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Radio-Data Network Bridge
Operator Manual

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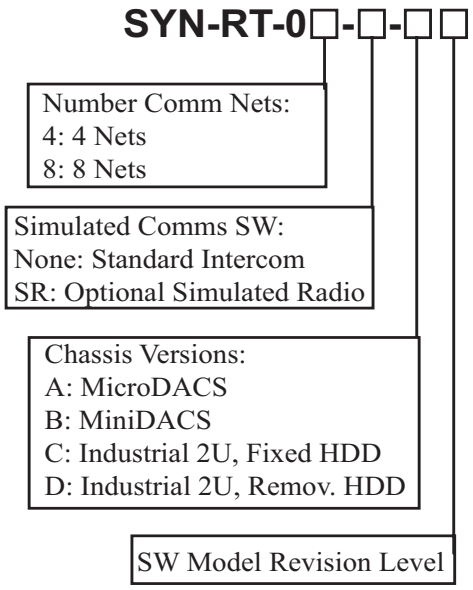
Advanced Simulation Technology inc. 500A Huntmar Park Drive, Herndon, Virginia, 20170 USA
Revision F (October 2006)

Product Name: ASTi Synapse

Description: Radio Transceiver to Data Network Bridge

Part No.:



ASTi Synapse Operator Manual

ASTi

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1. GETTING STARTED

ASTi's Synapse is a digital voice communications system that is used to link radio traffic between several sites over local and wide area data networks. It basically functions as a re-transmitter, using IP voice network technology in place of traditional radio frequency links.

In summary, here's how Synapse works:

Base station radio transceivers (RTs) receive audio over-the-air from field RTs. Analog audio streams from the base station RTs are interfaced to a DSP-based Synapse node, which digitize and attach the audio streams to discrete DIS intercoms. DIS intercoms are transported over long-haul networks, where they are received by other Synapse nodes. These remote Synapse nodes re-generate the analog audio streams and pass it to base station RTs for over-the-air transmission into the field. A complete system description can be found in Chapters 2 through 4.

ASTi network intercoms are a standard feature of the Synapse Radio Bridge. Network intercoms provide the user with an easy-to-configure and use solution for transporting digital voice over the network. Simply pre-configure basic DIS exercise and ID parameters, set their tuned frequencies and you're ready to operate.

It is important to note that ASTi network intercoms are only inter-operable with other network intercoms (or with ASTi simulated radios which are set to operate in 'Intercom' mode). They are not inter-operable with full fidelity simulated radios using features like: AM or FM modulation, and crypto or frequency-hopping.

For inter-operation with full-fidelity ASTi simulated radios (or any other DIS compliant radio), ASTi offers a Simulated Radio option for the Synapse Radio Bridge. This option provides high level DIS radio transceiver objects allowing direct inter-operation with airborne, vehicle and fixed-based simulators.

We have not included a “quick start” chapter because such a superficial approach would deprive users of the critical understanding necessary to install, operate and maintain the system. We highly recommend that first-time users read the complete installation, operation and maintenance information presented in Chapters 5 through 14.

To help users who are familiar with the system, here is a guide to finding necessary setup and integration information:

Chapter 5A: Setting the internal jumpers and address switch on each of the Remote Interface Units (RIUs).

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2. FUNCTIONAL DESCRIPTION

ASTi's Synapse system is a powerful voice communications system that bridges tactical radio-transceiver (RT) communications from one site through long-haul IP networks to RTs installed at other geographically remote sites. The system effectively extends the communications range of tactical RTs to any location on Earth served by a data network. Following is an overview of Synapse operation.

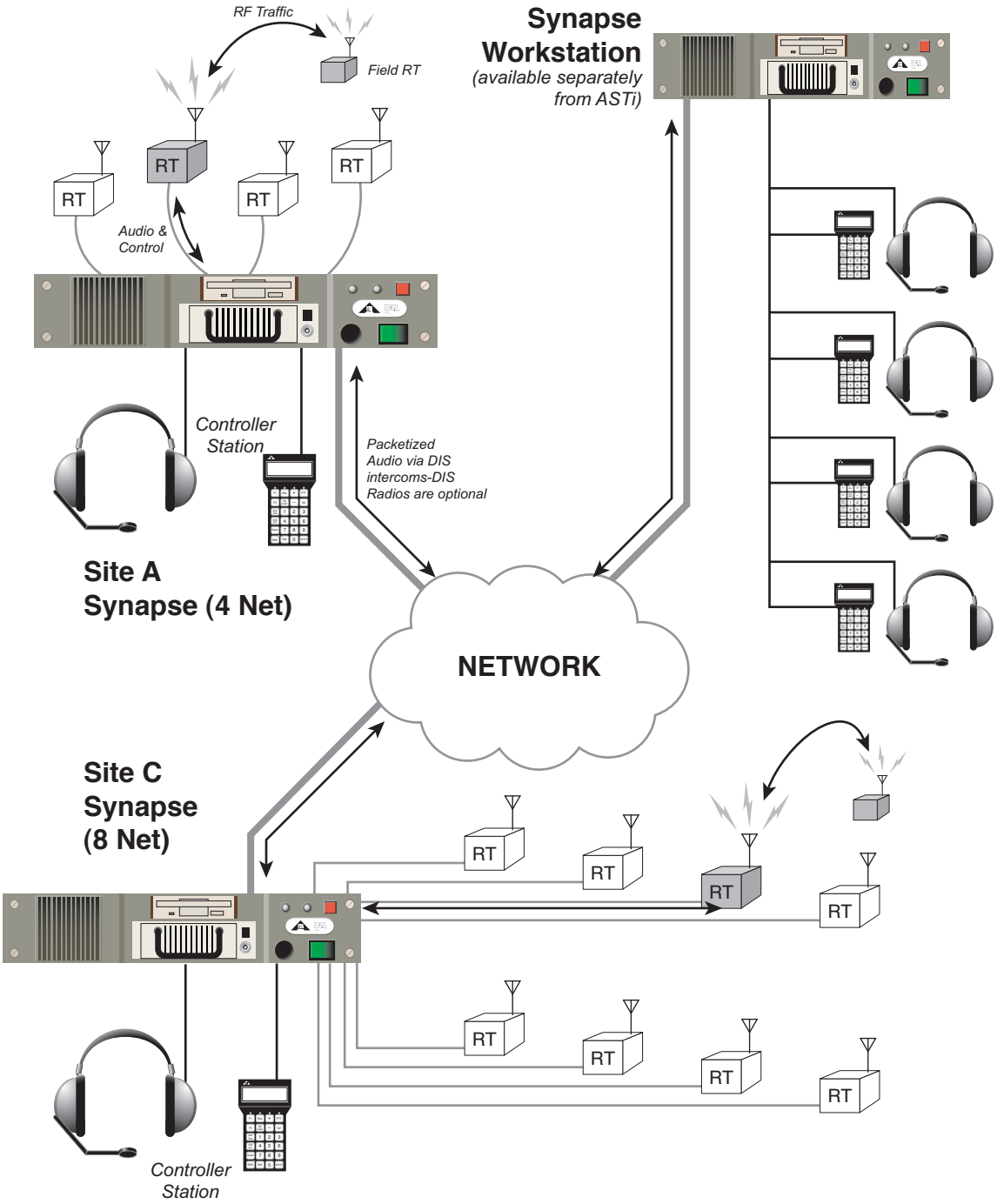


Figure 2: Synapse System Top Level View

For clarity, the following overview uses the term intercom to mean intercom (as featured in standard Synapse) or simulated radio (as featured in Synapse with Simulated Radio option).

A. An RT is connected to a Synapse node via baseband audio mic and speaker lines. This RT receives voice traffic over-the-air from locally installed RTs. The resulting baseband audio is passed to the Synapse system for digitization, compression and packetization. Each RT voice stream is associated with a DIS intercom, which is assigned a specific, virtual frequency.

B. The Synapse node transfers the compressed data packets via DIS intercoms over a lossless IP network to a remote Synapse node. Note that there may be many Synapse nodes residing on the network and each node can receive and process the digitized RT transmission.

C. On the remote Synapse, a DIS intercom–tuned to a matching frequency–receives the network transmission. Synapse then de-compresses and decodes the data packets producing an analog audio stream.

D. ASTi's digital signal processor (DSP) running inside the Synapse node distributes the voice stream to the RT connected to each of the remote Synapse nodes. The Synapse system automatically keys the remote RT's push-to-talk (PTT) switch to transmit the audio information, over the air, to one or more RTs installed at the remote site.

E. Each of the DIS intercoms can be thought of as a virtual RT net that extends across the data network, linking all Base RTs associated with a specific intercom/frequency.

F. For the sake of clarity only one RT communication net is described, however each Synapse system can simultaneously process many independent RT nets.

2A. Synapse Workstation

A. ASTi also offers a separate system called the Synapse Workstation that realizes distributed / multiple operator interfaces to the Synapse radio bridge RT nets.

The Synapse Workstation is based on ASTi's networked intercom product line, and provides operator links to IP network communications nets. Operators connected to Synapse Workstations have access to each of the RT Nets from the Synapse Radio bridging system via a local or wide area IP networks.

Figure 2 shows a Synapse Workstation connected to a network with Synapse radio bridges.

Each workstation provides the ability for up to eight operators to select up to 16 nets for transmit / receive capability.

Like the Synapse radio bridge, the Synapse Workstation is highly scalable. Simply connect more Synapse Workstations to the IP network to add operator positions. This network-centric architecture means that an elegant wiring scheme is implemented. Synapse Workstation nodes on the network are connected by Category 5 cables. This eliminates wiring installation constraints presented by analog systems. Operators can be located wherever there is access to the network.

Its important to note that the Synapse Workstations can operate without the Synapse RT interface nodes, as a local or wide area digital network intercom system.

Each Workstation operator interface includes an HHT user control / display device, and lightweight headset / mic with adapter cable. Optional operator peripherals are available: Paging mic with PTT, Powered Speaker, Industrial Headsets, etc.

Contact ASTi for more information about the Synapse Workstation.

3. SUMMARY OF OPERATION

Refer to the figure below for a node level view of the Synapse system:

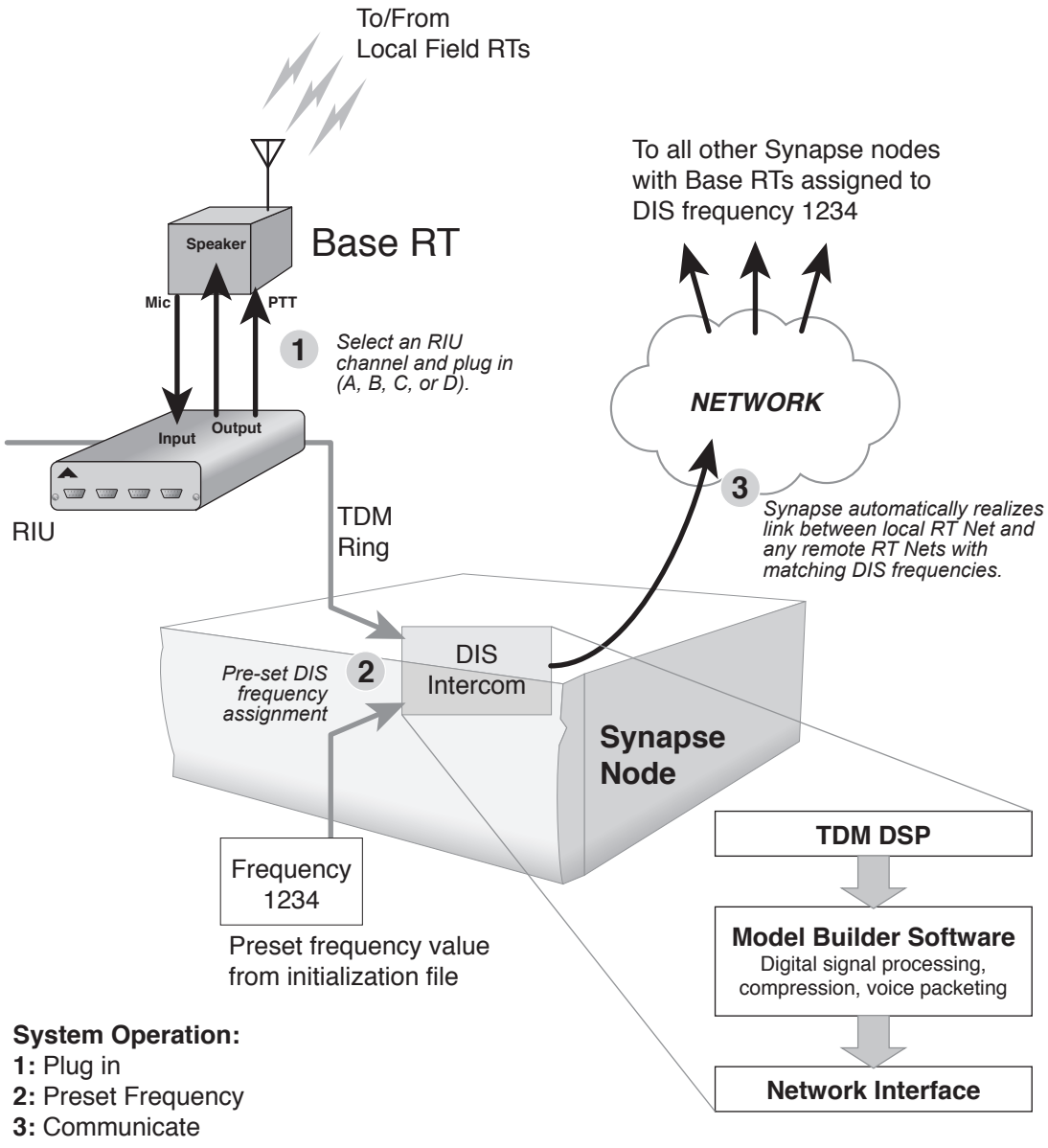


Figure 3: Synapse Node Level View

A. At the heart of the Synapse system is an ASTi base node (Digital Audio Communications System or DACS) that includes key digital signal processing hardware and software to implement the RT to data network bridge. Synapse is an embedded system - it operates automatically once the system is configured by the user.

B. For each Local RT net or channel number, one RT is physically connected to the Synapse system.

1. These RTs are referred to as the ‘Base RTs'. They serve as the base station radios for each Local RT Net associated with the Synapse node.

2. The Base RTs are connected to the Synapse node, which serves as the bridging interface between the Field RTs and data network.

3. Each Base RT is set up to communicate over-the-air with any number of Field RTs that are installed within line-of-sight (LOS) and range requirements and are configured with appropriate single channel, frequency hopping and crypto settings.

C. RT interface modules, called Remote Interface Units or RIUs, link the Base RT's front panel audio and PTT jacks to the Synapse system.

1. RIUs contain both signal conditioning circuitry as well as A/D and D/A convertors for conversion of audio between the analog (RT interfaces) and digital (networked Synapse) domains.

2. RIU Analog and Discrete Control interfaces include:

a. Input: This is an analog interface that routes audio traffic received over-the-air by the Base RT from the RT speaker line to the Synapse system, where it is encoded and packetized for transport over the IP network to remote Synapse systems with RTs.

b. Output: This analog audio interface links audio traffic from remote RTs, received from the IP network by the Synapse system to the Base RT microphone line for over-the-air transmission to local RTs.

c. Digital (PTT) Output: The PTT control signal is automatically generated by the Synapse node whenever a DIS Net is received from the network, is routed through a discrete digital interface to the Base RT when audio traffic is present at the RT Mic interface, thereby automatically keying RT transmission.

3. The RIU digital interface to the main Synapse node is a Time Division Multiplex (TDM) ring. To create the TDM ring, RIUs are cabled together in a daisy chain fashion using standard Category 5 network cable, then both ends of the ring are cabled to a TDM Controller card located in the main Synapse node.

a. Audio sampled by RIUs distributed on the TDM ring is passed back to the TDM Controller card in the Synapse node for processing by ASTi's DIS communications software.

b. Voice signals generated by the TDM controller card in the Synapse node are transported over the TDM ring to the RIUs, where they are converted to analog format and routed to the correct channels.

c. Digital audio and control signal distribution realized by ASTi's TDM architecture provides the benefits of: tidy cable runs and immunity to noise pickup and cross talk.

D. Distributed Interactive Simulation (DIS) Networking. The Synapse node includes embedded DIS communications software to provide the IP network transport mechanism for RT generated voice traffic.

1. ASTi's embedded software application, called Model Builder, runs inside the main Synapse node, executing a specialized software program called the custom model.

2. The custom model configures a series of DIS intercoms. The software model associates each DIS intercom with a specific RIU interface port connected to a Base RT.

3. The Synapse system user sets and stores the virtual frequency value of each DIS intercom using a simple script file.

4. The system also includes software utilities that provide network-wide coordination, monitoring and debugging.

5. ASTi can also provide High Level Architecture (HLA) voice networking solutions. For more information about ASTi's HLA products send us a message at info@asti-usa.com.

E. The standard Synapse system also includes a Controller Station, from which an operator can monitor voice traffic on all of the RT nets.

1. The Controller also has access to a dedicated DIS intercom that is tunable to any virtual frequency. This gives the Controller the same receive and transmit communications capability as using an actual RT.

2. The Controller can communicate with other Controller Stations at remotely located Synapse systems via a Controller intercom. This intercom is a common net linking Controllers at all sites - it is completely separate from RT communications, so Controllers can communicate in complete isolation from the RT nets.

3. The standard Controller Station features an ASTi Handheld Terminal (HHT) communications user interface device and a lightweight headset with microphone.

a. These peripherals connect to one of the RIUs. Audio signals from the headset / mic and control signals from the HHT are transported to and from the Synapse node via the TDM ring.

b. Optional audio peripherals are available to upgrade the standard Controller station (hearing protection headset, desk mic and speaker, footswitch PTT and belt clip PTT with volume).

c. The system also features three auxiliary Controller operator interfaces. These interfaces are available for additional Controller positions with headsets, microphones and speakers.

d. All four of the Controller interfaces share common transmit and receive audio circuits. All of the Controllers share common access to net transmit and receive, based on the HHT settings. Only one HHT may be connected to a Synapse node.

