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ASTi

Simulated SINGARS Panel User Guide for T4 ACE

Document: DOC-T4-SINC-UG-1

Product Name: ASTi Simulated SINGARS Radio Panel for T4

Part No.: SRT-1523-xx

ASTi Product and Document Name

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1.0. GETTING STARTED

This document presents a complete product description of ASTi's high fidelity-simulated SINCGARS radio panel (ASTi Part Number SRT-1523) including the basic functional description of the SINCGARS panel, use with ASTi's Telestra 4 Target and ACE Studio systems, as well as detailed hardware and software descriptions.

This manual focuses on SINCGARS function and operation. Refer to the Telestra 4 documentation (available at <http://www.asti-usa.com/support/document/index.html>) for complete instructions about system hardware installation and ACE Studio software configuration tools.

Basic Overview

The SINCGARS panel provides a realistic SINCGARS RT-1523 user interface that works in conjunction with ASTi's ACE radio communications software running on a Target. Refer to Figure 1 for a functional overview of the ASTi SINCGARS panel integrated with a Telestra simulated communications system.

When the operator changes the state of the SINCGARS panel switch settings, an embedded microcontroller in the panel generates a data message that is sent to an ACE-RIU. The ACE-RIU sends the data messages over the ACENet network to the Target.

The SINCGARS State Machine software resides on the Target and acts as the host computer in the local control I/O system. The State Machine software processes the switch settings and keypad sequences and converts them into control values for use in the SINCGARS panel custom model. The State Machine also sends panel display messages back over the ACENet/ACE-RIU serial communications link to the SINCGARS panel.

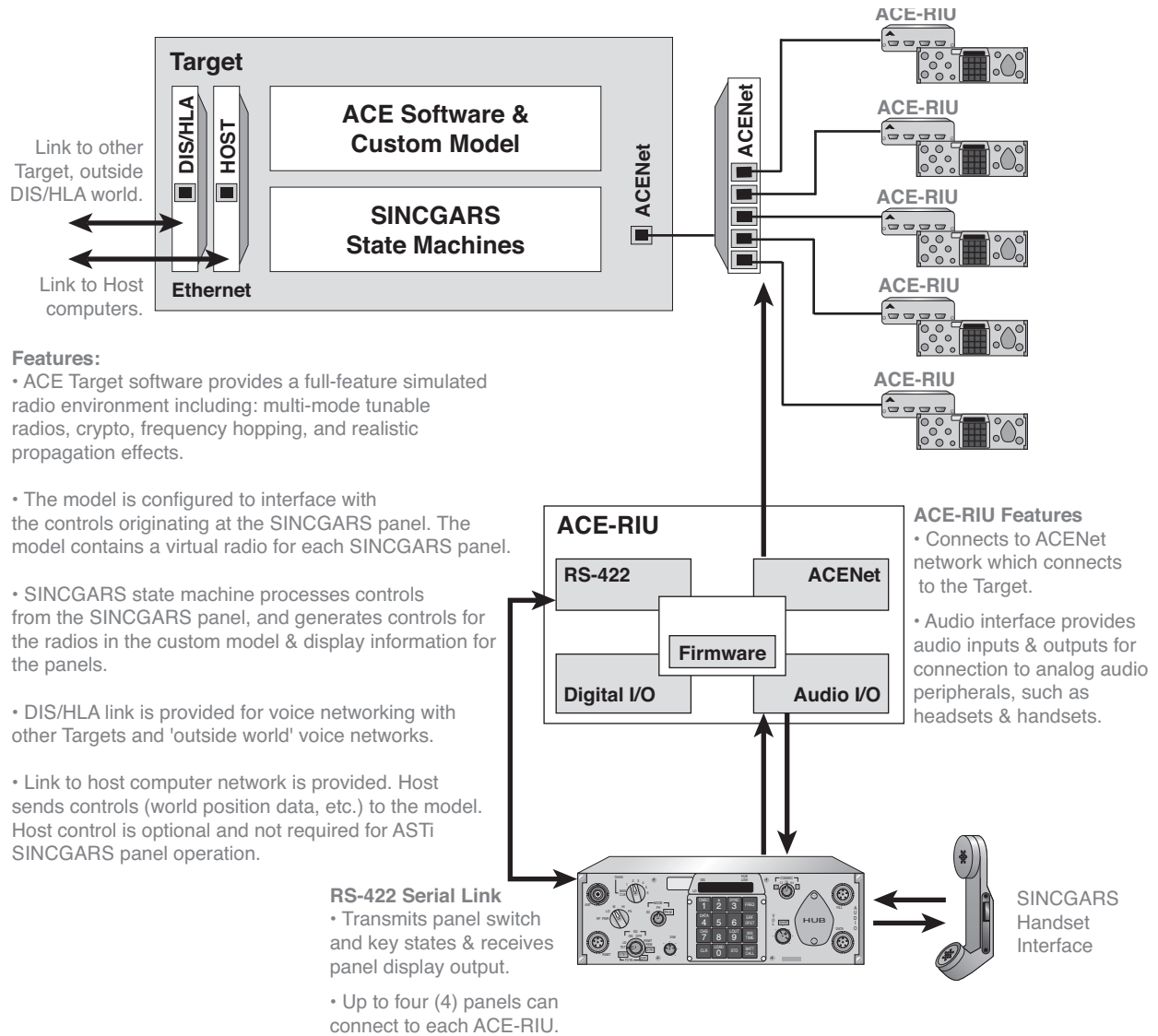


Figure 1: Functional Overview

2.0. PANEL FUNCTIONAL DESCRIPTION

The SINCGARS panel features front panel rotary switches, potentiometers, keypad and a LED display which are functionally identical to the real SINCGARS Model RT-1523/(E) radio.

Operators use the SINCGARS panel to adjust radio object parameters, including:

- Single Channel Tuned Frequency / Channels (Including loading, storing and clearing and offsetting)
- Volume with Whisper Mode
- Frequency Hopsets (Including zeroizing)
- COMSEC Functions (Including CT Mode, scrolling and zeroizing keys and crypto alarms)
- Transmit Power Level
- Squelch
- Standby and Off

The panels also include a high fidelity display with: realistic messages, dimmer control and built-in test modes.

The built-in handset interface provides the capability to connect a real world SINCGARS handset with PTT switch to the SINCGARS panel. This interface serves as an analog 'feed-through' to the ACE-RIU audio interface. An alternative is to directly connect audio ancillaries to the ACE-RIU. This option allows the use of many types of headsets, mics, speakers and PTTs.

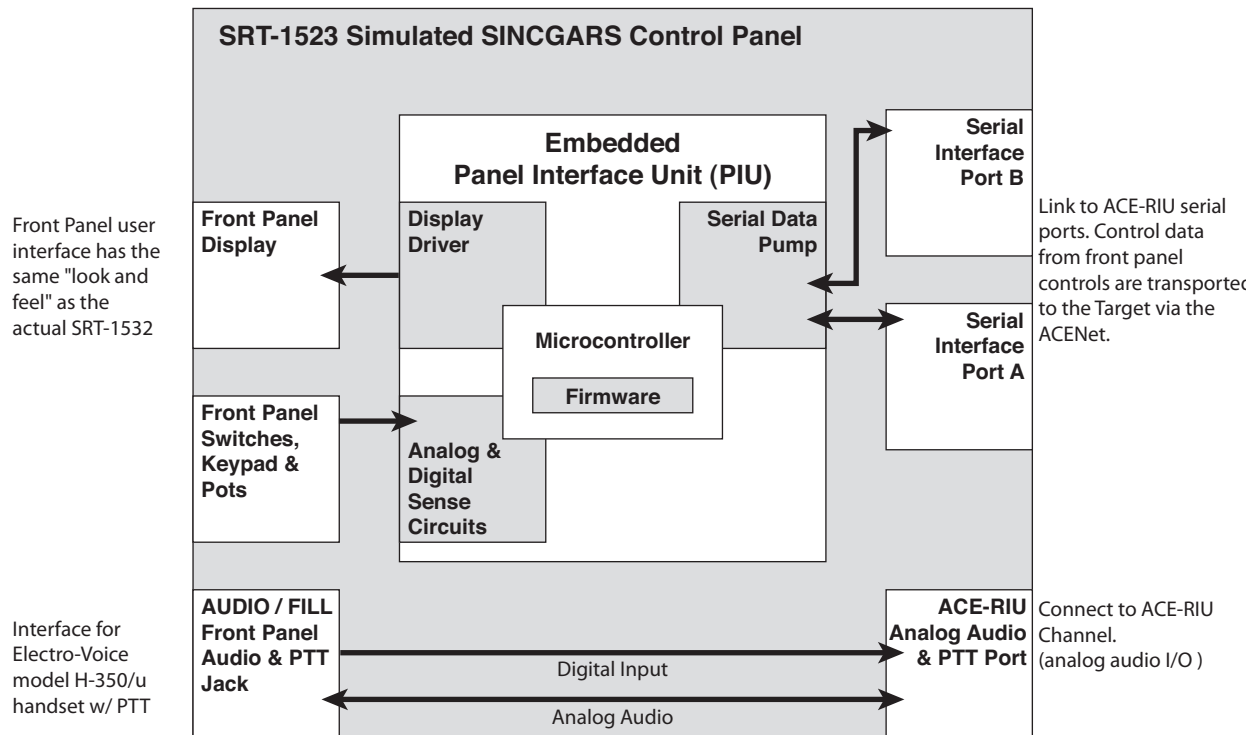


Figure 2: Functional Block Diagram of the SINGARS Panel

3.0. PANEL STATE COMMUNICATIONS OVERVIEW

The following steps describe the functional flow of the panel state data.

