocols, etc.

1.2.2. Direct to TRip units

DRCip controllers can communicate directly with AWCSL TRip VoIP gateways via IP networks. The DRCip will support up to 5 connections to TRip units. The TRip gateway has a 4-wire 600 ohm balanced line connector, RS232 input/output and 9 GPIO pins for connection to a radio system.

Using standard TRip units, the DRCip will directly control standard base stations, TETRA mobiles, etc. The addition of the AWCSL TRip signalling module (TRip-s) adds support for in-

band signalling protocols. With the signalling module, all radio protocols which are supported via the local 4-wire port are supported over TRip connection.

1.2.3. Mixed mode operation

It is possible to mix all modes of connection (TRICX, local and TRip connections) with a single controller. For example, it is possible to connect a single radio via the local 4-wire port and also to connect a number of remote radios via TRip units.

2. Physical Setup

2.1. Box contents

- DRCip unit
- Handset (with curly cord)
- 12 V DC power supply
- 2 m Cat. 5 Ethernet cable
- DRCip quick-start guide

2.2. Mounting

The DRCip has been designed with flexibility in mind. It can be:

2.2.1. Wall mounted

Placed on a desk at three different angles to suit multiple working environments.

In the default configuration, the DRCip is ready to be laid flat on a desk straight out of the box. For a low-angled user interface, there are two small feet on the reverse of the unit that can be lifted up and locked into position. These are easily released to fold flat again using the button located at the head of each foot. For a more raised user interface (approximately 45 degrees), the light grey stand must be attached to the rear of the unit. The stand (which is stored on the back of the unit and slides off downwards) holds the screws and key required for fixing to the unit.

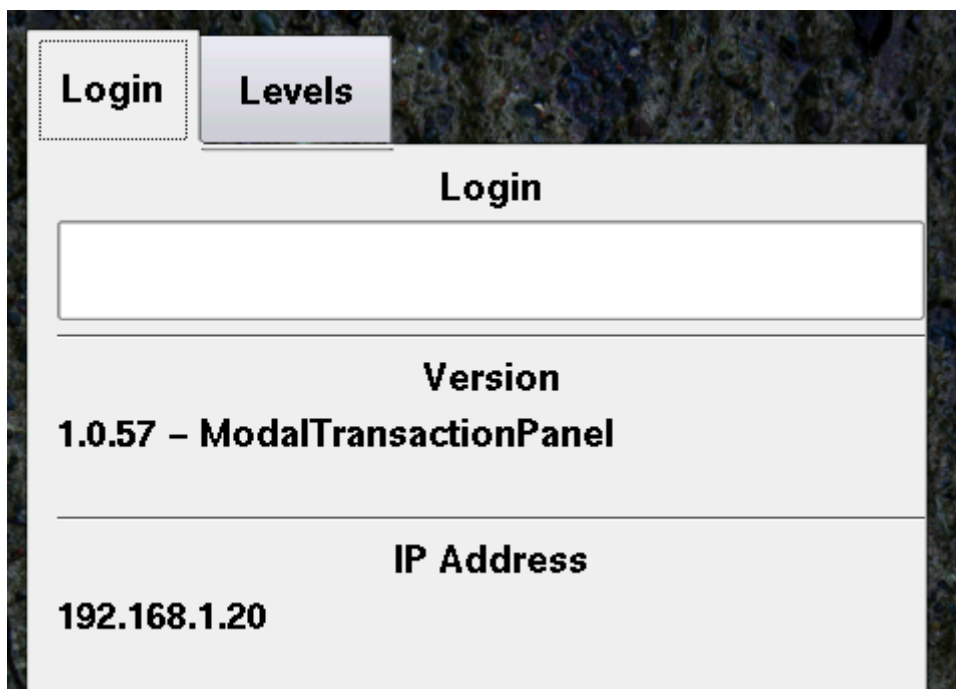
3. Configuration

The configuration menu can be accessed by pressing the “menu” hard button on the front panel of the DRCip. You can exit the configuration menu by pressing the “menu” button again. The menu will also be exited if any of the PTT inputs is activated.