F. Multiple voice compression algorithms are provided so that the user can optimize the system for maximum voice quality (with higher bandwidth consumption) or minimum bandwidth consumption (with slightly degraded voice quality).

G. System level presets are defined by the user through a script file that is automatically loaded upon system startup. The file stores commands that preset DIS system level parameters such as: network IP addresses and port numbers, DIS site and host IDs and voice compression types.

H. Net Configurations and Scalability:

1. Each Synapse node is available in two basic versions: Four RT Net Interface and Eight RT Net Interface.

2. The system is highly scalable. Simply connect additional Synapse nodes to the network to add more RT interfaces to your local site or to add more sites.

I. Note that the Synapse system does not provide built-in data network encryption. To establish a secure end-to-end network, the user should install NSA Type I data encryption devices (KG-84, KIV-7, etc.) at IP network connection points.

4. SYSTEM CONFIGURATION

4A. Standard Hardware Configuration

A. The standard Synapse system includes the following components:

DESCRIPTION	ASTi PART NUMBER	QTY for SYN-RT-04 (4 Nets)	QTY for SYN-RT-08 (8 Nets)	STANDARD FEATURE?
Main Node: Digital Audio Communications System (DACS), includes: Intel processor, CompactFlash® drive (version -AB, -BB), fixed HDD (version -CB), removable HDD (version -DB) Time Division Multiplex (TDM) DSP, 100BaseT ethernet. ASTi software configuration is described in Chapter 4C.	-AB version: ND-MC-P1-F2-CF1 -BB version: ND-MN-TA1-F1-RCF -CB version: ND-2U-TC1-F1-FD -DB version: ND-2U-TC1-F1-RD	1	1	-AB: Yes -BB: Yes -CB: Optional -DB: Optional Keyboard / Monitor are customer-furnished
Controller Station, Remote Interface Unit, 4 Channel	SYN-RIU-OP (Marked “Operator RIU”)	1	1	Yes.
Radio, Remote Interface Unit	SYN-RIU-RT (Marked “Radio RIU”)	2	3	Yes.
TDM Ring Cable, interconnects RIUs. Category 5, UTP, straight-through wiring.	CA-RJ45-RJ45-L L = Length in ft.	3	4	No. Customer-furnished or ordered separately.
RT to RIU cable, 25 ft.	CA-D9M-NC6M-25-C	4	8	Yes.
Controller Station Handheld Terminal User control and display: net transmit/receive, volume, PTT.	HHT-01-RAD	1	1	Yes. Also includes 7 ft. coiled cable, ASTi PN: CA-RJ12-RJ12-7-A
Controller Station Headset: super-lightweight headset with noise canceling boom-mounted mic and 6 ft. cord	HS-TELEX-PH88R	1	1	Yes.
Controller Station Headset Cable: headset to RIU, 5 ft. length. Shielded/twisted pair, ultra-flexible.	CA-D9M-X4F-5-B	1	1	Yes.
RIU Test Fixture Plug	SYN-RIU-PLUG	1	1	Yes.

4B. Controller Station Options

The standard Synapse system includes one lightweight headset with mic and cable for the Controller Station. ASTi also offers wide variety of optional ancillary devices to either upgrade a single Controller Station or to add auxiliary headsets, mics or speakers. Contact ASTi for more information.

4C. Software Configuration

A. The following software modules are integrated into the Synapse System.

B. ***IMPORTANT:*** The DEFAULT.CFG and SYN.INI files are the only user-alterable files on the system. Do not alter any other system files or you may disable system operation, requiring the reloading of system files, or even a full cold start procedure.

DESCRIPTION	DIRECTORY \ FILENAME	VERSION	USER CONFIGURABLE?
MODEL BUILDER: Application software, communications toolkit	C:\[VARIOUS] C:\MBUILDER\[VARIOUS] C:\MBUILDER\BIN[VARIOUS]	4.09c or higher	No.
OPTIONS FILE: This customer-specific software protection keycode file is unique for each ASTi node.	C:\MBUILDER\BIN\ <FILENAME>.OPT	Customer-specific	No.
CUSTOM MODEL: Application-specific Model Builder file, configures RIUs, DIS transceivers, voice compression types.	C:\MBUILDER\USER\MODELS\ <FILENAME>.MDL	Standard Synapse: 1.04 or later. With Simulated Radio Option: 2.01 or later.	No.
CONFIGURATION FILE: This file pre-sets systems level parameters for the DIS network and selects voice compression type.	C:\MBUILDER\USER\MODELS\DEFAULT.CFG	Standard Synapse: 1.04 or later. With Simulated Radio Option: 2.01 or later.	No. See Sections 7, 7A and 7B.
INITIALIZATION FILE: This file pre-sets the initial state of the Controller HHT and the DIS Frequency assignments for each Base RT.	C:\MBUILDER\USER\MODELS\ <FILENAME>.INI	Standard Synapse: 1.04 or later. With Simulated Radio Option: 2.01 or later.	No. See Section 8 and 8A.
PATH FILE: Embedded Model Builder file	C:\MBUILDER\USER\MODELS\SYN.PTH	Standard Synapse: 1.04 or later. With Simulated Radio Option: 2.01 or later.	No.

DESCRIPTION	DIRECTORY \ FILENAME	VERSION	USER CONFIG-URABLE?
TEST UTILITIES: Files that provide built-in test utilities for the RT interfaces and the Controller Station interfaces. See Chapter 13F and 13F.	C:\MBUILDER\USER\MODELS\TEST\[VARIOUS]	Standard Synapse: 1.04 or later. With Simu-lated Radio Option: 2.01 or later.	No.

C. All software modules were pre-installed during factory system integration. The system is ready to use, as shipped.

D. Should you need to re-install the system software, refer to Appendix B, Cold Start Procedures to re-load the operating system, Model Builder, options file and Synapse models.

5. ASTi HARDWARE INSTALLATION

The Synapse system, including the DACS node and the RIUs, is designed to operate in benign office type environments.

5A. RIU Configuration

A. Configure the hardware settings for each RIU using the following guidelines. Refer to the Appendix A, RIU Tech Guide for physical details about: address switch and internal jumper locations.

1. ***IMPORTANT:*** The specified RIU settings are critical to the correct operation of the Synapse system. Each RIU is pre-configured at the factory, prior to shipping. This includes labeling ("Operator RIU" for controller, "Radio RIU" for RT interfaces), internal jumpers and external address switches. If you have any concerns that the internal settings of the RIUs have been changed from the factory settings, open the RIU case and check the settings before starting the system.

2. The RIU addresses are set on the miniature rotary switch on the RIU front face plate (the side with the TDM jacks).

3. The internal jumpers are accessed by removing the two faceplate screws on the RIU front face, removing the faceplate and bezel and sliding the top cover off. ***IMPORTANT:*** this operation must be performed at an approved ESD station to avoid damaging the equipment and voiding the manufacturer warranty.

4. RIU internal jumper settings for ASTi Synapse, Series: SYN-RT-04 and SYN-RT-08 are:

DESCRIPTION	RIU JUMPER SETTING	RIU Address 1: ”Operator RIU” Controller Station (SYN-RT-04 / -08)	RIU Address 2: “Radio RIU” RT Nets 1 - 4 (SYN-RT-04 / -08)	RIU Address 3: “Radio RIU” RT Nets 5 – 8 (SYN-RT-08 ONLY)
Input Gain, Channel A	J1	40 dB	0 dB	0 dB
Input Gain, Channel B	J2	40 dB	0 dB	0 dB
Input Gain, Channel C	J3	40 dB	0 dB	0 dB
Input Gain, Channel D	J4	40 dB	0 dB	0 dB
Output Coupling, Channel A	J5	OPEN	OPEN	OPEN
Output Coupling, Channel B	J6	OPEN	OPEN	OPEN
Output Coupling, Channel C	J7	OPEN	OPEN	OPEN
Output Coupling, Channel D	J8	OPEN	OPEN	OPEN

Jumper guide is available in Appendix A.

5B. TDM Ring Installation

A. Inter-connect the RIUs and the TDM card to the Synapse node using standard Category 5 unshielded, twisted-pair cables, all four pairs wired straight through. See Appendix A, section C3 for details. The cables are installed in a daisy-chain fashion, with the first cable originating at the Main Node TDM card connecting to the first RIU. The next cable links the first RIU to the second, and so on, with the last RIU being connected back to the Main Node TDM card, completing the TDM ring. Refer to Figure 5A:

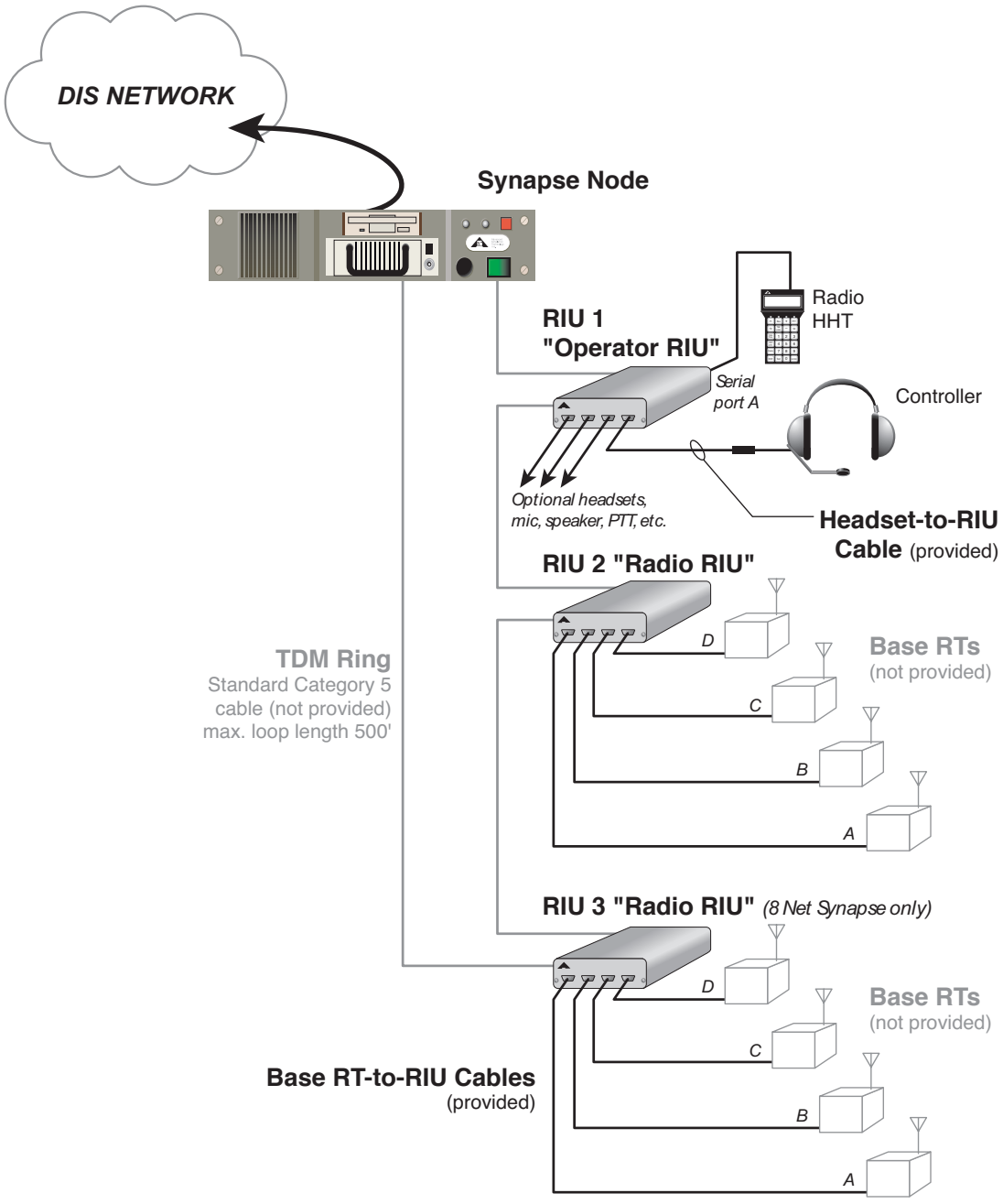


Figure 5A: TDM Ring and RIU Installation

1. The RIU order (by RIU addresses) on the TDM ring is not important - they can be installed on the TDM ring in any address order.

2. It is not important which TDM socket is used for the “input” and “output” on the RIUs and TDM card.

B. ***IMPORTANT***: Ensure that the RIU addresses (with corresponding internal jumper settings) are installed at the correct stations:

1. RIU Address 1, “Operator RIU” = Controller Station

2. RIU Address 2, “Radio RIU” = Base RTs 1-4

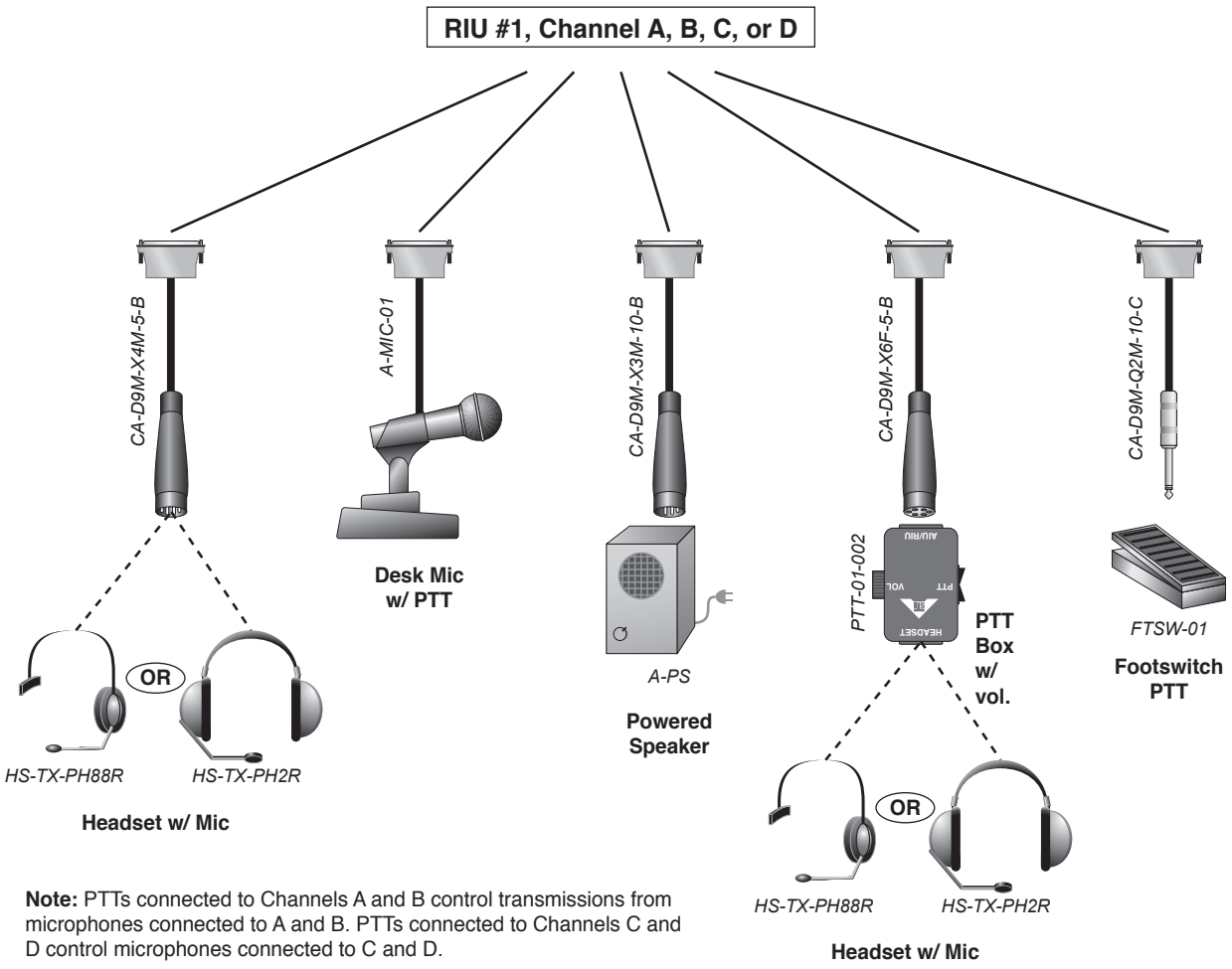
3. RIU Address 3, “Radio RIU” (for SYN-RT-08 only) = Base RTs 5 - 8.

C. ***IMPORTANT***: The maximum combined length of the TDM Cat5 cables is 500 feet. The system will not operate properly if more than 500 feet of Cat 5 cable is used to construct the TDM ring. Also note that the integrity of the Cat 5 cables is critical to the correct operation of the Synapse; we ***highly recommend*** using only commercial, premium grade cable with molded overboots as opposed to home-made cables.

5C. RT and Controller Station Installation

A. Connect the Controller Station Handheld Terminal (HHT) to RIU Address 1, Serial Port A (on the front faceplate).

B. Connect the RTs and Controller Station audio and PTT devices to the RIU according to the following table. Figure 5A shows Base RT connections RIUs 2 and 3. Figure 5B shows Controller audio and PTT connections (including options) to RIU 1.



Note: PTTs connected to Channels A and B control transmissions from microphones connected to A and B. PTTs connected to Channels C and D control microphones connected to C and D.