1. SINCGARS panels generate radio environment state information through operator adjustment of front panel controls and PTTs.
2. The SINCGARS panel transports state information to an ACE-RIU through the serial RS-422 link.
3. ACE-RIUs route panel state messages over the ACENet network to the Target.
4. The Target internally routes unprocessed panel data to the software module, known as the State Machine.
5. The State Machine decodes panel switch settings, and generates control data (tuned freq., hopsets, crypto keys, volume, squelch, etc.) for use in the custom model running under ASTi's ACE software.
6. The State Machine also generates panel display data that is routed to the SINCGARS panel via the Target, the ACENet network, and the ACE-RIU serial port.
7. The ACE software also routes control messages from the SINCGARS communications model to the State Machine.
8. The model is developed on the ACE Studio development workstation.

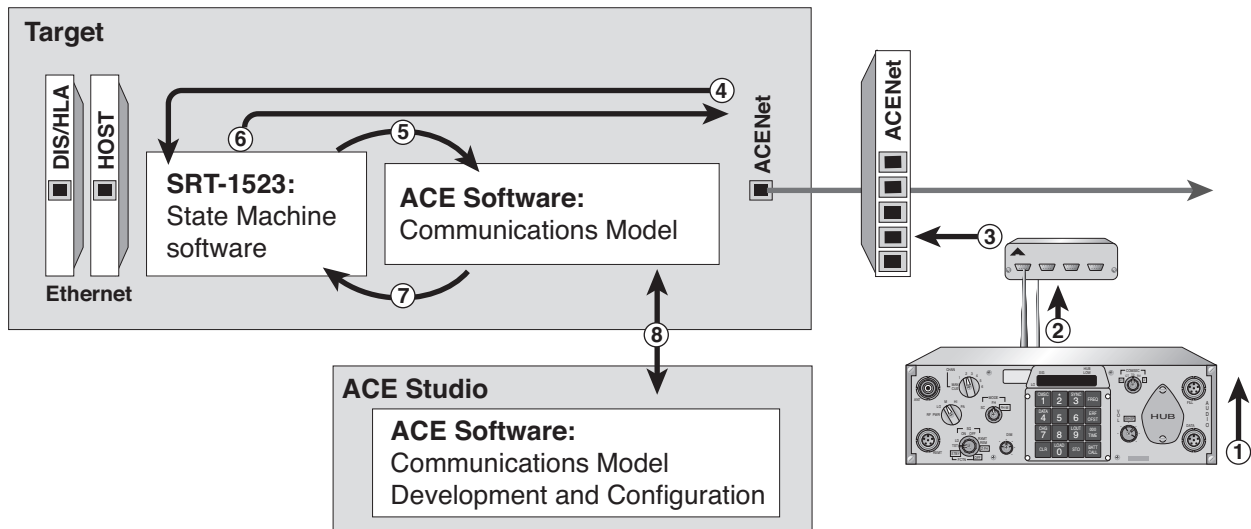


Figure 3: Control Communications Flow Diagram:

4.0. HARDWARE AND SOFTWARE OVERVIEW

System Hardware

QTY	Description
1	Simulated SINGARS Control Panel
1	Power Supply w/ Detachable Cordset (see below)
1	Power Supply Detachable Cordset
1	Serial Data Cable, Straight, 7 Feet

A minimally configured system consists of this base hardware:

- (1) Target
- (1) ACE Studio Development Workstation
- (1) ASTi Approved ACENet Ethernet Switch
- (1) Simulated SINGARS Panel
- (1) ACE-Remote Interface Unit (ACE-RIU)
- (1) Headset or Handset with PTT switch

Three ethernet interfaces are included in the base Target for DIS, ACENet and host computer interface. See chassis labels for Ethernet assignments.

Important: An ASTi simulated SINGARS system is comprised of an integrated set of hardware and software components. Consult with an ASTi engineer before designing, expanding or upgrading your system.

System Software

The system software includes the following software configuration for SINCGARS panel operation:

- **The State Machine.** ASTi's SINCGARS State Machine software module receives the real-time condition of each panel control (Vol / Whsp, Chan, Mode, Fctn, RF Pwr, Comsec and keypad sequences) and processes this state information to generate model control values that adjust radio parameters (tuned frequency, volume, cipher values, hopset variables, and transmit power level). The State Machine updates the model control values every time an operator changes the state of a panel control.
- **The Model.** The ACE Studio system provides a suite of software tools incorporating sound and communications model development, debug and management, communications monitoring and fault analysis, and equipment status and configuration. Models are generated by either ACE Studio Helpers and/or the ACE modeling environment. The communications model is comprised of a collection of interconnected software objects that realize one or more simulated SINCGARS radios, see the section "Creating a SINCGARS Software Model" for details. The software model created in this document uses ACE Studio Helpers, details of the complete communications software modeling environment development process are outside the scope of this manual.
- **Comm Plan.** Each SINCGARS software model includes a Communication Plan (Comm Plan) that is used to adjust the internal parameters of the radio, including: tuned frequency, waveform, crypto settings for single-channel or frequency hopping modes, see the section "Comm Plan for the SINCGARS Panels."

Remote Management System

The Remote Management System (RMS) is a specialized web server that provides complete sight and control of all ASTi devices on the simulation network. While RMS is not directly used with SINCGARS panel configuration, it provides general information on the Target's health, Option files, and system backup/restore.

RMS is accessible through any standard web browser on the network. On the ACE Studio, open the Firefox web browser and in the address bar type in the Target's IP address. This will open the Remote Management System (RMS). For full details on the Remote Management System please read the Remote Management System 4 User Guide (DOC-01-TEL4-RMS4-UG-4).

5.0. SYSTEM INSTALLATION

Installation Technical Specifications

SINCGARS

- Connect up to twenty SINCGARS panels to a single Target.
- From one to four SINCGARS panels can be connected to a single ACE-RIU.
- Panels can be located up to 25 feet from their associated ACE-RIU - this is in compliance with best engineering practices relating to maximum lengths of audio and control cables.

ACE-RIUs

- Each ACE-RIU is identified with a unique address number or name set in the Remote Management System (RMS).
- ACE-RIUs are connected to the ACENet network using an ASTi approved ACENet Ethernet switch.
- Each ACE-RIU has two serial port jacks, A and B. Each ACE-RIU serial port can accommodate one panel, as described below.
 - a. To connect one panel to an ACE-RIU serial port:
 - i. Connect the panel's serial port (either one of the two) to the ACE-RIU port
 - ii. Assign the panel a serial address of 0.
- Consult section the “Physical Interface Specifications” in this manual. Interconnecting cables and other ancillary equipment are available from ASTi - call for information.
- Refer to the ACE-RIU Technical User Guide (DOC-01-TEL4-AR-UG-1) for full product details.
- ACE-RIU internal jumper settings are configured for use with Telex headsets, contact ASTi for further information on jumper settings.
- Use only the ASTi 5 Volt Power Supply provided with the ACE-RIU. Using a substitute power supply may void your factory warranty.
- The ASTi power supply can be connected to 110 to 220 VACS, 50 / 60 Hz. The power supply is auto-voltage sensing - no adjustments are necessary.

Audio / PTT Ancillaries

- Only the approved version SINCGARS handset may be connected to the SINCGARS front panel to the ACE-RIU. If this option is selected, an audio / PTT cable is needed to interconnect the panel to the ACE-RIU channel.
- A variety of mics, speakers, PTTs may be connected directly to the ACE-RIU. If this option is selected, an adapter cable is needed to interconnect the audio / PTT devices to the ACE-RIU channel. Some audio devices cannot be directly connected to an ACE-RIU channel and may require intermediate interface circuitry.