3.1. Accessing Administrator Mode

The DRCip has two user modes - normal mode and administrator mode. Users may access user-mode settings without a password, but a password is required to access administrator-mode settings.

To access administrator mode, go to the “login” tab in the configuration menu and press the text field under “login” and enter the correct password (the initial password is “DEFAULT”) - the administrator tabs and settings will now be available.



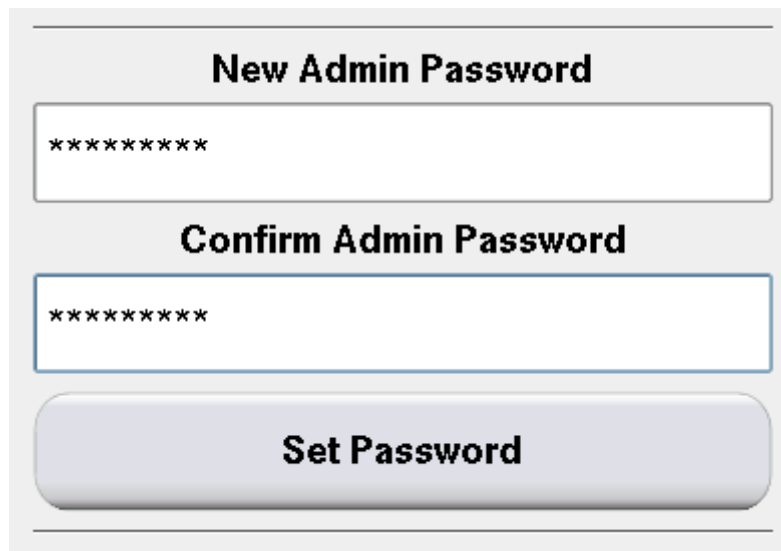
You can log out of administrator mode by pressing the “Logoff” button on the “Global” tab. Alternatively, you will automatically be presented with the option to either stay logged in or log off the first time you exit the menu in administrator mode - if you choose to stay logged in, you will remain in administrator mode until you use the “Logoff” button.

3.1.1. Changing the Administrator Password

The administrator password can be changed from the “Global” menu. To do this, first edit the “New Admin Password” and “Confirm Admin Password” to both contain the new password. Pressing the “Set Password” button will either give confirmation that the password was successfully changed, or report an error. If successful, the new password will take effect when the unit is next rebooted.

The administrator password can contain any number of characters (including none) and there are no restrictions on characters that cannot/must be used.

Note that although the new password will be visible on-screen when editing it, it will be masked when displayed on the menu.



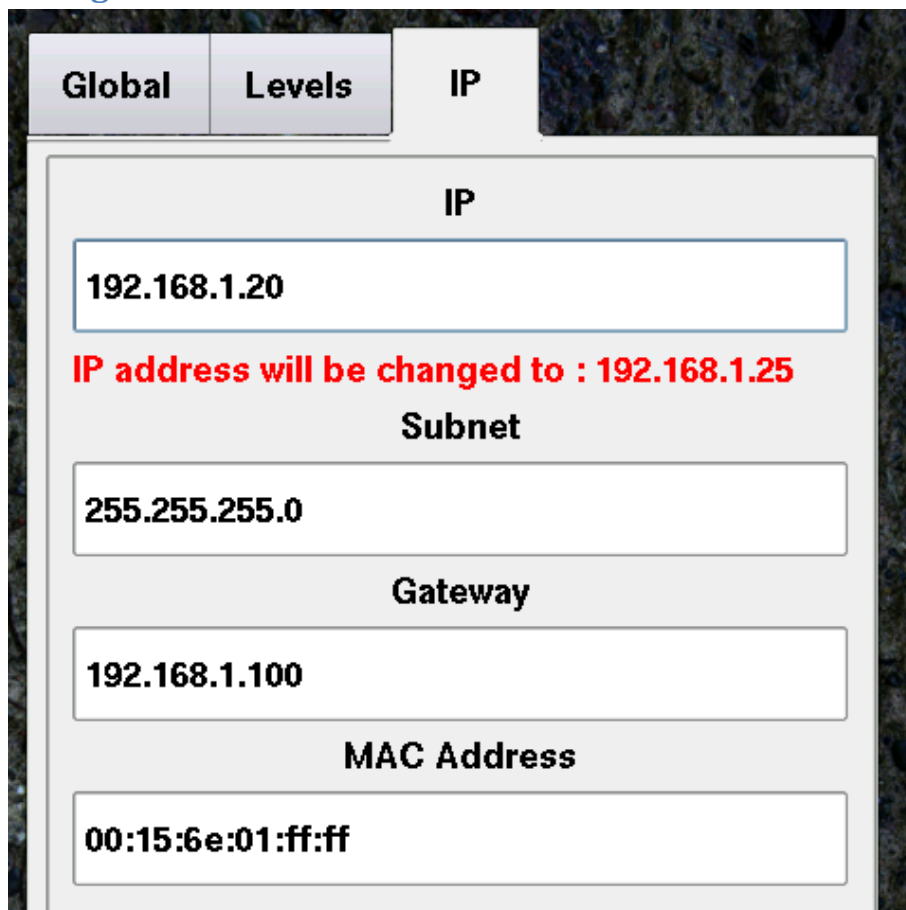
The image shows a web form titled "New Admin Password". It contains two text input fields, both containing masked text represented by asterisks. Below the second field is a large, rounded button labeled "Set Password".

