



Technical Information Bulletin - Network Data Logging S4100-TIB01 28 April, 2008

Replaced by TIB003 but retained for support purposes

Purpose:

This Technical Information Bulletin provides the required information to use the Network Logging feature. This feature is intended to be used selectively to identify and isolate network issues.

Scope:

This Technical Information Bulletin specifically addresses the operation of the logging feature and interpretation of logging information. Logging is available in every SkyRouter firmware release and can be enabled or disabled at any time; the default (factory) setting for logging is on (enabled).

Appendix A of this document describes the strategy employed to connect and reconnect to the wireless network and the sequence of measures used when connections cannot be established.

Theory of Operation

The logging feature is controlled by a configuration file named "*log_conf*" found in the directory "*/etc/conf.d*". The *log_conf* file is a simple ASCII text file that contains the following variables:

LOGTIME – Specifies interval between samples in five (5) second ticks. For example, setting this variable to 3 would indicate that a sample will be taken approximately every 15 seconds. A zero (0) setting will turn off logging.

LOGLENGTH – Specifies the size in bytes to which the log file will be allowed to grow. In the worst case the storage requirement will be twice this value since an old and new version of the log file is always maintained.

Network logging is accomplished by storing a highly compressed form of the information in a circular queue implemented as */etc/s4100log.new* and */etc/s4100log.old*. When *s4100log.new* grows to the size where it exceeds the LOGLENGTH setting in the configuration file it is renamed to be *s4100log.old* and logging continues in a freshly created *s4100log.new* file. This circular process repeats until such time as the configuration file parameter LOGTIME is set to 0 (zero) and a restart is performed. While information is stored on the SkyRouter in a highly compressed format it is made available to users in one of two clear channel formats, either as a text file or as a comma separated file suitable for downstream manipulation.

NOTE: To access a SkyRouter over the air interface using FTP you must first disable the firewall. To accomplish this use the administrative interface and change the "*Block Inbound IP Traffic From Wireless Network.*" setting to "*No*". Next perform an *Update* followed by a *Restart*. When the unit reconnects to the network you will be able to access it using FTP and or Telnet. This step is not required for local (LAN side) access.

Access to logged information is through a standard FTP client. There are two formats available for the data, text and comma separated values (csv). Text formatted output may be viewed with most text editors, while the csv format is more appropriate for loading into common spreadsheet



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and database applications. To access either format use FTP to log in to the selected SkyRouter. The default login ID is "root" and the default password is "pass". To retrieve text formatted information use the ftp command "get /log.txt" and to retrieve csv formatted information use "get /log.csv". An optional destination file name may also be specified if desired. Both output formats begin with the first event captured during the sample period and end with the most recent event. In addition the ftp command "get /log.del" will delete all log records and a file (log.del) will be created in your directory with the status of the operation.

Log File Field Definitions:

The column header labels assigned in the CSV format defines log file fields. Inline tags used in the Text format are also identified in the {} enclosure.

Dup {blank} - This column shows the beginning (I) and end (J) of a duplicate range. So if you have a record number 9 with data followed by a record 10 [followed by a record 22] then records 10 - 22 are the same as 9.

REC # {blank} - Record number or sequence (See Dup above)

BOOT {BT=} - When the system comes up a Boot event is logged here. If you look back at the previous record and see that "IDL03" was a 1 then you know that the unit was rebooted because it was idle too long. If "IDL03" was not a 1, then you know that a power fail occurred.

SID {SD=} - Network's System ID

RSSI {DB=} - Signal level without the minus

RDO ERR {ER=} - This is an error code delivered by the radio. It is primarily intended for use by Ctek support as there are many discrete values assigned.

SERVICE {SV=} - Status of wireless service. 0 = no service 1 = in service

ROAM {RM=} - Status of roaming indicator, 0 = not roaming 1 = roaming

CALL ST {CS=} - Call State I = Idle, C = Connected, D = Dormant

CALL TYP {CT=} - Call Type I = Idle/none, R = Packet relay, N = Packet network, M = Mobile IP

CON TERM:{TM=} - PPP initiated reset of the connection, which is a response to a network termination of the link via LCP. SkyRouter immediately attempts to reestablish the connection and sets this value.

Note - The next three values, **IDL_01**, **IDL_02**, and **IDL_03** represent a chronology of events that caused the SkyRouter to take measures that would reestablish the data connection.

IDL_01 {I1=} - This value will be set for one of two reasons:



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1. If the unit was connected and the call state went idle, it waits a maximum of 30 seconds and then restarts PPP and sets this value to 1.
2. If the unit was not connected, and is in Always On Mode, and cannot get a connection active in 20 minutes (adjustable in `/etc/conf.d/log_conf`) the SkyRouter restarts PPP and sets this value to 1.