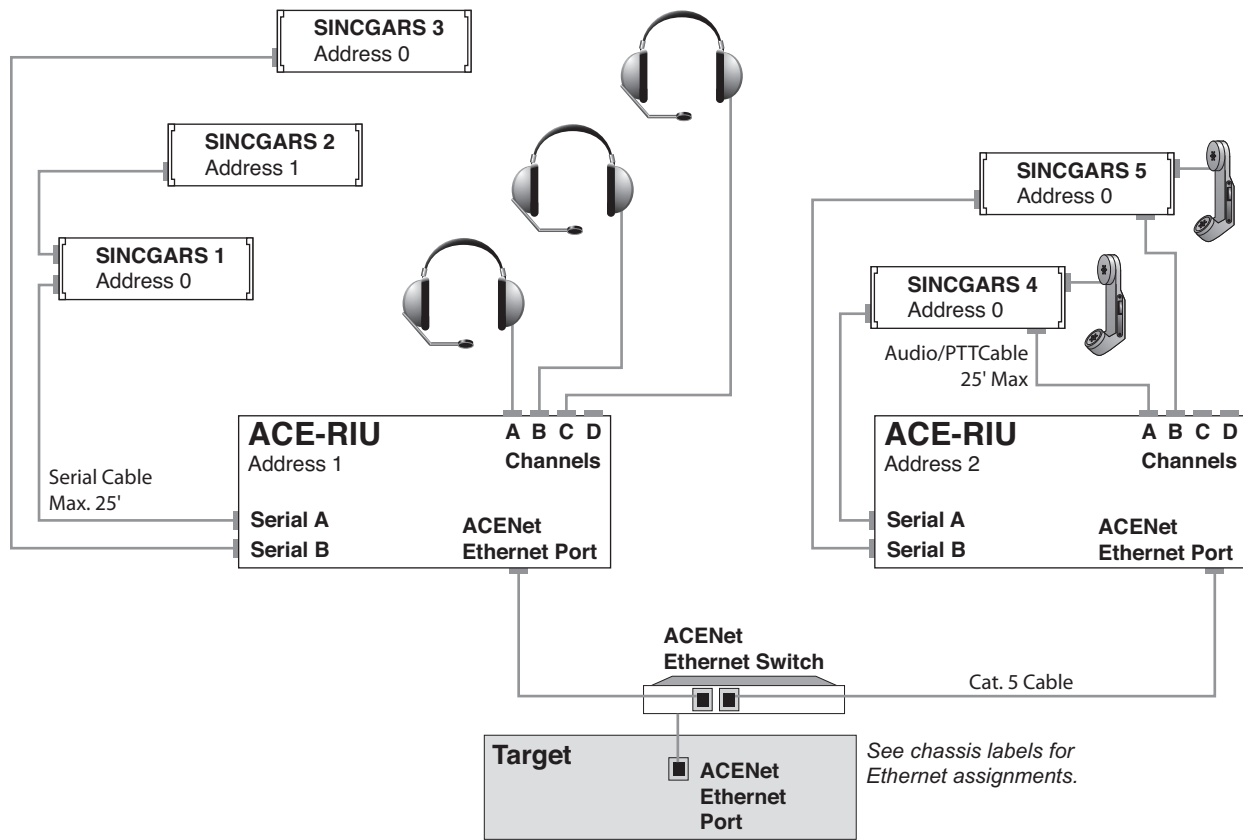


Figure 4: Example Layout

The example layout includes:

- One (1) Target
- One (1) ACENet approved Ethernet Switch
- Two (2) ACE-RIUs
- Five (5) SINGARS panels
- Audio / PTT ancillaries connected directly to ACE-RIU address 1.
- Approved-type handsets connected to SINGARS #4 and #5.

ACENet Network

The ACENet network provides a low latency, networked-based audio and I/O distribution architecture. ACE-RIUs connect to the ACENet network via an Ethernet port on the back panel of the device using a Category 5 cable. The Category 5 cable connects to an ACENet approved Ethernet switch. The maximum cable length is 100 meters (328 feet). The Ethernet switch connects to the Target via a Category 5 cable. The maximum cable length is 100 meters (328 feet).

Note: ACE-RIUs do not support daisy chaining to additional units or internal switching across networks.



Caution: Homemade cables are the number one reason for product performance problems. ASTi highly recommends using only manufactured, commercial, premium grade cable.

ACENet Requirements

In order to achieve a working ACENet infrastructure users must adhere to certain core requirements such as a closed network. No other traffic should be present on the ACENet network. Connect only Targets, ACE-RIUs, and ACENet compatible equipment to the network.

All ACENet capable devices must adhere to the following cabling requirements:

- CAT 5e cable or better
- 100 meters (328 feet) maximum distance
- Wire according to 1000 BASE-T Specifications

Guidance for advanced ACENet configurations:

Important: The Targets require that each individual system (comprised of a single Target platform and a number of ACE-RIUs) be interconnected on its own ACENet. Conversely, you cannot connect multiple Targets and ACE-RIUs on a common ACENet.

- An Ethernet switch is required for ACENet (no routers or hubs).
- Configure ACENet using multiple switches to realize flexible installations. Maximum of 6 hops (5 switches) are accommodated.
- 1Gb operation is required for ACENet
- Only port-based VLANs are acceptable.
- Each VLAN port must not see traffic from the other ports.
- If using VLANS: place each Target and its associated ACE-RIUs on a separate VLAN.
- VLAN tagging is not supported.
- Advanced protocols such as: 802.1p, port priority, spanning tree, etc. are not supported.
- The Target platform can connect directly to an ACE-RIU using crossover CAT5e cable.
- See the ACENet User Guide (DOC-01-TEL4-AN-UG-1) for more information. See the ASTi website for the most recent versions of documentation. (www.asti-usa.com/support)

Panel Installation

Follow these steps to connect each panel serial data port to an associated ACE-RIU serial port. Refer to the figure below for a rear panel view of the SINGARS panel.

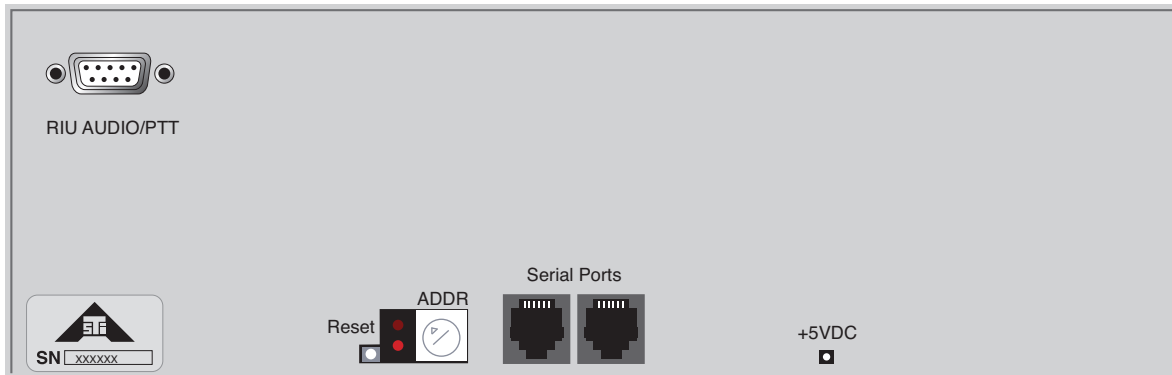


Figure 5: SINGARS Panel Rear View

Connect a panel to an ACE-RIU serial port:

- Connect the panel's serial port (either one of the two, labeled "ACE-RIU Interface") to the associated ACE-RIU serial port.
- Use a standard RJ-12 serial cable: 6 contacts / 6 conductors, wired straight through.
- Set the panel's serial address to 0 or 1.

Audio / PTT Ancillary Connection

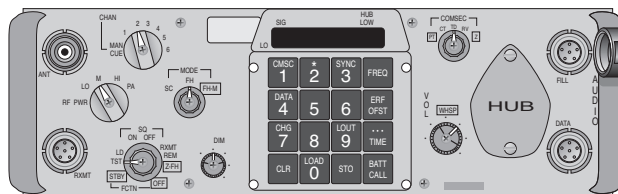
There are two basic audio / PTT configuration options:

a. Electro-Voice handset connected through the panel AUD / FILL jack with panel-to-ACE-RIU cable.

– or –

b. Direct audio / PTT ancillary connected to an ACE-RIU channel through an adapter cable. This manual describes a commonly used direct configuration: a professional series headset with mic (Telex Model PH-xx) and ASTi Push To Talk (PTT) Box. The ACE-RIU can accommodate many other configurations.

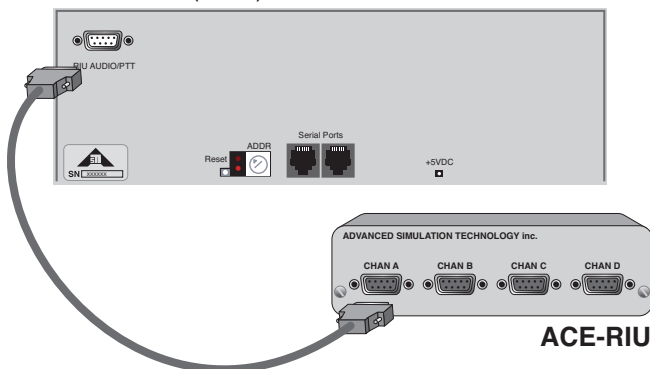
SRT-1523 (front)



**Electro-Voice
model H-350/u**



SRT-1523 (back)



ACE-RIU

Figure 6: Handset Connection

Follow the steps below for connecting audio/PTT ancillaries.

1. Connect the Electro-Voice handset to the panel's AUD / FILL port.
2. Select the appropriate ACE-RIU channel.
3. Interconnect the panel ACE-RIU AUDIO / PTT jack to the appropriate ACE-RIU channel using the appropriate cable. Interconnecting cable specifications are presented in Appendix A.
4. Direct connection of a Telex headset / mic and ASTi PTT box to the ACE-RIU:
 - a. Select the appropriate ACE-RIU channel.

- b. Install the headset, PTT box and adapter cable to the appropriate ACE-RIU channel.