New Admin Password

Confirm Admin Password

Set Password

3.2. IP Settings



The image shows a web interface for IP settings. At the top, there are three tabs: "Global", "Levels", and "IP", with "IP" being the active tab. Below the tabs, the form is titled "IP" and contains several input fields. The first field contains "192.168.1.20". Below it, a red message states "IP address will be changed to : 192.168.1.25". The next field is labeled "Subnet" and contains "255.255.255.0". The following field is labeled "Gateway" and contains "192.168.1.100". The final field is labeled "MAC Address" and contains "00:15:6e:01:ff:ff".

Global **Levels** **IP**

IP

192.168.1.20

IP address will be changed to : 192.168.1.25

Subnet

255.255.255.0

Gateway

192.168.1.100

MAC Address

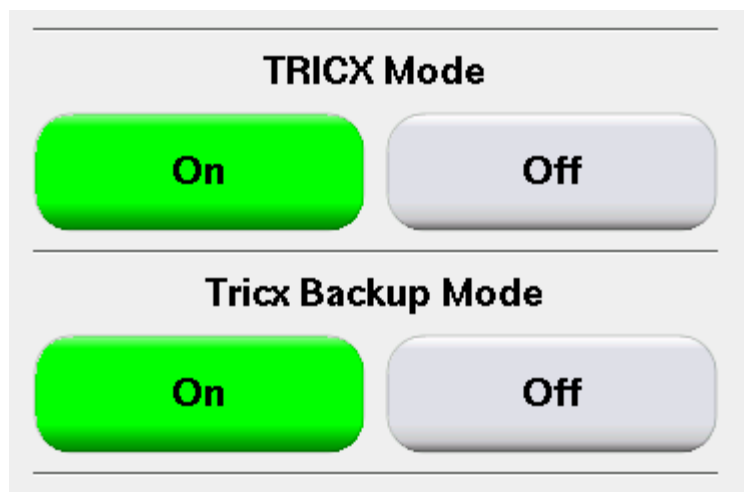
00:15:6e:01:ff:ff

In user mode, the unit's current IP address is available in the "Login" tab. In administrator mode, the "IP" tab can be used to view the unit's IP address, subnet mask, gateway and MAC address. All of these except for the MAC address can be edited. Any changes made to these settings will take effect on the next reboot of the unit.

When the one of these settings is to be changed on the next reboot, the new setting will be displayed in red text under the current setting.

3.3. TRICX Settings

The DRCip can act as a TRICX operator position, giving access to all the channels configured on that TRICX. In order to do this, the "TRICX Mode" setting in the "Global" menu must be set to "On". If a TRICX backup system should be used, set "TRICX Backup Mode" to "On" as well.