Figure 5B: Controller Station Audio and Control Device Installation

RIU ADDR.	RIU CH.	DEVICE	NOTES
1	A	Controller Station, Audio or Optional Upgrades, incl. PTT[1]	SYN-RT-04 and SYN-RT-08
1	B	Optional Controller Station, Audio and PTT[1]	SYN-RT-04 and SYN-RT-08
1	C	Optional Controller Station, Audio and PTT[1]	SYN-RT-04 and SYN-RT-08
1	D	Optional Controller Station, Audio and PTT[1]	SYN-RT-04 and SYN-RT-08
2	A	BASE RT #1 [2]	SYN-RT-04 and SYN-RT-08
2	B	BASE RT #2 [2]	SYN-RT-04 and SYN-RT-08
2	C	BASE RT #3 [2]	SYN-RT-04 and SYN-RT-08
2	D	BASE RT #4 [2]	SYN-RT-04 and SYN-RT-08
3	A	BASE RT #5 [2]	SYN-RT-08 only
3	B	BASE RT #6 [2]	SYN-RT-08 only
3	C	BASE RT #7 [2]	SYN-RT-08 only
3	D	BASE RT #8 [2]	SYN-RT-08 only

[1] Note that the standard Synapse system includes four active channels on the Controller RIU (RIU Address 1) and one Controller Station Headset and Cable. The only optional items are: upgrade ancillaries for Controller Channel A and additional ancillary devices for Controller Channels B, C and D.

[2] The Base RT numbers shown in this table are fixed interface designators - they are NOT DIS Frequencies. Each Base RT interface is assigned to a defined DIS Frequency by the user during setup. See Chapter 8, System Initialization Software for instructions.

C. Connect each RIU to an ASTi 5 volt power supply, then connect the power supply to power mains (110 / 220 VAC, 50 / 60 Hz).

1. ***IMPORTANT***: Only use the ASTi furnished RIU power supply. Equipment damage resulting from use of substitute power supplies may not be covered by the product warranty.

5D. Main Node Installation

A. Connect a monitor and keyboard (available as options) to the DACS node.

1. Keyboard connection is made through the PS-2 connector (USB on version -AB) located on the rear face of the chassis. The optional rackmount chassis (versions -CB & -DB) also has a standard AT-style 5 pin DIN keyboard connector on the front face. Any standard 101 key keyboard with a compliant connector type can be used.

2. Video connection is made through a female 15 pin, high density sub-D connector located on the back of the chassis. The video signal is standard VGA.

B. Apply power to the Synapse node.

1. ***IMPORTANT***: Some ASTi DACS nodes include a manual voltage setting switch. See the rear panel of the main node. If a voltage selector switch is present, the user should select the 110 Volt or 220 Volt setting before connecting the unit to the power mains. Failure to perform this procedure may result in equipment damage which is NOT covered by the ASTi warranty.

2. If a voltage selector switch is NOT present, the particular ASTi node features an auto-sensing power supply, suitable for connection to 110 / 220 VAC, 50-60 Hz power mains. No selection is necessary.

3. Synapse version -AB is powered from a +5VDC module. Input power requirements are printed on the power supply label.

C. Connect the Synapse node's DIS voice networking interface card to your DIS network using a Cat 5 cable.

6. RT SETUP

A. The ASTi Synapse system is designed for use only with the following radio transceivers:

DESCRIPTION	MODEL
SINCGARS, SIP	RT-1523C/D
SINCGARS, ASIP	RT-1523E
Falcon II	PRC-117 F

B. ***VERY IMPORTANT***: RTs should always be in the OFF or STANDBY state when not in use. Following this rule will prevent unintentional keying of RTs. Keying RTs for excessive periods of time may damage the RTs.

C. The following RT installation criteria MUST be followed for proper system operation:

1. The Base RTs (these are the RTs that are connected to the RIU. There is one Base RT for each RT net) must have the following panel settings:

RT PANEL SETTING	RT-1523C/D (SIP)	RT-1523E (ASIP)	PRC-117 F
VOL	Maximum (full clockwise)	9	9
WHSP	OFF (VOL pushed in)	OFF	OFF
SQ	ON	ON	ON
MODE	SC or FH	SC or FH	SC or FH
COMSEC	PT or CT	PT or CT	PT or CT

D. ***IMPORTANT***: Each of the Base RTs (up to 4 RTs for SYN-RT-04 and up to 8 RTs for SYN-RT-08) must have unique frequency or net settings (either SC frequencies or FH nets). If any of the RT frequency / net assignments are not unique, the system will not perform properly.

E. Setup the Field RTs. Each of the Field RTs comprising a given net must have panel settings for: MODE and COMSEC that match the corresponding Base RT for the net.

F. If the MODE-FH or COMSEC-CT settings are selected on any of the RT nets, follow proper procedures for loading the FH Data or COMSEC Keys into the Base and Field RTs. Refer to the RT manual for fill procedure details.

G. ***VERY IMPORTANT***: The Base RTs must be installed so that a high fidelity radio link with remote RTs is established (ideally) using the LOW transmit power setting on the Base RTs.

H. The Base RTs may be set to MEDIUM transmit power, but the possibility of Radio Frequency Interference (RFI) between the Base RT and the Synapse system is increased. If system malfunctions (such as spurious RT or network transmissions or increased audio noise on the nets) occur, re-establish the Base RT to Remote RT links using LOW power.

I. Under no circumstances should any of the Base RTs be set to HIGH transmit power - RFI will occur between the RTs and the Synapse system, causing the system to malfunction (spurious transmissions and increased audio noise).

1. The RT manual states that the planning range for low power, line of sight installations using the standard manpack or vehicle antenna is 200 meters to 400 meters.

2. These planning ranges may be degraded due to environmental factors.

3. Use of OE-254 (tower) antennas are highly recommended for increasing ranges, improving RF link fidelity and greatly reducing the chance of RFI.

J. The final step in the RT installation procedure is to perform a standard radio check between each set of Base and Field RTs as part of the system operational checkout:

1. See Chapter 10E for RT checkout procedure.

7. SYSTEM CONFIGURATION SOFTWARE

IMPORTANT: The first step toward successful setup and integration of a Synapse system is coordination between all Synapse sites to ensure that critical communications parameters are defined, including: a common DIS exercise ID number, common DIS receive and transmit port numbers, DIS Frequency numbers corresponding to each base station RT net.

A. Synapse system-level DIS configuration commands are stored in a pre-installed file called DEFAULT.CFG. These commands are executed when the file is automatically loaded at system startup. The user can customize the system configuration by modifying the commands in the file.

B. Follow the procedures in Chapter 7A to setup the DIS network configuration, including DIS IDs and network addresses and in Chapter 7B to select voice compression types.

C. ***IMPORTANT***: The DEFAULT.CFG file also contains system level commands that are embedded and should not be modified by the user. These command lines are clearly marked in the file. Modification of these critical commands could disable the system, necessitating a re-load of the factory version DEFAULT.CFG file.

D. To customize DIS network configuration and select voice compression types you must use the DOS Edit application to open, modify and save the DEFAULT.CFG file. The general procedure for customizing the DEFAULT.CFG file is (the commands, filenames and directory paths are denoted in upper-case letters for clarity - command sequences are not case sensitive):

1. From the C:\MBUILDER\USER\MODELS prompt,
2. Enter: EDIT DEFAULT.CFG
3. Create a backup of the current DEFAULT.CFG. Enter: ALT-F-A, DEFAULT.BAK
4. Open the file, DEFAULT.CFG. Enter: ALT-F-O, DEFAULT.CFG
5. As needed, customize the commands detailed in Chapters 7A and 7B.
    a. Command Form. Each configuration command consists of a single line in the form: COMMAND = PARAMETER(S)
    b. Change command line parameters using standard DOS Edit procedures.
6. After completing file customization, save the file and exit the Edit application.
7. The configuration commands will be executed when the Synapse system is restarted (see Chapter 9 for details on starting the system).

E. Automatic System Defaults. Command lines that are preceded by a semi-colon are disabled, that is they are ignored when the DEFAULT.CFG is loaded at system startup. The Synapse system automatically assigns default values to the parameters of any command that has been disabled. Some critical commands should not ever be disabled by a semi-colon. These critical commands are clearly marked in the file.

1. For example: if the command line to set the DIS broadcast IP address is entered as; DIS:BROADCAST_IP = 192.30.80.255, the system will ignore the command and load the standard default value of 255.255.255.255. System default values for each command are listed in the next section.

F. The Synapse system includes monitor screens that present the system DIS configuration. After making changes to the DEFAULT.CFG file and before using the Synapse system it is recommended that you check the monitor screens to ensure that system settings are correct. See Chapter 9 for details about system startup and operational verification procedures.

G. In case problems result from customizing the DEFAULT.CFG file:

1. Use the DEFAULT.BAK file that you created to restore the system. To restore the backup file, delete the problem DEFAULT.CFG, then rename the backup file:

enter: del default.cfg
enter: ren default.bak default.cfg.

2. You can also restore the system to its factory configuration by using the DOS COPY command to copy the original DEFAULT.CFG file from the Synapse Installation diskette to the Synapse working directory: Enter: A:\COPY DEFAULT.CFG C:\MBUILDER\USER\MODELS

7A. DIS Network Configuration

A. The DEFAULT.CFG file contains commands to preset the Synapse node's DIS configuration. Presets include:

1. Local IP address

2. Subnet Mask

3. DIS UDP Transmit and Receive Port addresses

4. Broadcast IP address

5. DIS Site and Host IDs

6. Voice Compression Type for DIS Transmission (see Section 7B)

7. The DIS Exercise ID is set using the initialization file, SYN.INI. See Section 9 for details.

B. Setting the DIS IP address

1. Description: Each Synapse node on the DIS network must have a unique DIS IP address. The Local IP address is used as the source IP address for all IP packets on the DIS port.

2. Syntax: DIS:LOCAL_IP= <IP ADDRESS>, where: <IP ADDRESS> = YYY.YYY.YYY.YYY The range of each field is 0 to 255.

3. Default: The Synapse system will assign an IP address that is derived from the (unique) physical layer address of the ethernet adapter card.

C. Setting the DIS Subnet Mask

1. Description: The subnet mask bits, in combination with the Broadcast IP, determine the IP Broadcast addresses.

2. Syntax: DIS:SUBNET_MASK= <MASK>, where: <MASK> = YYY.YYY.YYY.YYY, range of each field is 0 to 255.

3. Default: The Synapse system assigns the correct IP subnet mask value, based on the network class (Class A, B, C or D) of the IP address.

D. Setting the DIS Broadcast IP address:

1. Description: This command sets the outgoing destination address for packets on the DIS port.

2. Syntax: DIS:BROADCAST_IP= <IP ADDRESS>, where: <IP ADDRESS> = YYY.YYY.YYY.YYY, range of each field is 0 to 255.

3. Default: 255.255.255.255

E. Setting the DIS UDP Port numbers to the same value, using one command:

1. Description: All of the Synapse nodes on the DIS network must share common DIS transmit (Tx) and receive (Rx) UDP Port numbers. This command sets the Rx and Tx ports to the same value.

2. Syntax: DIS:UDP_PORT= <UDP PORT NUMBER>, where: <UDP PORT NUMBER> = YYYYY, integer, range is 0 to 65535

3. Default: RX and TX Ports = 53000

F. Setting the DIS UDP Port numbers independently:

1. Description: All of the Synapse nodes on the DIS network must share common DIS transmit (Tx) and receive (Rx) UDP Port numbers. This pair of commands sets the Rx and Tx ports independently.

2. Syntax: DIS:TX_UDP_PORT= <UDP TX PORT NUMBER> and DIS:RX_UDP_PORT= <UDP RX PORT NUMBER>, where: <UDP TX PORT NUMBER> and <UDP RX PORT NUMBER> = YYYYY, integer, range is 0 to 65535.

3. Default: RX and TX Ports = 53000

G. Setting the DIS Site and Host values:

1. Description: Each Synapse node on the data network must have a unique set of DIS Site and Host values.

2. Syntax: DIS:SITE= <SITE ID> and DIS:HOST= <HOST ID>, where: <SITE ID> and <HOST ID> = YYYY, integer, range is 1 to 9999.

3. Default: Unless defined in the command line, the Site and Host IDs are automatically derived from the Local IP address. The Site ID is defined as the third field from the Local IP address and the Host ID is defined as the fourth field of the Local IP address. For example: if the Local IP address is: 192.133.120.12, then the default Site ID is 120 and the default Host ID is 12.

7B. Voice Compression Configuration

A. The Synapse system provides the user with a choice of the type of voice compression algorithm that is applied to the data network voice streams generated by the Synapse node.

B. Here is a guide to the two types of compression. The user should decide which factor is most critical to their application: optimal voice quality or network bandwidth conservation.

C. The table shows that data rates and voice quality have a direct relationship.

1. Select MuLaw if optimal voice fidelity is required and adequate network bandwidth is available.

2. Select CVSD if network bandwidth conservation is critical and a reduction in voice fidelity is tolerable.

COMPRESSION TYPE	VOICE QUALITY[1]	MAX. DATA RATE[2,3]
CVSD	Recognizable	25 kbps
MuLaw	High Quality	100 kbps

[1] Voice Quality refers to the fidelity of the DIS network link portion only, not the end-to-end voice quality. The fidelity of the RF links at both ends of the system largely determine the end-to-end voice quality.

[2] Data Rate refers to the DIS Signal PDU data rate per network voice stream. It's expressed in kilobits per second.

[3] Network bandwidth consumption is fairly linear for multiple transmissions, for example: four simultaneous CVSD transmissions consume about 100 kbps of bandwidth.

D. You can customize the compression type for the network links by editing a DEFAULT.CFG file command line.

1. Requirement: Decide which voice compression type best suits your needs (see Chapter 7B - Lines A through C)

2. Syntax for standard Synapse:

MODEL1=<COMPRESSION>[NETS]_A.MDL, where:

<COMPRESSION> = MULAW or CVSD

[NETS] = maximum number of RT net interfaces available on your system (either 4 or 8). DO NOT CHANGE THIS VALUE!

Syntax for Synapse with Simulated Radio option:

MODEL1=<COMPRESSION>[NETS]RA.MDL, where:

<COMPRESSION> = MULAW or CVSD

[NETS] = maximum number of RT net interfaces available on your system (either 4 or 8). DO NOT CHANGE THIS VALUE!

3. Default: the DEFAULT.CFG file is originally configured with MuLaw selected.

4. ***IMPORTANT***: This command should never be disabled (preceded by a semi-colon). Disabling this command will completely disable the Synapse system.

8. SYSTEM INITIALIZATION SOFTWARE

A. Commands defining the Synapse HHT presets, the DIS Exercise ID value and the DIS Frequency assignments for the Base RTs are stored in a file called SYN[x].INI. (The [x] signifies the maximum number of RT Net interfaces that are available in your system, either 4 or 8.) These commands are executed when the file is automatically loaded at system startup.

B. Follow the procedures in Chapter 8A to preset the HHT initialization parameters, the DIS Exercise ID value and the DIS Frequency assignments for the Base RTs.

C. ***IMPORTANT***: The SYN[x].INI file contains some system level commands that are embedded and should not be modified by the user. These command lines are clearly marked in the file. Modification of these critical commands could disable the system, necessitating a re-load of the factory version SYN.INI file.

D. To customize the SYN[x].INI file use the DOS Edit application to open, modify and save the SYN.INI file. The general procedure for customizing the SYN.INI file is (the commands, filenames and directory paths are denoted in upper-case letters for clarity - all command sequences are not case sensitive):

1. From the C:\MBUILDER\USER\MODELS prompt,

2. Enter: EDIT SYN[x].INI where [x] = either 4 (for SYN-RT-04 systems) or 8 (for SYN-RT-08 systems)

3. Create a backup of the current SYN[x].INI. Enter: ALT-F-A, SYN[x].BAK

4. Open the file, SYN.INI. Enter: ALT-F-O, SYN.INI

5. As needed, customize the commands detailed in Chapter 8A.

a. Command Form. Each configuration command consists of a single line in the form: COMMAND = PARAMETER(S)

b. Change command line parameters using standard DOS Edit procedures.

6. ***IMPORTANT***: Unlike the DEFAULT.CFG file, the SYN[x].INI file is designed to contain no disabled commands (command lines preceded by a semi-colon). All initialization file commands must be active for the system to perform correctly.

7. After completing file customization, save the file and exit the Edit application.

8. The initialization commands will be executed when the Synapse system is restarted (see Chapter 9 for details on starting the system).

E. After making changes to the SYN[x].INI file and before using the Synapse system it is recommended that you verify HHT operation to ensure correct system settings. After starting the system, view the HHT display for correct settings, including: the frequency of each intercom, volumes and sidetone levels. See Chapter 9 for details about system startup and Chapter 10 operational verification procedures.

F. In case problems result from customizing the SYN[x].INI file:

1. Use the SYN[x].BAK file that you created to restore the system. To restore the backup file, delete the problem file, then rename the backup:

enter: DEL SYN[x].INI
enter: REN SYN[x].BAK SYN[x].INI.

2. You can also restore the system to it's factory configuration by using the DOS COPY command to copy the original SYN[x].INI file from the Synapse Installation diskette to the Synapse working directory: Enter: A:\COPY SYN[x].INI C:\MBUILDER\USER\MODELS

8A. Initialization of Controller HHT, DIS Frequency and Exercise ID

A. The SYN.INI file contains commands to initialize the Synapse nodes. The term intercom is used to mean intercom (standard Synapse) or simulated radio (Synapse option).

1. Master Volume and Master Sidetone levels

2. Individual volumes for: each RT intercom net, the Controller intercom, and Controller comms

3. DIS Exercise ID

4. DIS Frequency for each RT intercom net.

5. All other DIS presets (Site ID, Host, ID, UDP Ports, IP addresses, voice compression type) are set in the DEFAULT.CFG file (see Section 8).

B. Setting Master Volume and Sidetone

1. Description: Master Volume sets the main level for all receptions, while Sidetone Volume sets the level for own-voice feedback during net transmissions.

2. Syntax: TERMINAL:OPER_VOL_ST = 1, <VOLUME>, <SIDETONE>, where: <VOLUME> and <SIDETONE> = integers, range 0 to 9

C. Setting Individual Intercom Volumes

1. Description: This command sets the reception volume levels for each intercom individually.

2. Syntax: TERMINAL:OPER_RADIO_VOL = 1,[FIXED NET], <VOLUME>, where: [FIXED NET]: 1-8 for RT intercoms, 15 for the Controller intercom, and 16 for the Controller comms. ***DO NOT CHANGE VALUES!*** <VOLUME> = integers, range 0 to 9.