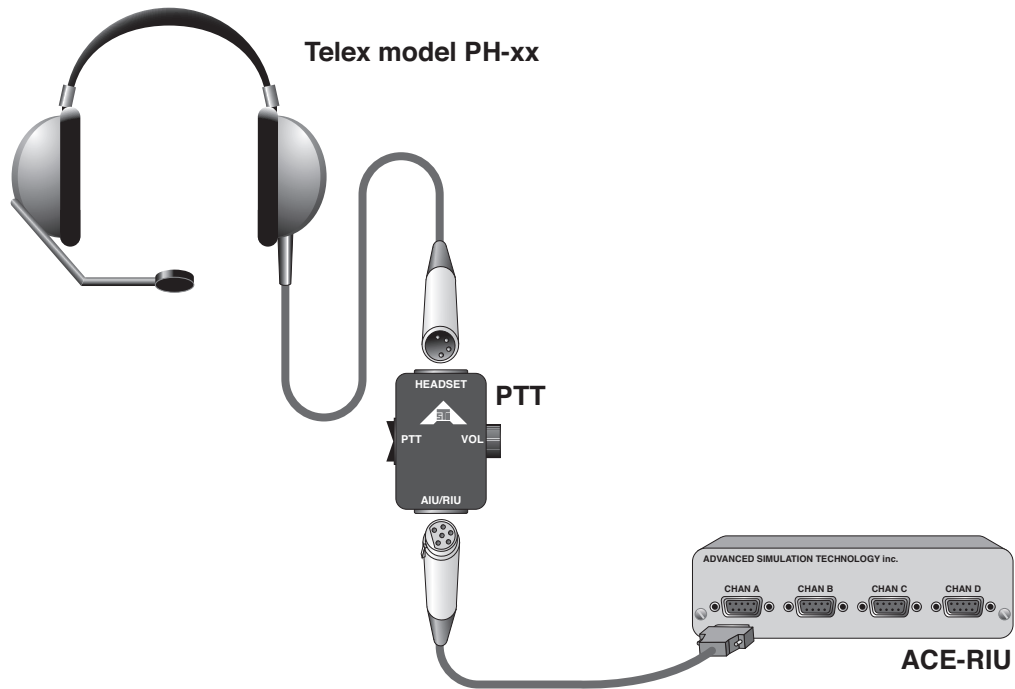


Figure 7: Headset and PTT Connection

6.0. COMM PLAN FOR THE SINGARS PANELS

The Comm Plan provides the necessary radio asset configuration parameters (or fills) for the SINGARS panels. Using the Comm Plan Editor, the user creates a library of radio “fills” consisting of crypto, frequency hop, waveform types, nets and other necessary parameters for the simulated radios. The preset information from the Comm Plan loads into the SINGARS State Machine upon system startup.

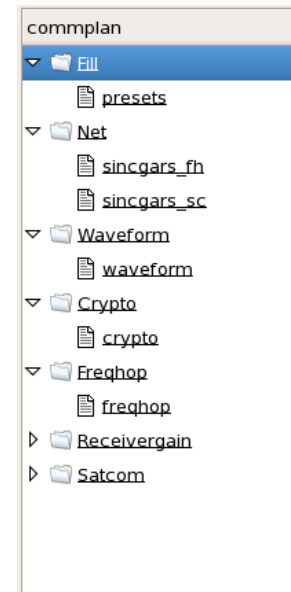
The Comm Plan supports two modes which are Frequency Hopping (FH) and SINGARS mode which includes Single Channel (SC) mode. There are 8 SINGARS channels; however, in order to support both modes in the Comm Plan there are 16 channels set in the Fill Presets (see “Fills” section for details).

Note: Users of the SINGARS panel have the ability to alter SC, FH and COMSEC values through operational procedures like: clearing, changing, scrolling and zeroizing. Radio parameters that are modified through operational procedures are changed only in the State Machine's temporary memory. The preset values located in the Comm Plan are not altered. Therefore, the original presets are restored when the Project is reinstalled.

Comm Plan Setup

The user must set the parameters in the Comm Plan for all ACE Studio Helper driven software models. The following Comm Plan parameters that must be configured:

- **Fill** - Contains the full set of parameters known as the Comm Plan.
- **Net** - Each net includes the common parameters that networked radios must share for successful inter-communications. Net parameters include: frequency, Tx frequency, waveform, crypto settings and frequency hopping settings.
- **Waveform** - Includes the modulation type, type of encoding for the wave, rate, bandwidth, transmitter power, and receiver gain.
- **Crypto** - Set the crypto key and the crypto system for secure radio transmissions.
- **FreqHop** - Set the simulation settings for SINGARS frequency hopping effects. Frequency Hopping includes the following parameters: net ID, Hopset Wod, Lockout ID, Sync Tod, and Transec key.



Note: Do not change the Receiver Gain and Satcom libraries.

While the library items can be created in any order, each folder builds upon each other, therefore the most logical way is to start from Frequency Hop and work your way up the list.

Frequency Hopping

In the Frequency Hop library, add six Frequency Hop parameters and set the non-zero net IDs required for each.

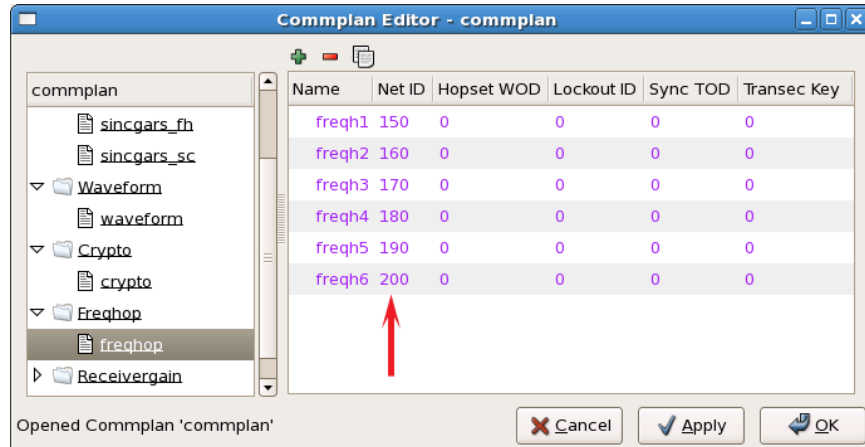


Figure 8: Frequency Hop Library

Crypto

In the Crypto library, add six crypto parameters and set ‘System’ to 1 and ‘Keys’ to a non-zero number.

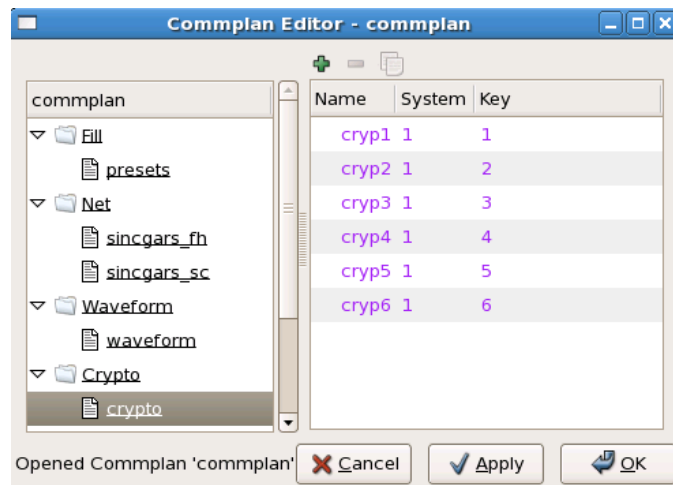


Figure 9: Crypto Library

Waveform

There are three required waveforms FM, SINGGARS, and SINGGARS_SC (Single Channel). The FM and SINGGARS waveforms are default options. In the Waveform library, add the SINGGARS_SC, as shown in the figure below.

The remainder of the waveforms are default options and are not necessary for the SINGGARS Comm Plan.

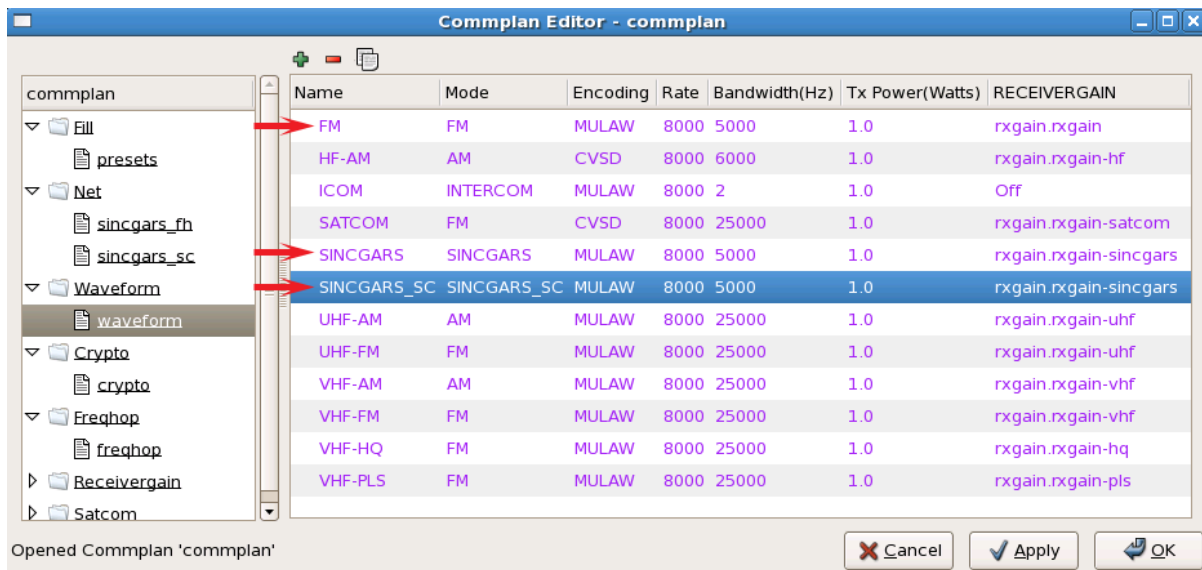


Figure 10: Waveform Library

Net

There are two types of Net Libraries required for the SINGGARS Comm Plan. In the Net folder, add a Net Library called SINGGARS_FH (as shown below) that contains 8 nets for Frequency Hop mode. Set the required frequency, waveform, crypto, and FH for each net.

