

# WAVEWARE REDIRAC MANUAL

## WaveWare ReDiRAC (Remote Display/Relay/Audio Controller)

### Overview

The WaveWare ReDiRAC is an Ethernet based device that allows you to remotely control the following:

- Adaptive LED displays
- Relay controlled equipment, such as audible and/or visual annunciators
- Pre-recorded audio output, which can be connected to a speaker, to a PA system, and to a mobile radio system

The ReDiRAC can be controlled using a variety of control protocols, such as COMP2 or plain text, via Ethernet TCP/IP commands. The message field can be plain text or it can contain an opcode prefix to cause the ReDiRAC to perform a particular action, such as:

- Route messages to specific LED display addresses (up to 5 different display address values, expandable to up to 32 displays if RS-485 output is used)
- Identify messages as priority messages
- Change the state of specific relays
- Play specific pre-recorded audio files
- Identify specific audio files as priority audio files
- Cause specific audio file outputs to be repeated a certain quantity of times

In addition to Ethernet control protocols, the ReDiRAC can be controlled by a dry contact input on either of two dry contact input points on the base ReDiRAC system. The dry contact inputs cause the repeated output of pre-recorded audio files, in addition to causing the primary relay to be cycled on for a period of time.

### Features

The ReDiRAC system incorporates the following features:

- Uses on-board MicroSD flash memory card, residing in an SD card adapter, to access the program, config files, and digital audio files.
- Runs on 12 – 15VDC with supplied 120 – 240VAC 50/60Hz wall transformer. Idle current is ~80mA @ 12VDC, and ~200mA @ 12VDC when playing a sound at a moderate level.
- RS-232 Serial Port for controlling Adaptive LED displays is the default mode. If you want to use RS-485 to control the LED displays, you must specify that option at the time of your order.
- Diagnostic LED's to indicate operating status.

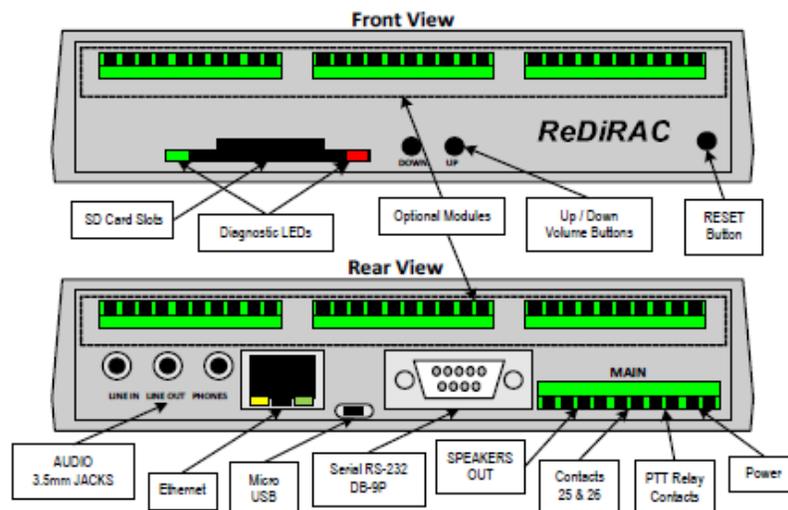
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- Two built-in contact inputs to activate predefined alert outputs
- Push-To-Talk (PTT) Form C relay contact output that can close whenever a sound is played, to drive PA systems and two-way radio base stations
- Digital Up/Down volume control push buttons.
- Built-in 20 Watt Class D Stereo (2 x 10W) Amplifier.
- Ethernet connection to allow remote control of the ReDiRAC
- Queueing of audio message output of up to 20 audio messages, in support of radio channel sharing
- Optional boards for additional Form C relay contact outputs.
- Optional Power-Over-Ethernet (POE) operation.

The ReDiRAC is powered by a 15VDC AC/DC power adapter. The ReDiRAC operation is controlled by a MicroSD card that contains a compiled .run file, an init.txt file, and zero or more .wav files. The .wav files contain the digital audio that is output from the audio outputs on the ReDiRAC.

