Mission-Critical Data Interoperability

SureLine Features

SUN2581, Revision 2.2 • May 1, 2025
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1 Introduction

This document describes the performance, features, and data conversions available with Sunhillo's SureLine® software. It distinguishes the availability of these options with SureLine's base license and its optional Tier 1 and Tier 2 licenses. Where applicable, it also notes any functionality nuances or limitations associated with different hardware platforms.

For additional details regarding any of these features or conversions, refer to document *SUN2353 - SureLine Users Guide*.

2 SureLine Base Overview

2.1 SureLine Base Functionality

SureLine's base functionality consists of the physical interface without additional radar-specific conversion functionality (for example, serial-to-IP, IP-to-serial). The base model supports up to **four** Input/Output streams, except for the Ventnor which supports up to 16 Input/Output data streams.

When UDP is used as a destination or source, the UDP data can be multicast, unicast, or broadcast and be contained in either raw UDP packets or within an Enroute Communications Gateway Protocol (ECGP) or Cyclic Redundancy Check (CRC) frame header, which contains additional information.

When TCP/IP is used as a destination or source, the TCP/IP data can be received and sent out either raw UDP, TCP/IP, translated serially, or any combination of these three transport mechanisms simultaneously.

Table 2-1 lists the base features of SureLine products:

Table 2-1: SureLine Base Features

Base Feature	Description
Serial port consolidation / Fan out	3 ports in → 1 port out 1 port in → 3 ports out Note: This can be up to 15 ports (rather than 3) in/out for the Ventnor.
Data Recording	10 MB recording
SNMP Status and Control	Remote control of SNMP V2 & V3 status and traps via a Management Information Base (MIB)
Security	Full or limited configurable system access with Account Management and User Roles
Unit redundancy	Two SureLine units can act as Active/Standby with UDP health messaging between the units to automatically switch over (with or without Preferred Primary behavior)
Local Area Network (LAN) redundancy	One SureLine unit can have two incoming LANs and can be configured to switch from LAN1 to LAN2 automatically as needed
Serial port redundancy	Two SureLine units using ***unit*** redundancy can also support ***serial port*** redundancy automatically from unit to unit (from Port *x* of unit 1 to Port *x* of unit 2)

2.2 SureLine Serial Port Functionality

Both UDP and TCP/IP can be translated to and from any SureLine platforms with configurable serial interfaces as shown in **Table 2-2**.

Table 2-2: SureLine Serial Port I/O Support

Serial Port Types	I/O Support
13-bit synchronous radar	Input/Output/Bidirectional
9-bit synchronous radar	Input/Output
9-bit synchronous Interfacility	Input/Output/Bidirectional
8-bit raw synchronous	Input/Output/Bidirectional
HDLC Transparent/Unnumbered/ABM DCE/DTE	Input/Output/Bidirectional
HDLC Unnumbered	Input/Output/Bidirectional
HDLC ABM DCE/DTE	Input/Output/Bidirectional
Asynchronous Transparent	Input/Output/Bidirectional
Bisynchronous Transparent	Input/Output/Bidirectional
Bisynchronous Aircat500	Input/Output
Bisynchronous TVT2	Input/Output
Westinghouse TI1033 radar	Input/Output
Raduga-2	Input/Output/Bidirectional
TPS-43	Input/Output/Bidirectional
TADIL-B**	Input/Output/Bidirectional

**Requires MPS TADIL-B license.

External clock is an option and the transmitting device can provide clock to Sunhillo products at speeds up to 1.8Mbps (under ideal conditions), which is supported with select products. SureLine has configurable baud rate support per serial port it can generate and the default selectable options are listed in **Table 2-3**.

Table 2-3: SureLine Configurable Baud Rates

Baud rates				
50 kbps	600 kbps	7200 kbps	56000 kbps	768000 kbps
75 kbps	1200 kbps	9600 kbps	57600 kbps	1024000 kbps
100 kbps	1800 kbps	14400 kbps	64000 kbps	1536000 kbps
134 kbps	2000 kbps	19200 kbps	115200 kbps	2048000 kbps
150 kbps	2400 kbps	28800 kbps	256000 kbps	
300 kbps	4800 kbps	38400 kbps	512000 kbps	

High Baud Rates Note

Baud rates greater than 115200 kbps are only available on the RICI 6000, Longport 6000, Ventnor 6000, and Asbury.

A detailed listing of the full features provided with SureLine's base functionality is provided in **Table 2-4**.

Table 2-4: SureLine's Base Functionality

Base Feature	Description
Translation Support	
IP to Serial	Translate IP to Serial
Serial to IP	Translate Serial to IP
IP to IP (4 I/O per unit)	Translate IP to IP
Serial to Serial	Translate Serial to Serial
Visualization	
Radar Display	Provide a graphical image of processed radar data. (CD2/ASR9/MAR1 only)
Generic Input Capabilities	
CD2 In	Receive CD2 data.
ASR9 In	Manage FAA vs. DoD Beacon/Search range radar input.
MAR1 In	Receive MAR1 data.
Framing Capabilities	
ECGP Framer	CD data encapsulated in ECGP LAN protocol.
ECGP Unframer	Receive data in ECGP format and reframe it as CD data.
CRC Framer	Adds a 2-byte index before the data and a 4-byte CRC-32 checksum after the data
CRC Unframer	Receives a message with a 2-byte index header and a CRC 32 footer and verifies its validity
Filtering Capabilities	
ASR9 Filter	ASR9 message filter.
CD2 Filter	CD2 message filter.
ASTERIX Filter	Processes specific ASTERIX category messages and potentially alters CAT048 messages.
Generic Filter	Message filtering that can be applied to a variety of input message formats. (CD2/ASR9/MAR1 only)
Site Name/ID Filter	Assign site filters for ECGP data from a particular ARTCC.
Duplicate Message Filter	Detect duplicate input messages and filters certain ones out
TI1033 Filter	Filter TI1033 messages.
Utilities	
ARTS Unpacker	Process ARTS data received via TCP/IP.
Timestamp Targets	Add a TOA timestamp to targets based on the scan rate, the targets azimuth and the receipt of scan related messages.
SOM EOM Remover	Drop a configurable number of bytes from the start or end of the data portion of a message before it is transmitted out.
ASTERIX Packer	Places multiple ASTERIX messages into a single packet.
ASTERIX Framer	Frames incoming messages into ASTERIX data.
ASTERIX SIC/SAC Changer	Modify the SIC/SAC in an ASTERIX message.
Radar Identifier	Assign radar identity to data that does not have this information within the data itself (e.g., raw UDP packets).
Message Receipt Latency Alert	Checks the received time of message receipt in the data against the current system time and logs an error when the difference in time is greater than the configured value.