D. Setting the DIS Frequency numbers for each RT intercom, Controller intercom and Controller comms

1. Description: Each Base RT connected to a RIU channel is associated with a DIS intercom in the ASTi model software. This command assigns a DIS frequency to each of these RT intercoms. This links the Base RT to all other Base RTs (remote and local) sharing the same DIS frequency. There is a DIS frequency command for each Base RT interface, 4 commands for SYN-RT-04 systems and 8 commands for SYN-RT-08 systems. Each command is marked, identifying which RIU Address / Channel it is associated with. Frequency commands are also provided for the private Controller intercom and Controller comms. IMPORTANT: To ensure privacy, set the Control intercom frequency to a value not used for any of the RT intercoms.

2. Syntax: TERMINAL:RADIO_FREQ_SQL=[FIXED NET], <NET> where: [FIXED NET] = 1-8 for RT intercoms, 15 for the Controller intercom, and 16 for the Controller comms. ***DO NOT CHANGE!*** <NET> = DIS frequency, integers, range 1 to 2^{64}.

E. Setting the DIS Exercise ID for all Nets

1. Description: This command sets the DIS exercise ID that will be applied to all net communications. Note that Synapse sites can inter-communicate only if they share the same DIS exercise ID.

2. Syntax: TERMINAL:RADIO_EXERCISE_ID = 1, <EXERCISE ID>, where: <EXERCISE ID> = integer, range 1 to 255.

9. SYSTEM STARTUP and SHUTDOWN

A. Ensure that you have completed all of the steps in Sections 4 through 8.

B. To start the system:

1. If the Synapse node is already powered ON and resting at the system prompt: C:\MBUILDER\USER\MODELS, Enter: mb

2. If the system is powered OFF, turn the Synapse node ON (the system software will load automatically) - no user responses are necessary during bootup.

C. The MB command:

1. Loads the system configuration file (DEFAULT.CFG) and Controller HHT initialization file (SYN.INI).

2. Launches Model Builder (ASTi's communications toolkit application) and the Custom Model (Model Builder file that is application specific to the Synapse system).

3. The system is ready for operation as soon as the Main menu appears on the screen (this is the menu beginning with the field'Models').

D. Proceed to the Pre-Operational System Checkout, Chapter 10.

E. The system is shutdown by selecting QUIT (speedkey Q) from the Main Menu.

10. PRE-OPERATIONAL SYSTEM CHECKOUT

A. The following pre-operational checkout should be performed prior to each Synapse system use and after changing system configuration and initialization files. This procedure assumes that the user has installed, configured and started the system (Chapters 5 through 9). All of the referenced software Menus and Pages are accessed through the Model Builder toolkit user interface on the main Synapse node.

1. Chapter 13 describes the use of advanced maintenance tools, useful for exercise communications coordination, realtime system monitoring and troubleshooting.

B. The Operational Checkout procedure should be performed in this order:

1. Errors: Chapter 10A

2. DSP Card and RIU Check: Chapter 10B

3. Model Status: Chapter 10C

4. HHT Checkout: Chapter 10D

5. RT Checkout: Chapter 10E

6. DIS Network Checkout: Chapter 10F

10A. Error Check

A. Check for system level errors. Refer to Figure 10A.

Figure 10A: Model Builder Error Pages showing Sample Error

1. From the Main Menu, go to Errors (speedkey E) and press Enter.
2. There should be NO error messages.
3. If any error messages are present, proceed to Chapter 14A, Troubleshooting.
4. Press ESC to exit to the Main Menu.

10B. TDM Card and RIU Check

A. Check the TDM Card. Refer to Figure 10B.

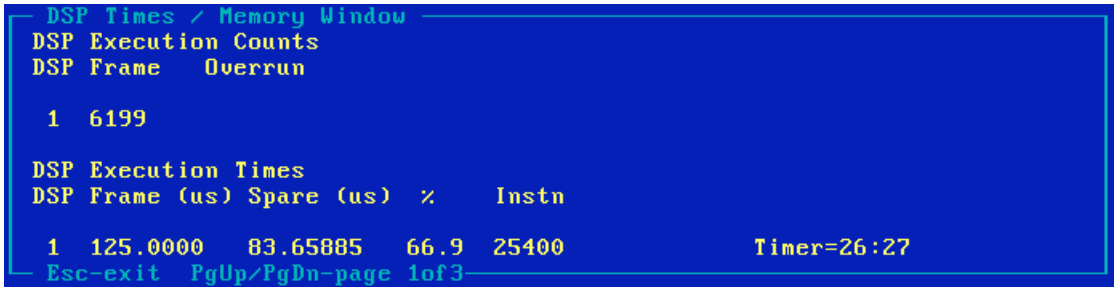


Figure 10B: Model Builder DSP Times / Memory Window

1. From the Main Menu, go to Waveform DSPs (speedkey W), then Times (speedkey T)

2. This page shows the performance metrics for the Time Division Multiplex (TDM) DSP card. The key indicators of good health for the TDM card is the DSP Execution Counts / Frame Counter. Inspect this counter to ensure that the frame count is incrementing. If the Frame Counter is not incrementing, proceed to Chapter 14B, Troubleshooting.

B. Check the RIUs and the TDM Ring.

1. Press Page-Down twice: go to Page 3 of 3.

2. For the SYN-RT-04 System, there should be two RIU addresses, 1 and 2, listed under the heading RIUs PRESENT. Refer to Figure 10C.

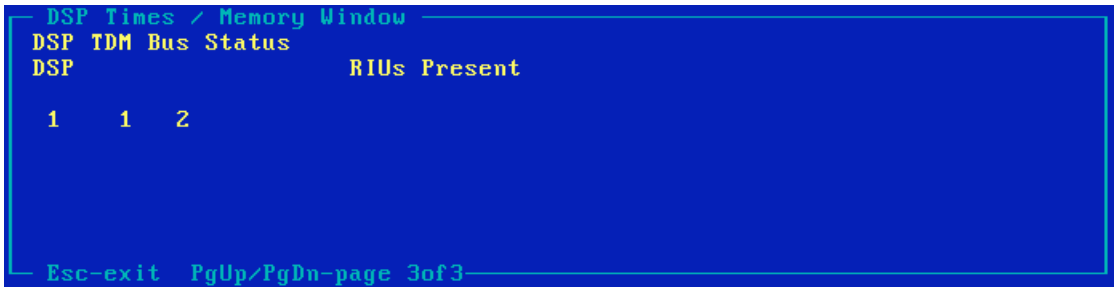


Figure 10C: DSP Times / Memory Window for SYN-RT-04

3. For the SYN-RT-08 System, there should be three RIU addresses, 1, 2 and 3, listed under the heading RIUs PRESENT. Refer to Figure 10D.

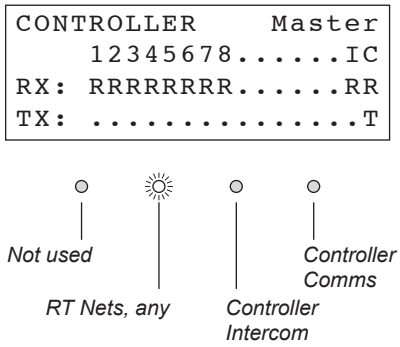


Figure 10D: DSP Times / Memory Window for SYN-RT-08

4. If the RIUs PRESENT window does not appear as specified, proceed to Chapter 14B, Troubleshooting.

5. Press ESC twice to exit to the Main Menu.

10C. Software Status

A. Inspect the Status Page to ensure that the correct Default Model has loaded. Refer to Figure 10E.

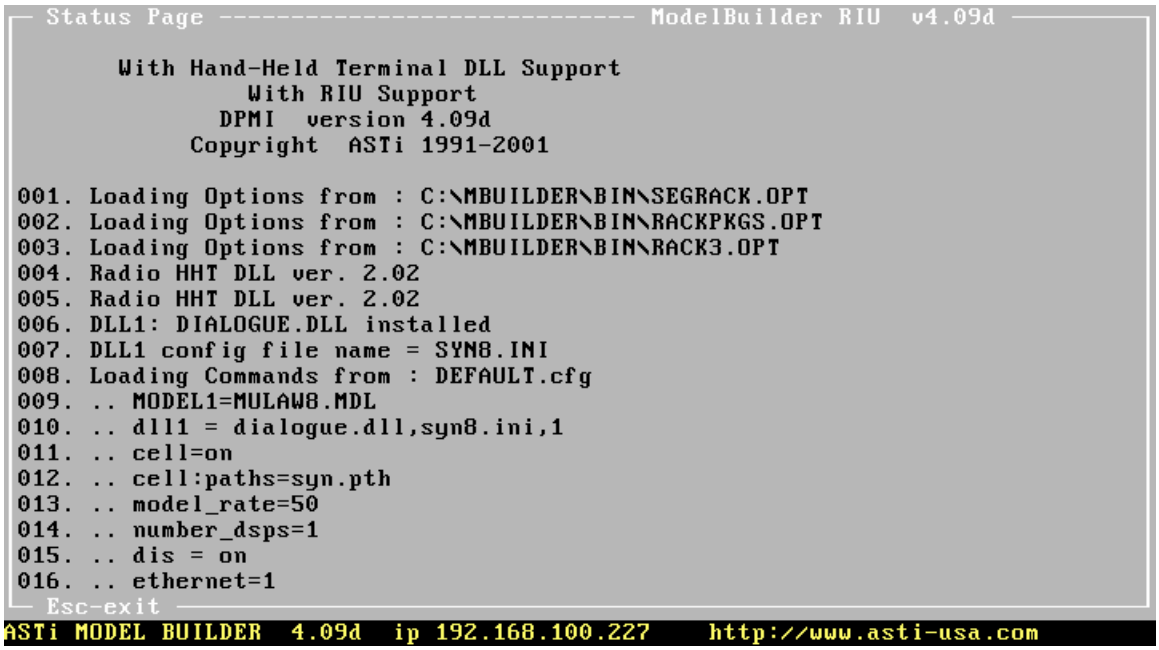


Figure 10E: Model Builder Status Page

1. From the Main Menu, go to the Status Page (speedkey S)
2. A list of the commands that loaded during system bootup is presented.

   a. The list should include a command line defining the Custom Model that you defined as Model1 in the DEFAULT.CFG file. This is the command for standard Synapse: MODEL1= <Compression> <Nets>-A.MDL, where: <Compression> = the type of voice compression, either MULAW or CVSD. <Nets> = the System Version: either <4> for SYN-RT-04 or <8> for SYN-RT-08.

   For Synapse with Simulated Radio option, the command is: MODEL1=<COMPRESSION>[NETS]RA.MDL. The same notes apply for <COMPRESSION> and [NETS]

3. If the correct "MODEL1 = "command line did not load, proceed to Section 7B, Voice Compression Configuration and repeat the configuration procedure, entering the correct model name, and repeat the system startup (Chapter 9) and operational checkout (Chapter 10).
4. All of the other commands in the status list are critical embedded commands (they should never be altered in the DEFAULT.CFG file). If any of the other commands are not correct, the DEFAULT.CFG includes non-standard commands and the system will not operate properly.

   a. Proceed to Chapter 14A, Troubleshooting.

5. Press ESC to exit to the Main Menu.

10D. Handheld Terminal Check

A. The Handheld Terminal (HHT) software embedded in the Main Node contains a simple offline test routine that can be triggered from the HHT keypad. This test allows the operator to verify correct operation of the HHT display and keypresses. It also proves that the HHT cable is sound and that the correct HHT software is loaded from the Main Node.

B. To initiate the HHT self test, the system must be configured and started - see Chapter 9 for Startup.

C. Once the system is started, you can trigger the HHT self test by pressing the SHIFT key, then the DEL key.

1. Pressing any HHT key will cause a key indicator to be displayed on the screen. For example, pressing the PTT key will trigger “PTT” to be displayed on the HHT screen.

D. To exit the self test mode, press the SHIFT key, then the DEL key. This will place the HHT back in Synapse system service.

E. If the self test is not successful, proceed to Chapter 14C, Troubleshooting.

10E. RT Check

A. All of the RT Nets should be checked out at each Synapse site before commencing operation. The RT Net check consists of a standard radio check to ensure that the RTs are correctly configured and that ideal RF comms have been established between all of the Field RTs and their associated Base RT.

B. To test each RT Net:

1. Temporarily disconnect the cables connecting the RTs to the RIU(s), and connect a handset to the Base RT under test.

2. Perform a transmit and receive check with each of the Field RTs tuned to the Base RT under test.

3. Correct any RT problems found during the radio check, then disconnect the handset from the Base RT and reconnect the Base RT to the RIU. Refer to Chapter 6 for RT installation guidance.

C. Repeat for each of the Base RTs.

D. This is a critical verification test - NEVER skip this step during a system installation.

E. RT Troubleshooting is presented in Chapter 14E.

10F. DIS Network Check

In this section, the term intercom is used to mean intercom (for standard Synapse) or Simulated Radio (for Synapse option). ASTi intercoms and radios share basic DIS operational characteristics. They both require the same types of DIS exercise and site:host:entity:radio ID configurations. The main difference between intercoms and radios is found in the internal settings of these software objects.

Intercoms require only one internal setting for inter-operation: tuned frequency. Assuming that all of the DIS parameters are set correctly, all intercoms with matching tuned frequencies will intercommunicate. Intercoms operate in the 'center of the earth' mode. They always provide clear communications and they do not exhibit propagation effects due to simulated geographical ranging.

Radios are more full featured (and therefore more complex to set up and use). The required settings are: power / mode setting, tuned frequency, modulation type and world location. Optional settings include, but are not limited to: crypto system / crypto keys and frequency hopping.

The topic of configuring and using DIS radios is outside of the scope of this manual. For details about the setup and use of ASTi simulated radios, refer to these information sources:

http://www.asti-usa.com/support/index.html

- Frequently asked questions
- Application Notes
- Help with Model Builder
- ASTi Documentation (see the Model Builder Reference Guide, Radio section)

A. Verify that the correct DIS configuration commands were loaded from the DEFAULT.CFG file. Refer to Figure 10F.

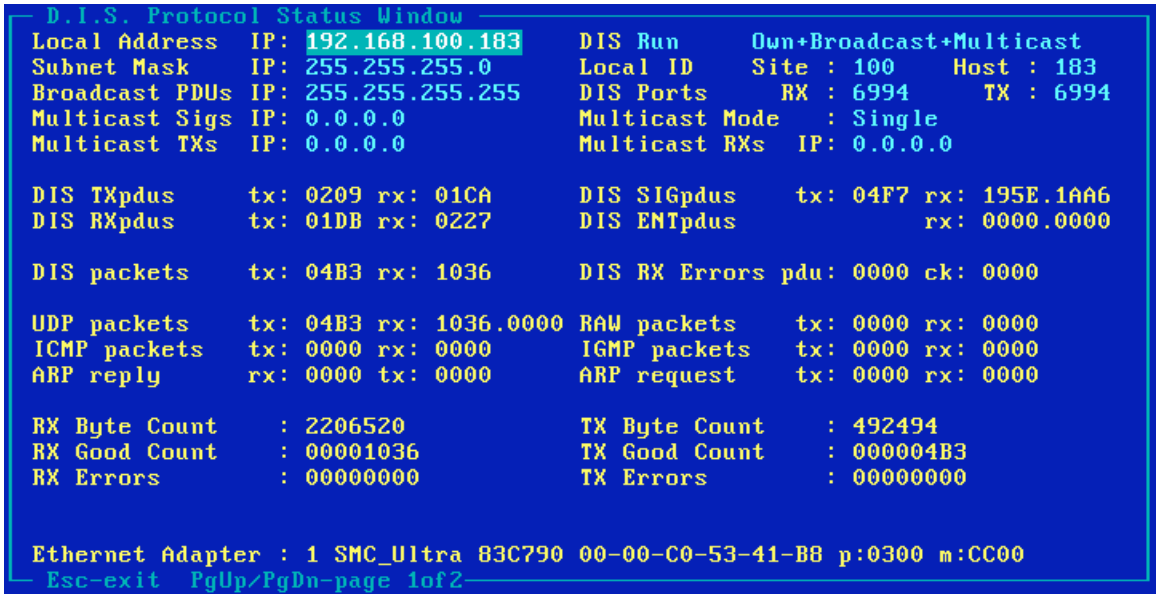


Figure 10F: Model Builder DIS Protocol Status Window

1. From the Main Window, Enter: DIS Network (speed-key = D), then enter: Status (speed-key = S).

a. ***IMPORTANT***: if the DIS Network menu heading is not present in the Main Menu, there is a critical problem relating to the DEFAULT.CFG file -you should proceed to Chapter 14, Troubleshooting.

2. Your network settings are presented on the top half of the DIS Network Status page:

a. Local Address IP

b. Subnet Mask

c. Broadcast IP Address

d. DIS Ports: Receive and Transmit

e. Site and Host IDs

3. If any of the DIS parameters are not correct, proceed to Section 7A, DIS Network Configuration and repeat the procedure, entering the correct values, then repeat the operational checkout, Chapter 10.

B. Verify that the node's DIS network interface is operational. Before beginning this test ensure that: the node is booted up, the RTs and Controller station HHT are connected, the node is connected to the DIS network and there is at least one other Synapse node connected to the network. The Controller stations should be manned with operators who use the HHT to access the Controller intercom, tuned to a common frequency.

1. Remain in the DIS Network Status page (or from the Main Menu: speedkey D and speedkey S). Inspect the network monitor fields:

RX Byte Count
RX Good Count
TX Byte Count
TX Good Count

a. All of these fields should show incrementing counters.

b. If the RX Good Count or TX Good Count are not incrementing (and the RX Errors and TX Errors counters are incrementing), proceed to Chapter 14F, Troubleshooting. ***NOTE***: If your Synapse node is the only one connected to the network, the RX Good Count will not be incrementing.

2. Ensure that the Controller HHT is initialized with at least one Net activated for Transmit and Receive (see Chapter 8).

a. Press and hold the PTT (either HHT button or discrete switch) to key a network transmission.

b. Inspect the DIS SIG pdus tx field - it should be incrementing at a fast rate. If this counter is not incrementing, proceed to Chapter 14F, Troubleshooting.

c. Press ESC once to go to the DIS Network Menu.