The ReDiRAC is provided with a single relay (PTT relay), but up to 16 additional relays can be purchased in increments of 8 relays. For LED sign control of a single sign, an LED sign interface harness is required, along with an Adaptive LED sign, such as the model 215C. For relay control, relay controllable devices need to be wired to the terminal block(s) built into the ReDiRAC. For pre-recorded audio output, the audio output of the ReDiRAC needs to be connected to the appropriate sound annunciation interface, such as speaker, PA system, or two way radio base station.

## ReDiRAC Connections



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## Main Connector

The main connector for the ReDiRAC is a ten pin, pluggable terminal block, which contains the following connections:

- Power, 10-18VDC regulated or unregulated. An AC/DC power adapter is provided with the ReDiRAC
  - PTT Relay, connects to PA systems or two way radio systems. Can also be used for priority message annunciation by control audio/visual annunciation devices. Form C relay
- Input Contacts, opto-isolated, allows dry contact triggering of up to 2 predefined alert actions from the ReDiRAC, and for monitoring the carrier detect signal when the radio interface feature is enabled.
- Speaker Connections for both right and left speakers, 4 or 8 ohm, 25W amplifier. In addition to the speaker connections, there is a LINE OUT connector, at an audio line level (1V RMS @ 0db volume, 47K ohms) at the 3.5mm Stereo LINE OUT jack



Pin #	Signal
1	Left Speaker +
2	Left Speaker -
3	Right Speaker +
4	Right Speaker -
5	Input Contact 25
6	Input Contact 26
7	PTT Contact COM
8	PTT Contact N.O.
9	10VDC - 18VDC
10	Ground

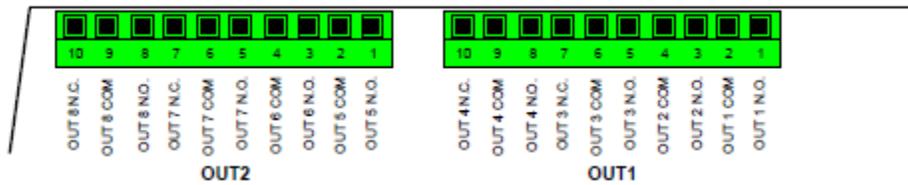
## Optional 8 Relay Output Daughter Boards

Following is information on how to connect equipment to the optional 8 relay output boards.

**NOTE: Each relay contact is rated at 1A @ 30VDC or 0.5A @ 125VAC**

The output connectors OUT1 and OUT2 consist of two 10 pin, removable terminal block connectors. The pinout is shown in the following diagram and table. The first 8 Relay Output board is facing the rear of the ReDiRAC. The second 8 Relay Output is facing the front.

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OUT2 Pin #	Rear Signal	Front Signal	OUT1 Pin #	Rear Signal	Front Signal
1	Relay 5 N.O.	Relay 13 N.O.	1	Relay 1 N.O.	Relay 9 N.O.
2	Relay 5 COM	Relay 13 COM	2	Relay 1 COM	Relay 9 COM
3	Relay 6 N.O.	Relay 14 N.O.	3	Relay 2 N.O.	Relay 10 N.O.
4	Relay 6 COM	Relay 14 COM	4	Relay 2 COM	Relay 10 COM
5	Relay 7 N.O.	Relay 15 N.O.	5	Relay 3 N.O.	Relay 11 N.O.
6	Relay 7 COM	Relay 15 COM	6	Relay 3 COM	Relay 11 COM
7	Relay 7 N.C.	Relay 15 N.C.	7	Relay 3 N.C.	Relay 11 N.C.
8	Relay 8 N.O.	Relay 16 N.O.	8	Relay 4 N.O.	Relay 12 N.O.
9	Relay 8 COM	Relay 16 COM	9	Relay 4 COM	Relay 12 COM
10	Relay 8 N.C.	Relay 16 N.C.	10	Relay 4 N.C.	Relay 12 N.C.

