StrataLink® 24

24 GHz All-Outdoor 750 Mbps FDD Point to Point License-Free Microwave System
Model: SL-24,SL-24-X, SL-24-E, SL-24-EX

Command Line Interface Guide

Revision History

Revision	Revision Date	Description
1.0	31 Mar 2013	Initial Release
1.1	8 April 2013	Updated QoS related sections, typographical errors throughout
2.2	17 May 2014	Update document to reflect Model SL-24-E, -EX Features - Commands for AES-256 Encryption (option) - Commands for Packet Buffer size - Mgmt port command Simultaneous use of both traffic ports - VLAN Port membership commands - Qos command changes 8 QoS Queues - Removed support for ACS

SL-24 Series Command Line Interface (CLI) Guide

This document provides a standalone guide to the commands available through the Telnet, SSH, and console port of the StrataLink 24.

This CLI Guide is valid for **Firmware Version 2.2 and prior.**

Command Keying Overview

Key Functions

Tab - Autocomplete

Completes a partial command name entry. When you enter a unique string of characters that is part of the command and press the Tab key, the system completes the command name. If you enter characters that could indicate more than one command, the system will display ”ambiguous command”. Enter a question mark (?) immediately following the partial command (no space). The system provides a list of commands that begin with that string.

Del or Backspace

Erases the character to the left of the cursor.

Return

At the command line, pressing the Return key performs the function of processing a command. At the –More-- prompt on a terminal screen, pressing the Return key scrolls down to show the rest of the information.

Space Bar

Allows you to see more output on the terminal screen. Press the space bar when you see the More prompt on the screen to display the next screen.

Left Arrow

Moves the cursor one character to the left.

Right Arrow

Moves the cursor one character to the right.

Up Arrow

Recalls commands in the history buffer, beginning with the most recent command. Repeat the key sequence to recall successively older commands.

Down Arrow

Return to more recent commands in the history buffer after recalling commands with the Up Arrow or Ctrl-P. Repeat the key sequence to recall successively more recent commands.

Different Node Levels

View Node

This is the default node the users log in. This is strictly for viewing configuration and statistics only. No configuration changes can be made at this level.

Config Node

Users can enter this node by typing in the command “config” from the view node. They will be prompted for a password and after successful authentication users enters the config mode. All configuration settings can be changed here.

- Most commands entered without any parameters will return the current configured values and are similar to “view” node.
- All configuration changes are applied immediately and don’t require any reboot except for the *date* command, after which a reboot must be done.
- All configuration changes have to be saved in order to be persistent across reboot. A single *config save* command will save all configuration changes made during the session.
- Users can go back to the “view” node by typing in the command *exit.*

Debug Node

This node allows the user to run several commands such as telnet and ping from inside the radio. Users enter the debug node by typing in the *debug* command from the config node. Users can re-enter the cli view node by entering the *cli* command from within the debug node.

Individual Command Detailed Descriptions

This section describes all the commands in detail for all modes.

acm

Syntax: *acm*

Description: The *acm* command displays the status of the Adaptive Coding and Modulation (ACM) downshift and upshift thresholds. The thresholds are displayed for all modulations from min to max as set using the *speed* command.

ACM will allow the radio to automatically downshift to lower, more robust modulations as temporary channel degradation occurs, based on the MSE of the receiver. When the receiver detects the receive MSE passing a pre-defined threshold, it will send a BPSK coded message to the far end telling the far end to switch its transmit modulation to the next level down.

NOTE: If the min and max modulation are set to the same, the threshold is not used and has no meaning.

ACM operation is not symmetric and each end of the link may be operating at a different modulation level based on the channel conditions (RSSI, MSE).

Example:

```
(CLI-eng)# acm

<======================= ACM status ======================>
ACM mod          MSE(improve)    MSE(degrade)
QPSK             -19.00          N/A
8PSK             -20.00          -17.00
16QAM            -22.90          -19.00
32QAM            -25.60          -21.90
64QAM            -28.20          -24.60
128QAM           -31.40          -27.20
256QAM           -33.70          -30.40
512QAM           -36.20          -32.70
1024QAM          N/A             -35.20
```

bootimage

Syntax: *bootimage upgrade*

Description: The *bootimage upgrade* command takes firmware recently loaded via the FTP or TFTP service and saves it into the Current Image partition of the FLASH memory. Any subsequent reboot of the unit will then make the new firmware effective. In addition, the Previous Image FLASH memory is overwritten with the last Image that was loaded into the radio and run.

It is critical to wait for the bootimage upgrade process to complete updating to avoid a corrupted FLASH. This can take 5 minutes or more. Wait for the command prompt to be displayed again before cycling power.

config

Syntax: *config export*
config import
config remove
config save
config view

Description: The *config* commands allow the configuration setup of the unit, including all operating variables which are stored in FLASH to be viewed, saved, removed, imported from an external file, or exported to an external file located on a remote device running FTP server software. The FTP server that the config file can be imported from or exported to can be setup using the *ftp* command.

Typically only the *config save* command will be needed to save changes made to system operating variables to FLASH memory.

The *config view* command allows all the saved system variables to be viewed in text format.

If many units need to be programmed with the same settings, the config file in ASCII format can be exported using the *config export* command, which uses the ftp server information stored in the radio.

The export_config.txt file can be imported to another identical unit by tftp or ftp transfer of the file and subsequently using the *config import* command, which will write the new config file into non volatile memory. After a subsequent radio reboot the new config file will be used.

To summarize the sequence of copying the configuration from one radio to another:

1) Set up the ftp server ip address, user, password using the *ftp* command from clli, web.
2) After setting up the radio parameters and saving, run *config export* command from cli, web, or snmp on the radio with the configuration you wish to copy.
3) Modify the config.txt file exported to the FTP server if desired using a text editor like Notepad.
4) Set up the ftp server ip address, user, password on second radio using the *ftp* command from clli, web.
5) Run the *config import* command on the second radio unit to import the file that was just edited on the ftp server.
6) Reboot the radio to make the changes take effect.

If the config file is somehow corrupted, the *config remove* command should be executed, followed by a reboot. The system will automatically create a new default config file upon reboot if the file is missing, allowing all the variables to be re entered by the user.

NOTE: The command *reset config*, while similar, will also reset the access passwords.