C. Verify that the DIS Nets from your Main Node and other Nodes connected to the network are present. Refer to Figure 10G.

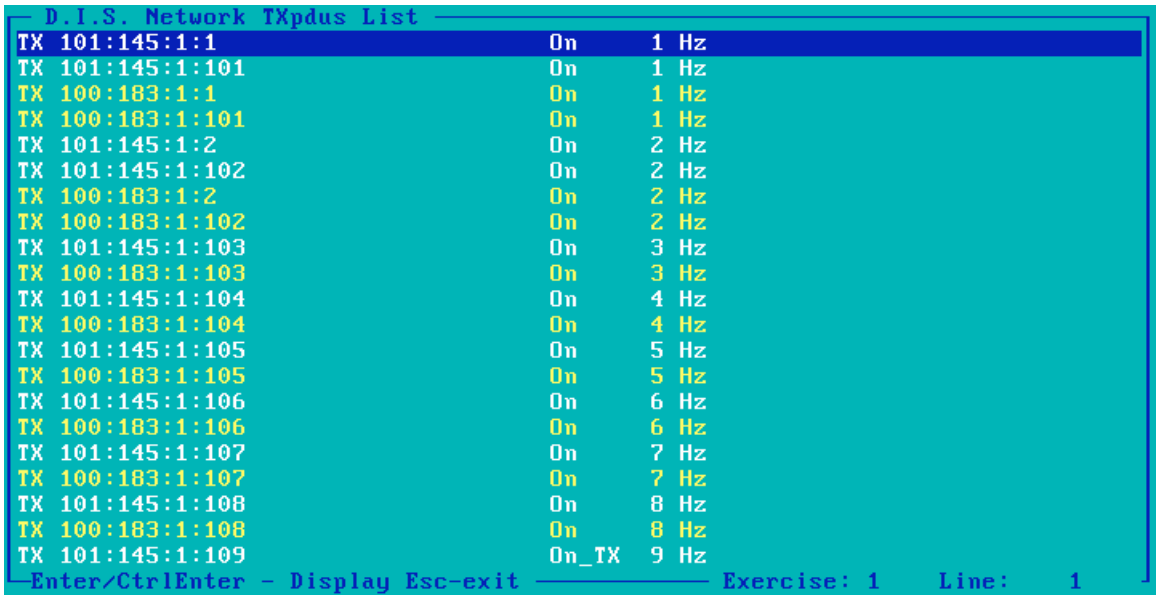


Figure 10G: Model Builder DIS Network Tx PDUs List

1. Go to the Freq of Xmitters Page (speedkey F)

2. Go to the appropriate Exercise ID page. Look at the bottom of the Freq of Xmitters page for Exercise: [N]. The default value is 1. If you have configured your Synapse to communicate using another Exercise ID, press the Plus [+] key until the appropriate Exercise ID is shown.

3. This monitor page shows all of the DIS intercoms that are detected by the Synapse node for the given DIS Exercise ID. This includes all of the DIS intercoms from your local Main Node and all of the DIS intercoms present on remote Synapse nodes.

a. The DIS intercoms are identified on the list as: TX SITE: HOST: ENTITY: RADIO ID ON [FREQ] HZ

4. First ensure that there are six (6) intercoms shown in yellow for a SYN-RT-04 system (4 RT intercoms, one Controller intercom, and one Controller comms) or 10 yellow transmitters for a SYN-RT-08 system (8 RT intercoms, one Controller intercom, and one Controller comms) - these are the DIS Nets modeled in your local Synapse node. The following table shows the all of the Nets that should be present.

a. Press HHT key [1], then [6] to activate the Controller comms, as its initial state is ‘off’.

NET DESCRIPTION	SITE ID[2]	HOST ID[2]	ENTITY ID	RADIO ID	FREQ.
Base RT 1	User-defined	User-defined	1	1	user-defined
Base RT 2	User-defined	User-defined	1	2	user-defined
Base RT 3	User-defined	User-defined	1	3	user-defined
Base RT 4	User-defined	User-defined	1	4	user-defined
Base RT 5[1]	User-defined	User-defined	1	5	user-defined
Base RT 6[1]	User-defined	User-defined	1	6	user-defined
Base RT 7[1]	User-defined	User-defined	1	7	user-defined
Base RT 8[1]	User-defined	User-defined	1	8	user-defined
Controller Intercom	User-defined	User-defined	1	10	user-defined
Controller Comms	User-defined	User-defined	1	100	user-defined

[1] Base RTs 5 though 8 present in version SYN-RT-08 only.

[2] Site ID and Host ID are defined by the user in the DEFAULT.CFG file.

a. If the specified transmitters are not present in the list, refer to Chapter 14F, Troubleshooting.

5. When other Synapse or Synapse Workstation nodes are connected to the DIS network, there should be a series of transmitters shown in white - these are the DIS intercoms present on remote Synapse nodes.

a. The remote Synapse DIS Nets should be present on the list in the same form as shown in the table: TX SITE: HOST: ENTITY: RADIO ID ON [FREQ] HZ

b. The remote Synapse Workstation nets are identified by the same protocol, but they are assigned RADIO IDs 1001 through 1016.

c. If the specified transmitters are not present in the list, refer to Chapter 14F, Troubleshooting.

6. Check the list for correct DIS IDs:

a. Inspect the Freq of Xmitters list to ensure that all of the transmitters, both local (yellow) and remote (white) have unique IDs.

b. Any DIS intercoms with non-unique IDs (those sharing the same combination of Site: Host: Entity: Radio IDs) should be changed by editing the DIS:Site and DIS: Host commands in the DEFAULT.CFG file on the incorrectly configured Synapse node.

c. See Chapter 7A for the DIS configuration procedure.

D. Networked Radio Checks. Ensure that the Controller HHT is initialized with the Controller intercom and all of the RT Nets activated for Receive (see Chapter 8). There should be least one other networked Synapse node that is configured with common frequencies.

1. Press HHT buttons [1] and [5] to activate the Controller intercom for receive and transmit. Press and hold the PTT (either HHT button or discrete switch) to key a network transmission on the Controller intercom.

2. On the DIS Network / Status page (from the Main Menu, speedkey D and speedkey S):

a. Inspect the DIS SIG PDUs TX field - it should be incrementing at a fast rate. If this counter is not incrementing, proceed to Chapter 14, Troubleshooting.

b. Talk into the microphone while pressing the PTT. Request a radio check from the other Controller(s). Check for sidetone (own-voice audio). If you cannot hear sidetone audio, proceed to Chapter 14, Troubleshooting.

c. Listen for received audio from other Controller stations. Also inspect the DIS SIG PDUs RX counter - it should be incrementing at a fast rate. If you cannot hear received audio or the counter is not incrementing, proceed to Chapter 14F, Troubleshooting.

3. Press HHT buttons [1] and [6] to activate the Controller comms. Select a frequency matching one of the RT intercoms (see Chapter 12, HHT Operation). Press and hold the HHT button to key a network transmission on an RT Net. Request radio checks on each active net. Note that at this point, you should be able to talk through the local Base RTs and to all network sites with DIS frequencies matching your own.

4. On the DIS Network / Status page:

a. Inspect the DIS SIG PDUs TX field - it should be incrementing at a fast rate. If this counter is not incrementing, proceed to Chapter 14F, Troubleshooting.

b. Talk into the microphone while pressing the PTT. Request a radio check from the other RT stations, both local and networked. Check for sidetone (own-voice audio). If you cannot hear sidetone audio, proceed to Chapter 14E, Troubleshooting.

c. Listen for received audio from RT stations. Also inspect the DIS SIG PDUs RX counter - it should be incrementing at a fast rate. If you cannot hear received audio or the counter is not incrementing, proceed to Chapter 14E, Troubleshooting.

11. FIELD RT AND BASE RT OPERATION

A. Operate the Field RTs as normal. Refer to the RT Operator's Manual for guidance.

B. Note that the Base RTs are embedded components in the Synapse system configuration - audio and PTT control is provided ONLY by the Synapse node through the RIUs.

1. During normal operation, handsets should not be used to initiate Base RT transmissions

2. During normal Synapse system operation, it is desirable to have a monitor speaker connected to each of the Base nodes to verify correct RF operation with associated Field RTs. Use a standard Loudspeaker (LS-454/U or equivalent) connected to the Base RT's Audio / Data jack.

3. A handset may be used to initiate manual Base RT transmissions only while performing RT troubleshooting and maintenance procedures. IMPORTANT: disconnect the RT-RIU Interface cable before connecting and using an RT handset for maintenance and troubleshooting.

C. Operational Note About Voice Activation Performance:

1. The Synapse system uses a voice activation feature to sense over-the-air receive activity at the Base RT and to trigger the transmission of voice packets across the DIS network.

2. When an operator keys a Field RT push-to-talk and transmits to a Base RT, the Synapse voice activation feature is instantly keyed and network transmission begins.

3. If the Field RT operator does not speak into the handset within 2 seconds of the initial PTT, the Synapse node senses that Base RT reception has stopped and disables DIS transmission for that net.

4. As soon as the Field RT operator resumes speaking, the Synapse node resumes network transmission.

5. In this case, the receiving Field RT on the remote side of the network may notice a very brief disruption of audio, when the operator resumes speaking after the period of silence.

D. Operational Note About DIS Net Communications

1. The Synapse system is configured such that, for a given RT Net, the first Base RT at a Synapse to key a transmission, essentially “locks out” any other subsequent transmissions on that RT Net. This prevents the communications interference that would result from “mixing together” multiple voice signals, were multiple Base RTs allowed to simultaneously transmit on the same DIS Net.

2. Of course, proper radio net etiquette calls for only one transmission at a time. Members of a net should release the PTT as soon as possible after completing a communication and others should wait 2 to 3 seconds before responding.

12. CONTROLLER STATION OPERATING CONCEPTS

In this section, the term intercom is used to mean intercom (for standard Synapse) or Simulated Radio (for Synapse option).

A. Controller Station Overview

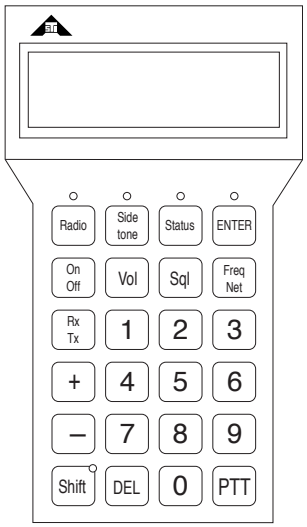


Figure 12A: Controller Station HHT Device

1. The Controller Station features audio and control devices that provide a complete operator interface to the DIS Net communications environment. The standard Synapse system includes one set of Controller Station ancillaries, including one each: headset with mic and adapter cable and a Handheld Terminal (HHT) operator control device - see Figure 12A. As an option, up to three additional Controller Station positions may be connected to the Synapse system.

a. Additional Controller positions may include optional headsets, mics, speakers and PTTs.

b. Only one HHT may be connected to each Synapse node. HHT settings (volume, sidetone, receive and transmit net access) apply to all Controller positions.

c. The output audio signals (both received audio and sidetone) are common for all Controller positions.

d. The HHT PTT button and PTTs connected to RIU #1 channels A and B activate transmission from microphones connected to RIU #1 channels A and B. PTTs connected to RIU #1 channels C and D activate microphones connected to RIU #1 channels C and D.

2. The HHT, as configured for the Synapse system, provides controls that effect Controller Station's access to receive and transmit audio from associated DIS intercoms. The HHT also provides controls such as Push To Talk (PTT), frequency selection, Volume and Sidetone.

B. The Initialization (INI) File provides pre-set values for the HHT. At system startup, these values are automatically read into the embedded DIS modeling software application running on the Main Node and to the HHT display. See Chapter 8 for INI file usage. INI settings include:

1. Master Volume: overall reception volume

2. Sidetone Volume: “own-voice” volume for transmissions

3. Intercom Volumes: individual reception volume settings for each intercom

4. DIS intercom frequencies

C. Once the system is started (Section 10), the HHT display shows the Controller Station communications status, as loaded from the INI file. This main display is called the Status Page. This page shows information relating to the DIS Net environment, from the Controller position vantage point.

1. The top line of the Status Page contains the identifier “Controller”.

2. The second line contains a line of numbers representing each DIS intercom. The DIS intercom assignments, as shown on the HHT display, are:

NET DESCRIPTION	DIS (HHT) NET NUMBER
RT Net 1	1
RT Net 2	2
RT Net 3	3
RT Net 4	4
RT Net 5	5
RT Net 6	6
RT Net 7	7
RT Net 8	8
Controller intercom	I
Controller comms	C

3. The third and fourth lines of the display are the receive and transmit lines. Access to each net is represented by a symbol showing its current state, “T” for transmit-receive and “R” for receive only.

a. The RT nets (1-8) are configured for receive only.

b. The Controller intercom (I) and comms (C) nets may be adjusted by the HHT operator for receive or transmit.

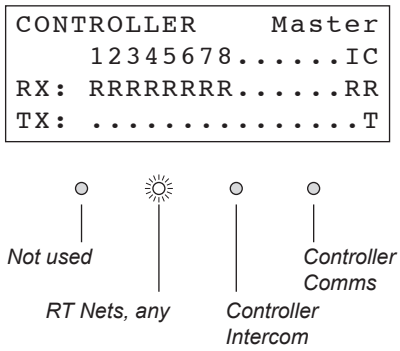
D. Example:

RT Nets 1 through 8: Receive only
Controller intercom: Receive only
Controller comms: Transmit and Receive
The HHT Status Page displays:

```
CONTROLLER    Master
    12345678......IC
RX: RRRRRRRR......RR
TX: ..............T
```


E. HHT Communications Activity Indication

1. When the Controller is transmitting or receiving, the active Net Designator number(s) on the HHT changes to an asterisk (*). Red activity LEDs also illuminate, as shown here.



12A. Controller Station Operation

A. Controller Station communications parameters can be set using the HHT keys after the system is running. The user can modify the following parameters: Master Volume, Net Volume (for each net), Sidetone, and frequency for each net.

B. Controller HHT Keypad Operation

1. Master Volume

From the main Status screen, press [Vol] then either press the numeric key 0-9 for the desired volume, or ramp up or down using [+] and [—] followed by [ENTER].

Controller Volume Page

```
Controller

 Volume: 5
```

2. Sidetone

From the main Status screen, press [Side tone] then either press the numeric key 0-9 for the desired sidetone, or ramp up or down using [+] and [—] followed by [ENTER].

Controller Sidetone Page

```
Controller

 Sidetone: 5
```

3. Transmit and Receive Access

a. The RT nets (HHT designators 1-8) are locked in the receive only mode. The Controller cannot use the HHT to transmit directly on these nets; the Controller comms net is used for operational transmission.

b. For transmit and receive access on the Controller intercom: from the main status screen, press [1], [5].

b. For transmit and receive access on the Controller comms net: from the main status screen, press [1], [6].

4. Frequency Selection

The initial frequencies of all nets are set in the. INI file (Ch. 8). During runtime, the HHT can be used to change net frequencies.

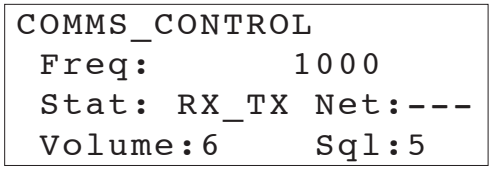
a. From the main status screen, press [Radio], then press [+] or [—] until the desired intercom net is displayed.

b. Press [FREQ], then enter the frequency in Hertz.

For 1kHz, for example, press [1][0][0][0].

Press [ENTER] to set the frequency.

c. Note: Net frequency changes via the HHT are not stored in the INI file.



C. Push to Talk (PTT) Operation

[Radio]

1. Activating any PTT switch (either HHT or discrete) connected to the Controller Station RIU keys transmissions for all DIS Nets selected for Transmit and Receive access (shown as T and R on the HHT display, respectively).

2. Specific PTTs control the activation of specific microphones:

PTT SOURCE	MICROPHONE SOURCE
HHT PTT Key -OR- PTT From RIU 1 / Channel A	RIU 1 / Channel A and B
RIU 1 / Channel B	RIU 1 / Channel A and B
RIU 1 / Channel C	RIU 1 / Channel C and D
RIU 1 / Channel D	RIU 1 / Channel C and D

13. ADVANCED MAINTENANCE TOOLS

A. Synapse Maintenance Tools, General

1. This chapter describes Synapse advanced maintenance tools that provide an effective means to monitor and maintain system net communications both during communications sessions and off-line.

2. These advanced tools are also used in conjunction with the troubleshooting procedures in Chapter 14.

3. Chapter 10 presents basic maintenance tools that are used for pre-operational check-out procedure and troubleshooting procedures.

B. Synapse System Maintenance Tools

1. Controller Station

a. The Controller Station can receive and transmit on the Controller comms net and Controller intercom, linking to other site Controllers, based on the INI file presets (Chapter 8) and the HHT keypad settings (Chapter 12).

b. This feature provides the Controller with a powerful tool that is capable of monitoring voice communications or performing 'radio checks' to and from any of the nets, for both local and networked sites.

C. DIS Network Monitoring Utilities

1. ASTi's Model Builder communications software provides a DIS Network menu that provides local node and network-wide monitors.

2. Under the DIS Network menu, is the DIS Status page, a utility that shows local node DIS configuration, including: Local IP address, Broadcast IP Address, UDP Ports, Subnet Mask, Site ID and Host ID. This page allows the user to check the node configuration presets, loaded from the DEFAULT.CFG file (Chapter 7), in real-time. See Chapter 10F for details.

3. The DIS Status page also features a series of counters that indicate good and bad transmit and receive packet counts at the IP and UDP level for DIS Receive, Transmit and Signal PDUs. These counters provide a utility that is useful for diagnosing network-level problems. These are described in Chapter 10F.

4. Also under the DIS Network menu is a series of lists (Freq of Xmitters, Local Xmitters, Transmitters, Receivers and Local Receivers) that provide the user with a network-wide view that is invaluable during exercise coordination or troubleshooting. These lists show local and network Transmit and Receive PDUs for a selected DIS exercise ID.