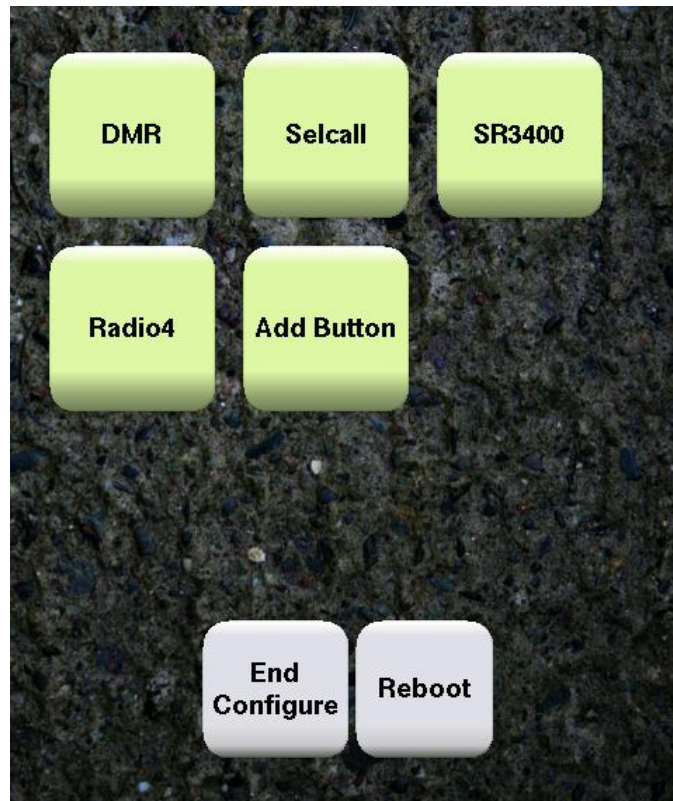


The following settings can be set for the TRICX:

- Main address and port
- Backup address and port (if TRICX backup mode is on)
- Operator number
- Operator name

The operator number must be unique amongst all operator positions (i.e. all DRCip units and standard operator positions) or the DRCip will be unable to log on the TRICX. The operator name is the name that will be presented to other operators and in TRICXMon.

3.4. Configuring Channels



3.4.1. Channel Configuration Mode

Channel configuration mode can only be accessed after logging into the DRCip as an administrator. To access this mode, press the “Configure Channels” button at the top of the “Global” menu. To leave this mode and return to the menu, press the “End Configure” button at the bottom of the screen.

3.4.2. Adding and Removing Channels

In channel configuration mode, the channel buttons are presented as they are on the DRCip main screen, as well as an additional “channel” button labelled “Add Button”. Pressing any channel button will bring up its configuration menu, and pressing the “Add Button” button will bring up a configuration menu for a new channel.



In order to remove a channel, set its type to “Delete” and the channel will be removed when the unit is next rebooted.

3.4.3. Configuring Channels

To configure a channel button, it must be provided with two main bits of information:

- The type of channel the button represents (e.g. radio, phone)
- How the DRCip should communicate with the channel (e.g. through a TRICX, directly through the line port)

Global settings for a TRICX are located on the “Global” tab of the menu.

3.4.3.1. *Configuring a Radio-Type Channel through a TRICX*

When the “TRICX” option is selected at the top of a channel’s configuration menu, select the “Radio” type to make that channel a radio-type channel through a TRICX.

A “radio-type” channel is any of the following:

- A standard radio channel,
- A standard radio channel with a selective calling (selcall) facility,
- A DMR channel, or
- A TETRA channel

The type of channel is set in the TRICX and communicated to the DRCip when it logs on to the TRICX. The DRCip will dynamically adjust the settings and options available to the user of that channel accordingly.

Channel Type

Radio **Phone**

Channel Name

Example Channel

Tricx Trip Number

1

DMR Broadcast Number

123

Name From TRICX

A channel configured to be a radio-type channel using the TRICX must to be supplied with the following:

- At least one of Channel Name or Name From TRICX. This determines the text that appears on the channel button. If “Name From TRICX” is specified (the button is green) then name specified as the “TRip_Name” in the TRICX’s Trip.ini file will be used, otherwise the “Channel Name” will be used. If both are specified, the name the TRICX gives will be used when the TRICX passes this information to the DRCip.
- TRICX Trip Number. This corresponds to the “TRip_Number” parameter in the TRICX’s Trip.ini file. This field will be zero-padded to four characters if it is not long enough (i.e. an entry in the DRCip of “1” is suitable for a trip with number “0001” specified in the TRICX).