3 SureLine Tier 1 Overview

3.1 SureLine Tier Licensing Overview

A tier license applies to a single SureLine product. If a respective tier is required for a user application using the SureLine product, then a separate tier license is required for each SureLine product. **Table 3-1** denotes the Tier licenses needed for the Longport, whose chassis can contain up to six Processor Card Modules (PCM).

Note that no additional Tier 1 license is required for a 16-port Ventnor versus an 8-port Ventnor.

Table 3-1: SureLine's Tier Functionality for Longport PCMs

Total Serial Ports	Number of PCMs	# of Tier Licenses
4	1	1
8	2	2
12	3	3
16	4	4
20	5	5
24	6	6

3.2 SureLine Tier 1 Functionality

SureLine Tier 1 functionality includes all base functionality plus additional functionality consisting of software features that convert from one radar format to another. SureLine Tier 1 functionality also includes the visualization package and real-time data analysis package via a built-in radar display and real-time data display for applicable data flows and input types. The SureLine Tier 1 functionality enables configuration support for up to a maximum of **10** IP Input/Output streams except for the Ventnor, which supports up to 16 Input/Output streams.

Table 3-2 provides a comprehensive list of all SureLine's Tier 1 functionality.

Table 3-2: SureLine's Tier 1 Functionality

Tier 1 Feature	Description
Translation Capabilities	
IP to Serial	Translate IP to Serial
Serial to IP	Translate Serial to IP
IP to IP (4 I/O per unit)	Translate IP to IP
Serial to Serial	Translate Serial to Serial
Visualization and Real Time Data Analysis	
Radar Display	Provide a graphical image of processed radar data.
Real-Time Data Display	Provide a tabular real-time display of radar data.
KML Display	Convert radar targets to Keyhole Markup Language (KML) for display.
Generic Input Conversions	
ASTERIX CAT 1&2 In	Receive ASTERIX CAT001/002 input.
ASTERIX Cat 8 Weather In (polar)	Receive ASTERIX CAT008 weather messages
ASTERIX CAT 21 In	Receive EUROCONTROL ASTERIX CAT021 (v.23, .26, 2.1, or 2.4)
ASTERIX CAT 33&23 In	Receive ASTERIX CAT033/023 messages to internal format. (FAA V3)
ASTERIX CAT 34&48 In	Receive EUROCONTROL ASTERIX CAT034/048.
ASTERIX CAT 62 In	Receive ASTERIX CAT062 input.
AIRCAT500 In	Receive AIRCAT500 messages and extract data for use in other functions.
ARSR4 In	Receive ARSR-4 data.
ASR9 In	Manage FAA versus Department of Defense beacon/search range radar input.
ASR9 Weather In	Receive ASR9 Weather data.
ASR11 ASTERIX In	Receive ASR-11 ASTERIX CAT001/002 data.
ASR11 Cat 8 Weather In (polar)	Receive ASR11 ASTERIX CAT008 weather messages
CD2 In	Receive CD-2 data.
CD2 Weather In	Receive CD-2 Weather data.
CD2-T In	Receive CD-2T data.
CD AMS In	Receive CD/AMS format.
MAR1 (FPS117) In	Receive MAR1 data.
Selenia In	Receive data in Selenia format.
SSR2001C In	Process inbound data from SSR2001C radars.
TPS70 13 Bit In	Receive TPS70 13 bit data.
XML SDO In	Receive Surveillance Data Object (SDO) XML input.

Tier 1 Feature	Description
Generic Output Conversions	
ASTERIX CAT 1&2 Out	Output ASTERIX CAT001/002 data.
ASTERIX CAT 8 Out (polar)	Output to ASTERIX CAT008 data.
ASTERIX CAT021 Out	Output ASTERIX CAT021 (v.23, .26, 2.4) data.
ASTERIX CAT 23/33 Out	Output ASTERIX CAT023/033 data.
ASTERIX CAT 34&48 Out	Output EUROCONTROL ASTERIX CAT034/048 data.
ASTERIX CAT062 Out	Output ASTERIX CAT062 data.
AIRCAT500 Out	Convert input data to AIRCAT500 messages, whose output requires synchronization with the radar sweep. By default, this is done by a north mark message in the incoming data. If no north mark is available, you can configure SureLine to use either the BRTQC or SRTQC.
ARSR4 Out	Output ARSR-4 data.
ASR9 Out	Output ASR-9 radar data.
ASR9 Weather Out	Output ASR-9 Weather radar data.
ASR11 ASTERIX CAT 1&2 Out	Output ASR-11 ASTERIX CAT001/002 data.
ASR11 CAT 8 Out (polar)	Output to ASR-11 ASTERIX CAT008 data.
CD2 Out	Output 13-bit CD-2 radar data.
CD2 Weather Out	Output 13-bit CD-2 Weather radar data.
CD2T Out	Output 13-bit CD-2T radar data.
CAA Out	Output 13-bit Civil Aviation Authority (CAA) radar data.
MAR1 (FPS117) Out	Output MAR1 data.
RDIF Out	Output RDIF data.
TPS70 13 Bit Out	Output TPS-70 13-bit data.
CSV Out	Output radar plots & tracks to ASCII comma-delimited data.
XML SDO Out	Output XML SDO data.
Specific Conversions	
ARSR-4 Military to CD2	Convert military ARSR4 format to CD-2 messages.
ARTS to CD2	Convert ARTS message data to CD-ASR messages.
ASR9 to CD2	Convert ASR-9 data to CD-2 format (no scan conversion).
ASR-11 ASTERIX (US UDP) to ASR9	Convert ASR-11 ASTERIX to ASR-9 format.
ASTERIX CAT033 to CD2 (FAA)	Convert ASTERIX CAT033 radar messages to CD-2 Beacon messages.
CD to ASTERIX CAT034/048 (FAA)	Convert CD radar messages to ASTERIX CAT034/048 data.
CD to FAA RAPPI	Converts CD radar messages to Microprocessor Enroute Automated Radar Tracking System (MEARTS) format for use with the FAA Java Random Access Plan Position Indicator (RAPPI).
NUNIO to ASR-9	Convert Sensis NUNIO data to ASR-9 radar data.

Tier 1 Feature	Description
Framing Capabilities	
ECGP Framer	CD data encapsulated in ECGP LAN protocol.
ECGP Unframer	Receive data in ECGP format and reframe it as CD data.
SGF Framer	Uses one or more individual raw messages to create an SGF framed radar packet.
SGF Unframer	Reads one or more messages from an SGF framed radar packet to create individual raw output messages.
CRC Framer	Adds a 2-byte index before the data and a 4-byte CRC-32 checksum after the data
CRC Unframer	Receives a message with a 2-byte index header and a CRC-32 footer and verifies its validity
Filtering Capabilities	
ASR9 Filter	ASR9 message filter.
ASTERIX Filter	Processes specific ASTERIX category messages and potentially alters CAT048 messages.
ASTERIX FRN Filter	Drop specific FRNs, based on input Data Item #, from an ASTERIX category and variant message.
CD2 Filter	CD2 message filter.
Duplicate Message Filter	Detect duplicate input messages and filters certain duplicates out
Generic Filter	Message filtering that can be applied to a variety of input message formats. (CD2/ASR9/MAR1 only)
Geographic Filter	Filter data based on geographic coordinates via polygon file (inside or outside the configurable polygon area).
Identity Filter	Filter targets based on Mode 3/A code, Mode S code, or Target ID.
Mode 3A Range/Azimuth Filter	Assign Range Azimuth Gate (RAG) filters to CD/ASR Beacon or BRTQC messages.
Site Name/ID Filter	Assign site filters for ECGP data from a particular ARTCC.
TI1033 Filter	Filter TI1033 messages.

Tier 1 Feature	Description
Utilities	
Add Lat Long	Convert radar coordinates to geodetic coordinates for a given site.
ARTS Unpacker	Process ARTS data received via TCP/IP.
ASTERIX CAT247 Generator	Generates an ASTERIX CAT247 input message.
ASTERIX Data Modifier	Modifies outbound ASTERIX messages based on the contents of inbound ASTERIX messages.
ASTERIX Edition Translator	Translate a limited set of EUROCONTROL ASTERIX categories/editions from one edition to another.
ASTERIX Framer	Frames incoming messages into ASTERIX data.
ASTERIX SIC/SAC Changer	Modify the SIC/SAC in an ASTERIX message.
ASTERIX Packer	Places multiple ASTERIX messages into a single packet.
ASTERIX Validator	Validates ASTERIX messages based on their corresponding ASTERIX Markup Language (AML) file.
FAA ASTERIX Header	Add a 2-byte message count to a frame to be compliant with the FAA ASTERIX format.
Generate Message	Generate messages from configurable data.
KML Display	Convert radar targets to KML for display.
Radar Identifier	Assign radar identity to data that does not have this information within the data.
SOM EOM Remover	Drop a configurable number of bytes from the start or end of the data portion of a message before it is transmitted.
Message Receipt Latency Alert	Checks the received time of in the data against the current system time and logs an error when the difference in time is greater than the configured value.
Site Switchover	Pass data from Primary/Secondary site based on degradation.
Track Limiter	Limit the number of output tracks by preventing a tracks from being updated for a period of time.
Timestamp Targets	Add a TOA timestamp to targets based on the scan rate, azimuth, and the receipt of scan related messages.
Plugins that require Tier 1 – Available upon request	
ASR12 to CD2 Status	Convert ASR12 Status messages to CD2 Status msgs.
MAR to CD2 Status	Convert MAR1 Status messages to CD2 Status msgs.
TPS75 In (9 bit-16 word)	Read data in the TPS-75 format (16 word only).
TPS75 Out (9 bit-16 word)	Output data in the TPS-75 format (16 word only).
Licensed plugins sold separately that require Tier 1 – Available upon request	
Encryption	Encrypts and decrypts encrypted UDP packets.
Multi Track Fuser (MTF)	Utilized for track data alignment of sensor tracks generated by multiple tracked sensors. It produces unique global (system) tracks from these sensor tracks.
Single Sensor Tracker (SST)	Processes plot data received from a single sensor, applies a smoothing algorithm to the data and correlates the output to a new or existing track.
Licensed features sold separately that require Tier 1 – Available upon request	
Virtual Radar (VR)	Receive Beacon track messages and use these in conjunction with the VR configuration parameters to emulate radar that outputs the data in a virtual scan.

3.3 SureLine Tier 1 Conversions

Input data messages are translated to an intermediary “generic” format. Some data bits may not map directly. Special configuration parameters can be added to handle unmapped data via custom software development, which may or may not require additional costs depending on the level of effort.

See **Section 5** for details regarding the available Tier 1 conversions.

4 SureLine Tier 2 Overview

4.1 Tier 2 Functionality Overview

All Base and Tier1 functionality are also contained within the Tier 2 license. The additional functionality and features beyond what are contained in the Base and Tier 1 configurations are shown in **Table 4-1**.

Tier 2 includes complex conversions that require persistent state data such as scan generation. The Tier 2 configuration supports a maximum of 150 IP Input/Output streams (sites) on Sunhillo hardware platforms that support higher levels of IP to IP processing.

Table 4-1: SureLine's Tier 2 Functionality

Tier 2 Feature	Description
Input/Output - Surveillance streams	Supports up to 150 IP Input/Output streams (sites)
ASR9-CD2 conversion and skip scan	CV4400 functionality including BRTQC adjustment and scan conversion.

5 Supported Conversions

This section focuses solely on the conversions available with the Base, Tier 1, and Tier 2 functionality of SureLine. The material is presented in the form of individual tables showing very specific feature subsets.

This section also describes the optional plugins to the SureLine software that are available. These plugins provide unique, and/or customizable additional application features.

The subsections are:

- **Section 5.1, Radar Format and Frame Conversions** – Depicts the conversions from one surveillance data format to another and the various framing options (e.g., ECGP framing)
- **Section 5.2**, **Input Plug-ins Conversions** – Describes the plug-ins used to convert data from the supported ***input*** data format to various output formats. It also lists any framing that is supported.
- **Section 5.3**, **Output Plug-ins Conversions** - Describes the plug-ins used to convert data input data to various ***output*** data formats. It also lists any framing that is supported.
- **Section 5.4**, **Built-in Features and Transports** – Provides a comprehensive list of the innate and licensed features of the SureLine software. These features include filters, utilities, and conversions. It also lists the Multi-Protocol Suite (MPS) supported transports. Refer to *SUN2353 - SureLine Users Guide* for further details regarding these features.
- **Section 5.5**, **Plug-ins** – Offers a comprehensive list of all plug-ins available for the SureLine application, which are provided separately upon request.

5.1 Radar Format and Frame Conversions

	CD2-C	CD2-T	AIRCAT500	ASTERIX CAT 001/002	ASTERIX CAT 034/048	ASR-9	MAR-1 (FPS117)	ARSR-4	ASR-11 CAT001/002	RDIF	TPS70 (13 bit)	CAA	ASR-9 Weather	CD-2 Weather	ASTERIX CAT 008	ASR-11 CAT 008	ASTERIX CAT 021*	ASTERIX CAT 062	ASTERIX CAT 023/033**	OTG	XML SDO	CSV	KML	SGF Framer/Unframer***	ECGP Framer/Unframer	CRC Framer/Unframer
ARSR-4	→	→	→	→	→	→	→	→	→	→	→	→					→	→	→	→	→	→	→	→	→	→
ASR-9	→	→	→	→	→	→	→	→	→	→	→	→					→	→	→	→	→	→	→	→	→	→
ASR-9 Weather													→	→	→	→								→	→	→
CD2-C	→	→	→	→	→	→	→	→	→	→	→	→					→	→	→	→	→	→	→	→	→	→
CD2-T	→	→	→	→	→	→	→	→	→	→	→	→					→	→	→	→	→	→	→	→	→	→
CD-2 Weather													→	→	→	→								→	→	→
CD AMS	→	→	→	→	→	→	→	→	→	→	→	→					→	→	→	→	→	→	→			→
MAR-1 (FPS117)	→	→	→	→	→	→	→	→	→	→	→	→					→	→	→	→	→	→	→	→	→	→
TPS70 (13 bit)	→	→	→	→	→	→	→	→	→	→	→	→					→	→	→	→	→	→	→	→	→	→
AIRCAT500	→	→	→	→	→	→	→	→	→	→	→	→					→	→	→	→	→	→	→			→
Selenia	→	→	→	→	→	→	→	→	→	→	→	→					→	→	→	→	→	→	→			→
SSR2001C	→	→	→	→	→	→	→	→	→	→	→	→					→	→	→	→	→	→	→			→
TSR-07C (Japanese Radar)	→	→	→	→	→	→	→	→	→	→	→	→									→	→	→			→
ASR-11 ASTERIX	→	→	→	→	→	→	→	→	→	→	→	→					→	→	→	→	→	→	→			→
ASR-11 ASTERIX CAT 008 Weather (polar)													→	→	→	→										→
ASTERIX CAT 001/002****	→	→	→	→	→	→	→	→	→	→	→	→					→	→	→	→	→	→	→			→
ASTERIX CAT 008 Weather (polar)													→	→	→	→										→
ASTERIX CAT 021*	→	→	→	→	→	→	→	→	→	→	→	→					→	→	→	→	→	→	→			→
ASTERIX CAT 023/033**	→	→	→	→	→	→	→	→	→	→	→	→					→	→	→	→	→	→	→			→
ASTERIX CAT 034/048*****	→	→	→	→	→	→	→	→	→	→	→	→					→	→	→	→	→	→	→			→
ASTERIX CAT 062	→	→	→	→	→	→	→	→	→	→	→	→						→		→	→	→	→			→
ADS-B (from RF Antenna - Margate II only)	→	→	→	→	→	→	→	→	→	→	→	→					→	→	→	→	→	→	→			→
Traffic Flow Management Data (TFMD)																	→	→	→	→	→	→	→			→
TADIL-B																										→
Raduga-2																										→
TPS-43																										→

Radar Format/Frame Conversion Support Legend

→	Conversion from row format to column format
→	Conversion requires addition of Virtual Radar (converts track data to plot data)
→	May require addition of the SST plugin if input data does not contain track information (**SGP only**)
→	ECGP, SGF, or CRC Framing capability supported

* ASTERIX CAT 021 supported sub-types	v.23, v.26, v2.1, v2.4 (limited to the confines of SureLine Generic data conversions)
** ASTERIX CAT 023/033 supported sub-types	FAA v3 (limited to the confines of SureLine Generic data conversions)
*** SGF version support	SGF versions 1.1 full & reduced & SGF version 2.0
**** ASTERIX CAT 001/002 variants supported	Eurocontrol, Colombia, TPS77, and Australia
***** ASTERIX CAT 034/048 variants supported	Eurocontrol, TPS78 Secure IFF, and Australia

5.2 Input Plug-ins Conversions

	CD2-C	CD2-T	AIRCAT500	ASTERIX CAT 001/002	ASTERIX CAT 034/048	ASR-9	MAR-1 (FPS117)	ARSR-4	ASR-11 ASTERIX CAT 001/002	RDIF	TPS70 (13 bit)	CAA	ASTERIX CAT 021*	ASTERIX CAT 062	ASTERIX CAT 023/033**	XML SDO	CSV	KML	SGF Framer/Unframer***	ECGP Framer/Unframer	CRC Framer/Unframer
TPS75 (9 bit)	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→		→
Cardion CTE-2F	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→			→
ASTERIX CAT 159	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→			→
MRDIF	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→			→
TPS-63SS	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→			→
Textron GCS	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→			→
MXTeaCSVSystem	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→			→

Input Plug-ins Conversions Legend

→	Conversion from row format to column format
→	Conversion requires addition of virtual radar (converts track data down to plot data for interoperability)
→	May require addition of the SST plugin if the input data does not contain track info (SGP only)
→	ECGP, SGF, or CRC Framing capability supported
* ASTERIX CAT 021 supported subtypes	v.23, v.26, v2.1, v2.4 (limited to the confines of SureLine Generic data conversions)
** ASTERIX CAT 023/033 supported subtypes	FAA v3 (limited to the confines of SureLine Generic data conversions)
*** SGF version support	SGF versions 1.1 full & reduced & SGF version 2.0

5.3 Output Plug-ins Conversions

	TPS75 (9 bit)	TPS 72	TARS OTG
CD2-C	→	→	→
CD2-T	→	→	→
AIRCAT500	→	→	→
MAR-1 (FPS117)	→	→	→
ASR-9	→	→	→
ARSR-4	→	→	→
CD AMS	→	→	→
SSR2001C	→	→	→
TPS70 (13 bit)	→	→	→
Selenia	→	→	→
TSR-07C (Japanese Radar)	→	→	→
ASR-11 ASTERIX	→	→	→
ASTERIX CAT 021*	→	→	→
ASTERIX CAT 023/033**	→	→	→
ASTERIX CAT 001/002****	→	→	→
ASTERIX CAT 034/048*****	→	→	→
ASTERIX CAT 062	→	→	→
ADS-B (from RF Antenna - Margate II only)	→	→	→
TFMD			→
SGF Framer/Unframer	→	→	→
ECGP Framer/Unframer			
CRC Framer/Unframer	→	→	→

Output Plug-ins Conversions Legend

→	Conversion from row format to column format
→	Conversion requires addition of Virtual Radar (converts track data down to plot data)
→	May require addition of the SST plugin if the input data does not contain track info (**SGP only**)
→	ECGP, SGF, or CRC Framing capability supported
* ASTERIX CAT 021 supported subtypes	v.23, v.26, v2.1, v2.4 (limited to the confines of SureLine Generic data conversions)
** ASTERIX CAT 023/033 supported subtypes	FAA v3 (limited to the confines of SureLine Generic data conversions)
**** ASTERIX CAT 001/002 variants supported	Eurocontrol, Colombia, TPS77, and Australia
***** ASTERIX CAT 034/048 variants supported	Eurocontrol, TPS78 Secure IFF, and Australia

5.4 Built-in Features and Transports

Filters	Utilities	Specific Conversions	Serial to/from UDP/TCP	MPS Transports***
ASTERIX Filter	Virtual Radar	CD to FAA RAPPI	13-bit radar**	MPS Async
Generic Filter*	Filler Module	ASR-11 ASTERIX (US UDP) to ASR-9	8-bit raw synchronous**	MPS SBSI
ASR-9 Filter	ARTS Unpacker	ARTS to CD-2	9-bit Interfacility**	MPS TADIL-B****
CD-2 Filter	Timestamp Targets	CD to ASTERIX CAT 34/48 (FAA)	9-bit radar	MPS X.25****
TI1033 Filter	Radar Display*	ASTERIX CAT 033 to CD-2 (FAA)	AIRCAT 500	**MPS Radar Protocols**
Duplicate Message Filter	Radar Identifier	ASR-9 to CD-2	Async Transparent**	ASTERIX
Site Name/ID Filter	SOM EOM Remover	NUNIO to ASR-9	Bisync TVT2**	CD-2
ASTERIX FRN Filter	ASTERIX Framer	ARSR-4 Military to CD-2	HDLC Transparent**	General 18-bit
Mode 3A Range/Azimuth Filter	ASTERIX Packer	CV4400 Emulation	HDLC Unnumbered**	Marconi 10-bit
Geographic Filter	ASTERIX SIC/SAC Changer		NADIN	Modified Eurocontrol
Identity Filter	Message Receipt Latency Alert		TI1033	NEC Radar Extractor
	ASTERIX Validator		Transparent Bisync**	Thompson-CSF
	Asterix Data Modifier		TADIL-B****	Thompson-TVT2
	FAA ASTERIX Header		Raduga-2	Toshiba
	Add Latitude and Longitude		TPS-43	TPS-75
	Generate Message			Raduga-2
	Radar Display			TPS-43
	Real-Time Data Display			**MPS HDLC Protocols**
	KML Display			DFX
	Site Switchover			HABM****
	Track Limiter			HNRM****
				LAPB****

Filters/Utilities/Specific/Conversions & Transports Legend

These filters, utilities and specific conversions are accessible with a base licensed SureLine product
These filters, utilities and specific conversions are accessible with a Tier 1+ licensed unit
These filters, utilities and specific conversions are accessible with a Tier 2 licensed unit
These filters, utilities, or specific conversions require Tier 1 and are also sold and licensed separately
*Applies only to CD-2, ASR-9, & MAR-1. The Tier 1 version applies to all radars.
**Includes bi-directional data.
***MPS protocols available on RICI and Ventnor only.
****Require a separate license key to activate. HABM, HNRM and LAPB are included in a single key called HDLC-Kit.

5.5 Plug-ins

Specific Conversion Plug-ins	Input/Output Plug-ins	Utility/Filter Plug-ins
ASR-12 to CD-2 Status	ASTERIX CAT 159 In	Encryption**
ASTERIX CAT 048/034 To NATS 001/002	CTE-2F In**	Single Sensor Tracker
CD-2 to ASTERIX CAT 034	MRDIF In	Multi Track Fuser
FPS117CnC**	MXTeaCSVSystem In	ABS-HQ-Encryption
MAR-1 to CD-2 Status	TARS OTG Out**	ABS-Message Throttler
MPSapi	Textron GCS In	Azimuth Eccentricity
	TPS75 In**	Generic Recorder
	TPS75 Out**	NASA LVC Gateway
	TPS72 Out	SIC/SAC Filter
	TPS-63SS In	Time Stamper
		RDFPS
		CAT034 Status Filter

Plug-ins Legend

These plug-ins are accessible with a Tier 1+ licensed unit
These plug-ins require Tier 1 and are also sold and licensed separately
**These plug-ins are export controlled.

Note

These plug-ins are available upon request from Sunhillo. The processing by some plug-ins may be too customized for most users as they were developed for specific field applications.

5.6 ASTERIX Solutions

SureLine provides a rich set of ASTERIX protocol handling solutions. These include:

- ASTERIX Framer
- ASTERIX Packer
- ASTERIX SIC/SAC Changer
- ASTERIX Filter
- ASTERIX FRN Filter
- ASTERIX CAT034 Status Filter
- ASTERIX Validator
- ASTERIX Data Modifier
- ASTERIX Edition Translator
- ASTERIX CAT247 Generator

5.6.1 ASTERIX Framer

The ***ASTERIX Framer*** is a base *Utility* function. As its name implies, it is used to frame incoming messages into ASTERIX data.

5.6.2 ASTERIX Packer

The ***ASTERIX Packer*** is a base *Utility* function that is used to pack multiple ASTERIX messages into a single packet. Configuration parameters for this utility node include:

- **Pack by Input Frame** – Allows you to pack messages to be identical to the input frame; Yes/No dropdown option.
- **Message Packing Order** – Sets the packed message order; dropdown options are First In First Out or Order by Category Number.

5.6.3 ASTERIX SIC/SAC Changer

The ***ASTERIX SIC/SAC Changer*** is a base *Utility* function that allows you to modify the System Identification Code (SIC) and System Area Code (SAC) values in an ASTERIX message.

5.6.4 ASTERIX Filter

The ***ASTERIX Filter*** is a base *Filter* function that allows you to drop/allow messages based on their ASTERIX category. Multiple category filters can be assigned and the drop/allow designation can be mixed. For example, this filter may allow ASTERIX CAT034 messages but drop ASTERIX CAT002 messages.

Additionally, this function provides a means to replace the existing CAT048 weather scale within the message. The two parameters used for this replacement are:

- **Replace Weather Scale** – Indicate whether or not to perform the Weather Scale replacement; Enabled/Disabled dropdown option
- **CAT048 Weather Msg Scale** – The Weather Scale replacement value; integer value in the range of -15 to +15

5.6.5 ASTERIX FRN Filter

The ***ASTERIX FRN Filter*** is a Tier 1 *Filter* function that allows specific Field Reference Numbers (FRN) to be dropped from one or more ASTERIX category/variant designations, and multiple FRNs can be dropped from any supported category/variant set.

5.6.6 ASTERIX CAT034 Status Filter

The ***ASTERIX CAT034 Status Filter*** is a plug-in *Filter* that supports filtering data items 50 and 60 from a CAT034 Sector Mark message (except when the data in these data items has changed or the Sector Mark is 0). These data items can be set to be filter either Grouped or Independent. If Grouped, a change to either data item allows both to pass through the filter. If Independent, these data items are treated separately.

Additionally, these data items can be removed from North Mark messages as well by setting the *Filter North Mark* option to “Filter”.

5.6.7 ASTERIX Validator

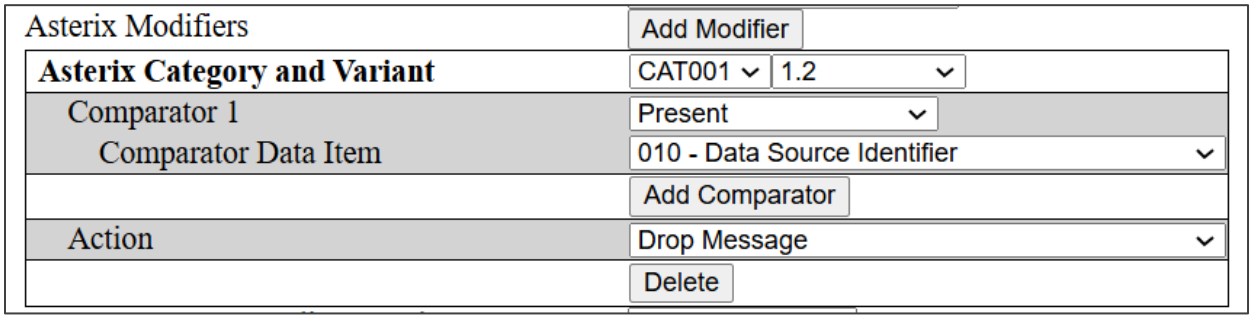
The ***ASTERIX Validator*** is a Tier 1 *Utility* function that provides validation for specific ASTERIX category/variant designations. Dropdown lists provide the means to select only valid category/variant combinations when configuring this node. Additionally, the option exists to ignore validating the SIC/SAC within the ASTERIX messages.

To designate whether or not the SIC/SAC are considered for the validation, use the following configuration parameters:

- **Validate SAC/SIC** – Indicates whether or not to validate the SAC/SIC in the message; dropdown list with Don't Validate and Validate by SAC/SIC values
- **SAC/SICs** – The SAC/SIC values to validate or ignore

5.6.8 ASTERIX Data Modifier

The ***ASTERIX Data Modifier*** is a Tier 1 *Utility* function that allows modification of the outbound ASTERIX message based on manipulation of the inbound ASTERIX message. For a detailed tutorial on how to use this utility function, see the Documentation\Tutorials folder on Sunhillo's support portal (www.sunhillo.com/support).



Briefly, a modifier entry consists of the following configuration items, and multiple modifier entries can be defined. (Note: some are not shown in the above image):

- **Asterix Category and Variant** – Dropdown lists provide selection of valid category/variant combinations
- **Comparator 1** – Designates the type of data comparison to perform; assigned via dropdown list of valid comparisons. Multiple comparators can exist and are numbered sequentially.
- **Comparator Data Item** – The data item(s) to be applied to the comparator; this entry changes based on the **Comparator 1** selection but is always, at a minimum, the data item in the ASTERIX message to be used for comparison. Multiple **Comparator Data Items** can be assigned by clicking the **Add Comparator** button.
- **Action** – Denotes the action to be performed upon successful comparison(s); this entry changes based on the **Action** chosen. Actions include Drop Message, Drop Field, Set, Increment, Decrement, Multiply, and Divide.
- **Comparator Data Field** – Shown for all **Comparator** operations other than Present or Not Present. This is the data field within the ASTERIX FRNs.
- **Comparator Value Data Type** – Indicates type of data to compare – Decimal, Hexadecimal, or String. For time values, Current Time Offset and Epoch Time Offset are also available.

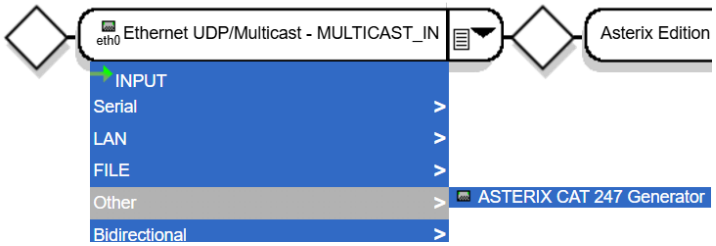
5.6.9 ASTERIX Edition Translator

The ***ASTERIX Edition Translator*** is a Tier 1 *Utility* function provides a means to translate from one edition (version) to another within a given ASTERIX category. The supported translations are:

- CAT021
  - v0.26 to v0.23
  - v2.1 to v0.26
  - v2.1 to v0.23
- CAT048
  - v1.23 to v1.18
- CAT062
  - v1.18 to v1.16

5.6.10 ASTERIX CAT247 Generator

The ***ASTERIX CAT247 Generator*** is a Tier 1 Input node feature that provides a way to periodically output ASTERIX CAT247 messages. To enable this feature, select Other → Asterix CAT247 Generator as an Input node.



In addition to the message interval (i.e., output rate), the configurable message parameters are: SIC/SAC, Service Identification, and multiple ASTERIX category/version entries.

Appendix A Asbury vs SureLine Features

The Asbury product uses a pared down version of the SureLine application software, which does not include all the features available on other SureLine platforms. **Table A-1** lists the SureLine menu option/feature and whether it is available on the Asbury.

Table A-1: Asbury Features

SureLine Feature	Available on Asbury
Information Menu	Yes
Status	Yes
Logs	Yes
Download Logs	Yes
Download User Settings	No
Download MIB	No
Radar Display	No
Real-Time Data Display	Yes
Configuration Menu	Yes
New	No
Edit	No
Edit Active	Yes
Edit Live	No
Set Active	No
Diff Config	No
Manage User Data	No
Administration	Yes
Network Config	Yes
Security	Yes
Account Management	Yes
Change Password	Yes
SNMP Management	No
License Management	Yes
Create RSA Key	No
Download RSA Public Key	No
Download RSA Private Key	No
System Menu	Yes
Go Standby/Go Active	No
Reboot	Yes
Restart Software	Yes
Enable Maintenance Mode	No
Upload Data	Yes
Flash OS	Yes
Network Diagnostics	Yes
About	Yes
Log In / Log Out	Yes

Additionally, the Asbury supports a limited set of serial data protocols:

- **Transparent HDLC** – Does not include HDLC headers in the frame data, only payload.
- **Unnumbered HDLC** – Includes the HDLC frame headers in the output.
- **Transparent Asynchronous** – Asynchronous serial data.
- **Transparent BISYNC** – Bidirectional, connectionless, synchronous data.
- **HDLC ABM DCE** – Asynchronous Balance Mode (ABM) HDLC for DCE. This type of HDLC will not make a connection; it will only respond.
- **HDLC ABM DTE** – ABM for DTE.
- **RAW Synchronous** – Receives/Transmits synchronous data. On transmit, 0xFF is sent out if there is no actual data to transmit.

Appendix B Supported ASTERIX Versions

The SureLine software inherently supports specific editions of ASTERIX EUROCONTROL specifications or other Interface Control Documents (ICD). Users can define their own ASTERIX variants by uploading their versions of ASTERIX Markup Language (AML) files.

Table B-1 lists the supported EUROCONTROL ASTERIX categories and their specification level(s). EUROCONTROL specifications are available at https://www.eurocontrol.int/asterix.

Table B-1: Supported EUROCONTROL ASTERIX Categories

ASTERIX Category	Edition Level	SureLine Support
CAT001	1.1 1.2	Conversion & AML Aware
CAT002	1.0	Conversion & AML Aware
CAT008	1.1 1.2	AML Aware Nodes Only
CAT009	2.1	AML Aware Nodes Only
CAT010	1.1	AML Aware Nodes Only
CAT011	1.2	AML Aware Nodes Only
CAT019	1.3	AML Aware Nodes Only
CAT020	1.8 1.9	AML Aware Nodes Only
CAT021	0.23 0.26 2.1 2.4	Conversion & AML Aware
CAT023	0.13 1.2	Conversion & AML Aware
CAT034	1.27	Conversion & AML Aware
CAT048	1.18 1.19 1.21 1.23	Conversion & AML Aware
CAT062	1.16 1.17 1.18	Conversion & AML Aware
CAT063	1.1 1.3 1.4	AML Aware Nodes Only
CAT065	1.3 1.4	AML Aware Nodes Only
CAT247	1.3	AML Aware Nodes Only

AML Aware nodes are ASTERIX Validator, ASTERIX Modifier, ASTERIX Editon Translator, ASTERIX FRN Filter, and Real Time Data Display.

The following additional ASTERIX protocols are supported. The ICDs associated with these protocols are proprietary and are not available from Sunhillo Corporation:

- ASR11 ASTERIX (ICDs controlled by FAA)
  - CAT001
  - CAT002
  - CAT008
  - CAT034
  - CAT048
- FAA ASTERIX variants
  - CAT023, version 3
  - CAT033, version 3
- TPS78 IFF ASTERIX (ICDs controlled by the DoD)
  - CAT034
  - CAT048
- Australian ASTERIX variants
  - CAT034
  - CAT048

Appendix C Performance per Platform

Statistic	Margate II ADS-B	Asbury	Longport/RICI/ Ventnor	Longport/RICI/ Ventnor 6000 Series	Brigantine-SGP	Brigantine-Data Diode
Maximum messages per second when performing a LAN-to-LAN distribution with no other processing.	Output: 3500 pps (875 pps per row) Config = UDP: 4 inputs 4 output	Output: 3500 pps (875 pps per row) Config = UDP: 4 inputs 4 outputs	Output: 3500 pps (875 pps per row) Config = UDP: 4 inputs 4 output	Output: 10000 pps (2500 pps per row) Config = UDP: 4 inputs 4 output	Output: 65000 pps (16250 pps per row) Config = UDP: 4 inputs 4 output	Output: 10000 pps (2500 pps per row) Config = UDP: 4 inputs 4 output
Maximum messages per second when performing a LAN-to-LAN distribution with a generic conversion in and out,	Output: 450 pps Config = ADS-B to Cat 21 v2.4	Output: 450 pps Config = UDP CAT 21 v2.4 to CAT 21 v2.4, 4 inputs 4 outputs (1 message per packet)	Output: 1125 pps Config = UDP CAT 21 v2.4 to CAT 21 v2.4, 4 inputs 4 outputs (1 message per packet)	Output: 7000 pps Config = UDP CAT 21 v2.4 to CAT 21 v2.4, 4 inputs 4 outputs (1 message per packet)	Output: 55000 pps Config = UDP CAT 21 v2.4 to CAT 21 v2.4, 4 inputs 4 outputs (1 message per packet)	Output: 5500 pps Config = UDP CAT 21 v2.4 to CAT 21 v2.4, 4 inputs 4 outputs (1 message per packet)
Maximum delay (in milliseconds) a message from its input to its output queues (not including serial delay).	23 ms	23 ms	14 ms	15 ms	62 ms	23 ms
Comparative maximum delay (in milliseconds) a message from its input to its output queues (not including serial delay).	23 ms	23 ms	14 ms	15 ms	62 ms	23 ms

Note: One message per packet. Packet size is 100 bytes; 80% memory used maximum during all tests. Latency measured on Lan-To-Lan setup without conversion. The comparative maximum delay is measured at 3500 pps for all products. The following latency results should be relied upon within a 10% margin.