5. To view any of the lists, you will have to navigate to the appropriate Exercise ID page. After entering a particular list, look at the bottom of the page for Exercise: [N]. The default value is 1. If you have configured your Synapse to communicate using another Exercise ID, press the Plus [+] key until the appropriate Exercise ID is shown.

6. Each page shows the DIS intercoms that are detected by the Synapse node for the given DIS Exercise ID.

7. Highlighting a specific DIS intercom (arrow up or down keys) and pressing Enter will bring up a screen that displays the PDU header information (Site, Host, Entity, Frequency).

8. The DIS Lists include:

a. Freq of Xmitters (From the Main Menu: speedkey D - speedkey F). See Figure 13A.

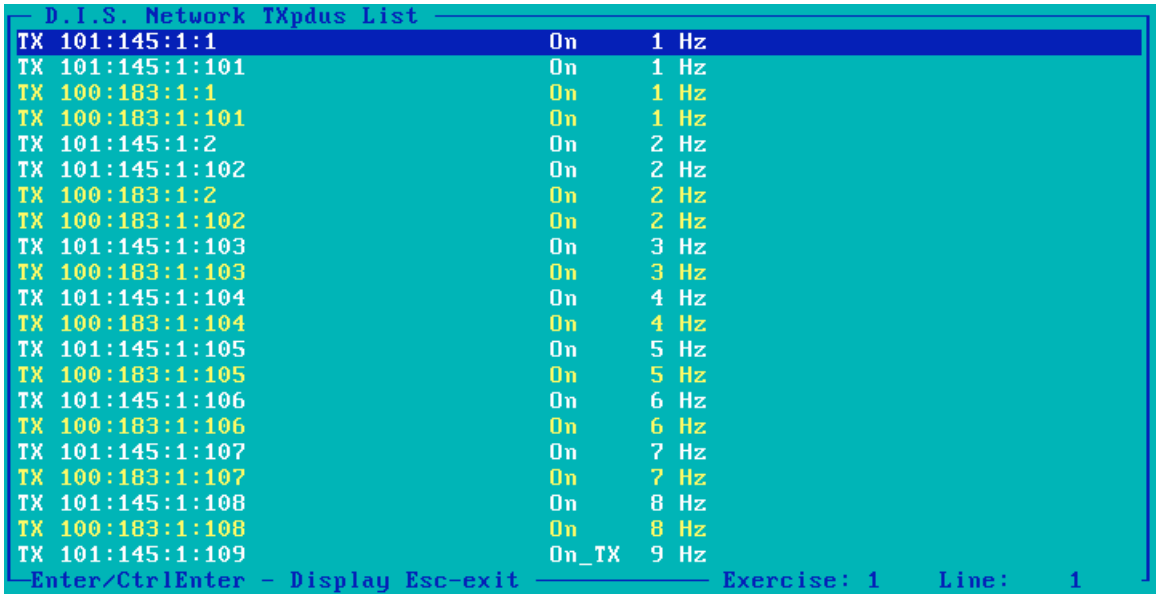


Figure 13A: Model Builder DIS Network Tx PDUs List

i. This list shows all local and remote DIS transmitter PDUs for a specific DIS exercise.

ii. The list is sorted by Frequency in Hertz

iii. Transmitter PDUs from the local Synapse node are shown in yellow text.

iv. Transmitter PDUs from remote network Synapse nodes are shown in white text.

v. Local or remote transmitters that are actively transmitting are shown as:
TX SITE: HOST: ENTITY: RADIO ID ON_TX [FREQ] HZ

b. Transmitters (From the Main Menu: speedkey D - speedkey T). See Figure 13B.

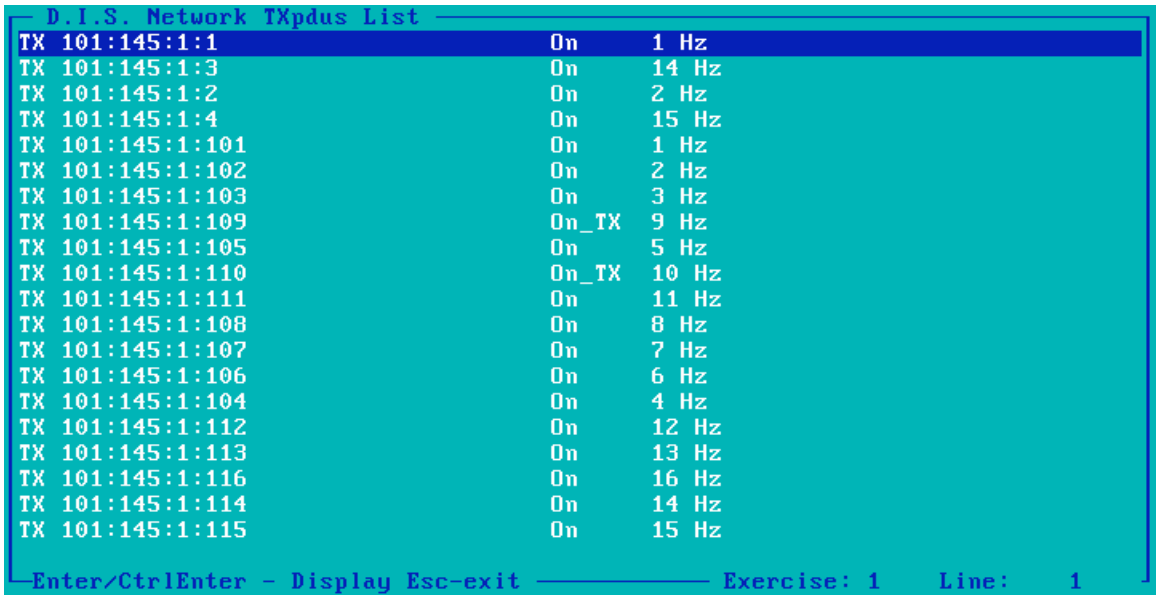


Figure 13B: Model Builder DIS Network Tx PDUs List

i. This list shows all remote DIS transmitter PDUs for a specific DIS exercise.

ii. Transmitter PDUs from the network Synapse nodes are shown in white text.

iii. Remote transmitters that are actively transmitting are shown as:
TX SITE: HOST: ENTITY: RADIO ID ON_TX [FREQ] HZ

c. Local Transmitters (From the Main Menu: speedkey D - speedkey L). See Figure 13C.

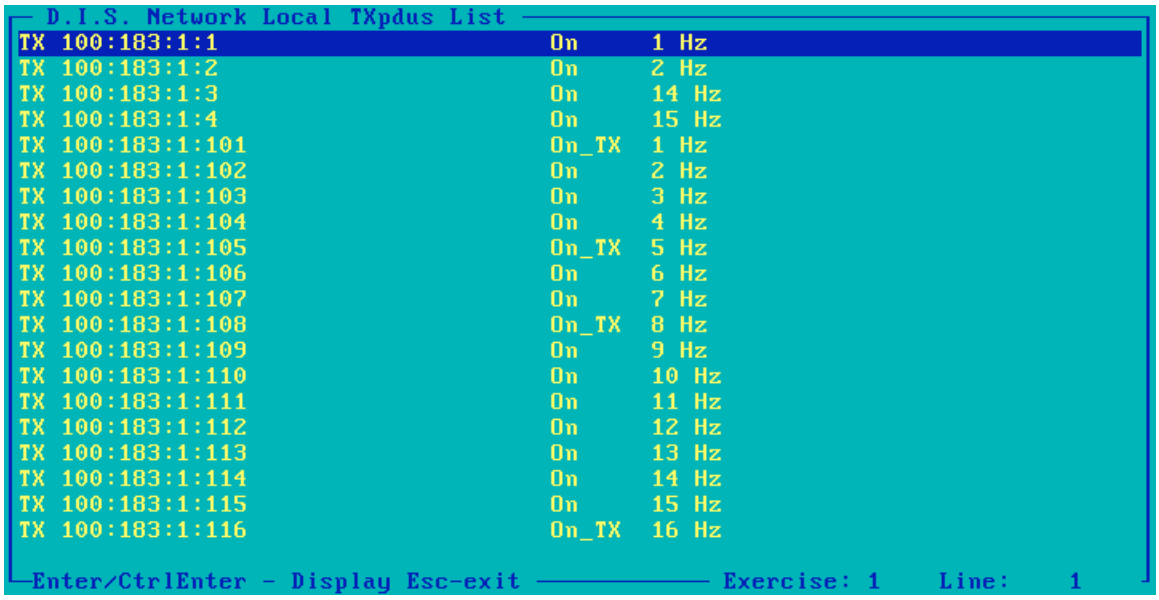


Figure 13C: Model Builder DIS Network Local Tx PDUs List

i. This list shows all local DIS transmitter PDUs for a specific DIS exercise.

ii. Local transmitters that are actively transmitting are shown as:
TX SITE: HOST: ENTITY: RADIO ID ON_TX [FREQ] HZ

d. Receivers (From the Main Menu: speedkey D - speedkey R). See Figure 13D.

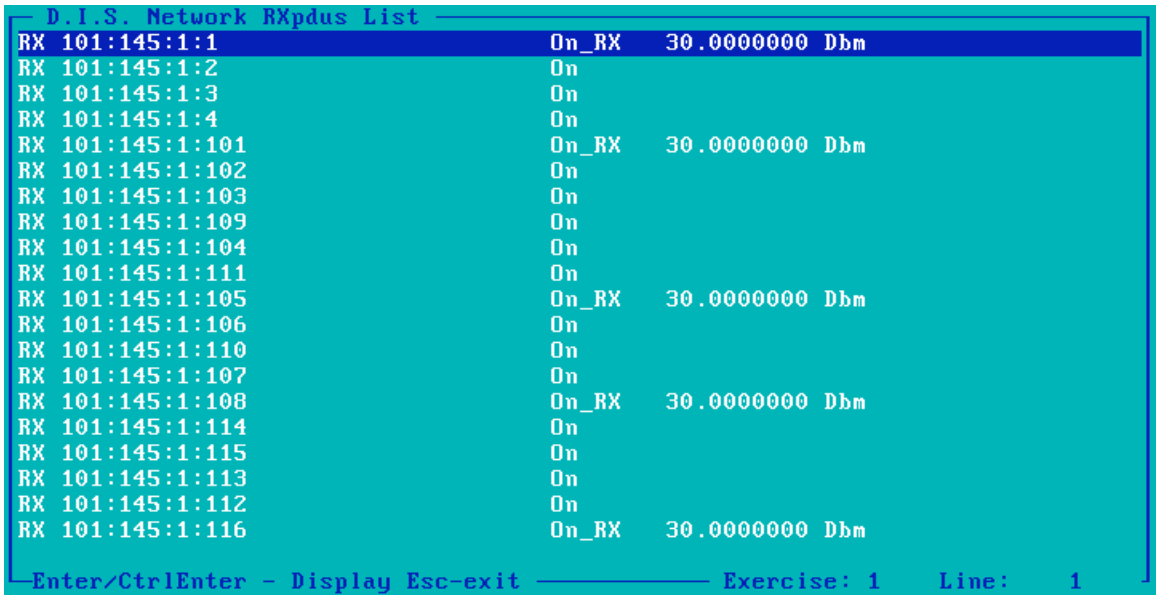


Figure 13D: Model Builder DIS Network Rx PDUs List

i. This list shows all remote DIS receiver PDUs for a specific DIS exercise.

ii. Remote receivers that are actively receiving are shown as:
RX SITE: HOST: ENTITY: RADIO ID ON_RX [FREQ] HZ

e. Local Receivers (From the Main Menu: speedkey D - speedkey V). See Figure 13E.

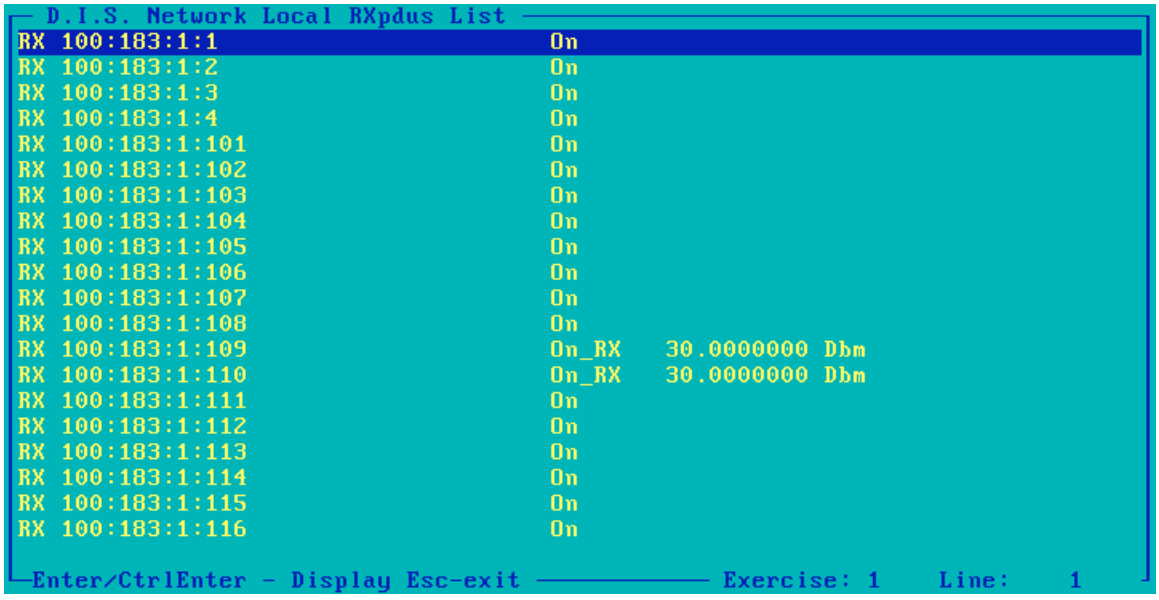


Figure 13E: Model Builder DIS Network Local Rx PDUs List

i. This list shows all local DIS receiver PDUs for a specific DIS exercise.

ii. Local receivers that are actively receiving are shown as:
RX SITE: HOST: ENTITY: RADIO ID ON_RX [FREQ] HZ

D. Node Performance Utility – TDM Card and RIUs

1. Synapse includes a series of Waveform DSP monitor pages that present node performance parameters for the Time Division Multiplex Digital Signal Processor (TDM DSP) and the Remote Interface Units (RIUs). This monitor indicates the general health of the internal TDM card and whether RIUs have been configured and installed properly.

2. Refer to Chapter 10B for details.

E. Controller Station Audio and PTT Offline Test

1. An off-line utility is provided that tests the audio inputs (microphone), audio outputs (speaker) and discrete digital inputs (PTT) for all channels on RIU address 1 (the Controller RIU).

2. Ensure that the system is running and that you have installed at least one Controller station audio (and if applicable, optional PTT) configuration. This test requires a known-good TDM ring. Check the RIU / TDM Ring (Chapter 10B) before attempting the Controller offline test.

3. Quit the Synapse application before running the utility: speedkey Q from the Main Menu.

a. Then from the prompt: C:\MBUILDER\USER\MODELS

b. Enter: CD TEST

c. Then enter: TESTCON

4. This utility loops audio from each of the RIU 1 microphone inputs to all of the RIU 1 speaker outputs. Check for overall audio quality and proper audio level. A periodic tone pulse is also heard.

5. To test each of the PTT inputs (Channels A, B, C and D), simply press the PTT switch. This will trigger a momentary tone that is heard at all RIU 1 speaker outputs.

6. If the system does not pass the audio loop or PTT tests, proceed to Chapter 14, Trouble-shooting.

7. To quit the offline Controller test enter: speedkey Q from the Main Menu.

a. This will leave you at the prompt: C:\MBUILDER\USER\MODELS\TEST.

b. To return the Synapse runtime directory, enter: `cd..`

F. Base RT Interface Offline Test Utility

1. This off-line utility is used to test the audio and discrete digital interfaces on the Base RT interfaces, that is: RIU addresses 2 and 3. (RIU address 3 for SYN-RT-08 systems only).

a. The utility loads a model that creates an audio path from the Contoller's microphone, through an output-to-input loop on a Base RT RIU channel, then back to the Controller's earphones. Audio loop-back of the Controller's voice signifies that the Base RT audio interface is working.

b. The utility is also used to test the discrete digital interfaces on RIUs 2 and 3. The model creates a control signal path that routes PTT signals from the Controller HHT, through a discrete digital output-to-input loop on a Base RT RIU channel, then back to the model, where the looped control signal triggers an audible tone that is passed to the Controller's earphones. Reception of the tone signifies that the Base RT digital interface is working.

c. A hardware test plug replaces the RT interconnection cable at the specified RIU channel to loop discrete digital and audio signals.

d. The Controller HHT is used to select the RT channel under test. Note that only one RIU channel is tested at a time.

2. To prepare for the test: ensure that you have connected a Controller headset (or speaker), a microphone and a HHT to RIU 1. The Base RT interface test requires a known-good Controller station setup and a known-good TDM ring. Perform the Controller offline test (Chapter 13, Item E) and check the RIU / TDM Ring (Chapter 10B) before performing the RT offline test.

3. To test a specific RT interface channel on RIU 2 or RIU 3, disconnect the RT-to-RIU cable from the RIU channel and install the RIU Test Loop fixture (ASTi PN: SYN-RIU-PLUG). This test fixture is a standard DB-9 male connector with a set of looping wires:

FROM PIN	TO PIN
1	3
6	8
2	4
7	9

4. Quit the Synapse application before running the utility: speedkey Q from the Main Menu.

a. Then from the prompt: C:\MBUILDER\USER\MODELS

b. Enter: CD TEST

c. Then enter: TESTRT

5. Next, select the RIU channel to be tested using the Controller HHT keypad: reference the table below and press the two-digit number corresponding to the RIU / Channel.

IMPORTANT: Ensure that you have selected the same RIU / Channel to which the Test Loop is installed.