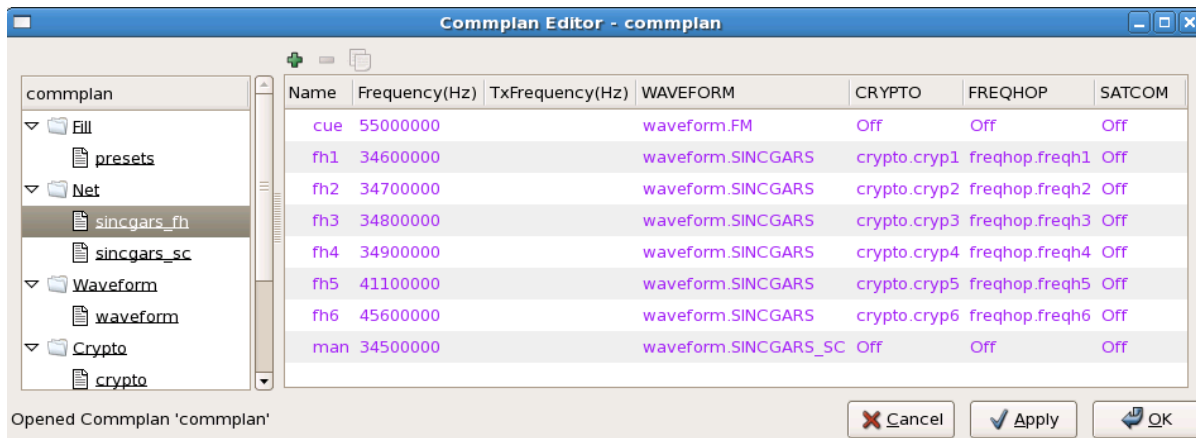


Figure 11: Net Library for FH Mode

Next add a Net Library called SINGGARS_SC (as shown below) that contains 8 nets for Single Channel mode. Set the required frequency, waveform, and crypto for each net. Note: The Frequency Hop is off for SC mode.

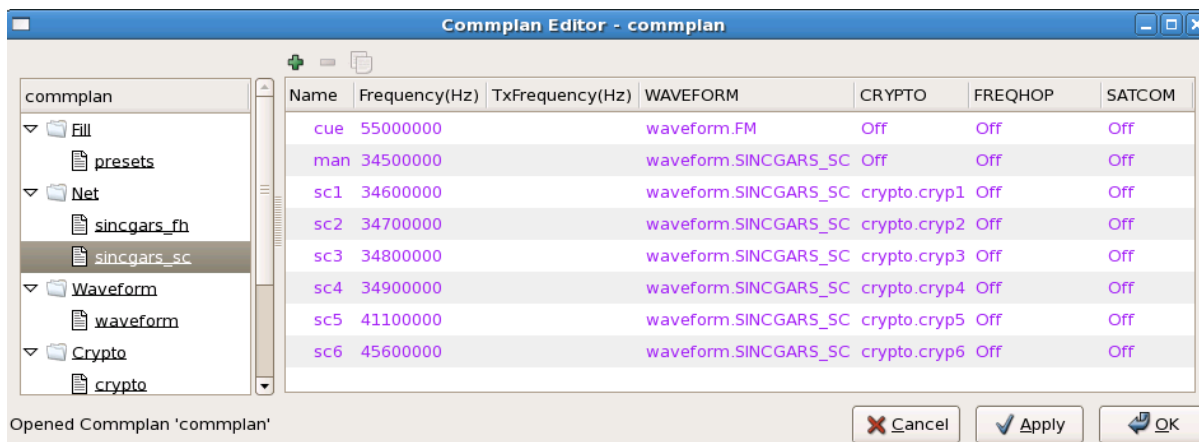


Figure 12: Net Library for SC Mode

Fill

There are 16 presets required for the Comm Plan: 8 for single channel mode and 8 for frequency hop mode. Set the required index numbers 1 through 8 and 11 through 18 (as shown below). These numbers are required due to the logic in the Helper generated model.

Important: If the Fill has the FH Nets first (1-8) and the SC Nets on the latter half (13-18) then the result is SC Mode does not properly work. The Fill must be filled in the order as shown below, with SC Nets first (1-8) and FH Nets on the latter half (13-18).

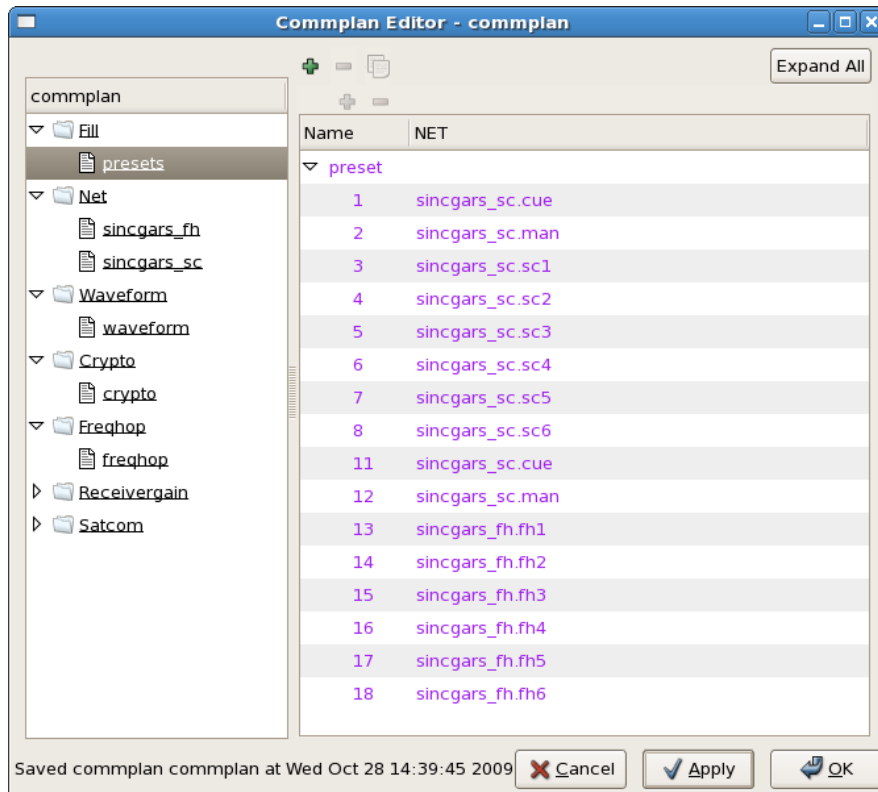


Figure 13: Fill Library

7.0. CREATING A SINGARS SOFTWARE MODEL

The ASTi ACE Studio Helpers are used to build communications models and model integration with SINGARS panels and State Machine software.

Follow the steps below to create a communications model for use with the SINGARS panels. Before getting started, open ACE Studio and create a project or open an existing project. Then create a new layout or use the default layout.

Before getting started, create the Comm Plan as instructed in previous section, if you have not done so.

Step 1: Add a Domain

1. Open the Domain Editor.
2. Select the '+' and type in the Domain name.
3. Select 'OK' to add the Domain.
4. Select 'OK' in the Domain Editor.