## Controlling the ReDiRAC

The ReDiRAC can be controlled using a variety of control protocols, such as COMP2 or plain text, via Ethernet TCP/IP commands. The message field can be plain text or it can contain an opcode prefix to cause the ReDiRAC to perform a particular action, such as:

- Route messages to specific LED display addresses (up to 5 different display address values)
- Identify messages as priority messages
- Change the state of specific relays
- Play specific pre-recorded audio files

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- Identify specific audio files as priority audio files
- Cause specific audio file outputs to be repeated a certain quantity of times

## LED Display Control

The Adaptive LED display control feature of the ReDiRAC provides the following:

- Control the LED display using plain text messages as an option
- Control up to 32 separate displays using messages that contain sign control opcodes. Support for up to 5 unique display addresses.
- Automatically display up to 25 messages on each LED display
- Automatically detect and annunciate priority messages via display color and via exercising the PTT relay
- Priority messages are displayed before normal messages
- Automatically manage the message display queue using a FIFO method
- Automatically remove individual messages based on a configured message aging rule
- Automatically escalate individual messages to priority status based on a configured message aging rule
- Automatically detect when an alert has been reset and automatically remove the original alert message from the display
- When priority messages are detected, the ReDiRAC PTT relay is automatically cycled on then off with a pre-configured cycle
- Configurable to operate as either RS-232 or RS-485 serial output. When RS-485 output is used, you can control up to 32 LED displays.
- Messages of 15 characters or less are displayed statically, while longer messages are rotated on the display from right to left
- Display a default message when all messages have timed out. The default message can also be the current time, in HH:MM AM/PM format
- Allow the LED display time to be synchronized at midnight through the “timesynch” command

## Relay Output Control

The relay output control feature of the ReDiRAC provides the following:

- When priority messages are detected for display output and audio output, the ReDiRAC PTT relay is automatically cycled on then off with a pre-configured cycle
- Control individual relays using messages that contain relay control opcodes

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## Audio Output Control

The audio output feature of the ReDiRAC provides the following:

- Play individual pre-recorded sound using messages that contain audio control opcodes
- Play individual pre-recorded sound using dry contact inputs, unless the radio interface feature is enabled
- When priority messages are detected, the ReDiRAC PTT relay is automatically cycled on then off with a pre-configured cycle, unless the radio interface feature is enabled, then priority messages do not affect the PTT relay.
- Repeat the play of specific sounds when the audio control command includes a sound output repeats parameter

## Control Protocol Formats

- The ReDiRAC, when operating in COMP2 mode, can auto-detect the following Ethernet based industry standard alert paging control protocols:
- COMP1, formatted as Message<CR>
- COMP2, formatted as Address<CR>Message<CR>
- WaveWare, formatted as <SOH>TAddress<STX>Message<ETX><EOT><CR>, where the T and B parameters are ignored by the ReDiRAC. Note that the normally optional <CR> suffix must be included to ensure proper processing of the WaveWare protocol.
- TAP (message block only), formatted as <STX>Address<CR>Message<CR><ETX>Checksum<CR>, where the checksum field is ignored by the ReDiRAC

The ReDiRAC uses standard acknowledgements for a given protocol when the command string is properly formatted. If the ReDiRAC cannot properly process the command, it issues a basic NAK response for COMP1 and COMP2 protocols, and the appropriate NAK response for WaveWare and TAP protocols to indicate a rejected message.

You can see that all of the above protocols include a Message field, but not all include an Address field. The Address field is only used with the ReDiRAC to try to identify if the Address field value matches the **prioritypin** config parameter, which would trigger priority message processing.

The control protocol's Message field can be of the following formats:

- Plain text (no opcodes detected) - The entire message is routed through the ReDiRAC serial port in Adaptive LED sign control protocol, using a sign address value of 0. Examples:
  - “Pendant Alert Room 214”, causes that message to appear on all attached Adaptive LED displays, routed to display address 0