Also, the following parameter is optional:

- DMR Broadcast Number. This number is used when making a broadcast call on a DMR channel. If not set, a default of “1” will be used.

3.4.3.2. *Configuring a Phone Channel through a TRICX*

When the “TRICX” option is selected at the top of a channel’s configuration menu, select the “Phone” type to make that channel a Phone channel through a TRICX.

The image shows a configuration form for a channel. It is titled "Channel Type" and has two radio buttons: "Radio" (unselected) and "Phone" (selected). Below this is a "Channel Name" field containing "Example Channel". The next field is "Phone Line" containing "123". The "Phone Host" field contains "192.168.1.1". The "Phone Stages" section has two radio buttons: "One Stage" (unselected) and "Two Stage" (selected).

A channel configured to be a phone channel using the TRICX must to be supplied with the following:

- Channel Name. This is the text that appears on the channel button.
- Phone Host. This is the IP address of the gateway/server that will handle the SIP requests the DRCip makes.
- One Stage or Two Stage dialing. This determines the dialing mode of the telephone.
 - One stage dialing. This is commonly used with a SIP server or SIP PBX, such as Asterisk, which act as a single phone line through which numbers can be

dialed. In this mode, the DRCip only needs to supply the server with the number to dial. This is supplied by the user when a phone call is initiated.

- Two stage dialing. This is commonly used with telephone gateways such as Vegastream or Audiocodes gateways, which act as several phone lines through which numbers can be dialed. In this mode, the line number for the DRCip to use must be specified in the Phone Line parameter, and the number to dial will be supplied by the user when a phone call is initiated.

Also, the following parameter is required if the phone line has two stages:

- Phone Line. This is the line number, only required for phone lines with two stages.

3.4.3.3. *Configuring a Standard Radio Channel through a TRip*

Delete TRICX TRip/IP

Channel Name

Example Channel

TRip IP Address

192.168.1.74

TRip Port Number

5004

In addition to using channels through a TRICX, the DRCip can also communicate with TRip units directly. In order to do this, the following must be configured for each TRip channel:

- Channel Name. This is the text that appears on the channel button.
- TRip IP Address. This is the IP address of the TRip unit.
- TRip Port Number. This is the base port (i.e. the RTP port) to use to contact the TRip unit on. The following ports must be set on the TRip unit:
 - Base port: The RTP port
 - Base port + 2: The logic port
 - Base port + 3: The remote/RS232 port

3.5. Selcall Configuration

The DRCip can be configured with Selcall status and identity tags to enable this information to be displayed in a more user-friendly manner when dealing with Selcall channels.

To configure Selcall statuses or identities, log in as an administrator and use the “Edit Selcall Statuses” and “Edit Selcall Idents” buttons on the Global menu. The editing process is identical for the two.

	SELCALL Status	SELCALL Tag
1	01	Available
2	02	Busy
3	03	Voice Call
4	04	At Lunch
5	05	Committed
6	SELCALL status	SELCALL tag

3.5.1. Editing a Tag

To edit a tag, select either the field to edit and press the “Edit Tag” button. For example, in the image above, the Status field of the 6th tag has been selected, and this is what will be changed when the Edit Tag button is pressed.

3.5.2. Adding/Removing Tags

The “Add Tag” button will add a new tag to the end of the current list of tags. To remove a tag, select it and press the “Remove Tag” button.

3.6. Configuring Talk Through/Facility

If talk through and/or facility should be used through TRip units on the DRCip, the mode must be configured with the correct setting, found in the Global menu.



If the TRip units the DRCip will be controlling have signalling modules installed in them, and the signalling module is being used to enable talk through mode, the “Signalling Module” mode should be enabled - otherwise the “Normal” mode is required.

Note that this setting applies regardless of whether the DRCip is controlling the TRip units through a TRICX or not.