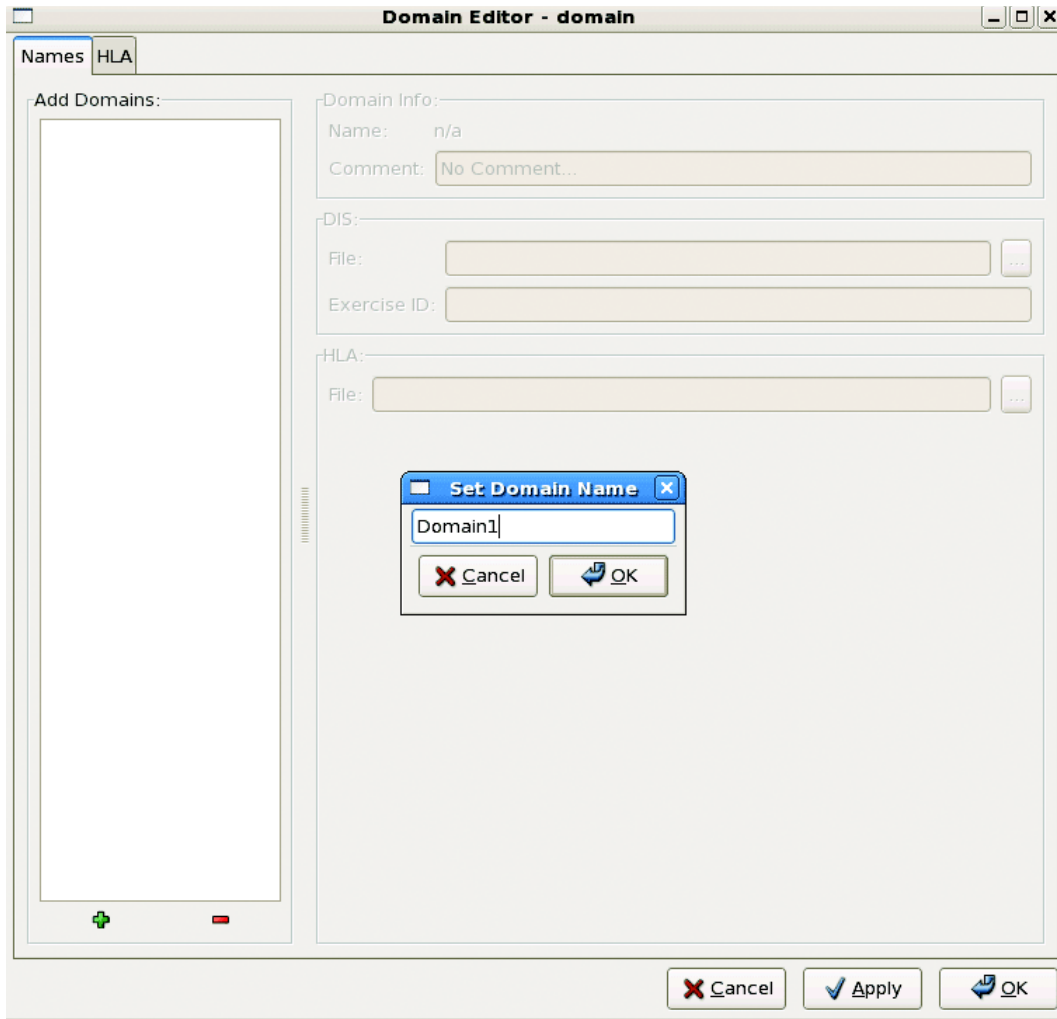


Figure 14: Domain Editor

Step 2: Add a Channel

The channels are the audio connection points that connect the audio distribution within the model.

1. Open the Channel Helper.
2. Select '+' and select SINCGARS from the drop down list.
3. Type the SINCGARS name and select 'OK.'
4. Select the 'SINCGARS' tab.
4. Set the Domain, select the '...' box to select the Domain. All radios must have the same Domain to communicate.

Note: World Position is *Optional*.

5. Set the Radio Preset. This sets the radio parameters that are set up in the Comm Plan. See the section "Comm Plan for the SINCGARS Panel" for information on creating the Comm Plan.
6. Enter the protocol ID. This is a string of the format 'DIS:site.app.entity.radio' or 'DIS:entity.radio' or 'DIS:radio', where site, app, entity, and radio are positive integers. If you exclude site and app the radio environment will assign the default site and app from the DIS file in the Domain Editor to the radio. If you exclude entity the radio environment will assign a random, unique number for the entity ID of the radio. Ex: 'DIS:3.4' will use 3 as the radio's entity and 4 as the radio ID. The site and app are populated from the defaults in the Domain.
7. Select 'Update.'

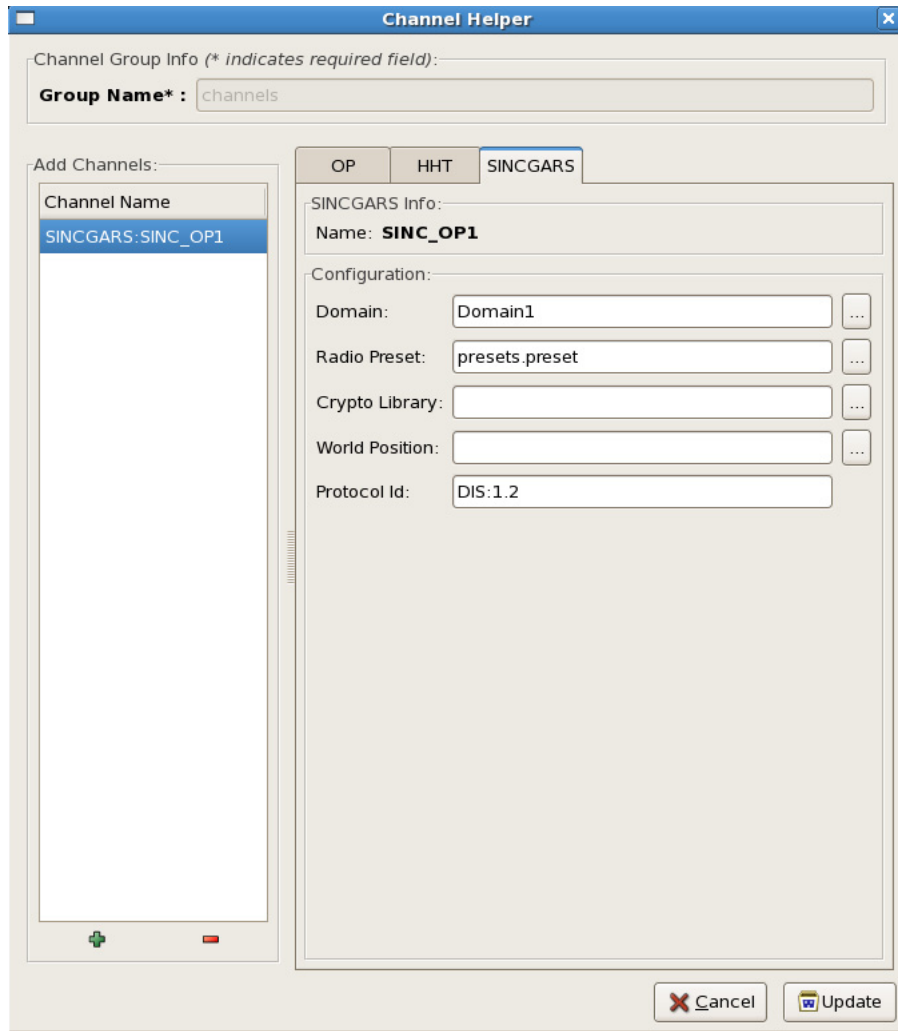


Figure 15: Channel Helper

Step 3: Add an ACE-RIU

This step connects the hardware ACE-RIU to the software ACE-RIU in the model. Each ACE-RIU is given a unique identifier name, to view the names see the RMS > ACE-RIU page.

1. In the canvas (graphical layout) right-click and select the ACE-RIU.
2. Set the name and ACE-RIU field.
3. Select the Telestra, Group and Channel.
4. Select 'Add.'

ACE-RIU Editor

Configure (* required fields)

Name: * ACE_RIU01

ACE-RIU: * ACE_RIU01 ...

Location:

Channels 4

Blade A -> channels CGARS:SINC_OP1

B -> Select Group Select Channel

Select Telestra C -> Select Group Select Channel

D -> Select Group Select Channel

Select Telestra E -> Select Group Select Channel

F -> Select Group Select Channel

Cancel Update

Figure 16: ACE-RIU Editor

Step 4: Edit the Telestra Configuration

1. In the canvas (graphical layout) right-click the Telestra and select 'Edit.'
2. In the Telestra Editor select the 'SM' tab.
3. Check the 'SINGGARS Enable' box and the 'Auto Generate SINGGARS INI File' box.
4. Select 'Update.'

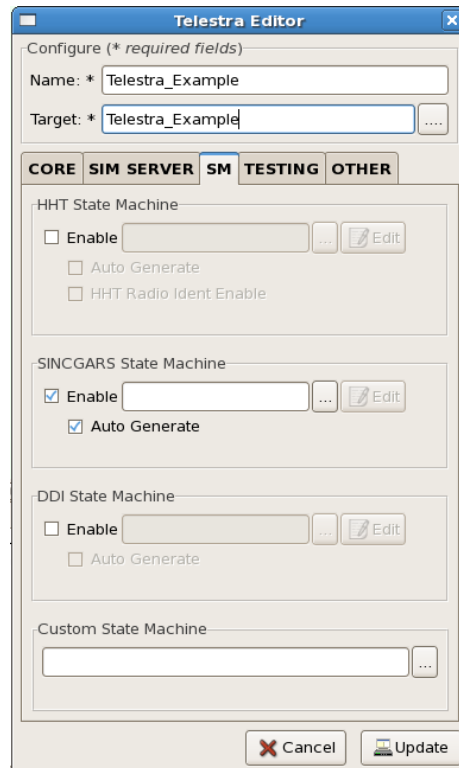


Figure 17: Telestra Editor State Machine Tab

Step 5: Install the Project

Select the 'Install' button. The model is complete.

*This software model example was updated to ASTi ACE software version 4.14.

8.0. FRONT PANEL CONTROLS AND JACKS

The operation of the SINGARS panel is based on the information from the RT-1523 Operator's Manual. The panel incorporates the following controls. Not all of the front panel controls and jacks are operational. See the “Operational Features and Non-operational Features” section of this manual.

A front view of the SINGARS panel is shown in Figure 10.