Example:

```
(CLI-config)# config view
Frequency_Tx:              24085.00
Frequency_Duplex:          130.00
Tx_Power:                  0.00
Opmode:                    on
Httpd:                     on
Snmpd:                     on
Telnetd:                   on
Log_Timer:                 1
ACS_Enable:                0
ACS_MSE_Up:                -30.00
ACS_MSE_Down:              -10.00
HC_Enable:                 1
PLA_Type:                  off
XPIC_Enable:               off
Speed_Mod_Max:             1024QAM
Speed_Mod_Min:             QPSK
Speed_Bandwidth:           60
Data_Port:                 GE1
IBM_Enable:                off
IBM_Vlan_ID:               100
IBM_Tagging:               off
Remote_Mgmt:               0
Egress_Margin              60
ETH1_Enable:               on
ETH1_Auto_Nego:            on
ETH1_Duplex:               full
ETH1_Pause_Frame:          off
ETH1_Speed:                1000
ETH1_Max_Rate:             1000
ETH1_Priority:             0
ETH2_Enable:               on
ETH2_Auto_Nego:            on
ETH2_Duplex:               full
ETH2_Pause_Frame:          off
ETH2_Speed:                1000
ETH2_Max_Rate:             1000
ETH2_Priority:             0
QOS_Mode:                  0
QOS_Priority0_Queue:         0
QOS_Priority1_Queue:         1
QOS_Priority2_Queue:         2
QOS_Priority3_Queue:         3
QOS_Priority4_Queue:         4
QOS_Priority5_Queue:         5
QOS_Priority6_Queue:         6
QOS_Priority7_Queue:         7
QOS_QUEUE0_Weight:         1
QOS_QUEUE1_Weight:         2
QOS_QUEUE2_Weight:         4
```

```
QOS_QUEUE3_Weight:        8
QOS_QUEUE4_Weight:        12
QOS_QUEUE5_Weight:        15
QOS_QUEUE6_Weight:        18
QOS_QUEUE7_Weight:        21
QOS_ETH1_DSCP_0:        0
QOS_ETH1_DSCP_1:        0
QOS_ETH1_DSCP_2:        0
QOS_ETH1_DSCP_3:        0
QOS_ETH1_DSCP_4:        0
QOS_ETH1_DSCP_5:        0
QOS_ETH1_DSCP_6:        0
QOS_ETH1_DSCP_7:        0
QOS_ETH1_DSCP_8:        0
QOS_ETH1_DSCP_9:        0
QOS_ETH1_DSCP_10:        0
QOS_ETH1_DSCP_11:        0
QOS_ETH1_DSCP_12:        0
QOS_ETH1_DSCP_13:        0
QOS_ETH1_DSCP_14:        0
QOS_ETH1_DSCP_15:        0
QOS_ETH1_DSCP_16:        0
QOS_ETH1_DSCP_17:        0
QOS_ETH1_DSCP_18:        0
QOS_ETH1_DSCP_19:        0
QOS_ETH1_DSCP_20:        0
QOS_ETH1_DSCP_21:        0
QOS_ETH1_DSCP_22:        0
QOS_ETH1_DSCP_23:        0
QOS_ETH1_DSCP_24:        0
QOS_ETH1_DSCP_25:        0
QOS_ETH1_DSCP_26:        1
QOS_ETH1_DSCP_27:        0
QOS_ETH1_DSCP_28:        0
QOS_ETH1_DSCP_29:        0
QOS_ETH1_DSCP_30:        0
QOS_ETH1_DSCP_31:        0
QOS_ETH1_DSCP_32:        0
QOS_ETH1_DSCP_33:        0
QOS_ETH1_DSCP_34:        2
QOS_ETH1_DSCP_35:        0
QOS_ETH1_DSCP_36:        0
QOS_ETH1_DSCP_37:        0
QOS_ETH1_DSCP_38:        3
QOS_ETH1_DSCP_39:        0
QOS_ETH1_DSCP_40:        4
QOS_ETH1_DSCP_41:        0
QOS_ETH1_DSCP_42:        0
QOS_ETH1_DSCP_43:        0
QOS_ETH1_DSCP_44:        0
QOS_ETH1_DSCP_45:        0
QOS_ETH1_DSCP_46:        5
QOS_ETH1_DSCP_47:        0
QOS_ETH1_DSCP_48:        6
QOS_ETH1_DSCP_49:        0
QOS_ETH1_DSCP_50:        0
QOS_ETH1_DSCP_51:        0
QOS_ETH1_DSCP_52:        0
QOS_ETH1_DSCP_53:        0
QOS_ETH1_DSCP_54:        0
QOS_ETH1_DSCP_55:        0
QOS_ETH1_DSCP_56:        7
```

```
QOS_ETH1_DSCP_57:        0
QOS_ETH1_DSCP_58:        0
QOS_ETH1_DSCP_59:        0
QOS_ETH1_DSCP_60:        0
QOS_ETH1_DSCP_61:        0
QOS_ETH1_DSCP_62:        0
QOS_ETH1_DSCP_63:        0
Snmp_Trap_1:        0
Snmp_Trap_2:        0
Snmp_Trap_3:        0
Snmp_Trap_4:        0
Snmp_Trap_5:        0
Trap_IP_1:        0.0.0.0
Trap_IP_2:        0.0.0.0
Trap_IP_3:        0.0.0.0
Trap_IP_4:        0.0.0.0
Trap_IP_5:        0.0.0.0
RSSI_Min:                 -85.00
RSSI_Max:                 -20.00
RSSI_Action:              none
MSE_Min:                  -45.00
MSE_Max:                  -15.00
MSE_Action:               none
BER_Min:                  0.00
BER_Max:                  -4.00
BER_Action:               none
FER_Min:                  0.00
FER_Max:                  -4.00
FER_Action:               none
Temp_Min:                 -10.00
Temp_Max:                 70.00
Temp_Action:              none
IN_Port_Util_Min:         0.00
IN_Port_Util_Max:         100.00
IN_Port_Util_Action:      none
OUT_Port_Util_Min:        0.00
OUT_Port_Util_Max:        100.00
OUT_Port_Util_Action:      none
Link_Down_Action:         none
Unit_ID:                  StrataLink 24

GPS_Coordinate1:          N 00 00.00

GPS_Coordinate2:          S 00 00.00
```

data_port

Syntax: *data_port <1-2>*

NOTE: This command applies to SL-24 and SL-24-X only . For SL-24-E and SL-24-EX see the *mgmt_port* command.

Description: The *data_port* command allows the user to select which port will be used for traffic **and** In Band Management (IBM). When IBM is disabled, the Out of Band Management (OBM) port will always be forced to the opposite port of the data port.

The system is shipped with IBM enabled and Data/IBM Port set to the RJ45 port (GE1). Below are the steps required to configure the various combinations of IBM and OBM using GE1 (RJ45) and GE2 (SFP):

1) To run both traffic and IBM to the GE2 port, simply run the *data_port 2* command. Reconnect to GE2 since both data and IBM will immediately be moved to GE2.

2) To run traffic on GE2 and run OBM on GE1, run the *ibm enable off* command. OBM only is now on GE1. Connect traffic to GE2.

3) To run traffic on GE1 and OBM on GE2, a two step process is required:

    a. Run the ibm_enable off command. Management will still be on GE1 and traffic on GE2.

    b. Run the *data_port 2* command to swap the management and data ports. Management is now on GE2 and Data on GE1.

    c. Reconnect to GE2 which will now be in OBM mode.

    NOTE: using the web steps (a) and (b) can be done at the same time, eliminating the need to change the connection.

Example:

```
(CLI-config)# data_port
Data/IBM Port:  GE1
```

date

Syntax: *date*
date <year> <month> <date> <hour> <min>

Description: The *date* command with no argument displays the current date and time in 24 hr format. When the arguments are input, the system Real Time Clock (RTC) is updated.

The system time, which is used for syslog entries and is incremented using local on-board time references only, may not be accurate over long periods of time. It is highly recommended that NTP using the *ntp_enable* command be enabled for better accuracy since is updated periodically.

The date will be maintained through power interruptions up to 8 hours.

Example:

```
(CLI-config)# date
  <00-99>  YEAR:  <year> <month> <date> <hour> <min>
  <cr>


(CLI-config)# date 13 02 13 16 22
Wed Feb 13 16:22:00 MST 2013
```

debug

Syntax: *debug*

Description: The *debug* command allows the user to enter the debug node which has special networking commands executed outside the normal operating application. To enter the debug node the user must be logged into the config node of the main application.

Once in the debug node the user may run *ping* and *route* commands to external network devices, as well as open ssh or *telnet* sessions with other radios or network devices to assist in troubleshooting. If IBM is enabled on both radios then it is possible to telnet into the far side radio using the telnet command from within the debug node.

To exit from the debug node back into the main application, the command *cli* should be used. To completely exit the debug node the *exit* command can be used.

Example:

```
(.71-config)# debug
debug>
```

dhcp

Syntax: *dhcp <on/off>*

Description: The *dhcp* command allows the user to enable and disable the dhcp protocol to obtain an IP address automatically for the radio. When DHCP is enabled the unit will attempt to get and IP address. If the server is not available, the unit will use the locally saved IP address. Disable DHCP if you wish to use the static IP address all the time.

Example:

```
(.71-config)# dhcp on
DHCP:               on

SUCCESS
```

diagnostic

Syntax: *diagnostic*

Description: The *diagnostic* command is used to generate a file that can be used by Trango support personnel. It should be run when instructed by Trango personnel during troubleshooting.

Example:

```
(.71-config)# diagnostic
Checking all necessary system files........       PASSED
Getting first snapshot of counters........        PASSED
Getting device versions........                   PASSED
Checking FPGA connection........                  PASSED
Checking Modem connection........                 PASSED
Checking PIC connection........                   PASSED
Checking switch connection........                PASSED
Getting ODU information........                   PASSED
Getting timer information........                 PASSED
Getting second snapshot of counters........       PASSED
```

dns_ip

Syntax: *dns_ip <a.b.c.d>*

Description: The *dns_ip* command is used to specify the IP address of the DNS server which is used to resolve any server names entered such as NTP.

Example:

```
(cli-config)# dns_ip 10.14.0.7
```

dscp_info

Syntax: *dscp_info*

Description: The *dscp_info* command is used to display the current diffserv code point to priority mappings. Code points are mapped to priorities, which are mapped to queues. The actual mappings are set using the *qos dscp_source* command. Priority to queue mappings are set using the *qos cos_queue* command.

Example: The example shows the default settings

```
(cli-config)# dscp_info
DSCP 1:      0         DSCP 2:      0          DSCP 3:      0
DSCP 4:      0         DSCP 5:      0          DSCP 6:      0
DSCP 7:      0         DSCP 8:      0          DSCP 9:      0
DSCP 10:     1         DSCP 11:     0          DSCP 12:     1
DSCP 13:     0         DSCP 14:     1          DSCP 15:     0
```

```
DSCP 16:     0          DSCP 17:     0          DSCP 18:     3
DSCP 19:     0          DSCP 20:     3          DSCP 21:     0
DSCP 22:     3          DSCP 23:     0          DSCP 24:     0
DSCP 25:     0          DSCP 26:     3          DSCP 27:     0
DSCP 28:     3          DSCP 29:     0          DSCP 30:     3
DSCP 31:     0          DSCP 32:     0          DSCP 33:     0
DSCP 34:     5          DSCP 35:     0          DSCP 36:     5
DSCP 37:     0          DSCP 38:     5          DSCP 39:     0
DSCP 40:     7          DSCP 41:     0          DSCP 42:     0
DSCP 43:     0          DSCP 44:     0          DSCP 45:     0
DSCP 46:     7          DSCP 47:     0          DSCP 48:     7
DSCP 49:     0          DSCP 50:     0          DSCP 51:     0
DSCP 52:     0          DSCP 53:     0          DSCP 54:     0
DSCP 55:     0          DSCP 56:     7          DSCP 57:     0
DSCP 58:     0          DSCP 59:     0          DSCP 60:     0
DSCP 61:     0          DSCP 62:     0          DSCP 63:     0
```

egress_margin

Syntax: *egress_margin*
egress_margin <-90 to 90>

NOTE: The *egress_margin* command only supported on SL-24 and SL-24-X since later models handle this function automatically.