IDL_02 {I2=} - If the unit was not connected, and is in Always On Mode, and cannot get a connection active in 20 minutes (adjustable in `/etc/conf.d/log_conf`) following an **IDL_01**, the PPP connection will be restarted and this value is set to 1.

IDL_03 {I3=} - If the unit was not connected, and is in Always On Mode, and cannot get a connection active in 20 minutes (adjustable in `/etc/conf.d/log_conf`) following an **IDL_02** this value is set to 1 and the SkyRouter is rebooted.

RDO EVNT {RE=} - If the SkyRouter detects a radio event such as a failure to authenticate with or stay in synchronization with the network this value is set and the radio is reset.

RDO_RCVR {RR=} – [Only applies if the Auto Configure script is used] If the SkyRouter detects that the MDN of the radio does not match the MDN of a stored configuration file, we set this value to a 1 and reflash the radio.

IP ST {IP=} - IP address state has three values: N = none (no IP address), A = Active (unit has a valid IP address), C = changed, meaning that the Network forced a new IP address on the existing PPP connection. If a change from N to A is detected or if it detects C SkyRouter logs the IP address.

IP ADDR {blank} - This field will contain an IP address if a transition from N to A or C under IP ST is detected.

Understanding Network Availability – Evaluate By Priority

- 1) **SERVICE**: Regardless of the content of any other field, if there is no service during a sample period you cannot transport data. In some cases the log continues to show a call state of dormant and may have an IP address but there is no service data cannot be transported.
- 2) **CALL ST** (call state): If this field indicates Idle data cannot be transported. As with the SERVICE case above the log may still show a valid IP address.

So if you really want to understand availability, you have to first look at **SERVICE** and then look at **CALL ST** and then look at **IP ST**. A unit is only available for data transport if **Service** = 1 and **CALL ST** = D or C and **IP ST** = A. The remaining variables in the log are intended to be forensic in nature and provide a timeline of where the SkyRouter is in its recovery process and what the status of the network is during the sampled interval.

APPENDIX A – SkyRouter Radio Interface Details



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There are 2 files in /etc/conf.d and etc/factory.d that define the radio reset functions of the SkyRouter:

radio_inactive - This file contains a value that defines the inactivity (idle) period that must occur before we will take action. The value is the number of 5 seconds ticks + 6. The current default is 246, which results in an inactivity period of 20 minutes. The format of this file is simple. It contains only the value followed by a new line.

radio_reset - This file contains a value that defines the number of seconds we will power off the radio if a radio reset is required. It is in one second ticks. The current default is 15. The format of this file is simple. It contains only the value followed by a new line.

There is one file in /etc that tracks the reset functions of the Skyrouter:

reset_status - This file contains six, one character variables that will contain an ascii value between '0' and 'z' (74 events). Each variable represents a rolling total of the following events that show up in the log file:

CON_TERM	IDL_01	IDL_02	IDL_03	RDO_RCVR	RDO EVNT
----------	--------	--------	--------	----------	----------

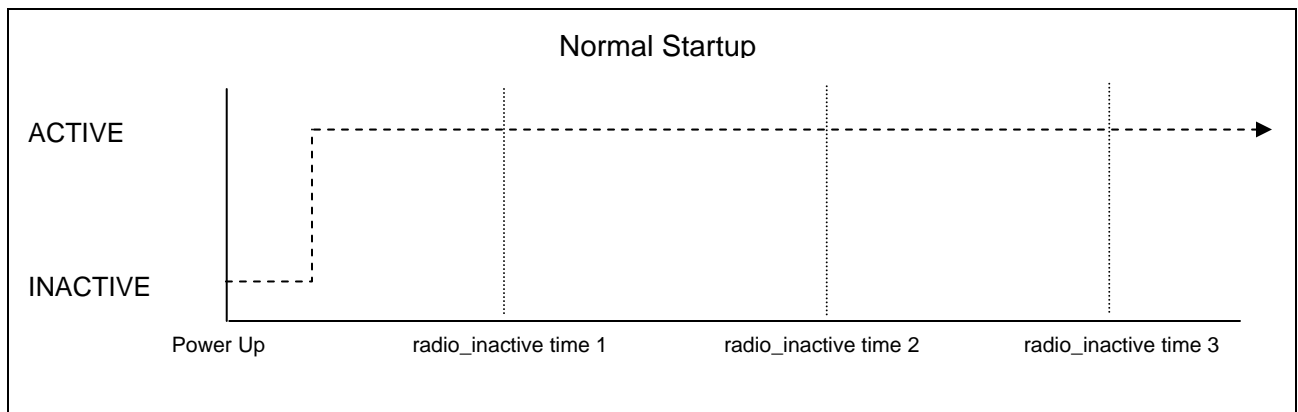


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Description – Radio Activity and relationship to log variables

NORMAL - The following diagram shows a normal start up process. The unit is powered on and our PPP stack tries to establish a connection with the network. PPP will retry every 45 seconds until it goes active with the network. To the SkyRouter, active means that the radio has established a connection and call state is **not idle (connected or dormant)**. For this to occur, the radio has to have service, has to authenticate, has to bring up a connection and we have to get an IP address.

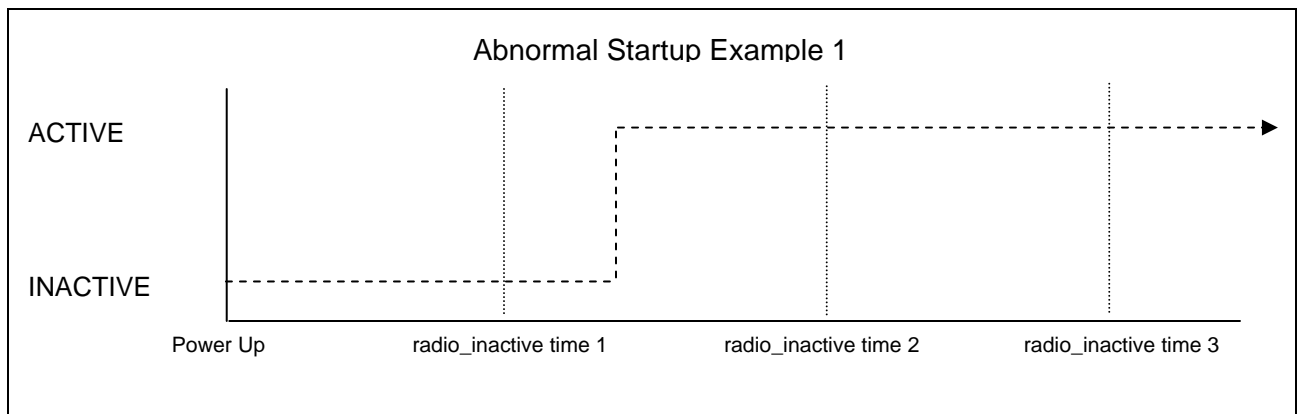




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IDL_01 - The following diagram shows an abnormal startup where the SkyRouter and the network are not able to establish a connection within the period specified in `radio_inactive`. When SkyRouter reaches `radio_inactive` time 1 PPP is killed and restarted. This event is logged as "IDL_01" and we increment the appropriate counter in `/etc/restart_status`. In this example, the connection is then established so no further action is required.

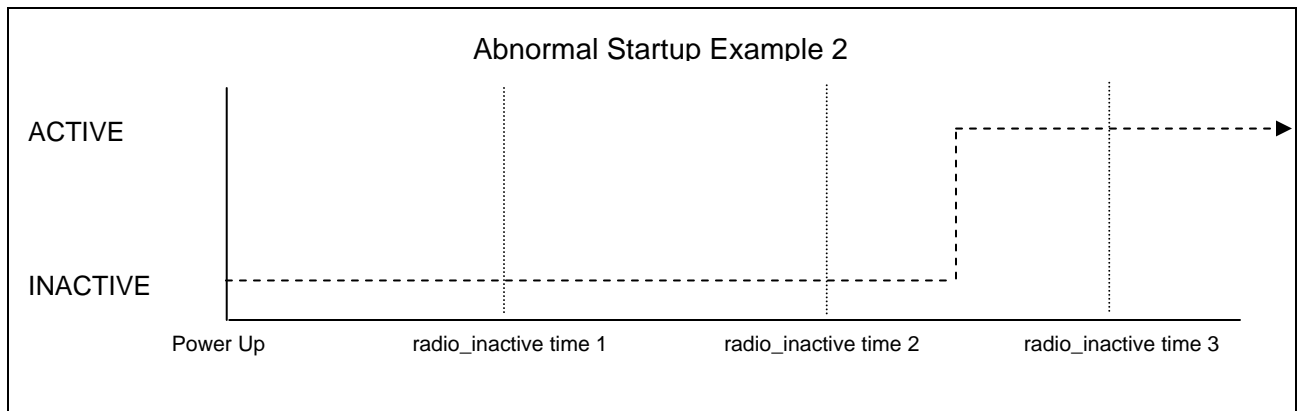




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IDL_02 - The following diagram shows an abnormal startup where the SkyRouter and the network are still not able to establish a connection within the period specified in `radio_inactive` after the "IDL_01" corrective actions were taken. When SkyRouter reaches `radio_inactive` time 2, it kills PPP and restarts it. This event is logged as "IDL_02" and we increment the appropriate counter in `/etc/restart_status`. In this example, the connection is then established so no further action is required.

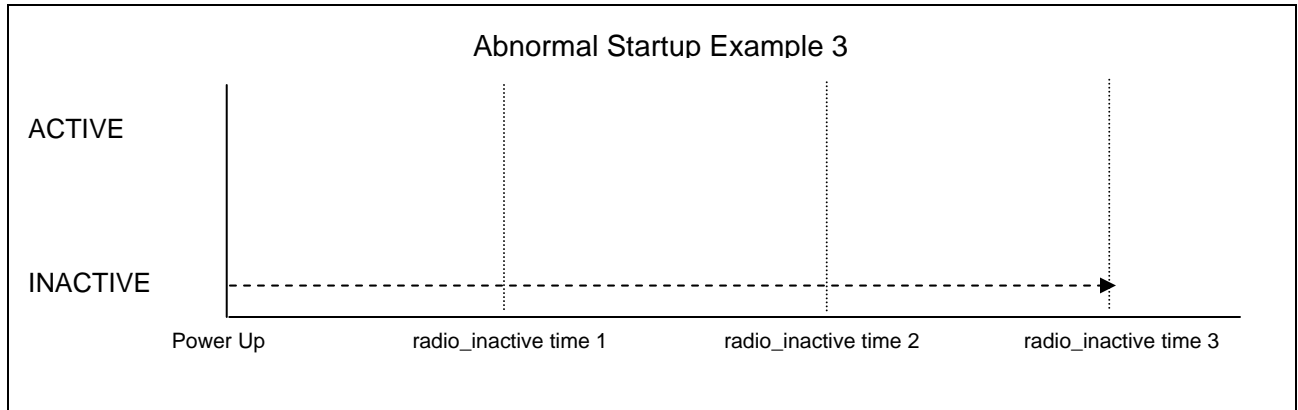




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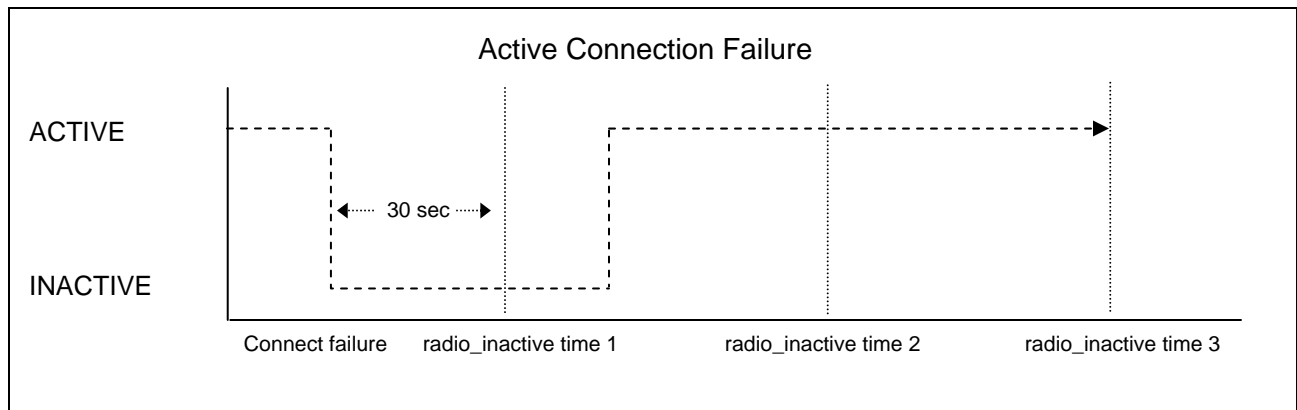
IDL_03 - The following diagram shows an abnormal startup where the SkyRouter and the network are still not able to establish a connection within the period specified in `radio_inactive` after the "IDL_02" corrective actions were taken. When this event is reached, `radio_inactive` time 3, we log this event as "IDL_03" and increment the appropriate counter in `/etc/restart_status`. SkyRouter then kills PPP, waits for the radio to go inactive. Following that the radio is reset for the period of time defined in `radio_reset` and finally the SkyRouter is rebooted. Since the SkyRouter is now starting up, we go back to the Power Up point and begin the recovery process described above.





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Active Connection Failure - The following diagram shows an active connect failure. Please note that the diagram is not referenced to power up since a connection can fail at any time after it has been established. The following diagram represents any period in time starting with an active connection. For some reason, that connection then gets disrupted and the radio goes to an idle state (connect failure). At that point in time SkyRouter starts a 30 second timer. If the radio remains idle for that period of time PPP is killed and restarted. This event is logged as "IDL01" and the appropriate counter in /etc/restart_status is incremented. In the diagram below, the connection is then reestablished so no further action is required. If the connection could not be reestablished the procedures defined previously for "IDL_02" and "IDL_03" would be executed as required.



Other recovery actions that may be initiated:

RDO_RCVR - On units that were successfully configured with the auto_config process and an associated radio.conf file, there will be a radio.conf~ script. During operation when we retrieve the MDN from the radio, we look to see if radio.conf~ exists. If it does, we compare radio MDN to the MDN in radio.conf~. If they do not match, we rename radio.conf~ to radio.conf, update the RDO_RCVR counter in /etc/restart_status, log the event and restart the SkyRouter. During restart, radio.conf will be detected and the radio will be reflashed with its contents.

RDO EVNT - During operation, if we detect that the radio is no longer communicating with us on either com port, we set call status to idle, set call state to idle, set RSSI to -255 set SID to 0, update the RDO EVNT counter in /etc/restart_status and log a RDO EVNT event. We then kill PPP, wait for the radio to go inactive, reset the radio for the period of time defined in radio_reset, and we then reboot the SkyRouter. Since the SkyRouter is now starting up, we go back to the Power Up point and begin the recovery process described above.



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APPENDIX B – Sample Text Log Output

```
0      BT=0 SD=2   DB=90 ER=0  SV=1 RM=0 CS=D CT=I TM=0 I1=0 I2=0 I3=0 RE=0 RR=0 IP=A
[ 1
] 79
80      BT=0 SD=2   DB=110 ER=0  SV=1 RM=0 CS=D CT=I TM=0 I1=0 I2=0 I3=0 RE=0 RR=0 IP=A
81      BT=0 SD=2   DB=92 ER=0  SV=1 RM=0 CS=D CT=I TM=0 I1=0 I2=0 I3=0 RE=0 RR=0 IP=A
[ 82
] 470
471     BT=0 SD=2   DB=122 ER=0  SV=1 RM=0 CS=D CT=I TM=0 I1=0 I2=0 I3=0 RE=0 RR=0 IP=A
472     BT=0 SD=2   DB=95 ER=0  SV=1 RM=0 CS=D CT=I TM=0 I1=0 I2=0 I3=0 RE=0 RR=0 IP=A
[ 473
] 521
522     BT=0 SD=2   DB=101 ER=0  SV=1 RM=0 CS=D CT=I TM=0 I1=0 I2=0 I3=0 RE=0 RR=0 IP=A
523     BT=0 SD=2   DB=95 ER=0  SV=1 RM=0 CS=D CT=I TM=0 I1=0 I2=0 I3=0 RE=0 RR=0 IP=A
[ 524
] 527
528     BT=0 SD=2   DB=101 ER=0  SV=1 RM=0 CS=D CT=I TM=0 I1=0 I2=0 I3=0 RE=0 RR=0 IP=A
529     BT=0 SD=2   DB=95 ER=0  SV=1 RM=0 CS=D CT=I TM=0 I1=0 I2=0 I3=0 RE=0 RR=0 IP=A
[ 530
] 710
711     BT=0 SD=2   DB=101 ER=0  SV=1 RM=0 CS=D CT=I TM=0 I1=0 I2=0 I3=0 RE=0 RR=0 IP=A
712     BT=0 SD=2   DB=92 ER=0  SV=1 RM=0 CS=D CT=I TM=0 I1=0 I2=0 I3=0 RE=0 RR=0 IP=A
[ 713
] 719
720     BT=0 SD=2   DB=92 ER=0  SV=1 RM=0 CS=C CT=M TM=0 I1=0 I2=0 I3=0 RE=0 RR=0 IP=A
[ 721
] 724
725     BT=0 SD=2   DB=109 ER=0  SV=1 RM=0 CS=D CT=I TM=0 I1=0 I2=0 I3=0 RE=0 RR=0 IP=A
726     BT=0 SD=2   DB=92 ER=0  SV=1 RM=0 CS=D CT=I TM=0 I1=0 I2=0 I3=0 RE=0 RR=0 IP=A
```