1. RF PWR: LO, M, HI, PA
2. LED Display: 8 Characters and TX Power Level
3. CHAN: CUE, MAN, 1, 2,3, 4, 5 or 6
4. DIM: 8 Levels of Display Intensity
5. MODE: SC, FH, FH-M
6. FCTN: STBY, TST, LD, SQ ON, SQ OFF, RXMT, REM, Z-FH, OFF
7. Keypad Switch Matrix:

1 (CMSC)	2 (*)	3 (SYNC)	FREQ
4 (DATA)	5	6	(OFST)ERF
7 (CHG)	8	9 (LOUT)	(....)TIME
CLR	0 (LOAD)	STO	(CALL)BATT

8. COMSEC: PT, CT, TD, RV, Z
9. VOL: Linear taper, Min = Full CCW, Max = Full CW
10. WHSP: Pull ON, Push OFF
11. AUDIO / FILL: operational handset / PTT jacks (for Electro-Voice H-350/U only)

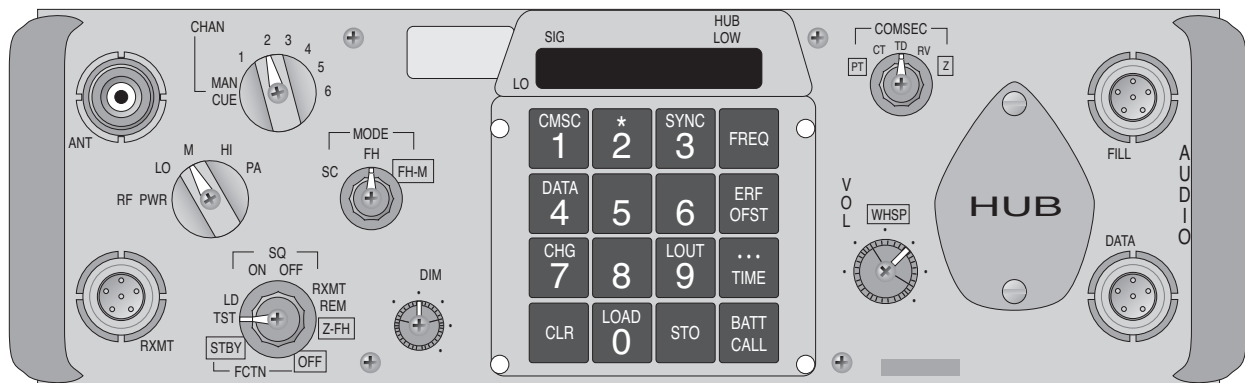


Figure 10: SINGARS Panel, Front View

9.0. OPERATIONAL RT-1523 FEATURES

Operation of the SINCGARS panel is modeled after the SINCGARS Ground Combat Net Radio, Model RT-1523/(E), as described in the SINCGARS Operator's Manual, US Army Document Number CECOM TM 11-5820-890-10-1.

The ASTi SINCGARS panel supports the RT-1523 SINCGARS features listed in this section. Unless noted, the SINCGARS panel feature responds to user control as described in the RT-1523 Operator Guide.

A. SC Mode:

1. Load Frequencies
2. CLR (clear): clear last digit and backspace
3. Display Timer: display will blank 7 seconds after last key press.
4. Display Timer Stop and Reset: the Display Timer will stop and the display will not blank if a key is held down. When the key is released, the 7 second timer will restart.
5. Clearing SC Frequencies
6. Loading and Storing SC Offset Frequencies
7. Clearing SC Offset Frequencies.
8. Selecting a SC Channel: MAN, CUE, 1,2,3,4,5,6

B. COMSEC Mode:

1. Scroll COMSEC Keys. This procedure is used to change the COMSEC key while maintaining the same SC frequency or FH net.
2. STBY Alarm. If there is a COMSEC key loaded and the radio has been set to FCTN=STBY and is then switched to FCTN=SQ ON, a COMSEC alarm will sound. Press PTT once to clear the alarm.
3. Note that COMSEC TEK initial values are set in the State Machine at system startup.
4. COMSEC-CT places the radio in a cipher text (secure) mode.
5. COMSEC-PT places the radio in a plain text (non-secure) mode.
6. TEK values can be zeroized by the COMSEC-Z control and by the FCTN-OFF control.

C. FH Mode:

1. FH data initial values are set in the State Machine at system startup.
2. MODE-FH places the radio in a DIS compliant frequency hopping mode.
3. FH data values can be zeroized by the Z-FH control and by the FCTN-OFF control.

D. General Controls:

1. RF PWR: low, medium, high, PA. Note - RF level is indicated on the display when the radio transmitter is activated (PTT pressed)
2. FCTN: Squelch OFF, ON
3. FCTN: [Power] OFF
4. FCTN: STBY
5. VOL: Min to Max
6. WHSP: OFF, ON
7. FCTN-TST. Generates a display test sequence. (See section for “Troubleshooting Procedures” for a description of the display message.)
8. DIM - provides 8 levels of intensity control.

E. AUDIO / FILL:

1. The U-183/U jack is provided.
2. Functional - configured to interface with SINCGARS handset with PTT

10.0. NON-OPERATIONAL RT-1523 FEATURES

The following features are **not** operational in the current version SINCGARS panel. When non-operational switch settings are selected or invalid key sequences are entered, the display shows the message “NO OPO”.

A. ANT: Painted legend only

B. Frequency Hopping Mode:

1. Local fill of FH dataM. Note - FH data is loaded during system initialization.
2. Clearing FH data (using the CLR button).
3. Cold Start Net Opening (using ERF)
4. FH Update using ERF
5. Late Net Entry
6. NCS (Net Control Station) procedures

C. COMSEC Mode:

1. Loading COMSEC keys through a local fill. Note - COMSEC key (TEK) data is loaded during system initialization.

* Function

2. COMSEC-TD
3. COMSEC-RV

D. General Controls:1

1. FCTN-RXMT
2. FCTN-REM

E. AUDIO / DATA, RXMT: Painted legend only.

11.0. BUILT-IN SELF-TEST PROCEDURES

Introduction

The SINCGARS panel features a built-in self test capability that allows an operator to verify that the following components are functioning as an integrated system:

1. Target and ACE Studio
2. SINCGARS State Machine
3. ACENet Network
4. ACE-RIUs
5. SINCGARS Panels: Including the display and front panel controls.

Note that the built-in test routine does not automatically test panel and ACE-RIU audio and DI circuits. The provided ASTi test utilities (described below) test audio and DI circuits, as well as running the SINCGARS panel self test.

A. System Setup

1. To run the self test procedure, the SINCGARS panel and Target platform must be installed and the application-specific software must be installed, including: model and configuration.
2. You can run the self test mode on any panel in the system during runtime of the SINCGARS model or stand-alone, using an ASTi-provided test utility. Note: During the test mode, the State Machine *does not* send panel data to the custom model and communications are paused.
3. Using your application-specific model; start the SINCGARS custom model as usual.

Once the model is running, follow the procedure under “B. Panel Settings” to test panel controls.

4. If you are experiencing system problems, and are unable to run the self-test using your application-specific software (model and configuration), run the SINCGARS panel test utilities, furnished with the system. The SINCGARS panel utilities enable stand-alone panel tests; they do not enable simulated communications with other panels.

To resume communications-mode operation after running the ASTi test utilities, reload the application-specific software configuration.

5. Audio / PTT tests are also enabled. These tests work for both types of Audio / PTT configurations: handset–panel–ACE-RIU and mic/speaker/PTT–ACE-RIU.

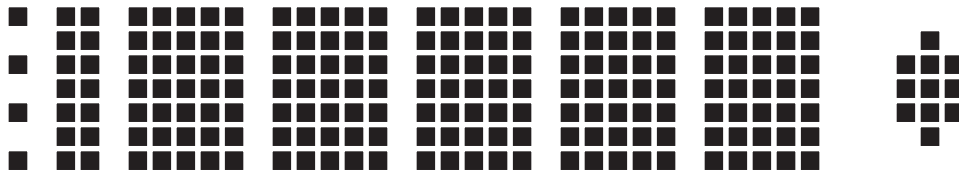
Tests include:

- i. Audio loop-back through ACE-RIU channels A, B, C, and D. Speak into the mic, and listen for sidetone. Additionally, a pulsing tone is routed through the ACE-RIU audio outputs.

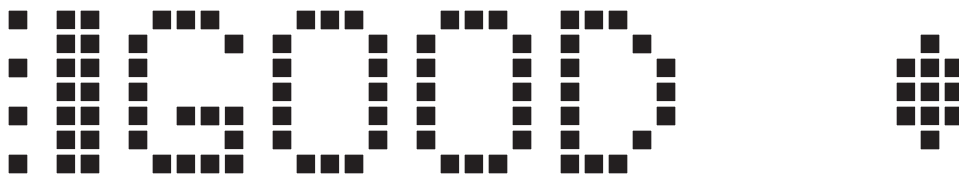
B. Panel Settings for the Display Test

1. Adjust the front controls of the SINCGARS panel under test:
 - a. FCTN: TST, MODE:SC
 - b. DIM = Mid Position
2. First, the SINCGARS panel will run the normal FCTN-TST display test sequence.

The display test sequence begins with:



And ends with:



C. Panel Settings for Controls Test

1. After the display test sequence is complete, switch the MODE control to MODE:FH-M. This commands the SINCGARS panel to enter the panel test mode.
2. To test the front panel functions, simply select any switch setting and view the display; the switch setting will be graphically displayed.
3. For example, if the FCTN-OFF setting is selected, the display will show “FCTN OFF”.

D. Exit the Self Test Mode

1. To return to communications model operation, press the TIME key four times.

E. In Case of Trouble

1. Refer to “Troubleshooting Procedures” section for details.

12.0. TROUBLESHOOTING PROCEDURES

Introduction

If you experience problems relating to panel operation, perform the following procedures to determine the source of the problem and find a remedy. This troubleshooting guide assumes that the reader has a fundamental understanding of Target operation (including the ACENet and ACE-RIUs) and ACE Studio software. It may be necessary during the procedure to consult other ASTi reference documents listed in the “Further Reading” section of this manual.

About Simulated Radio Communications Problems

It is possible that your ASTi SINCGARS panel is functioning perfectly, but you are still experiencing problems with simulated local or DIS radio communications. There are a number of factors, external to the Target/SINCGARS panel system that effect simulated radio communications. The following factors are considered outside of the scope of this manual:

- Custom model design issues.
- DIS network configuration.
- Radio environment settings - coordinating tuned frequencies, frequency hopping and crypto variables and geographic location.