4. Updating the DRCip

The DRCip can be updated either from a USB stick with an update file, or using HTTP/FTP over a network. In order to update, you must be logged into the DRCip as the administrator.

Both methods require two files - the update file itself (with suffix `.tar.bz2`) and an MD5 checksum file which must be in the same location and have the same name as the update file, with `.md5` appended to the end. The MD5 file is used to check that the update file itself has not been corrupted.

4.1. Updating from a USB Memory Stick

1. Place both files in the same directory on the memory stick.
2. Insert the memory stick into the USB port on the back of the DRCip.
3. Press the “Update” button at the top of the “Global” tab in the menu.
4. The DRCip will automatically search through the memory stick for files named “update-*.tar.bz2” and present them in a list. If the DRCip has not recognised the USB stick, or a new USB stick is inserted, press the “Refresh” button to search the memory stick again.
5. Select the file to update from, press the “Update” button and follow the prompts.



6. If the update completes successfully, reboot the unit when prompted.

4.2. Updating from a Server

1. Make sure the following settings are correct:
 - Update Protocol: Either HTTP or FTP
 - Update Server: The address of the server to download from
 - Update File: The name of the update file to request from the server

Update Protocol

http

Update Server

83.104.73.249

Update File

downloads/DRCIP/update-test.tar.bz2

2. Press the "Update" button at the top of the "Global" tab in the menu.
3. Select the "Remote" file, press the "Update" button and follow the prompts.
4. If the update completes successfully, reboot the unit when prompted.

5. Connectors



5.1. Connector Descriptions

Connector	Form	Function
Power		12v DC input
Network	RJ-45	Network connectivity
USB	Standard USB-A	Connect a USB memory stick or keyboard

Footswitch		External PTT input
Aux	DB-9 female	Auxiliary audio input/output
Desk Mic		External desk mic input
L/S	3.5mm jack	External speaker output (8Ω 5 watt)
Line	RJ-45	4-wire 600Ω line input/output
Headset		Operator headset input/output
Handset		Operator handset input/output

5.2. Connector Pin-Outs

5.2.1. Line port

Pin	Signal	Notes
1	Line in 0	600Ω balanced
2	Line in 1	600Ω balanced
3	Line out 0	600Ω balanced
4	RS232 TX	
5	RS232 RX	
6	Line out 1	600Ω balanced
7	PTT output	Active low
8	GND	

5.2.2. Desk Mic

Pin	Signal	Notes
1	N/C	
2	GND	
3	Mic input	Electret biased 10k Ω
4	PTT input	Active low
5	GND	
6	Auxiliary 12v DC output	Limited to 500mA

5.2.3. Auxiliary Connector

Pin	Signal	Notes
1	Auxiliary 12v DC output	Limited to 500mA
2	Audio out 0	600 Ω balanced
3	Audio in 0	600 Ω balanced
4	Auxiliary PTT input	Active Low
5	Ops Busy signal/alarm output	Active Low
6	GND	
7	Audio out 1	600 Ω balanced
8	Audio in 1	600 Ω balanced
9	GND	

5.2.4. Headset

Pin	Signal	Notes
1	GND	
2	GND	
3	Audio out	
4	Audio in	

5.2.5. Handset

Pin	Signal	Notes
1	GND	
2	Handset PTT input	Active Low
3	Audio out	
4	Audio in	

6. Using the DRCip



The main screen comprises the following areas:

- The **Call Stack** (optional) at the top. This displays incoming Selcall/TETRA information, in order for the user to be able to see and/or respond to such events. The call stack is enabled or disabled according to an administrator-level setting in the Global menu.
- The **Main Channel Area** in the middle. This contains a grid of buttons, each one representing a particular radio resource (e.g. a radio base station controlled by a TRICX or TETRA mobile the DRCip talks directly too) or a telephone line. If there are more channel buttons than can fit on the screen, this area will be scrollable (vertically) using a bar at the side.

- The **Function Menu** at the bottom. This area shows functions available when applicable channels are selected or monitored - for example, if a radio channel is selected, the Talk Through and Facility buttons will be shown.

6.1. Standard Radio Channel Operation

For radio channels, the colour of each channel button, as well as icons displayed on the button, indicates its current state:

Indication	State	Notes
Pale green	Unmonitored	This channel is not in use. No audio will be heard from or sent to this radio.
Blue	Monitored	Audio from the radio is audible to the operator, but the radio is not selected for transmission.
Orange	Selected	Audio from the radio is audible to the operator position. Operator's outgoing audio will be transmitted on this radio.
Green	COR	The channel is currently in receive state.
Speech Icon	Transmitting	The operator is transmitting on this channel.



From left to right, channels are (i) unmonitored, (ii) monitored and (iii) selected



From left to right, channels are (i) transmitting and (ii) receiving

Pressing a channel in the unmonitored state will move the channel into the monitored state. Once monitored, subsequent button presses will toggle between the select and monitor states. To unmonitor a channel, press and hold the button while in the monitored state.

The DRCip operates in single-channel select mode, so only one channel can be selected at a time. If you try to select a channel while another is selected, the currently selected channel will be put into the monitor state.

6.1.1. Talk Through and Facility on PMR Channels

Note: "Facility" is used for a system-defined purpose, typically squelch defeat.

When a standard radio channel is selected, the function menu at the bottom of the screen will display the "Talk Through" and "Facility" buttons. The current status of a channel's talk through/facility is indicated via the presence of two icons placed on the channel.



The DRCip Main Screen with a PMR Channel Selected



A PMR Channel Button with both Talk Through and Facility Enabled

7. Specifications

Power supply:	12v 1A DC
Dimensions:	250(h) x 220 (w) x 120 (d) mm
Line interface:	4 wire, -2 to -22 dBm
Record Level:	-10 dBm
Auxiliary Level:	-10 dBm
Ethernet port:	10/100 Mbit Ethernet
Radio channels:	1 local channel Up to 5 TRip units Up to 64 TRICX channels
LCD screen:	7" 480x800 pixels
Touch screen:	Resistive
Processor:	ARM, 533 MHz (Samsung S3C2443/ARM920T)
RAM:	256 MB DDR SDRAM
Internal Storage:	1 GB NAND Flash
External VGA:	480x640 pixels
Operating System:	Embedded Linux (Digi EL 5.2)

7.1. Supported radio protocols

List available radio protocols for each connection mode:

- TRICX mode:
 - Standard PMR
 - Selcall
 - DMR
 - TETRA-PEI
- Direct to TRip mode:

- Standard PMR
- TETRA-PEI

8. Glossary

Term	Definition
Codec	Coder-Decoder: Voice codecs are used from compression and decompression of voice audio from transmission over IP data networks.
DSP	Digital Signal Processing
G711	Voice codec for use in telephony applications providing 64 kbit/s data rate. There are two variations: A-law (used in AWCSL products) and μ -law.
IP	Internet Protocol. Communications protocol for relaying packets of data over a computer network (such as the internet)
IP Address	Network address for devices connected to computer networks used for internet-device communication.
Linux	Family of open-source operating systems.
MAC Address	Media Access Control. Unique hardware address assigned to network interfaces.
Operating System	Software which runs on computers and provides services such as file access and networking for applications.
RTP	Real-time Transport Protocol. Network standard for transmitting real time data (such as voice, audio or video) over IP networks. Defined as RFC3550.
SIP	Session Initiation Protocol. Protocol for telephony signalling over IP networks.
TCP/IP	Transmission Control Protocol. Transport layer protocol providing ordered, reliable delivery of data over IP networks.

TRICX	TRICX is an IP-based multiple operator, multiple radio and telephony switching system from AWCSL.
TRip	AWCSL audio to IP gateway. Provides 4-wire interface, RS232 and logic controls for connecting radio systems to IP networks.
UDP/IP	User Datagram Protocol. Stateless transmission layer protocol for transferring packets of data over IP networks. Favours speed of delivery over reliability.
USB	Universal Serial Bus. Industry standard interface for connecting peripheral devices to computer hosts.
USB-A	USB connector on host devices (computers)
USB-B	USB connector on peripheral devices.
VGA connector	Common video output connector for computer systems utilizing DB-15 connectors.