Description: The *egress_margin* command is used to control the Layer 1 bit rate from the internal switch to the modem. Since the SL-24 uses header compression, the L1 rates can be much higher than the L2 rates, so a margin is added to the radio L2 capacity to allow taking advantage of the header compression.

In general this parameter does not need to be changed by the user since hardware handshaking is used between the switch and modem. Default settings are recommended for most applications.

The margin is a percentage that is added to or subtracted from the current max radio capacity using the following equation:

egress rate = current radio capacity + (current radio capacity x *egress_ margin*)

As ACM downshifts, the egress rate is automatically adjusted for the current radio capacity and the user set egress margin is applied accordingly.

For radios that are constrained by the capacity license, the max egress margin is limited to 25%. Radios with a full capacity license are defaulted to 40%.

The most common use of egress margin is to reduce the link capacity to shape traffic or maintain a Service Level Agreements (SLAs).

Example:

```
(CLI-config)# egress_margin
Egress margin:  0 percent
```

```
(CLI-config)# egress_margin 25
Egress margin:  25 percent

SUCCESS
```

enc

Syntax: *enc enable <on|off>*
enc psk <20-32 character shared key>

Description: Enable or disable the AES 256 encryption function. Before enabling the function, the License Key for encryption must be entered using the *license_encryption* command. After enabling the encryption function, the license key should be entered. This key must be the same on both ends of the link to pass traffic. If user is logged into the config node, *exit* will take the user back to the view node.

NOTE: if encryption is used, the radio must be rebooted after enabling encryption or changing the speed. Even though the RF link will be operating normally, encrypted traffic will not pass until the reboot is done. The recommended sequence is:

1) Enable encryption using the *enc enable* command
2) Set the shared key using the *enc psk* command (must be same on both ends of link)
3) Set speed if a different one is desired using the *speed* command
4) Save the configuration using the *config save* command
5) Reboot the unit using the *reboot* command

Always set up the remote unit first

exit

Syntax: *exit*

Description: Exit the current management node. If user is logged into the config node, *exit* will take the user back to the view node.

If user is in the debug node, *exit* will close the session.

freq

Syntax: *freq*
freq <tx freq in MHz>

Description: The *freq* command will set the RF transmit frequency of radio, as well as the RF receiver frequency which is determined by the following equation:

rx freq = tx freq + freq_duplex *when tx freq <= 24147 MHz*

rx freq = tx freq - freq_duplex *when tx freq >= 24153 MHz*

TX frequencies between 24147 and 24153 are not allowed.

The transmitter is muted before changing the transmitter frequency to avoid potential interference to adjacent channels during synthesizer reprogramming.

The minimum resolution of the *freq* command is 1 MHz .

Depending on the channel bandwidth from the *speed* command, the min and max transmit frequencies will be different. Refer to the User Manual or Quick Start Guide to see the min and max for each channel width and the recommended channel pairings for best frequency reuse.

If no argument is included the command will return the current frequency settings.

Example:

```
(cli-config)# freq 24085
Tx Freq:                24085.00 (MHz)
Rx Freq:                24215.00 (MHz)
Freq Duplex:            130.00 (MHz)
```

freq_duplex

Syntax: *freq_duplex*
freq_duplex <duplex in MHz>

Description: The *freq_duplex* command specifies a customer frequency duplex which will be used to calculate and load the RX frequency after the freq command is run.

If a nonstandard frequency duplex, or TR spacing is to be used, this command should be executed before the *freq* command to ensure correct TX and RX frequency programming.

CAUTION: Upon running the *freq_duplex* command, the RX frequency will be reprogrammed, possibly causing a link down condition.

Refer to the User Manual or Quick Start Guide to see the recommended *freq_duplex* settings for best frequency reuse.

Example:

```
(cli-config)# freq_duplex 100
```

```
Freq Duplex:  100.00 (MHz)
```

ftp

Syntax: *ftp <server IP Address> <user name>*

Description: This command allows any file to be retrieved from an FTP server and loaded onto the radio. Entering the ftp server IP address and user name will prompt the user for the password, which is provided by the administrator of the FTP site. After entering the password, the *ftp>* prompt will be displayed and the following ftp commands can be run:

ftp> get <file_name> - get the file from the ftp server.

ftp> mode <mode> - default is passive

ftp> put <file_name> - perform the ftp put command to put a file from the radio onto the FTP site

ftp> logout – log out of the current session

gps_info

Syntax: *gps_info*

Description: Displays the gps coordinates entered by the user for the radio. The coordinates are available via SNMP for mapping applications. There is no GPS unit inside the radio, so the user must enter these coordinates manually using the *gps_lat* and *gps_long* commands.

Example:

```
(cli-config)# gps_info
GPS Latitude:           N 00 00.00
GPS Longitude:          S 00 00.00
```

gps_lat

Syntax: *gps_lat <text string>*

Description: Allows the user to set the GPS latitude for the radio for retrieval via SNMP Managers for mapping purposes. The field is a text string which supports several different formats.

Example:

```
(cli-config)# gps_lat N 12 34.567
GPS Latitude:           N 12 34.567
GPS Longitude:          S 00 00.00
```

gps_long

Syntax: *gps_long <text string>*

Description: Allows the user to set the GPS longitude for the radio for retrieval via SNMP Managers for mapping purposes. The field is a text string which supports several different formats.

Example:

```
(cli-config)# gps_long S 12 34.567
GPS Latitude:           N 12 34.567
GPS Longitude:          S 12 34.567
```

green_buff

Syntax: *green_buff <500-8000>*

Description: Allows setting the packet buffer size in kBytes for all the QoS Queues.

Feature Description: Larger buffer size settings will support bursty traffic and better TCP performance over networks with high latency. Longer latency and higher latency jitter over the radio link may occur with higher buffer size settings. The default setting for this parameter is 2000, or 2 Mbytes.

Example:

```
(CLI-config)# green_buff 8000
Green Buffer:           8000 kbytes

SUCCESS
```

hc_enable

Syntax: *hc_enable*
hc_enable <on|off>

Description: Displays the current status of the multilayer header compression feature and allows turning header compression on and off.

Feature Description: Multilayer Header Compression is a powerful feature of the StrataLink system. By removing redundant Ethernet L1-L4 packet header information and replacing them with small tags before transmission over the air, real Ethernet capacity can be significantly increased. At the other end of the link the original header information is replaced before egress out the Ethernet port.

The performance of the Header Compression is not dependent on the content of the packets, but rather on the packet size. For small packets, the capacity increase is significant since so much of the packet is comprised of header information. For larger packets the improvement will be less since the header portions are a smaller percentage of the overall packet. The actual benefit can be monitored using the *hc_stats* command.

There are two engines that are used to process the incoming data, one primarily for layer 2 compression, and the other for layer 3 and layer 4 compression.

For L2-L4 compression done by the two engines, up to 2048 flows can be stored. Flows are defined as a stream of packets where each packet has the same MAC or IP Source and Destination address. As the flows disappear from the traffic entering the radio Ethernet port, they are automatically aged out to allow room for new flows. In addition, higher capacity flows have priority over lower capacity flows.

All packets will have the L1 interframe gap and preamble removed prior transmission and the number of flows is not limited in this case.

The user does not need to make any adjustments to the header compression feature as it is fully automatic.

Example:

```
(cli-config)# hc_enable
HC Enable:              on
```

hc_stats

Syntax: *hc_stats*

Description: Displays the current statistics for the header compression engines, including the number of flows currently active and the percentage improvement. The L2 and L3 thresholds shown are age out times in milliseconds. Age out times are automatic and cannot be changed by the user.

Example:

```
(CLI-config)# hc_st
HC Enable:                      on

L2 Flow Count:                  1
L3 Flow Count:                  1
L2 Threshold:                   1000
L3 Threshold:                   1000
Net Compression Percent:        4
Gross Compression Percent:      4
```

help / ?

Syntax: *?*

Description: Displays all available commands for the current node. Simply enter a "?" followed by the return for a full list of commands

Example:

```
(CLI-config)#?
  acm               Display ACM feature status
  acs               Display ACS feature status
  bootimage         Upgrade system firmware
      .
      .
      .
  version           Display system software version
  voltage           Read voltage values
  xpic              XPIC configuration
  xpic_stats        Display XPIC statistics
```

httpd

Syntax: *httpd*
httpd <on|off>

Description: Displays the current http daemon status and allows turning the daemon off. Turning *httpd* off will prevent access to the radio via web browser, so exercise caution when turning off and saving changes.

Example:

```
(CLI-config)# httpd off
Httpd:                off
```

ibm

Syntax: *ibm*
ibm enable <on|off>
ibm tagging <on|off>
ibm vlanid <1-4088>

Description: Displays the current In-band Management (IBM) configuration and allows the user to turn IBM on/off or set the management of the radio unit up on a management VLAN. To enable a management VLAN, the user must set the VLAN ID first, then enable the tagging. All traffic coming into the IBM port with the set VLAN ID will be forwarded to the local radio CPU. All Traffic originating at the CPU will have the VLAN tag applied.

Example:

```
(CLI-config)# ibm
IBM Enable:             off
IBM Tagging:            off
IBM Vlan ID:            100
IBM Port:               GE2
```

ipconfig

Syntax: *ipconfig*
ipconfig gateway <gateway ip address>
ipconfig ip (ip address subnet mask>

Description: With no argument the *ipconfig* command displays the current ip configuration radio unit and the MAC address. The default ip for the radio is 192.168.100.100 or 192.168.100.101 and should be changed along with the gateway before installation. The example below shows how to change the IP address and gateway. Changes are made permanent in FLASH after the setting without running the *config save* command.

Example:

Change the IP address:

```
(CLI-config)# ipconfig ip 10.14.0.6 255.255.254.0
IP Address:             10.14.0.6
Subnet Mask:            255.255.254.0
Gateway IP:             192.168.100.1
ETH MAC:                00:01:de:72:23:71
```

Change the gateway:

```
(CLI-config)# ipconfig gateway 10.14.0.1
IP Address:             10.14.0.6
Subnet Mask:            255.255.254.0
Gateway IP:             10.14.0.1
ETH MAC:                00:01:de:72:23:71
```

license_capacity

Syntax: *license_capacity*
license_capacity <1-3> <license key>

Description: Displays the current capacity license level and allows the user to enter a new license key to increase capacity. License keys are alphanumeric and are specific to the MAC address of each radio unit. License Key 1 increases capacity to 300 Mbps full duplex, Key 2 to 400 Mbps, and Key 3 to Maximum capacity. After entering the license key the capacity will immediately become available for use.

Example:

```
(CLI-config)# license
  Maximum Capacity enabled
```

license_encryption

NOTE: This feature is not available on SL-24 and SL-24-X models

Syntax: *license_encryption*
license_encryption <license key>

Description: Displays the current encrypton license key status and allows the user to enter a new license key to enable AES 256 encryption. License keys are alphanumeric and are specific to the MAC address of each radio unit. After entering the license key the encryption function will be available will immediately become available for use. See *enc psk* command for the shared key entry. Both ends of the link must have the same psk.

Example:

```
((CLI-config)# license_encryption
Encryption License: No encryption license key
```

L2_age_timer

NOTE: This feature is not available on SL-24 and SL-24-X models

Syntax: *l2_age_timer*
l2_age_timer <0-86400>

Description: The *l2_age_timer* command allows setting of the internal switch MAC table ageout period. The default is 1800 seconds (30 minutes). The valid range is from 0 to 86400 seconds (24 hrs). If set to 0, the switch will not learn and incoming packets will flood to all ports. It is highly recommended that the age timer be set to a value higher than the external network switch, which is generally in the 4-5 minute range.

Example:

```
((CLI-config)# link_history
```

link_history

Syntax: *link_history*

Description: The *link_history* command shows how many times since reboot the radio link has unlocked and relocked. This command also shows the Link steady indicator, which will be 0 if the link has not been locked for more than a minute and 1 if the link has been locked for over a minute. These metrics are used for diagnostic purposes only.

Example:

```
((CLI-config)# link_history
Link History:           3
Link Steady:            1
```

linktest

Syntax: *linktest <1-99>*

Description: *linktest* is a diagnostic command used to see the current RSL, MSE, BER and transmit/receive modulation levels over time. The *linktest* command is entered with a number of iterations which are each 1 second apart. This command will block any other changes to the radio unit, and cannot be interrupted after being started.

Example:

```
(CLI-config)# linktest 5
        LOCK      RSSI       MSE            BER         Tx        Rx
  1>    1       -42.00      -40.30      0.00E+00      1024QAM   1024QAM
  2>    1       -42.00      -40.30      0.00E+00      1024QAM   1024QAM
  3>    1       -42.00      -39.80      0.00E+00      1024QAM   1024QAM
  4>    1       -42.00      -40.40      0.00E+00      1024QAM   1024QAM
  5>    1       -42.00      -40.20      0.00E+00      1024QAM   1024QAM
```

loglevel

Syntax: *loglevel <0 1 2>*

Description: Displays the syslog log levels and allows them to be changed. Log level 0 records only changes made by the user via web, snmp, or CLI. Level 2 records Events such as threshold violations, ACS/ACM downshifts and upshifts. Level 3 records statistics such as RSSI, MSE, BER and capacity utilization every 1 minute.

It is recommended that only log level 0 and 1 be used unless the user is trying to diagnose a problem since the syslog will fill up more quickly. To reduce the number of Level 3 events in the syslog, the *log_timer* command can be used to increase the interval between entries for Level 3 statistics.

The syslog can hold 3000 entries in RAM.

Example:

```
(CLI-config)# loglevel
  [1-6]  <1:Alert, 3:Error, 4:Warning, 5:Notice, 6:Info>
```

log_timer

Syntax: *log_timer <1-30>*

Description: Allows changing the time between logging statistics when log level 3 is enabled. The default time is 1 minute and the timer can be set from 1- 30 minutes. It is recommended that the Level 3 logging only be used when trying to diagnose a problem to avoid filling up the syslog and potentially overwriting other events.

Example:

```
(CLI-config)# log_timer 15
Syslog Timer:           15 (minutes)
```

loopback_auto

Syntax: *loopback_auto <5-120>*
show loopback_auto

Description: *loopback_auto* is a diagnostic command that allows verification of the radio by transmitting and receiving at the same frequency. The signal is transmitted through the OMT/diplexer back to the receiver which allows verification that the transmitter and receiver are working properly. In addition, this command will report the current Link Lock status, MSE and BER. The RSSI will vary depending on the transmit power level but as a reference for a 0 dBm set power, the RSSI should be in the -40 to -50 dBm range and the MSE should be better than -36 dB when the LINK indicator=1

NOTE: This command will break the RF link and stop user service to the far end of the link, so exercise caution before use.

When in operation, the internal switch modem port is blocked to prevent traffic from looping back the Ethernet port and forming a loop.

After running the *loopback_auto* command, the *show loopback_auto* must be executed to display the test results

Example:

```
((CLI-config)# loopback_auto 5
Wait for a few minutes then execute show loopback_auto to
display the loopback result

(CLI-config)# show loopback_auto
        LINK       RSSI          MSE             BER

1>       1       -43.00          -40.70          0
2>       1       -43.00          -40.50          0
3>       1       -43.00          -40.80          0
4>       1       -43.00          -41.10          0
5>       1       -43.00          -41.10          0
```

mgmt_port

Syntax: *mgmt_port < port# >*

Description: The *mgmt_port* command allows the user to select which port will be used for radio management (IBM or OBM). When IBM is enabled, traffic can flow through the link on the same port. If IBM is off, the management port is essentially an OBM port and all traffic entering on the specified port will be routed to the local radio only.

The system is shipped with the management port set to 1 (GE1-RJ45) and IBM enabled). Traffic will flow over the link through GE1 and GE2 per VLAN membership, but the radio can only be managed using GE1.

Below are the steps required to configure the various combinations of IBM and OBM. **Note that each step assumes a starting point of IBM on GE1, the default configuration:**

1) To move the IBM to the GE2 port, simply run the *mgmt_port 2* command. Reconnect to GE2 - IBM will immediately be moved to GE2. Traffic flows over both ports based on VLAN membership.

2) To run traffic on GE2 and run OBM only on GE1, run the *ibm enable off* command. OBM only is now on GE1. Traffic flows over GE2 using and SFP module running 1 Gbps.

3) To run traffic on GE1 and run OBM only on GE2, run the *ibm enable off* command, then run the *mgmt_port 2* command. OBM is now on GE2- Connect using an SFP module running 1 Gbps. Connect traffic to GE1.

Note that radios are shipped allowing all untagged traffic, **and no tagged traffic support** . See the *vlan_add* command for detail on how to add support for additional vlan tagged traffic on port by port basis.

If IBM tagging is used, the system will automatically add the required VLAN support to the port used for IBM.

Example:

```
(CLI-config)# mgmt_port
Management Port:  GE1
```

model

Syntax: *model*

Description: Reads the following from ODU FLASH memory, and displays them for reference:

ODU Model
Hardware ID number
ODU Serial Number
Current Transmit/Receive Spacing (Frequency Duplex)

Example:

```
(CLI-config)# model
Model:                  SL-24
HW ID:                  1
Serial ID:              7480177
Freq Duplex:            100.00 (MHz)
```

mse

Syntax: *mse*
mse <1-99>

Description: Displays the Mean Squared Error for the number of iterations entered, in 1 second intervals. This command is useful for diagnostic purposes.

Example:

```
(CLI-config)# mse 4
  1>  MSE                -40.50  (dB)
  2>  MSE                -40.10  (dB)
  3>  MSE                -40.00  (dB)
  4>  MSE                -40.10  (dB)
```

ntp

Syntax: *ntp*
ntp enable <on/off>
ntp server_ip <a.b.c.d>
ntp server_name <server name>
ntp time_zone <offset +12 to -12 hrs>

Description: Network Time Protocol settings. The ntp server name works in conjunction with the DNS server to resolve the IP address and is only required if the IP is not known. IF the IP address is known.

The ntp time is used to update the local real time clock. The time derived from the ntp will be used for local syslog entry timestamps.

If ntp is disabled, the *date* command can be used to set the real time clock.

opmode

Syntax: *opmode*
opmode <on|off>

Description: Displays and allows changing the state of the transmitter. *opmode on* turns the transmitter on at the last set transmit power and frequency and *opmode off* unlocks the transmitter PLL and turns the transmit amplifiers off.

Example:

```
(CLI-config)# opmode on
Opmode:                on
```

passwd

Syntax: *passwd <new password> <repeat new password>*

Description: Allows setting a new password for entering the config node. The new password must be no more than 8 characters in length and may only contain lower and upper case characters, numbers and the following symbols: @#$%&*.-_. Spaces are not allowed

Example:

```
(CLI-config)# passwd?
  passwd  Assign the config node password

(CLI-config)# passwd trango12 trango12
SUCCESS
```

pla_stats

Syntax: *pla_stats*

Description: Displays the Physical layer Link Aggregation (PLA) stats which show the mode, receive and transmit states, Alarm Indication, and cable state. Under normal operation the TX and RX states will indicate "both" indicating that both radio links are being used for transmit and receive data. If one of the paths is not available then either "master only" or "slave only" will be displayed.

The cable will show down if no cable is connected or if the cable is not a crossover cable. The PLA Mode should indicate master for one unit and Slave for the other unit at the same site for proper operation.

Example:

```
((CLI-config)# pla_stats
PLA Mode:               off
Rx State:               master only
Tx State:               both
AIS Condition:          normal
Cable Down:             down
```

pla_type

Syntax: *pla_type*
pla_type <off|master|slave>

Description: Allows setting or display of the radio unit PLA type. "Master" should be set for the radio unit connected to the network, and "slave" should be set for the radio unit connected to the Master PLA port via the crossover cable.

If PLA is not being used then the *pla_type* should be set to off.

Example:

```
((CLI-config)# pla_type
PLA Type:              off
```

port

Syntax: *port eth <1|2> auto_negotiate <on|off>*
port eth <1|2> duplex <half|full>
port eth <1|2> maxrate <0-1000>
port eth <1|2> pause <on|off>
port eth <1|2> priority <0-7>
port eth <1|2> speed <10|100|1000>

Description: Allows setting the port characteristics for either GE1 or GE2. All settings are done on a port basis where *port eth 1 xxxx* commands apply to GE1 (RJ45) and *port eth 2 xxxx* commands apply to GE2 (SFP).

port eth <1|2> auto_negotiate allows turning the port auto negotiation on or off and is defaulted to on. Note that GE2 is fixed and autonegotiate cannot be turned off.

port eth <1|2> duplex <half|full> allows setting the port duplex to half or full mode. Auto negotiate must be turned off before running this command. Note that GE2 is fixed at Full Duplex and cannot be changed.

port eth <1|2> maxrate <0-1000> allows the user to limit the ingress traffic for the port to restrict capacity over the link.

port eth <1|2> pause <on|off> enables pause behavior at the port. This feature only applies to Gigabit Ethernet operation and will have no effect for connections running at 10 or 100 Mbps.

port eth <1|2> priority <0-7> allows the user to assign a fixed priority for all incoming traffic that is not in a VLAN. The priority assigned will map the traffic into one of the 8 queues for Quality of Service. If left at the default value of 0, all untagged traffic will go to the lowest priority queue. If *dscp_enable* is on, the traffic will be processed according to the IP header Diffserv field.

port eth <1|2> speed <10|100|1000> allows the user to assign a fixed speed to the port. Auto negotiate must be turned off before running this command. Note that GE2 is fixed at 1000 Mbps and cannot be changed.

Examples:

```
CLI-config)# port eth 2 maxrate 500
Port 2 max rate: 500
SUCCESS


(CLI-config)# port eth 2 pause on
Port 2 pause frame: on
SUCCESS

(CLI-config)# port eth 2 priority 7
Port 2 priority: 7
SUCCESS
```

power

Syntax: *power*
power <0 to -20>

Description: Allows setting or displaying the transmitter power in dBm. In general the power will be set to the maximum unless the link is extremely short. For US operation the power should be set to no higher than -3 dBm. For Canada, the power may be set to 0 dBm. Changes will take effect immediately after setting.

Example:

```
(Power:                  0.00
Power min:              -20.00
Power max:              0.00


(CLI-config)# power -1
Power:                  -1.00
Power min:              -20.00
Power max:              0.00
```

prompt

Syntax: *prompt <new prompt label>*

Description: Allows customization of the prompt label for the CLI node which may be desired to identify the particular unit. In the example notice that the prompt changes immediately after executing the command.

Example:

```
(CLI-config)# prompt Woodson
SUCCESS
(Woodson-config)#
```

qos

Syntax: *qos mode <0-3>*
qos weight <0-7> <0-49>
qos dscp_source <0-63> <0-7>
qos dscp_enable <on|off>
qos cos_queue <0-7> <0-7>

Description: Allows display and changing of the quality of service (qos) mode and qos weights, and Diffserv to Priority mappings. The qos mode may be set to one of the following modes which control how packets are scheduled out from the 8 queues:

- All queues strict mode using the *qos mode 0* command,
- All queues deficit weighted round robin (DWRR) using the *qos mode 1* command.
- Queues 6-7 Strict Mode, Queues 0 - 5 DWRR mode using the *qos mode 2* command
- Queues 4-7 Strict Mode, Queues 0 - 3 DWRR mode using the *qos mode 3* command

In strict mode, all of the traffic in the highest priority queue will be forwarded and the queue must be emptied before any traffic from the lower priority queues will be forwarded.

In DWRR mode, as long as the weights are non zero, some traffic from each queue will be forwarded - the user has control of how often the individual queues are serviced via the qos weights. The qos weights are mapped to individual queues queues using the *qos weight* command. Higher weights will translate to more of the traffic from that priority being forwarded to the modem section of the system.

In strict mode the weights will have no effect.

The *qos cos_queue <0-7(Priority)> <0-7(Queue)>* command allows mapping the priority field of the received packet VLAN tag to one of the 7 queues in the switch portion of the radio. For strict mode Queue 7 is always the highest priority, with queues 6,5,4,3,2, 1, and 0 being decreasing priority. For weighted mode the weights assigned to each queue will dictate which queues have higher priority. Defaults are shown below:

Priority 0: **COS Queue = 0**
Priority 1: **COS Queue = 1**
Priority 2: **COS Queue = 2**
Priority 3: **COS Queue = 3**
Priority 4: **COS Queue = 4**
Priority 5: **COS Queue = 5**
Priority 6: **COS Queue = 6**
Priority 7: **COS Queue = 7**

COS Queue 0 Weight: **1**
COS Queue 1 Weight: **2**
COS Queue 2 Weight: **4**
COS Queue 3 Weight: **8**
COS Queue 4 Weight: **12**
COS Queue 5 Weight: **15**
COS Queue 6 Weight: **18**
COS Queue 7 Weight: **21**

The same priority mapping applies for Diffserv traffic, as IP packet DS fields (codepoints) are mapped to the priority level and then to the corresponding queue.

Using the *qos dscp_source < 0-63(Code Point) > < 0-7(Priority)>* command, the Diffserv code points in the DS field of an IP packet will be used to map the packet to a priority level from 0-7.

The *qos dscp_enable* command is used to determine which field in the incoming packet is used for qos prioritization. If *dscp_enable* is off, the PRI filed in the VLAN header will be used (802.1p) and non tagged traffic will be processed according to the port priority setting. If *dscp_enable* is on, the TOS bits in the IP header, also known as the Diffserv code point, will be used.

Example:

To enable WRR mode:

```
(CLI-eng)# qos mode 1
QOS Mode:              All WRR
SUCCESS
```

To re assign a weight of 5 to Queue 2

```
(CLI-eng)# qos weight 2 5
COS Queue 0 Weight:             1
COS Queue 1 Weight:             2
COS Queue 2 Weight:             5
COS Queue 3 Weight:             8
COS Queue 4 Weight:             12
COS Queue 5 Weight:             15
COS Queue 6 Weight:             18
COS Queue 7 Weight:             21
SUCCESS
```

To map DS codepoint 40 to priority 7

```
(CLI-config)# qos dscp_source 40 7
DSCP 1:      0          DSCP 2:      0          DSCP 3:      0
DSCP 4:      0          DSCP 5:      0          DSCP 6:      0
DSCP 7:      0          DSCP 8:      0          DSCP 9:      0
DSCP 10:     1          DSCP 11:     0          DSCP 12:     0
DSCP 13:     0          DSCP 14:     0          DSCP 15:     0
DSCP 16:     0          DSCP 17:     0          DSCP 18:     1
DSCP 19:     0          DSCP 20:     0          DSCP 21:     0
DSCP 22:     0          DSCP 23:     0          DSCP 24:     0
DSCP 25:     0          DSCP 26:     1          DSCP 27:     0
DSCP 28:     0          DSCP 29:     0          DSCP 30:     0
DSCP 31:     0          DSCP 32:     0          DSCP 33:     0
DSCP 34:     2          DSCP 35:     0          DSCP 36:     0
DSCP 37:     0          DSCP 38:     3          DSCP 39:     0
DSCP 40:     7          DSCP 41:     0          DSCP 42:     0
DSCP 43:     0          DSCP 44:     0          DSCP 45:     0
DSCP 46:     5          DSCP 47:     0          DSCP 48:     6
DSCP 49:     0          DSCP 50:     0          DSCP 51:     0
DSCP 52:     0          DSCP 53:     0          DSCP 54:     0
DSCP 55:     0          DSCP 56:     7          DSCP 57:     0
DSCP 58:     0          DSCP 59:     0          DSCP 60:     0
DSCP 61:     0          DSCP 62:     0          DSCP 63:     0
```

qos_info

Syntax: *qos_info*

Description: Displays the current quality of service (QOS) settings, including the QOS mode, class of service priority mappings to queues, and weight to queues. Note the weight to queue mappings only apply when running one of the qos modes with WRR active. The qos settings apply to data path and in band management traffic only.

Example:

```
(CLI-config)# qos_info
QOS Mode:              All strict

Priority 0:          COS Queue = 0
Priority 1:          COS Queue = 0
Priority 2:          COS Queue = 1
Priority 3:          COS Queue = 1
Priority 4:          COS Queue = 2
Priority 5:          COS Queue = 2
Priority 6:          COS Queue = 3
Priority 7:          COS Queue = 3

COS Queue 0 Weight:             1
COS Queue 1 Weight:             2
COS Queue 2 Weight:             4
COS Queue 3 Weight:             8
```

reboot

Syntax: *reboot*

Description: Allows the user to remotely reboot the unit, which will interrupt service for approximately 2 minutes until the saved configuration is reloaded and the radio reinitialized. The current SSH or Telnet session will be broken as soon as the command is executed.

Example:

```
(CLI-config)#reboot
```

reload

Syntax: *reload in*
reload in <1-240>
reload cancel

Description: Allows the user to schedule an automatic reboot and reload the previously saved configuration automatically. This feature is very useful if changes to a remotely connected radio are to be made but the change may run the risk of losing connection to the radio. In this case the user would run the *reload in x* command, make the changes, and if the changes were successful, run the *reload cancel* command. If the changes were not successful, the remote radio will reboot after the timer expires and the link would be restored to the known good condition, preventing a truck roll to the remote site.

To periodically check how much time is remaining, the *reload in* command with no argument can be used.

Example:

```
(CLI-config)# reload in 10
Reload in 10 minutes. Less than 10 minutes remains

(CLI-config)# reload in
Reload in 10 minutes. Less than 9 minutes remains

(CLI-config)# reload cancel
Reload cancelled
```

remote_mgmt

Syntax: *remote_mgmt <on|off>*

Description: This command allows the allows access to the remote radio unit from the local OBM port when IBM is off. *remote_mgmt* must be enabled on both ends of the link for proper operation. Care must be exercised when this command is used since the OBM ports on both ends of the link are in the same internal VLAN and will also pass traffic, although passing traffic over this interface is not recommended. A loop may be formed if the OBM ports on both radios are connected to the same switch.

Example:

```
(CLI-config)# remote_mgmt
Remote management:    off
SUCCESS
```

reset

Syntax: *reset config*
reset ipconfig
reset license_key

Description: These commands allow resetting the configuration, ip configuration and capacity license capacity back to factory default values.

When running *reset config*, the radio configuration and settings will be changed which may break the link depending on the current settings.

When running *reset ipconfig*, the connection to the radio will be lost since the IP address will be changed back to 192.168.100.100 with a gateway of 192.168.100.1.

Resetting the license key will reduce the max capacity of the radio to 200 Mbps full duplex.

Example:

```
(CLI-config)# reset config
Reset to factory default configuration

SUCCESS
```

rssi

Syntax: *rssi*
rssi <1-99>

Description: Displays the current Receive Signal Strength Indication (RSSI), also known as Receive Signal Level (RSL) and can be run either without an argument (single measurement), or with a specified number of iterations. The iterations can be useful for identifying RF signal variations due to weather or antenna movement.

Results are displayed in units of dBm.

Example:

```
(CLI-config)# rssi 5
  1>  RSSI              -41.00 (dB)
  2>  RSSI              -41.00 (dB)
  3>  RSSI              -41.00 (dB)
  4>  RSSI              -41.00 (dB)
  5>  RSSI              -41.00 (dB)
```

show

Syntax: *show history*
show loopback_auto
show passwords

Description: *show history* shows the last 20 commands that were executed on the system. *show loopback_auto* shows the results of running the *loopback_auto* command. *show passwords* shows all the CLI, SNMP and web passwords and is only available at the config login level.

Example:

```
(CLI-config)# show history
  survey 1
  survey 2
  linktest
  status save
  status pll
  status remote
  status modem
  status compare
  date
  stats show
  siglevel
  stats show
  speed 30 qam1024 qam16
  speed 60 qam1024 qpsk
  snmpd
  snmpd off
  snmpd on
  siglevel
  show

(CLI-config)# show passwords
CLI View node:          trango
CLI Config node:        trango
SNMP Read community:    public
SNMP Write community:   private
Web Interface View:     trango
Web Interface Config:   trango
Snmp Trap:              trapstr
```

siglevel

Syntax: *siglevel*

Description: Displays the current signal statistics of the incoming receive signal at the modem input. These parameters are useful for diagnosing link signal degradation and should be used in consultation with Trango Tech Support.

Example:

```
(CLI-config)# siglevel
Normalized MSE:                 -367
Radial MSE:                     -361
LDPC Decoder Stress:            3581009
External AGC:                   4095
Carrier Offset:                 19016313
Rx Symrate:                     52001020
Block counter:                  24349
Uncorrect Block:                0
LDPC Avg Iteration:             74975
Output corrected bytes:         0
```

snmpd

Syntax: *snmpd*
snmpd <on|off>

Description: Displays the simple network monitoring protocol (SNMP) daemon status and allows turning the daemon off. Turning *snmpd* off will prevent access to the radio via snmp, so exercise caution when turning off and saving changes.

Example:

```
(CLI-config)# snmpd off
Snmp:                   off
```

speed

Syntax: *speed*
speed <ch bw> <max mod> <min mod>

Description: Allows setting and displaying the current local unit speed. The speed is comprised of the channel occupied bandwidth in MHz, maximum modulation, and minimum modulation. If the max and min modulation are set to the same level then no ACM shifting will occur and the radio will remain at the set modulation always.

NOTE: if encryption is used, the radio must be rebooted after enabling encryption or changing the speed. Even though the RF link will be operating normally, encrypted traffic will not pass until the reboot is done. The recommended sequence is:

6) Enable encryption using the *enc enable* command

7) Set the shared key using the *enc psk* command (must be same on both ends of link)
8) Set speed if a different one is desired using the *speed* command
9) Save the configuration using the *config save* command
10) Reboot the unit using the *reboot* command

Always set up the remote unit first

Acceptable values are as follows:

Channel Bandwidth *(<ch bw>):* 10, 14, 20, 25, 30, 40, 50, 60 MHz

Min and Max Mod*(<max mod>, <min mod>):* QAM1024, QAM512, QAM256, QAM128, QAM64, QAM32, QAM16, 8PSK, and QPSK.

If no argument is presented, the speed command will return the current speed information along with the symbol rate in Msym/sec, current capacity in Mbps and Max capacity in Mbps.

Current capacity represents the max rate that the local unit can transmit given the current transmit modulation. Max capacity indicates the max rate the local unit can transmit if the transmit modulation is set to the Maximum modulation which would be the normal operating point in most installations.

The capacities shown are for small packet sizes assuming a header compression gain of approximately 50%. Large packet size capacities will be approximately 67% of the numbers shown.

Example:

```
(CLI-config)# speed 30 qam1024 qam16
Bandwidth:              30
Max Modulation:         1024QAM
Min Modulation:         16QAM
Symrate:                26.00
Current Speed:          72.00
Max Speed:              380.00
```

stats

Syntax: *stats show*
stats clear

Description: Displays the current traffic and management Ethernet and RF port statistics including port counters, utilization, packet size statistics, and dropped frame information. The counters can be cleared by running the *stats clear* command.

Example:

```
(CLI-config)# stats show

<====================== Ethernet Counters ======================>
Port:                      GE1         GE2         Modem
Status:                    on          on          on
Duplex:                   full        full        full
Speed:                    1000        1000        1000
In Octets:            24594884  3079179912  1176167558
In Ucast Pkt:           13307   348750103   348119608
In NUcast Pkt:         251104           0           0
In Port Rate:               0          48          48
In Port Util:               0           4           4
InPkt64:               217866           0       91670
InPkt65_127:             9462    12563459    14404776
InPkt128_255:           28535    30937874    30717115
InPkt256_511:            4193    61872172    61414727
InPkt512_1023:           4355   123739290   122821599
InPkt1024_1518:             0   119637308   118761403
Out Octets:           4457827  1170316066  2192520051
Out Ucast Pkt:          12929   348119620   347638507
Out NUcast Pkt:             3           0           0
Out Port Rate:              0          48          48
Out Port Util:              0           4           4

<======================== RF Counters ========================>
                          IN                      OUT
Total Octets:                 1175014820       1918979348
Total Pkt:                     348200725        347294714
Total Drop Air Frames:                 0              N/A
Port Rate(Mbps):                      49               50
Port Util(per):                        6                6
```

status

Syntax: *status modem*
status pll
status remote
status save
status compare

Description: Displays various system status information as follows:

status modem provides the current local MSE, RSSI, Bit Error Rate (BER) and Frame Error Rate (FER), modem locks and Transmit/Receive Modulation levels (Profiles). All data is an instantaneous snapshot of the link condition.

status pll provides the transmit and receive Phase Locked Loop (PLL) status where 1 = locked (normal) and 0= unlocked (not normal). The exception for the

status pll TX to show unlocked is when the transmitter is turned off which occurs if opmode is off or if the unit is running the survey command.

status remote shows the current MSE, RSSI, Lock and RX profile status of the far end radio which is obtained via internal communication to the far end radio unit.

status save saves the current status of the radio including MSE, RSSI, various counters and PLL Status. This command is useful for recording the state of the local side of the link after the radio has been put into service and is aligned properly and passing traffic. At any later date the user may run the *status compare* command to observe which parameters may have changed since the link was put in.

For example, if the user suspects that the antenna has moved, the *status compare* command can be used to see the current RSSI vs the original RSSI. The status can always be overwritten by re-running the *status save* command

status remote shows the current MSE, RSSI, Lock and RX profile status of the far end radio which is obtained via internal communication to the far end radio unit.

Example:

```
((CLI-config)# status modem

<==================== Modem Status ====================>
MSE:                    -36.50 (dB)
RSSI:                   -41.00 (dBm)
BER:                    0.00E+00
FER:                    0.00E+00
BER(cumulative):        0.00E+00
FER(cumulative):        0.00E+00
Acquire Lock:           1
Timing Lock:            1
Preamble Lock:          1
LDPC Lock:              1
Tx Profile:             1024QAM
Rx Profile:             1024QAM


(CLI-config)# status pll

<========================= PLL Status =========================>
Tx PLL:                 1
Rx PLL:                 1
```

```
(CLI-config)# status remote
MSE:                    -38.09 (dB)
RSSI:                   -39.00 (dBm)
Link Lock:              1
Rx Profile:             1024QAM

(CLI-config)# status save
All system status saved
```

survey

Syntax: *survey <1-50>*

Description: Runs a survey of the entire RF band using a step size of 10 MHz, and displays the Average and Max RSSI. This is useful for determining if the spectrum is occupied. Note that the filter used is roughly 28 MHz. At the band edges of signals received there will be a tendency to read a stronger signal than is actually present. Also, the RSSI noise floor for the unit is approximately -85 dBm, so interference lower than this will not be detected.

Each iteration takes roughly 1 minute so exercise caution when running survey with a large iteration count.

This command will break the RF link and turn the local transmitter off while the test is running. **After the survey is complete the original speed , frequency and transmit power will be restored automatically.**

Example:

```
((CLI-config)# survey 1
Current Speed:  60 1024QAM  QPSK
Set Speed to bandwidth 10, QAM512
Opmode: off


Frequency Survey count 1
Freq            RSSI           RSSI_MAX        RSSI_AVG
24055.00        -53.00          -53.00          -53.00
24065.00        -47.00          -47.00          -50.00
24075.00        -45.00          -45.00          -48.33
24085.00        -44.00          -44.00          -47.25
24095.00        -44.00          -44.00          -46.60
24105.00        -44.00          -44.00          -46.17
24115.00        -47.00          -44.00          -46.29
24125.00        -53.00          -44.00          -47.13
24135.00        -68.00          -44.00          -49.44
24145.00        -81.00          -44.00          -52.60
24155.00        -66.00          -44.00          -53.82
24165.00        -85.00          -44.00          -56.42
24175.00        -66.00          -44.00          -57.15
24185.00        -66.00          -44.00          -57.79
24195.00        -66.00          -44.00          -58.33
24205.00        -85.00          -44.00          -60.00
24215.00        -85.00          -44.00          -61.47
24225.00        -85.00          -44.00          -62.78
24235.00        -85.00          -44.00          -63.95
24245.00        -59.00          -44.00          -63.70

Restore Original Frequency:     24215.00

Restore Original Frequency Duplex:      130.00
Restore Original Speed:         60 1024QAM  QPSK
Opmode: on
```

sysinfo

Syntax: *sysinfo*
sysinfo <1-7>

Description: Displays the current radio system information. Without an argument all sections are shown. *sysinfo* followed by a number will show only the corresponding section according to the examples shown below

sysinfo 1 – Management Information Section

```
<======================= 1. Management ====================>
Unit ID:                StrataLink 24 WoodsonL
IP Address:             10.14.3.6
Subnet Mask:            255.255.255.252
Gateway IP:             10.14.3.5
ETH MAC:                00:01:de:72:22:E1
```

```
Model:                  SL-24
FPGA Version:           0002010D
OS Version:             2p6r22b0D021213
FW Version:             1p0r4D021213
Modem Version:          6201.4.4
```

sysinfo 2 – Radio Configuration Section

```
<================= 2. Radio Configuration ==================>
Freq (Tx):              24210.00 (MHz)
Freq (Rx):              24080.00 (MHz)
Freq Duplex:            130.00 (MHz)
Power:                  -5.0 (dBm)
Speed Symbol Rate:      43.00
Speed Max Modulation:   512QAM
Speed Min Modulation:   QPSK
Speed Bandwidth:        50
Current Speed:          120.00 (Mbps)
Max Speed:              556.00 (Mbps)
```

sysinfo 3 – System Configuration Section

```
<================ 3. System Configuration ==================>
Header Compression:     on
Httpd:                  on
PLA:                    off
Snmpd:                  on
Tftpd:                  off
Telnetd:                on
```

sysinfo 4 – Ethernet Port Configuration Information Section

```
<=============== 4. ETH Port Configuration =================>
Port:               GE1         GE2
Enable:             on          on
Status:             on          on
Pause Frame:        off         off
Auto Negotiate:     on          on
Duplex:             full        full
Priority:           4           6
Speed:              1000        1000
Max Rate:           100         1000
```

sysinfo 5 – Adaptive Coding and Modulation (ACM) Section

```
<====================== 5. ACM status ======================>
ACM             MSE(improve)    MSE(degrade)
QPSK            -17.00           N/A
8PSK            -20.00           -15.00
```

```
16QAM          -22.90          -19.00
32QAM          -25.60          -21.90
64QAM          -28.20          -24.60
128QAM         -31.40          -27.20
256QAM         -33.70          -30.40
512QAM         -36.20          -32.70
1024QAM        N/A             -35.2
```

sysinfo 6 – Threshold Information Section

```
<==================== 6. Threshold Info ====================>
                      min             max             action
RSSI (dBm):             -85.00          -20.00          none
MSE (dB):               -45.00          -15.00          none
BER:                    N/A             1.00E-04        none
FER:                    N/A             1.00E-04        none
Temp (celsius):         -10.0           70.0            none
IN Port Util:           N/A             100.0           none
OUT Port Util:          N/A             100.0           none
Link Down:              N/A             N/A             none
```

sysinfo 7 – In Band Management (IBM) Section

```
<======================= 7. IBM Info =======================>
IBM Enable:             on
IBM Tagging:            off
IBM Vlan ID:            100
IBM Port:               GE1
```

syslog

Syntax: *syslog*
syslog <clear|export|0-2>
syslog_enable <on/off>
syslog_ip <a.b.c.d>

Description: Displays a log of all set actions, events, and statistics, depending on the *loglevel* set by the user. The syslog has approximately 3000 entries and is not saved across a reboot. To clear the syslog, use the *syslog clear* command. For troubleshooting and post processing, the syslog can be exported using the *syslog export* command. Once this command has been executed, a file named "syslog.txt" may be transferred from the radio to the host computer ,

To view all events, run *syslog* with no argument. To view events only, run *syslog 0*. To view user set changes and events only, run *syslog 1*.

telnetd

Syntax: *telnetd*
telnetd <on|off>

Description: Displays the current telnet daemon status and allows turning the daemon off. Turning *telnetd* off will prevent access to the radio via telnet, so exercise caution when turning off and saving changes.

Example:

```
(CLI-config)# telnetd off
Telnetd:                off
```

temp

Syntax: *temp*

Description: Displays the current radio temperatures in degrees C. This value is read from an internal temperature sensor and will always be 15-30 degrees higher than the ambient temperature.

The temp values should be used to spot unusual temperature changes which may indicate poor airflow around the radio. If thresholds are set to trigger action based on temperature, ensure that this offset is considered.

Example: (Taken with outside air of 17 deg C/62 deg F)

```
(CLI-config)# temp

System Temperature:     43              (celsius)
```

tftpd

Syntax: *tftpd*
tftpd <on | off>

Description: The *tftpd* command without any argument displays the current status of the trivial file transfer protocol (tftp) server in the radio. *tftpd on* turns the server on to allow firmware upgrades or transfer of files to and from the radio internal RAM. It is recommended to keep the tftp server off during normal operation.

Example:

```
(cli-config)# tftpd
Tftpd:                  off

(cli-config)# tftpd on
```

```
Tftpd:                    on
```

threshold

Syntax: *threshold*
threshold action <0-8 (threshold)> <0-2 (action)>
threshold value <0-7 (threshold)> <min | max> <value>

Description: The *threshold* command allows individual link parameters to be internally monitored against user set thresholds. If the thresholds are violated, an action can be assigned to either notify an external network monitoring program or take action on the data path of the link. The following thresholds can be set:

Threshold Mapping:

0	RSSI
1	MSE
2	BER
3	FER
4	On board System Temperature
6	In Port Utilization (percent of max available)
7	Out Port Utilization (percent of max available)
8	Link Down

For each threshold above, except Link Down, minimum and maximum threshold values can be entered using the *threshold value* command.

If a threshold value is exceeded (lower than the min value or higher than the max value), the following actions can be taken:

Action Mapping:

0	none (no action)
1	snmp trap is generated and sent to all trap IP Addresses that are enabled
2	RPS – Rapid Port Shutdown of the datapath physical interfaces (PHY) is made on both ends of the link to allow layer 2 path switching using STP or RSTP protocols running on a connected switch.

Example: Shows how to set an SNMP trap for RSSI dropping below -75 dBm or going above -15 dBm. The SNMP trap IP must have been previously set up using the *trap* command.

```
(cli-config)# threshold
                          min              max              action
```

```
RSSI (dBm):             -85.00          -20.00          none
MSE (dB):               -45.00          -15.00          none
BER:                    N/A             1.00E-04        none
FER:                    N/A             1.00E-04        none
Temp (celsius):         -10.0           70.0            none
IN Port Util:           N/A             100.0           none
OUT Port Util:          N/A             100.0           none
Link Down:              N/A             N/A             none

(cli-config)# threshold action 0 1
Threshold 0:         min=-85.00, max=-20.00, action=snmptrap
SUCCESS

(cli-config)# threshold value 0 min -75
Threshold 0:         min=-75.00, max=-20.00

SUCCESS

(cli-config)# threshold value 0 max -15
Threshold 0:         min=-75.00, max=-15.00

SUCCESS
```

trap

Syntax: *trap*
trap enable <1-5> <on |off>
trap ip <1-5> <IP Address in A.B.C.D format>

Description: The *trap* command with no argument displays the saved IP config for the each trap and shows whether the trap is enabled.

trap enable turns on each trap on or off. A trap will be sent to the corresponding IP address if the trap is enabled. No trap will be sent if the trap is off. Up to 5 trap IPs can be assigned and enabled.

If a threshold violation with action= 1 (send snmptrap) occurs, an snmp trap will be sent to each IP address that is enabled. **No traps will be sent unless at least one threshold action is set to snmptrap.** See the *threshold* command for more information.

trap ip allows assigning a trap manager ip address to send the trap to in the event of a threshold violation.

Examples:

```
(.72-config)# trap
                IP                  Enable
Trap 1:         0.0.0.0             off
Trap 2:         0.0.0.0             off
Trap 3:         0.0.0.0             off
Trap 4:         0.0.0.0             off
```

```
Trap 5:         0.0.0.0                 off

(.72-config)# trap ip 1 192.168.0.1
                IP              Enable
Trap 1:         192.168.0.1              off

SUCCESS

(.72-config)# trap enable 1 on
                IP              Enable
Trap 1:         192.168.0.1              on

SUCCESS
```

unit_id

Syntax: *unit_id <text string up to 100 characters>*

Description: Allows the user to save a unit identification text string, up to 100 characters. The *unit_id* appears at the top of each web page and in the *sysinfo 1* (Management section). *unit_id* is typically used to state the location of the radio unit but may be used for any identification purpose the user desires.

Example:

```
(cli-config)# unit_id Trango SL-24 Stowe>Woodson
Unit ID:  Trango SL-24 Stowe>Woodson
```

uptime

Syntax: *uptime*

Description: Displays the following:

1) Current time in 24 hr format as set using the date command
2) Time since the last reboot in dd : hr: min format
3) CPU load averages to indicate the resource usage of the CPU

Example: (shows radio was up for 20 hrs, 55 minutes)

```
17:37:47 up 20:55, load average: 1.45, 1.41, 1.28
```

version

Syntax: *version*

Description: Reads the following items and displays them for reference. Previous versions of firmware may be restored using the *bootimage toggle* command.

Current FPGA Version Stored in FLASH
Current OS Version Stored in FLASH
Current Firmware Version Stored in FLASH
Current Modem Version Stored in FLASH

Previous FPGA Version Stored in FLASH
Previous OS Version Stored in FLASH
Previous Firmware Version Stored in FLASH
Previous Modem Version Stored in FLASH

Example:

```
(cli-config)# version
Current Image Version
FPGA Version:                   0002010D
OS Version:                     2p6r22b0D021213
FW Version:                     1p0r3D021213
Modem Version:                  6201.4.4

Previous Image Version:
FPGA Version:                   0002010D
OS Version:                     2p6r22b0D020613
FW Version:                     1p0r3D020613
Modem Version:                  6201.4.4
```

vlan_info

NOTE: This feature is not available on SL-24 and SL-24-X models

Syntax: *vlan_info*

Description: Displays the current VLAN IDs allowed to pass from the input data ports to the radio modem. The list of VLAN IDs must match on both ends before the traffic will pass.

Example:

```
(CLI-config)# vlan_info
1, 10, 11, 12, 13, 14, 15, 16, 17,
100,
200,
400,
```

vlan_add

NOTE: This feature is not available on SL-24 and SL-24-X models

Syntax: *vlan_add <2-4085>*

Description: Allows adding a single VLAN ID to the list of VLANs that are allowed to traverse the link. The VLAN added must be added to both radio units before traffic will pass.

Example:

```
(CLI-config)# vlan_info
1, 10, 11, 12, 13, 14, 15, 16, 17,
100,
200,
400,
```

vlan_remove

NOTE: This feature is not available on SL-24 and SL-24-X models

Syntax: *vlan_remove <2-4085>*

Description: Allows removing a VLAN ID from the list of VLANs that are allowed to traverse the link. The VLAN removed must be removed from both radio units before traffic will pass.

Example:

```
(CLI-config)# vlan_remove 500

SUCCESS
```

vlan_add_range

NOTE: This feature is not available on SL-24 and SL-24-X models

Syntax: *vlan_add_range <startingID > <endingID>*

where starting ID is lower than endingID and both are between 2 and 4085

Description: Allows adding a a range of VLAN IDs to the list of VLANs that are allowed to traverse the link. The VLANs added must be added to both radio units before traffic will pass.

Example:

```
(CLI-config)# vlan_add_range 500 600

SUCCESS
```

vlan_remove_range

NOTE: This feature is not available on SL-24 and SL-24-X models

Syntax: *vlan_remove_range <startingID > <endingID>*

where starting ID is lower than endingID and both are between 2 and 4085

Description: Allows removing a range of VLAN IDs from the list of VLANs that are allowed to traverse the link. The VLANs removed must be removed from both radio units before traffic will pass.

Example:

```
(CLI-config)# vlan_remove_range 500 600

SUCCESS
```

voltage

Syntax: *voltage*

Description: Reads the current input voltage to the radio unit. The voltage is measured at the RJ45 connector and terminal block. This measurement is used to ensure the input voltage is within the specification. It is read each time the command is executed.

Example:

```
(cli-config)# voltage
-48 Volt Input:                 -48.94
```

xpic

Syntax: *xpic enable <on|off>*
xpic hv <h|v>

Description: Applies to -X models only. Allows the user to enable or disable the XPIC feature and to set the polarization of the unit (h for horizontal polarization or v for vertical polarization). When enabled, the radio will process the XPIC IN signal (from the oppositely polarized slave radio) to cancel the interference from the oppositely polarized link. The coaxial cables between the two units must be installed and XPIC should be enabled on both radio units. The MSE will improve once the XPIC feature is enabled.

Example:

```
(cli-config)# xpic enable on
XPIC Enable:          on
```

xpic_stats

Syntax: *xpic_stats*

Description: Reads the current statistics from the modem for the XPIC function, indicating XPIC status (on or off), Cross Polarization Discrimination (XPD), and other parameters used for diagnostic purposes

Example:

```
(cli-config)# xpic_stats
XPIC Enable:                    on
XPD Tenths:                     170
Slave Carrier Offset:           19033224
Slave Internal AGC:             -114
Slave External AGC register:    4095
Slave Sweep In Progress:        0
AAF Gain Slave:                 14897
```