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- “Fire – East Corridor”, causes that message to appear on all attached Adaptive LED displays, routed to display address 0. If “fire” is one of the prioritykeyN config parameter values, the message is displayed in the priority text color, and the priority relay is activated for a predefined time cycle.
- “timesynch”, causes all LED message boards to reset their internal clock to midnight. This becomes valuable only if control systems can output “timesynch” as a scheduled message that is output at midnight or a few seconds before midnight.
- Control commands formatted as **DAPMessage**, where D is the LED display output opcode value of “D”, A is the sign address (0-5), P is the priority code (0-1), and Message is the message to be displayed on the sign. Examples:
  - “D01Priority msg to sign addr 0”, causes “Priority msg to sign addr 0” to appear on all connected LED displays, and simultaneous activation of the PTT relay to cycle on then off.
  - “D00Normal msg to all signs”, causes “Normal msg to all signs” to appear on all connected LED displays
  - “D41Priority msg to address 4”, causes “Priority msg to address 4” to appear on all connected LED displays that are programmed with an address value of 4.
- Control commands formatted as **ROOM**, where R is the Relay output control opcode value of “R”, OO is the relay number (00-16), and M is the mode of operation (0-2). A mode value of 0 is relay OFF. A mode value of 1 is relay ON. A mode value of 2 is cycle relay ON for the **relaytime** parameter value, in seconds, then OFF. Examples:
  - “R000”, causes relay #00 (PTT relay) state to be changed to the OFF state
  - “R002”, causes the PTT relay state to be changed to the ON state, then after the **relaytime** config parameter value expires, changed to the OFF state.
  - “R161”, causes relay #16 to be changed to the ON state
  - “R022”, causes relay #02 state to be changed to the ON state, then after the **relaytime** config parameter value expires, changed to the OFF state.
- Control commands formatted as **APRFilename**, where A is the Audio output control opcode value of “A”, P is the priority code (0-1), R is the quantity of repeats (0 to 9), with 0 meaning the WAV file plays just once, and Filename is the name of the WAV file to play. The following examples demonstrate Audio output control when the **radiointerface** config parameter is set to a value of 0, allowing control of the PTT relay via the priority code. If **radiointerface** config parameter is set to 1, the priority code parameter would be ignored and the PTT relay would always be activated during the playing of the sound files, to allow a connected radio system to be keyed via the PTT relay:

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- “A121” causes a file called 1.wav to be played, with simultaneous activation of the PTT relay timed cycle, and repeats playing 1.wav twice after the first play.
- “A001” causes a file called 1.wav to be played once, and no other activity occurs.
- “A011” causes a file called 1.wav to be played, then repeated once
- “A1323” causes a file called 23.wav to be played, with simultaneous activation of the PTT relay timed cycle, and repeats playing 23.wav 3 times after the first play.
- “A00999” causes a file called 999.wav to be played once, and no other activity occurs.
- “A10nursecall” causes a file called nursecall.wav to be played once, with simultaneous activation of the PTT relay timed cycle, and no other activity occurs

If the **endcmd** config parameter is set to a value of 1, the ReDiRAC will expect a command formatted as **AEnd** to be received before it will output queued audio files. This allows a host system to control concatenation of multiple audio files into a single stream of audio. If audio file concatenation methods are used, it might also be beneficial to add an audio file preamble sound and/or postamble sound to help listeners recognize the beginning and/or end of a concatenated series of audio files.

## Priority Message Processing

Priority message processing in the ReDiRAC is detected using the following methods:

- Address field value in a COMP2 or TAP or WaveWare protocol command string matches the **prioritypin** configuration parameter
- Message field value in a COMP2 or TAP or WaveWare protocol command string matches one or more of the **prioritykey1** through **prioritykey5** configuration parameters
- Priority parameter enabled in Message field values beginning with the D opcode
- Priority parameter enabled in Message field values beginning with the A opcode

When priority is detected with LED display output (opcode D), the relay defined by the **priorityrelay** config parameter is cycled ON for **relaytime** config parameter quantity of seconds, then OFF, and the displayed message color is displayed as the priority color defined by the **prioritycolor** config parameter.

When priority is detected with audio output (opcode A), the relay defined by the **priorityrelay** config parameter is cycled ON for **relaytime** config parameter quantity of seconds, then OFF, simultaneously with the playing of the WAV file.

If the **radiointerface** config parameter is set to a value of 1, and the **priorityrelay** config parameter is set to a value of 0, then priority message processing will not be in effect. To resolve that issue, you would need to purchase a relay option board, and set the **priorityrelay** config parameter value to a number greater than 0.

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## ReDiRAC Configuration

The ReDiRAC is configured using the following methods:

- Web browser
- init.txt file

### Web Browser Configuration

The ReDiRAC default ships with DHCP enabled, so that it will become compatible with the LAN that it is connected to. Use the [WaveWare Discover and Reset Tool](#) to discover the ReDiRAC and to pull up the ReDiRAC web config screen in a browser. The only thing you need to configure in the ReDiRAC web server is the following:

- #15 Use Static IP – Set to Yes. DO NOT click the Update button yet.
- #17 IP Address – Set to whatever static IP address you want to use (ensure that the static IP address is compatible with the LAN that the ReDiRAC will be connected to)

Once those two changes are made, click any Update button. You will then lose connectivity to the ReDiRAC. Cycle power on the ReDiRAC for the network changes to take place. If the new IP address assignment is compatible with the LAN that your web browser is running on, manually edit the URL in the web browser to point to the newly assigned IP address of the ReDiRAC and try to re-load the ReDiRAC config page.

NOTE: You may need to also edit the ReDiRAC MAC address, #13 on the Config web page if multiple ReDiRAC units are on the same LAN, or if you experience network device compatibility issues.

### init.txt File Configuration

On the ReDiRAC SD card, there is a file called init.txt. init.txt is a text file that can be edited in any text editor. The file format is comma separated values with double quote characters for each field value. Following are the configuration fields supported by the ReDiRAC and their default values.

Config parameter	Default Value
mode	COMP2
cancelkey1	Cancel
cancelkey2	Cancel
cancelkey3	Reset
cancelkey4	Reset
cancelkey5	
prioritykey1	Code

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prioritykey2	fire
prioritykey3	Failure
prioritykey4	
prioritykey5	
priorityrelay	0
relaytime	8
radiointerface	0
queue	20
normalcolor	Green
prioritycolor	Red
prioritypin	911
msgtimeout	5
msgescalation	2
ipport	3131
volume	50
audio1	1
audio2	2
Audiorepeats	5
defaultmsg	ReDiRAC

## mode config parameter

The **mode** parameter defines the control protocol for the ReDiRAC. When operating in the default COMP2 mode, the ReDiRAC can auto-detect commands sent in the following control protocols:

- COMP2 – Address<CR>Message<CR>
- COMP1 – Message<CR> (COMP1 is also known as plain ASCII or plain text protocol)
- TAP (message block only, no Log-in or Log-out processes supported) - <STX>Address<CR>Message<CR><ETX>Checksum<CR>, where the Checksum value is ignored

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- WaveWare - <SOH>T BAddress<STX>Message<EOT><CR>, where the T and B parameters are ignored. Note: In order for the WaveWare protocol to operate properly with the ReDiRAC, the command string must be terminated with a <CR> character

Please refer to other sources for specifics of how to compose these control protocols. The ReDiRAC uses the Address field value to compare to the **prioritypin** config parameter, and it uses the Message field value to decide which actions to perform.

## cancelkeyN config parameters

The **cancelkeyN** parameter, where N ranges from 1 to 5, defines up to 5 key string values that are compared to the contents of Message fields to determine if the message should be tested as an alert cancellation message. A message is considered cancelled when the following conditions all occur:

- An incoming Message field value is flagged as a cancellation candidate
- There is an active message being displayed on an LED display where the only difference between the displayed message and the cancellation candidate message is that the cancellation candidate message has an additional prefix or suffix value that matches a cancelkeyN parameter.

When the above conditions are met, the message being displayed on the LED display is removed from the display.

## prioritykeyN config parameters

The **prioritykeyN** parameter, where N ranges from 1 to 5, defines up to 5 key string values that are compared to the contents of Message fields to determine if the message should be flagged as a priority message. A prioritykeyN config parameter can be left blank. The prioritykeyN key string can be located anywhere in the incoming Message field.

## priorityrelay config parameter

The **priorityrelay** parameter defines which relay should be used for priority alert annunciation. The default value is 0, which refers to the PTT relay included with the base ReDiRAC unit. If additional relay boards are purchased for the ReDiRAC, then the **priorityrelay** value can be assigned to values ranging from 0 to 8 if a single relay board is purchased, to 0 through 16 if two relay boards are purchased.

If the **radiointerface** config parameter is set to a value of 1, then priority message processing will not be allowed to affect the PTT relay (relay 0) operation, and it is suggested that an optional relay board be purchased, to allow operation of both the PTT relay for audio output control through a radio or PA system, and another relay be assigned for use with priority message alert annunciation.

## relaytime config parameter

The **relaytime** parameter defines the amount of time, in seconds, that any relay will be activated if the relay is placed into the “cycle” state. The default value is 8 seconds. A relay can be placed into the “cycle” state by the following methods:

- A priority message is detected via a **prioritykeyN** config parameter
- A priority message is detected via a **prioritypin** config parameter
- A priority message is detected via the **priority** parameter in Message field values containing the D opcode for LED display control
- A priority message is detected via the **priority** parameter in Message field values containing the A opcode for audio output

## radiointerface config parameter

The **radiointerface** parameter defines if the ReDiRAC is connected to a land mobile radio or to a PA system. A **radiointerface** value of 0 indicates that there is no radio/PA interface. A **radiointerface** value of 1 indicates that a radio or PA interface is wired up to the ReDiRAC, and that the ReDiRAC will exercise the PTT relay (relay 0) for the duration of the audio output from the ReDiRAC. In addition, the ReDiRAC will ignore any priority message processing that affects the PTT relay (relay 0). In order to have both a radio/PA interface and a priority relay, a customer must order the relay interface optional board, and the **priorityrelay** config parameter must be configured to a value other than 0.

If the **radiointerface** value is set to 1, the Input Contact #25 will be used to monitor for radio channel availability (carrier detect) rather than being used to trigger pre-defined audio output. In this case, when Input Contact #25 is closed, ReDiRAC will assume the radio channel is busy and will queue output until that contact is opened. The audio message queue size is a maximum of 20 audio messages by default, unless adjusted to a different number by the **queue** parameter. If the queue gets full while waiting for Input Contact #25 to open, ReDiRAC will respond to audio file play commands with a queue full response. When ReDiRAC starts playing queued sounds, the state of Input Contact #25 will be ignored until the audio files are all played. Once the queued sounds are all played, ReDiRAC will delay output of any newly queued sounds for a few seconds, to allow any other radio devices to grab the radio channel.

## queue config parameter

The **queue** parameter defines the maximum size of the audio file output queue. The default value is 20. The output queue can build up if the **radiointerface** parameter is set to a value of 1 and the Input Contact #25 is closed when there are files in the output queue.

## endcmd config parameter

The **endcmd** parameter defines if the ReDiRAC will wait until it detects an AEnd command before it tries to output the audio file output queue. The default value is 0. The purpose of the **endcmd** mode is to

allow a host system to output a series of audio output commands that should be concatenated on output, and the AEnd command tells the ReDiRAC that the series of concatenated file commands is complete and can be output.

## **normalcolor config parameter**

The **normalcolor** parameter defines the text display color to be used on the LED display(s) to display messages that do not have a priority flag associated with them. Valid values can be “red”, “green”, or “yellow”. Some LED display models have red only LEDs, so this parameter would have no effect on those models of LED displays. The default value is green.

## **prioritycolor config parameter**

The **prioritycolor** parameter defines the text display color to be used on the LED display(s) to display messages that have a priority flag associated with them. Valid values can be “red”, “green”, or “yellow”. Some LED display models have red only LEDs, so this parameter would have no effect on those models of LED displays. The default value is red.

## **prioritypin config parameter**

The **prioritypin** parameter defines the value that is used to detect priority messages by analyzing the Address field value for control protocols that include an Address field. If the Address field value matches the prioritypin parameter value, the incoming message is flagged as a priority message. The default value is 911.

## **msgtimeout config parameter**

The **msgtimeout** parameter defines, in units of minutes, how long messages should be displayed on LED displays before the messages are automatically removed from the display(s). The default value is 5 minutes.

## **msgescalation config parameter**

The **msgescalation** parameter defines, in units of minutes, how long messages should be displayed on LED displays before the message display color is automatically shifted to the priority display color defined by the **prioritycolor** config parameter. The default value is 2 minutes.

## **annunciateesc config parameter**

The **annunciateesc** parameter defines if automatically escalated messages should be annunciated via activation of the PTT relay when those messages are escalated. The default value is 1, which means the message escalation annunciation feature is enabled.

## **ippport config parameter**

The **ippport** parameter defines which IP Port value to use when the ReDiRAC opens a TCP/IP socket and establishes a listening cycle for incoming socket connections. The ReDiRAC can support only a single

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socket connection. The host system must close the socket connection after receiving an acknowledgement from the ReDiRAC. The default value is 3131.

## **volume config parameter**

The **volume** parameter defines the output volume level that will be generated on the audio output of the ReDiRAC. Volume level requirements vary depending upon which audio output connector is used and depending upon which speaker, PA system, or radio base station the ReDiRAC is connected to. The value can range from 0 to 63, with a default value of 50.

## **audio1 config parameter**

The **audio1** parameter defines which pre-recorded audio file to play when one of the two dry contact input points on the ReDiRAC board is triggered. In addition to audio file playback, the priority relay is activated for one cycle period. The audio file is repeated for the quantity of times defined by the **audiorepeats** config parameter. “audio1” config parameter. The default value is 1. If the **radiointerface** parameter is set to a value of 1, this parameter will be ignored, to allow this dry contact input point to be used to detect for availability of the radio channel.

## **audio2 config parameter**

The **audio2** parameter defines which pre-recorded audio file to play when one of the two dry contact input points on the ReDiRAC board is triggered. In addition to audio file playback, the priority relay is activated for one cycle period. The audio file is repeated for the quantity of times defined by the **audiorepeats** config parameter. The default value is 2.

## **audiorepeats config parameter**

The **audiorepeats** parameter defines how many additional times a pre-recorded audio file is played after being played the initial time when the contact input is triggered. The default value of the **audiorepeats** parameter is 5. In that case, after playing the assigned audio file once, that file will be played 5 more times after the appropriate input contact point is triggered.

## **defaultmsg config parameter**

The **defaultmsg** parameter defines what to display on the LED displays when there are no active alert messages. If the **defaultmsg** value is blank, no default message will be displayed on the LED displays. If any alert message becomes active, on any LED display address, the default message will be removed. Once all messages on all LED display addresses are removed, the default message will reappear on all LED displays.

If the **defaultmsg** parameter is set to “time”, then the LED message boards will display the current time in HH:MM AM/PM format.

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## ReDiRAC Operation

In order for the ReDiRAC to properly perform, the appropriate MicroSD card residing in an SD card adapter, needs to be inserted in the ReDiRAC SD card slot, and the ReDiRAC powered up. The ReDiRAC also needs to be connected to an Ethernet network and have the appropriate network configuration.

To control the Adaptive LED sign, an interface harness needs to be installed. The LED display interface harness is composed of an RS-232/RJ-12 adapter connected to the ReDiRAC RS-232 port and a straight wired 6 wire silver satin cable with RJ-12 modular plugs on both ends needs to be connected between the ReDiRAC adapter and the Adaptive LED display.

To control relay outputs, the devices being controlled need to be wired to the appropriate normally open and common contacts on the ReDiRAC.

To control audio output, the appropriate speaker, PA system, or two way radio system needs to be connected to the ReDiRAC. In the case of PA system and two way radio connections, the LINE OUT connector should be used and the PTT relay should be used to signal the system when it needs to acquire the audio channel on the attached equipment. In the case of two radio connections, contact input #25 should be used to monitor for busy channel, to allow sharing of the radio channel with other devices, such as walkie-talkies.

## Troubleshooting

A flashing green LED on the front of the ReDiRAC should be considered normal. A flashing red LED indicates an error condition.

The green LED should flash once per second during normal operation.

When the red LED flashes, following is what the flash pattern indicates:

- 1 flash – problem with SD card, execution stops
- 2 flashes – error opening a WAV file
- 3 flashes – error reading a file
- 5 flashes – no valid FAT or FAT32 file system found on SD card
- 7 flashes – error initializing CODEC
- 8 flashes – invalid .WAV file internal structure
- 9 flashes – Unsupported .WAV format (not Windows PCM)
- 10 flashes – Unsupported .WAV sample rate
- 11 flashes – Unsupported .WAV sample size

## Recording Digital Audio

It is recommended that all recordings use the following rules:

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- Record with a sample rate of 44.1kHz and 16-bit mono, as a .WAV file
- After recording, apply a normalization function on the recording, to ensure a uniform perceived volume level when the files are played
- Ensure that the recordings have silence both at the beginning and end of the file. It is recommended that you use ¼ second of silence at both the beginning and the end of each recording
- Name your WAV files so that they match the filename defined in the audio output command defined above.

### Disclaimers

The ReDiRAC includes a one year warranty from date of purchase, for depot level parts and labor, if the ReDiRAC is used as specified and not abused or damaged through misapplied installation or acts of nature.

The ReDiRAC is not designed for life safety applications and WaveWare Technologies, Inc. takes no responsibility for any failures of the ReDiRAC system in customer applications, other than the normal one year warranty.

The use of the ReDiRAC by the customer confirms the customer's acknowledgements of these disclaimers.