The ASTi Simulated SINCGARS panel is comprised of an integrated set of hardware and software components. If you are experiencing problems during initial system integration, the first step in the troubleshooting process is to determine whether all of the system components are compatible.

Self Test Procedure

A. Run the Self Test

1. If you experience problems with your Target/ SINGARS system, the first step is to quit the current SINGARS custom model and run the built-in SINGARS panel self test utility on all of the panels that are not functional.
2. Use the described procedure with the ASTi-provided SINGARS panel utilities. This will help isolate the working custom model as the cause of the problems.

B. Self Test Results

Go to the specified troubleshooting subsection based on the results of the self test. Each troubleshooting subsection includes a series of sequential checks - if you find a negative result to any of the checks, perform corrective measures and re-check before moving to the next step. After completing the checks in a subsection, re-run the self test procedure.

Results (using the ASTi SINGARS utility software):

1. If all of the panels in the system function properly when the ASTi SINGARS utility is run, then one or more problems exist in the application-specific software configuration. See section E “Custom Software Level Troubleshooting” for guidance.
2. If all of the SINGARS panels connected to the Target (or connected to a specific ACENet switch to the Target) are malfunctioning, go to section C “System Level Troubleshooting.”
3. If a specific panel or a sub-group of panels are not functioning, go to section D “Individual ACE-RIU / Panel Level Troubleshooting.”
4. If all of the panels pass the self test, but you are still experiencing problems when using a specific combination of customized software modules go to section E “Custom Software Level Troubleshooting.”

C. System Level Troubleshooting (All panels are not functioning when the ASTi utility is run)

1. Re-start the Target.
2. Ensure that all of the ACE-RIU addresses are ‘Present’ in the RMS ACE-RIU page.
 - a. Ensure that all of the ACE-RIUs have valid names/identifiers and are setup properly in the ACE Studio Project Layout.
 - b. Inspect the ACENet connections and that all of the ACE-RIUs are connected properly.
 - c. Test to determine that the ACENet is working. Connect one ACE-RIU at a time to the ACENet switch using a pair of tested ‘known-good’ Cat 5 cables and inspect for proper ACE-RIU operation.

D. Individual ACE-RIU / Panel Level Troubleshooting (Individual panel or subset of panels not functioning when the ASTi utility is run)

1. Power the Target down and press the Reset button on the malfunctioning panel(s).
2. Re-start the Target.
3. Run the self test on the panel under test. If it is not functioning continue with the following steps.
4. If possible, replace the SINGARS panel with a known-good unit and re-test.
5. Inspect the RS-422 serial cable connecting the panel to the ACE-RIU. If possible substitute with a known-good cable. *Homemade cables are the number one reason for product performance problems. ASTi highly recommends using only manufactured, commercial, premium grade cable.*
6. Is the panel connected to an ASTi power supply? Check the Power Supply - a voltmeter should read 5 VDC between the inner and outer conductors of the plug. Replace the power supply if necessary. **Warning:** Use only ASTi power supplies.
7. ACE-RIU Troubleshooting

a. General:

- Ensure that each ACE-RIU's status green light is flashing at a once per second rate.
- Ensure that the correct ACE-RIU addresses are shown on the RMS ACE-RIU page.

b. Problem:

No lights are illuminated on one or more of the ACE-RIUs.

Suggestion:

Ensure that the ACE-RIU power supply is securely mated to the ACE-RIU, the detachable AC cord is securely mated to the power supply and that AC power (110 to 240 VAC, 50/60 Hz) has been applied to the power supply. Substitute power supply or AC cord as necessary to isolate and correct faults.

c. Problem:

The RED lights are illuminated on all ACE-RIUs.

Suggestion:

Restart the Target system, inspect the RMS Health pages and fix any error messages.

d. Problem:

The RED and GREEN lights are both lit.

Suggestion:

Press the ACE-RIU Reset button located on the front faceplate.

e. **Problem:**

The GREEN light on one or more of the ACE-RIUs is blinking at a fast rate (about 4 times per second).

Suggestion:

Possible causes include: incorrect model running on the main node, one or more of the ACE-RIUs is mapped in the software incorrectly or there is one or more faulty cables.

Step 1) Inspect the RMS Health page for error messages. Make corrections as needed.

Step 2) Ensure that the ACE-RIU are mapped correctly in the software model.

Step 3) Ensure that all of the Category 5 cables are correctly installed and securely mated at each connector on the ACE-RIUs and the ACENet switch.

Step 4) Check the Category 5 cables, substitute with spare cables to isolate faults, then restart the system.

E. Custom Software Level Troubleshooting (Panels function properly with the ASTi utility, but not with the application-specific software load.)

1. In ACE Studio, check the working model to ensure that it contains valid ACE-RIU software components, with correct ACE-RIU names/identifiers for each ACE-RIU on the ACENet switch.
2. In ACE Studio, view the log file to look for errors.
3. Verify the SC Frequencies, Crypto and Frequency Hop data.
4. Also check the hardware: ACE-RIU address and ACE-RIU serial port.
5. Check the RMS System Status page for Model Credit related errors. It is possible that your model has depleted the available credits.

13.0. PANEL TECHNICAL SPECIFICATIONS

Size: 10.875" (W) by 3.375" (H) by 9.5" (D)

Weight: Less than 3 lbs.

Power: 5 VDC at 1 A, provided by ASTi power module, included

14.0. PHYSICAL INTERFACES

A. ACE-RIU Interface

The SINCGARS panel connects to an ACE-RIU serial port via a RS-422 serial link. Each panel includes two ACE-RIU Interface jacks to allow connecting two panels to each ACE-RIU serial port.

The interconnection cable is an off-the-shelf unshielded twisted pair cable with RJ-12 modular plugs. The plug-to-plug connections are straight-through.

Connector Type: Female, 6 Conductor, RJ-12

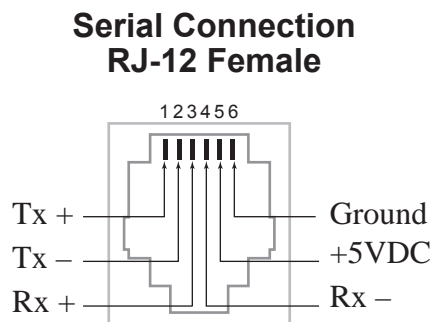


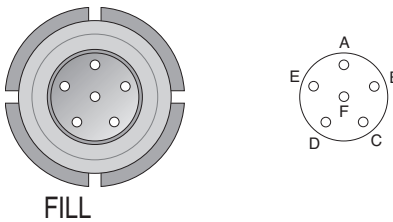
Figure 6: RJ-12 Pinout Diagram

B. Audio / Fill

The Audio Fill jack provides an interface to Electro-Voice handset Model H-350/U. A separate cable is needed to interconnect the panel's ACE-RIU "Audio / PTT" jack to the ACE-RIU channel. Application information about this cable is provided in Appendix A.

IMPORTANT: The audio port of the SINCGARS panel is configured for connection to the specified handset **ONLY**. Connection to any other equipment may cause damage to the SINCGARS panel, the handset or the ACE-RIU. Connection to non-specified equipment is considered equipment misuse; damage occurring due to equipment misuse is not covered by the ASTi warranty.

Pins	Signal
A	Ground
B	Audio Output
C	PTT Input
D	Audio Input
E	No Connection
F	No Connection



C. ACE-RIU Audio / PTT

This interface is designed for connection with ASTi's ACE-RIU. See Appendix A for ACE-RIU compatibility information.

Connector Type: Female, 9 Conductor, DB-9

Pins	Signal
1	Digital Out + (Not Used)
2	Audio Out, High
3	Digital Input +
4	Audio In, High
5	Signal Ground
6	Digital Out – (Not Used)
7	Audio Out, Low
8	Digital In – (I/O Ground)
9	Audio In, Low



ACE-RIU AUDIO/PTT

D. Power

The power jack is designed for use with the provided 5 VDC power supply only.

Connector Type: Female, 2 Conductor, concentric 2.1 mm power jack

Pins	Signal
Center	Positive
Ring	Negative

15.0. FURTHER READING

For information about the other ASTi components in the integrated ASTi communications system, refer to the Telestra 4 /ACE technical documentation on the ASTi website:

<http://www.asti-usa.com>

Look for up-to-date technical information under the heading:

Support > Documentation > Telestra 4

Refer to the following document for more SINCGARS radio operational information.

Operator's Manual, SINCGARS Ground Combat Net Radio, ICOM

Document Number CECOM TM 11-5820-890-10-1, dated 9/1/93

Appendix A: SINGARS to ACE-RIU Audio / PTT Cable

When an Electro-Voice Model H-350/U handset is connected to the SINGARS panel, a separate ASTi audio / PTT cable is required to interconnect the panel and the ACE-RIU.

The ASTi audio / PTT cable is connected between the panel's ACE-RIU AUDIO / PTT jack and an ACE-RIU channel.

For reference, the following specifications apply to the ASTi audio / PTT cable:

Description:

- DB-9 / Male to DB-9 / Male Extension Cable
- Multi-conductor cable, stranded, 24 AWG (Min)
- Overall shield, 100% coverage, braid or foil
- Shielded EMI / RFI Shells
- Drain wire bonded to the bodies of both connectors
- Maximum length is 25 feet

Schematic:

