

## **Rockhound to Earthworm Data Relay**

The Rock-to-EW module provides a data relay to the USGS Earthworm software package (<http://folkworm.ceri.memphis.edu/ew-dist>). Rock-to-EW emulates an Earthworm "export\_generic" module, providing a TCP/IP listen port for external "import" programs to connect to.

The data-output operation of this module is similar to "export\_generic": Messages are queued in a memory based FIFO, and sent to the receiving "import\_generic", or similar program, via a TCP connection. If the available bandwidth of the link is lower than the aggregate rate of messages being queued for shipping, the FIFO will eventually overflow. In that case, an error is logged, and the queue becomes circular. That is, if the queue is configured to be N messages long, it will contain the most recent N messages. Two-way heartbeats are used to assure that the link is actually capable of transmitting data. The heartbeats consist of agreed-upon text strings sent at an agreed-upon rate. If a proper heartbeat is not received in time, it is presumed that the link is broken. In this case, Rock-to-EW will log the error, close the connection, and then wait for the import program to reestablish the connection.

The Rock-to-EW module supports simultaneous connections from more than one "import" client. Each connection operates via a separate listen-port number; see the 'ListenPortNums' parameter for configuration details. Having each connection on a separate listen-port number allows the module to keep track of which messages have been delivered to which "import" client.

The optional 'ListenPortAddr' parameter may be used to specify a specific host address or IP to use when binding to the listen port.

When the delivery of a message to an "import" client fails, the module will delay by the 'RetryDelayMS' number of milliseconds before attempting to resend the message.

When the connection to an "import" client is lost and then restored, the module will resume the sending of messages starting with the last unsent message in the queue, provided that the queue has not overflowed and the time elapsed is not greater than the 'DropTimeoutSecs' parameter value.

Messages generated by this module are in the Earthworm TRACEBUF2 format, using the module and installation ID values specified in the 'EwModuleId' and 'EwInstallId' parameters.

The 'ChannelNames' parameter may be used to select which channels are delivered. If any channel-name entries are specified then the channel information for each message must match a given entry, or the message will be discarded. If no channel-name entries are specified then all messages will be delivered. The specified channel-name entries are separated by commas, and may be in the following forms:

1. CH
2. CH.LOC
3. CH.NET.LOC

4. STA.CH.NET.LOC
5. dig1:X

The asterisk wildcard character (\*) may be used to specify "match any name", and two dashes ("--") may be used to specify a null location code. The following are example 'ChannelNames' entries:

```
"HNZ" : select any channel with channel name "HNZ"
"HNZ.00" : select channel with channel name "HNZ" and location "00"
"HNZ.KM.00" : channel name "HNZ", network "KM" and location "00"
"KMI.HNZ.KM.00" : station "KMI", channel "HNZ", network "KM" and location "00"
"dig1:3" : select third channel configured on instrument
"KMI.HNZ.*.00" : station "KMI", channel "HNZ", any network, and location "00"
"KMI.HNZ.KM.--" : station "KMI", channel "HNZ", network "KM" and no location
```

Multiple entries may be specified, for example:

```
"HNZ,HNN,HNE"
"KMI.HNZ.KM.00,KMI.HNN.KM.00"
"dig1:4,dig1:5"
"HNZ,KMI.HNN.KM.00,dig1:5"
```

The 'SohChansEnabledFlag' parameter may be set 'true' to enable the sending of state-of-health channels. The availability of these channels on the instrument can be configured using ROCKTalk (or the web interface), usually via the "dig 1, Ch 1, Rock Data Interface" parameters. The state-of-health channels are shown below, with the channel-ID names in quotes (i.e., "deg").

<i>SOH Name</i>	<i>Default</i>	<i>Scale</i>	<i>Description</i>
Temperature	true	x10	Temperature stream as "deg"
Humidity	true	x10	Humidity stream as "hum"
VofV12Batt	false	x1000	VofV12Batt stream as "vvb"
VofSysPwr	true	x1000	System voltage stream as "vep"
IofSysPwr	false	x1000	System current stream as "vec"
TimeQual	true	x1	Time quality stream as "lcq"
LoadAverage	true	x100	CPU Load Average stream as "cpu"
PercentUsed	false	x100	Percent of Data Storage Used stream as "dsk"
MassPos1	false	x1000	Mass position stream as "um#1"
MassPos2	false	x1000	Mass position stream as "um#2"
MassPos3	false	x1000	Mass position stream as "um#3"
TCXODAC	false	x1	TCXO DAC stream as "vco"
TCXODrift	false	x1	Clock phase stream as "lce" (ns)
UserStat	false	x1	User status stream as "usr"

The module writes its version number to the file "/var/log/versions/rockhound-ISTI-RockToEW" on the instrument, and this information may be viewed by typing "versions" at the Linux command prompt.

During the first 10 seconds after the module starts up, warning and debug messages will be sent to both the console and the "SMARTSLog.txt" log file. After 10 seconds, messages will only be sent to the "SMARTSLog.txt" log file. This is to prevent the possibility of repetitive console messages interfering with console-command operations (i.e., communications with the ROCKTalk program).

All debug messages are sent to the "SMARTSLog.txt" log file, and the following debug-mask values are supported:

- Debug mask 0x0001 = Debug level 1 (basic debug output)
- Debug mask 0x0002 = Debug level 2 (more debug output)

Debug mask 0x0004 = Debug level 3 (even more debug output)  
Debug mask 0x0008 = Debug level 4 (verbose, per-message debug output)

Category: DATARELAY

Publishes: Output

Subscribes to: RECORDER\_Output  
and/or CONTINUOUSRECORDER\_Output  
and/or KMITESTRECORDER\_Output  
and/or DATAINTEGRATOR\_Output  
and/or CHANNELDATASOURCE\_Output

Parameters added to module specific .cfg file:

**Earthworm module ID number**

Name: EwModuleId

Type: int

Range: 1 to 255

Default: 99

Example: EwModuleId=99

**Earthworm installation ID number**

Name: EwInstallId

Type: int

Range: 1 to 255

Default: 255

Example: EwInstallId=255

**Optional listen-port host address or IP**

Name: ListenPortAddr

Type: String

Range: 0 to 128 characters

Default: none

Example: ListenPortAddr=192.168.0.10

**List of listen-port numbers (comma-separated)**

Name: ListenPortNums

Type: String

Range: 1 to 128 characters

Default: 16005

Example: ListenPortNums=16005,16006,16007

**Maximum number of messages in queue (0 = no limit)**

Name: MaxQueueSize

Type: int

Range: 0 to 9999999

Default: 100

Example: MaxQueueSize=99

**List of specifiers for channels to be sent (comma-separated, empty = send all)**

Name: ChannelNames

Type: String

Range: 1 to 4096 characters

Default: none

Example: ChannelNames=HNZ.00,HNN.00

**Enable sending of state-of-health channels**

Name: SohChansEnabledFlag

Type: boolean

Default: false

Example: SohChansEnabledFlag=true

**Interval between sent heartbeat messages (seconds)**

Name: SendAliveIntvlSecs

Type: int

Range: 0 to 9999

Default: 30

Example: SendAliveIntvlSecs=30

**Text of sent heartbeat messages**

Name: SendAliveMsgText

Type: String

Range: 0 to 128 characters

Default: alive

Example: SendAliveMsgText=alive

**Maximum interval between received heartbeat messages (seconds)**

Name: RecvAliveIntvlSecs

Type: int

Range: 0 to 9999

Default: 150

Example: RecvAliveIntvlSecs=150

**Expected text of received heartbeat messages**

Name: RecvAliveMsgText

Type: String

Range: 0 to 128 characters

Default: alive

Example: RecvAliveMsgText=alive

**Retry delay after failed message sends (milliseconds)**

Name: RetryDelayMS

Type: int

Range: 0 to 9999999

Default: 2000

Example: RetryDelayMS=2000

**Disconnect time after which queuing is dropped (seconds)**

Name: DropTimeoutSecs

Type: int

Range: 0 to 9999999

Default: 300

Example: DropTimeoutSecs=300

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The Rock-to-EW entries for the Rockhound 'modules.cfg' file are as follows:

```
Type=RockToEW
Category=DATARELAY
Descr=Rock-to-EW Data Relay
Help=Converts instrument data into a stream of Earthworm TRACEBUF messages, delivered via a
TCP/IP port
Subscribes=CHANNELDATASOURCE~Output
Config=EwModuleId|int||99|1|255|0|Earthworm Module ID|Earthworm module ID number
Config=EwInstallId|int||255|1|255|0|Earthworm Install ID|Earthworm installation ID number
Config=ListenPortAddr|String|||0|128||Listen Port Address|Optional listen-port host address or IP
Config=ListenPortNums|String||16005|1|128||Listen Port Numbers|List of listen-port numbers (comma-
separated)
Config=MaxQueueSize|int||100|0|9999999|0|Maximum Queue Size|Maximum number of messages in
queue (0 = no limit)
Config=ChannelNames|String|||0|4096||Channel Names|List of specifiers for channels to be sent (comma-
separated, empty = send all)
Config=SohChansEnabledFlag|boolean||false|||SOH Channels Enabled|Enables sending of state-of-
health channels
Config=SendAliveIntvlSecs|int||30|0|9999|0|Send Alive Interval (secs)|Interval between sent heartbeat
messages (seconds)
Config=SendAliveMsgText|String||alive|0|128||Send Alive Text|Text of sent heartbeat messages
Config=RecvAliveIntvlSecs|int||150|0|9999|0|Receive Alive Interval (secs)|Maximum interval between
received heartbeat messages (seconds)
Config=RecvAliveMsgText|String||alive|0|128||Receive Alive Text|Expected text of received heartbeat
messages
Config=RetryDelayMS|int||2000|0|9999999|0|Retry Delay (ms)|Retry delay after failed message sends
(milliseconds)
Config=DropTimeoutSecs|int||300|0|9999999|0|Drop Timeout (secs)|Disconnect time after which queuing
is dropped (seconds)
MaxUses=1
```