RIU # / CHANNEL	HHT KEYS	FOR SYSTEM P/Ns
2 / A	01	SYN-RT-04 and SYN-RT-08
2 / B	02	SYN-RT-04 and SYN-RT-08
2 / C	03	SYN-RT-04 and SYN-RT-08
2 / D	04	SYN-RT-04 and SYN-RT-08
3 / A	05	SYN-RT-08 only
3 / B	06	SYN-RT-08 only
3 / C	07	SYN-RT-08 only
3 / D	08	SYN-RT-08 only

6. For example, to test the RIU 2 / Channel C interface, press 0, then 3. The HHT display will show:

```
   1 2 3 4 5 6 7 8
RX . . R . . . . .
TX . . T . . . . .
Vol 7  ST 5
```

7. At the Controller station, speak into the microphone and listen in the headphones for good audio quality.

8. To test the digital interface, press the Controller HHT PTT switch. This will trigger a tone that is heard at Controller station speaker outputs.

9. If the system does not pass the audio or digital loop tests, proceed to Chapter 14B, Troubleshooting

10. To quit the RT test enter: speedkey Q from the Main Menu.

a. This will leave you at the prompt: C:\MBUILDER\USER\MODELS\TEST

b. To return to the Synapse runtime directory, enter: `cd..`

G. Offline HHT Test

1. Synapse includes an offline HHT test that can be triggered from the HHT keypad. This test allows the operator to verify the following:

a. Correct operation of the HHT display and keypad

b. Soundness of the HHT cable

c. Soundness of the TDM cables

d. Correct RIU 1 address

e. Correct HHT software configuration on the Main Node.

f. See Chapter 10D for guidance.

H. Advanced HHT Tests

1. Synapse also includes a HHT software monitor page in the Model Builder communications toolkit that displays the embedded software status and the presence of display message and key press control communications between the HHT, the RIU, the TDM ring and the main node.

2. To access the HHT monitor page, from the Main Menu, go to Cell Interface (speedkey C), then DLL Status (speedkey D).

3. Page 1 of 3: Look for slow incrementing counts in both the Put No and Get No columns. Press any key on the HHT; the Put No and Get No counts should increment with each key entry. See Figure 13F.

Figure 13F: Model Builder DLL Status Window, 1 of 3

4. Enter: Page Down to Page 2 of 3: Look for the presence of a library file called “DIALOGUE.DLL”. See Figure 13G.

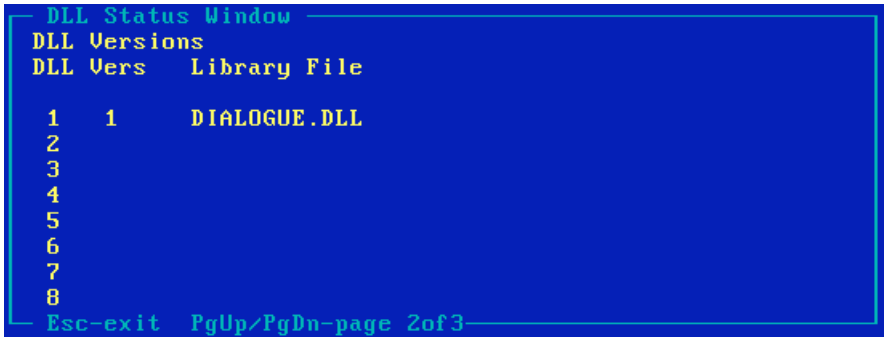


Figure 13G: DLL Status Window, 2 of 3

5. Enter: Page Down to Page 3 of 3: Look for the presence of a configuration file called “SYN <NET>.INI, where <NET> is 4 for a SYN-RT-04 system and 8 for a SYN-RT-08 system. See Figure 13H.

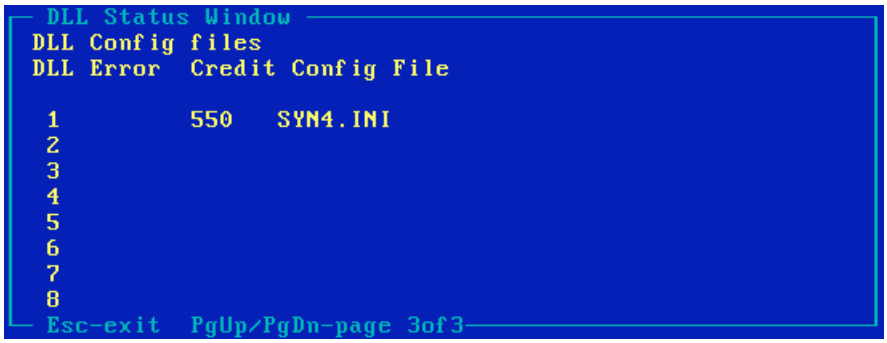


Figure 13H: DLL Status Window, 3 of 3

6. If the results of any of these tests is negative, proceed to Chapter 14C, Controller HHT Troubleshooting.

14. SYSTEM TROUBLESHOOTING

A. The system checkout procedure outlined in Chapter 10 should always be performed before operating the Synapse system. If you are experiencing operational problems and didn't perform the system checkout procedure, you should shut down and re-start the system, then methodically step through the system checkout.

B. If you still experience problems after running the checkout procedure, follow the trouble-shooting procedures described in Chapter 14 to isolate and fix the source of system problems.

C. Unless specified otherwise, or it is obvious to the user that the source of a problem resides at a particular site, these procedures should be executed at all nodes.

D. HINTS:

1. Coordination between site Controllers can expedite the fault isolation process. If the network communications problems don't inhibit your ability to talk with other site Controllers, make a quick call to verify if the problem is local to your site or system-wide.

2. Communication problems encountered during initial startup are most likely related to basic user configuration problems: RIU / TDM hardware installation, script file commands for DIS exercise ID, site and host IDs, Base RT frequency assignments and network configuration. The radio link between Base RTs and Field RTs is also a likely source of initial problems.

3. Communications problems encountered after a successful startup are most likely related to the Base and Field RTs: battery failure, RF LOS problems, frequency hop time sync problems are common sources of failure. Network infrastructure problems are also a likely source of problems.

14A. Main Node Troubleshooting / Error Messages

A. Problem:

System doesn't respond to keyboard entries.

Suggestion:

Reset the main node by pressing the font panel Reset button. If the problem persists, contact ASTi support.

B. Problem:

Error message: “Interrupt Jumper Missing”

Suggestion:

Reset the main node by pressing the front panel Reset button. If the error message persists, contact ASTi support.

C. Problem:

Error message: “DSP1 Failed at Startup”

Suggestion:

Reset the main node by pressing the front panel Reset button. If the error message persists, contact ASTi support.

D. Problem:

Incorrect commands are observed in the Status Page (from the Model Status procedure in Chapter 10C).

Suggestion:

If the Model1= <FILENAME> command is incorrect, repeat the DIS Configuration procedure in Chapter 7B.

If any of the other commands are incorrect, your DEFAULT.CFG file needs to be repaired or re-loaded. To repair the file, refer to the list of commands in Chapter 10C and edit the file to revise the incorrect command. Then save and exit. The alternative is to re-load the file from either your backup copy or from the original Synapse model installation disk. To install from the model installation disk, use the command: COPY A:\DEFAULT.CFG C:\MBUILDER\USER\MODELS

E. Problem:

Error message: “DLL error… ini”.

Suggestion:

The system initialization file (INI file) contains commands with incorrect syntax. Repeat the procedures in Chapter 8, System Initialization to revise the INI file.

F. Problem:

Error message: “Stream Open Error: File Not Found Model”.

Suggestion:

The Model1= <FILENAME> command is incorrect. Repeat the DIS Configuration procedure in Chapter 7B.

G. Problem:

Error message: “Cannot Open Command File Default.Cfg”

Suggestion:

This message will occur if you attempt to start the system (command: MB) from the incorrect directory. Ensure that you are starting the system by entering “MB” from the directory: C:\MBUILDER\USER\MODELS. This message will also occur if the DEFAULT.CFG file is missing from the...\MODELS directory. To look for the file, from the C:\MBUILDER\USER\MODELS directory, enter: DIR *.CFG.

If the DEFAULT.CFG file is missing, re-load it from either your backup copy or from the original Synapse model installation disk. To install from the model installation disk, use the command: COPY A:\DEFAULT.CFG C:\MBUILDER\USER\MODELS

H. Problem:

Error message: “No Valid Option File …”

Suggestion:

The system software option file is missing or corrupted. In either case, you must reload it from the original Option Installation disk. Insert the disk in the floppy drive and enter: A:\INSTALL. If you don't have an option install disk, contact ASTi support.

I. Problem:

Error message: “Credits Exhausted at...” (SYN-RT-04 systems only)

Suggestion:

Software for an 8-net Synapse system has been loaded into a 4-net system. To restore system operation, you must reload the Synapse system software. Insert the installation diskette, enter “install”, then follow the prompts. Enter “4” when prompted for the number of nets.

J. Problem:

Error message: “DLL error: File <filename.ini> not found”

Suggestion:

One of the critical embedded commands in the DEFAULT.CFG file has been corrupted. Re-load the DEFAULT.CFG file from either your backup copy or from the original Synapse model installation disk. To install from the model installation disk, use the command: COPY A:\DEFAULT.CFG C:\MBUILDER\USER\MODELS

K. Problem:

Error message: “Cannot open Command File Default.Pth”

Suggestion:

One of the critical embedded commands in the DEFAULT.CFG file has been corrupted. Reload the DEFAULT.CFG file from either your backup copy or from the original Synapse model installation disk. To install from the model installation disk, use the command: COPY A:\DEFAULT.CFG C:\MBUILDER\USER\MODELS

L. Problem:

Error message: “DLL load error <filename.dll>

Suggestion:

One of the critical embedded commands in the DEFAULT.CFG file has been corrupted. Reload the DEFAULT.CFG file from either your backup copy or from the original Synapse model installation disk. To install from the model installation disk, use the command: COPY A:\DEFAULT.CFG C:\MBUILDER\USER\MODELS

14B. TDM and RIU Troubleshooting

A. General:

1. Perform the TDM Card and RIU checkout procedure, Chapter 10B, then follow this procedure:

2. NOTE: A healthy TDM ring is indicated by:

a. All RIUs on the ring show green lights, flashing at a once per second rate -AND-

b. The correct RIU addresses are shown on the Waveform DSP / Times / RIU Present page in Model Builder. See Chapter 10B for more guidance.

B. Problem:

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

Suggestion:

Ensure that: the RIU power supply is securely mated to the 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 RIUs.

Suggestion:

1. The main node is not running. Start the system, inspect the Error page and fix any error messages (Chapter 14A)

2. Check the integrity of the Cat5 TDM ring cables, and repair or replace, as needed.

D. Problem:

The RED and GREEN lights are both lit.

Suggestion:

Press the RIU Reset button located on the front faceplate.

E. Problem:

The GREEN light on one or more of the 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 RIUs is incorrectly addressed or there is one or more faulty TDM cables in the ring.

Step 1) Inspect the Error list for error messages. Make corrections as needed. See Chapter 14A for guidance.

Step 2) Ensure that the RIU addresses are correctly set: Address 1 = Controller, Address 2 = Base RTs 1 - 4, Address 3 = Base RTs 5 - 8 (see Chapter 5A for guidance)

Step 3) Ensure that all of the Category 5 TDM cables are correctly installed and securely mated at each connector on the RIUs and the TDM card. See Chapter 5C for TDM ring installation guidance.

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

NOTE: RIU lights can indicate the location of a TDM ring fault. For example: if RIU 1 and RIU 2 both have slow blinking GREEN lights and RIU 3 has a fast blinking GREEN light, there is most likely a faulty cable between RIU 2 and RIU 3 -OR- RIU 3 is addressed incorrectly.

F. Problem:

For SYN-RT-08 systems only: The GREEN lights on RIU addresses 1 and 2 blink slowly and addresses 1 and 2 are shown on the Waveform DSP / Times / RIU Present page. The GREEN light on RIU address 3 blinks fast and RIU address 3 is not present on the RIU Present page.

Suggestion:

Software for a 4-net Synapse system has been loaded on an 8-net system. To restore system operation, you must reload the Synapse system software. Insert the installation disk, enter: “install”, then follow the prompts. Enter “8” when prompted for the number of nets.

G. Problem:

The GREEN lights on all of the RIUs are flashing once per second, but not all of the correct RIU addresses are displayed on the Waveform DSP / Times / RIUs Present page.

Suggestion:

Step 1) Ensure that all of the Category 5 TDM cables are securely mated at each connector on the RIUs and the TDM card. Step 2) Check the Category 5 TDM cables, substitute with spare cables to isolate faults, then reset all RIUs and restart the system.

14C. Controller HHT Troubleshooting

A. Problem:

The HHT does not pass the HHT Check test procedure (Chapter 10D).

Suggestion:

Step 1) Ensure that there are no error messages listed. See Chapter 14A for guidance.

Step 2) Perform the TDM Card and RIU check, Chapter 10B. If the results are negative, follow the procedures in Chapter 14B to correct problems.

Step 3) Ensure that the Controller HHT is connected to RIU address 1, Serial Port A.

Step 4) Perform the Advanced HHT test in Chapter 13, item H.

Page 1 of 3 test results:

The Put No and Get No counts should be slowly incrementing (with no HHT key presses). If both aren't incrementing: One of the critical embedded commands in the DEFAULT.CFG file has been corrupted. Re-load the DEFAULT.CFG file from either your backup copy or from the original Synapse model installation disk. To install from the model installation disk, use the command: COPY A:\DEFAULT.CFG C:\MBUILDER\USER\MODELS HHT keypresses should cause both the Put No and Get No counts to increment once per key entry. If not:

Either: One of the critical embedded commands in the DEFAULT.CFG file has been corrupted. Re-load the DEFAULT.CFG file from either your backup copy or from the original Synapse model installation disk. To install from the model installation disk, use the command: COPY A:\DEFAULT.CFG C:\MBUILDER\USER\MODELS

Or: The HHT-to-RIU cable is not securely mated to RIU 1, Serial Port A or the cable is faulty.

Or: The HHT is faulty.

Determine cable or HHT fault source through substitution with spare components.

Page 2 of 3 test results:

A library file called “DIALOGUE.DLL” should be displayed. If not:

One of the critical embedded commands in the DEFAULT.CFG file has been corrupted. Re-load the DEFAULT.CFG file from either your backup copy or from the original Synapse model installation disk. To install from the model installation disk, use the command: COPY A:\DEFAULT.CFG C:\MBUILDER\USER\MODELS

Page 3 of 3 test results:

A configuration file called “SYN <NET>.INI” should be displayed. (NET = 4 for SYN-RT-04-xx or 8 for SYN-RT-08-xx). If not: One of the critical embedded commands in the DEFAULT.CFG file has been corrupted. Re-load the DEFAULT.CFG file from either your backup copy or from the original Synapse model installation disk. To install from the model installation disk, use the command: COPY A:\DEFAULT.CFG C:\MBUILDER\USER\MODELS

B. Problem:

Controller HHT initializes with blank display when system starts.

Suggestion:

Follow the suggestions in Chapter 14C, item A to correct problems.

C. Problem:

Controller HHT initializes and functions correctly, then subsequently goes blank during operation.

Suggestion:

Step 1) Ensure that the main node is running. Correct main node problems as needed: restore power or restart system.

Step 2) Perform the TDM Card and RIU check, Chapter 10B. If the results are negative, follow the procedures in Chapter 14B to correct problems.

Step 3) Determine whether the HHT or HHT-to-RIU cable is faulty through substitution with spare components.

14D. Controller Station Troubleshooting

If the Controller station cannot communicate with local or remote nets, make sure that the HHT, RIUs and TDM ring are functioning properly - see Chapter 14C for guidance. If the procedures in Chapter 14C are successfully completed and communication problems persist, follow the procedures in this chapter to correct problems.

A. Problem:

Controller can't communicate with any Local RT Nets, Remote RT Nets or other remote Controllers.

Suggestion:

Step 1) Inspect the HHT display to ensure that it is correctly configured for Transmit / Receive status on the desired nets. This is accomplished either at startup through the initialization file or by the user from the HHT keypad. See Chapter 8 for the HHT initialization procedure. See Chapter 12 for an overview of Controller HHT operation.

Step 2) Perform the TDM Card and RIU check, Chapter 10B. If the results are negative, follow the procedures in Chapter 14B to correct problems.

Step 3) Inspect the Error page (from the Main Menu: speedkey E) for error messages. Correct any errors - see Chapter 14A for guidance.

Step 4) Test the audio peripherals (mics, speakers, headsets, PTTs and cables) using the offline Controller station test procedure in Chapter 13, Item E. Isolate faults through substitution with spare components.

B. Problem:

The Controller can't communicate with any Local RT Nets, but can communicate with Remote RT Nets and other Controllers.

Suggestion:

Step 1) Inspect the HHT display to ensure that it is correctly configured for Transmit / Receive status on the desired nets. This is accomplished either at startup through the initialization file or by the user from the HHT keypad. See Chapter 8 for the HHT initialization procedure. See Chapter 12 for an overview of Controller HHT operation.

Step 2) Perform the TDM Card and RIU check, Chapter 10B. If the results are negative, follow the procedures in Chapter 14B to correct problems.

Step 3) Inspect the Error page (speedkey E from the Main Menu) for error messages. Correct any errors - see Chapter 14A for guidance.

Step 4) Ensure that each of the Base RT interfaces has been assigned the correct DIS intercom frequency. The user must manually enter these assignments into the INI file to map specific RIU addresses and channels to specific DIS frequencies. These DIS frequencies must agree with the Receive and Transmit settings on the HHT. Refer to Chapter 8A for guidance.

C. Problem:

Controller can communicate with all Local RT Nets, but can't communicate with any remote DIS Nets.

Suggestion:

This indicates a DIS network problem. Refer to Chapter 14F for guidance.

D. Problem:

Controller, remote Controllers and other remote RTs cannot communicate with a specific Base RT net at one site.

Suggestion:

Step 1) If the problem has been encountered during initial startup: ensure that the specific Base RT interface has been assigned the correct DIS Frequency number. The user must manually enter these assignments into the INI file to map specific RIU addresses and channels to specific DIS frequencies. These DIS Frequencies must agree with the Receive and Transmit settings on the HHT. Refer to Chapter 8A for guidance.

Step 2) Perform an RT checkout procedure between at least one Field RT and the Base RT. See Chapter 10E for guidance. Correct any RT related problems: front panel settings, LOS, battery, FH sync, etc. See Chapter 6 for guidance.

Step 3) Perform the TDM Card and RIU check, Chapter 10B. If the results are negative, follow the procedures in Chapter 14B to correct problems.

Step 4) Determine whether the RT-to-RIU cable is faulty through substitution with a spare cable.

Step 5) Test the RIU using the offline RT interface test procedure in Chapter 13, Item F. If a problem is found during the offline RT test, try resetting the RIU (press the Reset button on the RIU faceplate) and re-testing. If the problem persists, isolate the source of the fault by substituting with a spare RIU. Ensure that the substitute RIU is configured correctly (internal jumpers and address switch) before it is connected to the TDM ring. See Chapter 5A for guidance.

E. Problem:

The volume of Controller voice transmissions is excessively quiet or excessively loud at all receive stations (including other Controllers, Local and Remote RT Nets).

Suggestion:

The internal jumpers for RIU address 1 are not configured correctly. Re-configure the jumpers following the procedure in Chapter 5A.

14E. Base RT Troubleshooting

A. Problem:

Communications from a specific Base RT have failed.

Suggestion:

See Chapter 14D, item D for guidance.

B. Problem:

Communications from a set of Base RTs, all connected to a specific RIU, have failed.

Suggestion:

Perform the TDM Card and RIU check, Chapter 10B. If the results are negative, follow the procedures in Chapter 14B to correct problems.

C. Problem:

Communications for all Base RTs connected to a specific Synapse node, have failed.

Suggestion:

Step 1) Perform the TDM Card and RIU check, Chapter 10B. If the results are negative, follow the procedures in Chapter 14B to correct problems.

Step 2) Inspect the Error page (speedkey E from the Main Menu) for error messages. Correct any errors - see Chapter 14A for guidance.

Step 3) Ensure that each of the Base RT interfaces have been assigned the correct DIS Frequency number. The user must manually enter these assignments into the INI file to map specific RIU addresses and channels to specific DIS frequencies. These DIS Frequencies must agree with the Receive and Transmit settings on the HHT. Refer to Chapter 8A for guidance.

D. Problem:

Base RT transmissions are audible, but very quiet at Controller and networked receive stations.

Suggestion:

Step 1) Ensure that the RT volume setting is correct. Refer to Chapter 6.

Step 2) Check the RT to RIU cable by substitution with a spare.

E. Problem:

Base RT transmissions are excessively loud at local Controller and all networked receive stations.

Suggestion:

The internal jumpers for RIU address 2 (Base RTs 1 through 4) or 3 (Base RTs 5 through 8) are not configured correctly. Re-configure the jumpers following the procedure in Chapter 5A.

14F. DIS Network Troubleshooting

HINT: Model Builder includes some powerful network monitoring utilities that run in realtime. You should become familiar with these utilities: The DIS Status page, a utility that shows local node DIS configuration, including: Local IP address, Broadcast IP Address, UDP Ports, Subnet Mask, Site ID and Host ID. This page allows the user to check the node configuration presets, loaded from the DEFAULT.CFG file. See Chapter 10F for details.

The DIS Status page also features a series of counters that indicate good and bad transmit and receive packet counts at the IP and UDP level for DIS Receive, Transmit and Signal PDUs. These counters provide a utility that is useful for diagnosing network-level problems. These are described in Chapter 10F.

Also under the DIS Network menu is a series of lists (Freq of Xmitters, Local Xmitters, Transmitters, Receivers and Local Receivers) that provide the user with a network-wide view that is invaluable during exercise coordination or troubleshooting. These lists show local and network Transmit and Receive PDUs for a selected DIS exercise ID. These are described in Chapter 13, item C.

In this section, the term intercom is used to mean intercom (for standard Synapse) or Simulated Radio (for Synapse option). ASTi intercoms and radios share basic DIS operational characteristics. They both require the same types of DIS exercise and site:host:entity:radio ID configurations. The main difference between intercoms and radios is found in the internal settings of these software objects.

Intercoms require only one internal setting for inter-operation: tuned frequency. Assuming that all of the DIS parameters are set correctly, all intercoms with matching tuned frequencies will intercommunicate. Intercoms operate in the 'center of the earth' mode. They always provide clear communications and they do not exhibit propagation effects due to simulated geographical ranging.

Radios are more full featured (and therefore more complex to set up and use). The required settings are: power / mode setting, tuned frequency, modulation type and world location. Optional settings include, but are not limited to: crypto system / crypto keys and frequency hopping.

The topic of configuring and using DIS radios is outside of the scope of this manual. For details about the setup and use of ASTi simulated radios, refer to these information sources:

http://www.asti-usa.com/support/index.html

- Frequently asked questions
- Application Notes
- Help with Model Builder
- ASTi Documentation (see the Model Builder Reference Guide, Radio section)

A. Problem:

Controller can communicate with all Local RT Nets, but can't receive or transmit to remote DIS Nets. Remote sites cannot communicate with the Base RT nets at your site.

Suggestion:

Step 1) Ensure that a link with the DIS network has been established. Inspect the DIS Status page (from the Main Menu: speedkey D - speedkey S), there should be incrementing counts in the TX Byte Count and TX Good Count fields. If these fields are not incrementing, and the TX Errors field is incrementing, the Synapse DIS ethernet interface is not linked to the network. Resolve network link problems and re-try communications with remote sites. If problems persist:

Step 2) Ensure that your Synapse node has been configured with the correct DIS Exercise ID. Inspect the Frequency of Xmitters page (from the Main Menu: speedkey D - speedkey F) for the desired exercise to ensure that local (yellow) and remote (white) DIS transmitters are present in the list. See Chapter 10F, item C for guidance. If the local transmitters are not in the desired exercise list, you need to revise the INI file to include the correct DIS Exercise ID. Refer to Chapter 8A, item F for guidance. If problems persist:

Step 3) Ensure that your Synapse node has been configured with the correct DIS receive and transmit port numbers. Inspect the DIS Status page (from the Main Menu: speedkey D - speedkey S) to see if the system has been configured with the correct DIS UDP port numbers. If the incorrect port numbers have been assigned, make corrections to the DEFAULT.CFG file. See Chapter 7A, items E and F for guidance.

NOTE: If there is a DIS Port Number mismatch between your site and all of the other remote sites, you will notice the following indications on the DIS Status page during active DIS communications:

```
TX Byte Count, TX Good Count, DIS tx pdus, DIS SIG pdus tx: All Incrementing
RX Byte Count = Incrementing
RX Good = Incrementing
DIS rx pdus and DIS SIG pdus rx = Not Incrementing
```

APPENDIX A: SYNAPSE RIU TECHNICAL GUIDE

A. General Information

1. There are two special configurations of the ASTi Remote Interface Unit (RIU) used with Synapse:

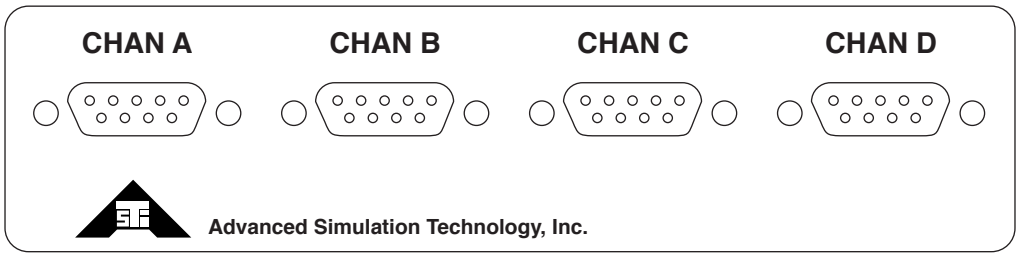
a. Operator RIU: ASTi PN SYN-RIU-OP. Interface module for Controller Station. Marked "Operator RIU". Unique internal jumper settings are shown here in section D1.

b. Radio RIU: ASTi PN SYN-RIU-RT. Interface module for radio transceivers. Marked "Radio RIU". Unique internal jumper settings are shown here in section D1.

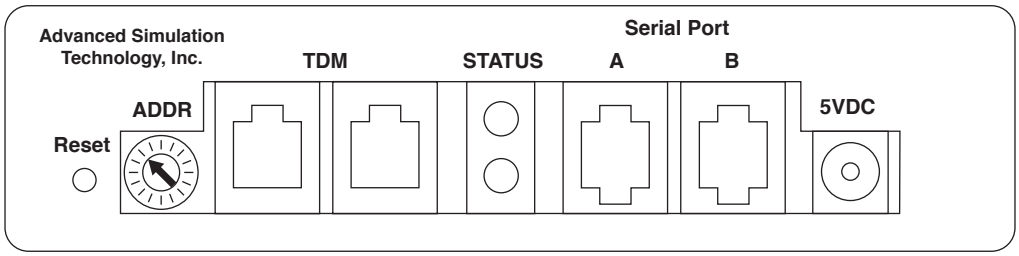
2. A packaged RIU weighs 1.5 lbs. The power supply included with the RIU weighs 0.5 lbs.

3. 19", 1U high rackmount kits are available. Each kit will hold 3 RIUs.

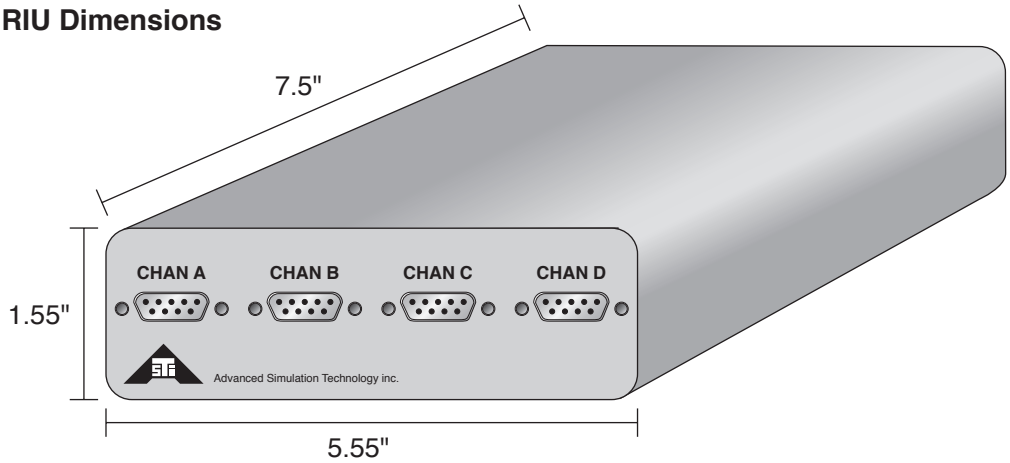
RIU Front Panel Face



RIU Rear Panel Face



RIU Dimensions



B. Power Supply

1. Each RIU is supplied with an external +5 VDC regulated power supply. These power supplies are rated for 50/60Hz, 100-240Vac, and will supply a maximum of 2.5A.

2. The RIU includes an over-current protection device (1.1A trip point) that automatically resets itself.

C. Connector Information

1. Power Supply: 2.1mm socket, center positive

2. Serial connections A & B: RJ-12 jacks

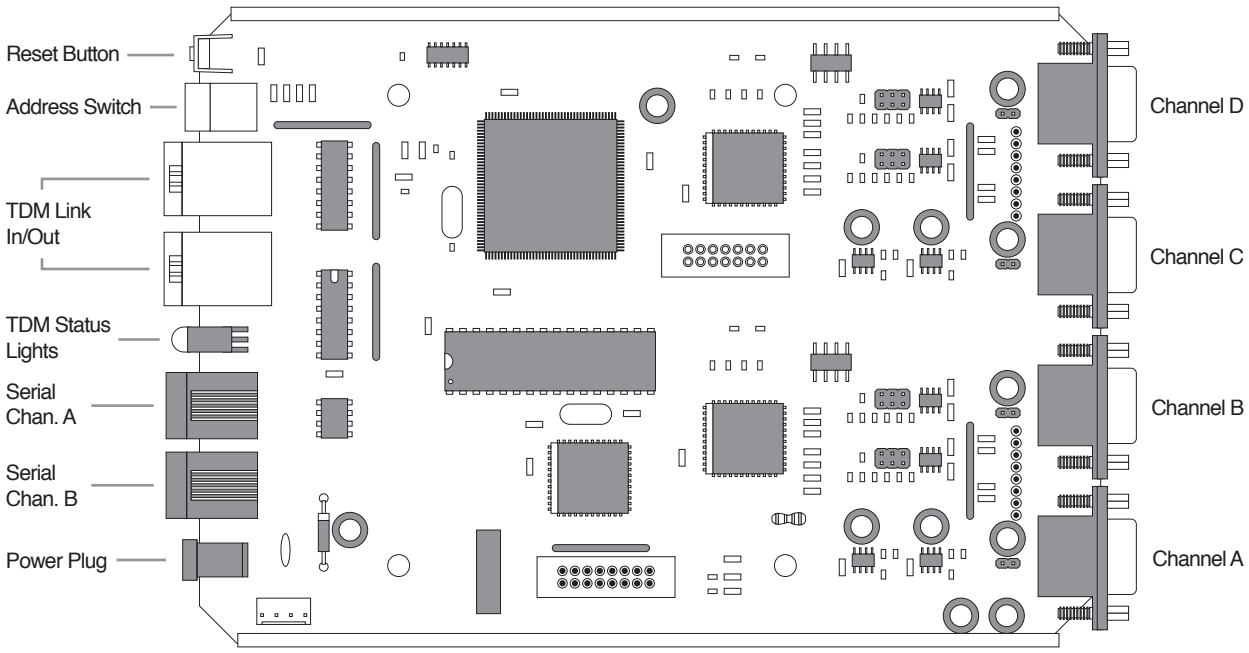
1 = TX+	4 = RX-
2 = TX-	5 = +5 VDC
3 = RX+	6 = Ground

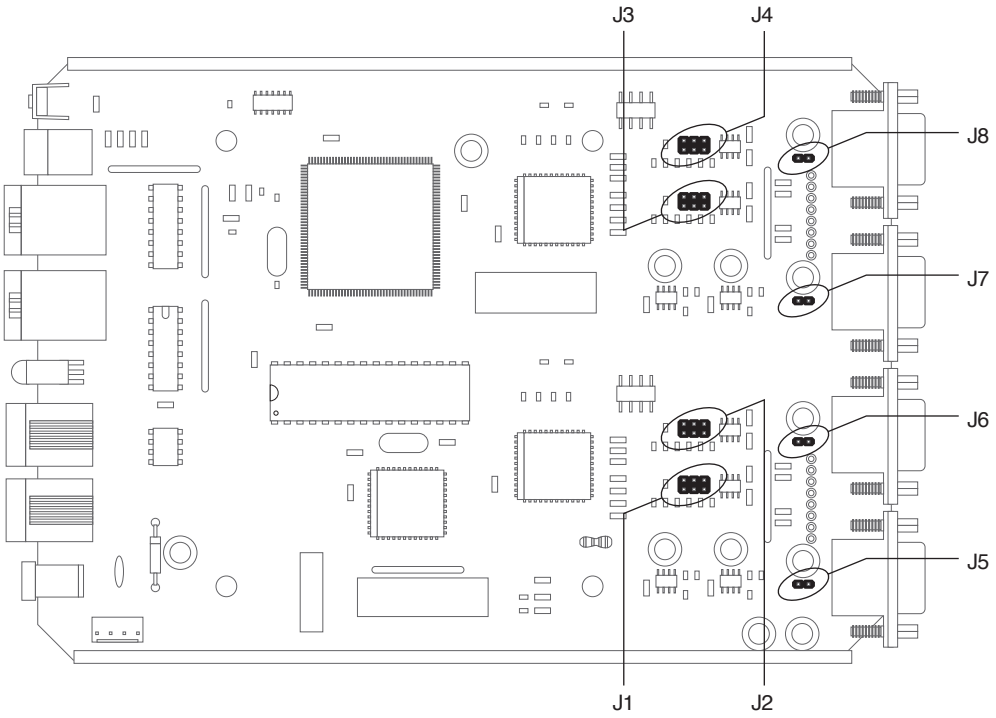
3. TDM Link In/Out: RJ-45 jacks

1 = RX+	5 = SYN+	Interconnect using standard
2 = RX-	6 = TX-	Category 5 unshielded twisted
3 = TX+	7 = SCK+	pair straight-through cables.
4 = SYN-	8 = SCK-	(EIA/TIA 568A wiring standard)

4. Channels A, B, C & D: 9-pin, female, subminiature 'D' connector

1 = Digital Out +	6 = Digital Out-
2 = Audio Out, Hi	7 = Audio Out, Lo
3 = Digital In+	8 = Digital In- (I/O GND)
4 = Audio In, Hi	9 = Audio In, Lo
5 = Chassis Ground	





Warning: Take ESD precautions when handling the RIU board, EEPROM, or jumpers. When changing jumpers, first touch chassis ground, and then reposition the jumper.

D. Internal Jumper Settings

DESCRIPTION	RIU JUMPER SETTING	**RIU Address 1:** ”Operator RIU” Controller Station (SYN-RT-04 / -08)	**RIU Address 2:** “Radio RIU” RT Nets 1 - 4 (SYN-RT-04 / -08)	**RIU Address 3:** “Radio RIU” RT Nets 5 – 8 (SYN-RT-08 ONLY)
Input Gain, Channel A	J1	40 dB	0 dB	0 dB
Input Gain, Channel B	J2	40 dB	0 dB	0 dB
Input Gain, Channel C	J3	40 dB	0 dB	0 dB
Input Gain, Channel D	J4	40 dB	0 dB	0 dB
Output Coupling, Channel A	J5	OPEN	OPEN	OPEN
Output Coupling, Channel B	J6	OPEN	OPEN	OPEN
Output Coupling, Channel C	J7	OPEN	OPEN	OPEN
Output Coupling, Channel D	J8	OPEN	OPEN	OPEN

Jumper guide for J1 through J4:

APPENDIX B: COLD START

Complete disk preparation and software installation procedures vary, depending on the hardware platform used. For example, the μDACS cold start procedure is completely different than that of the industrial, 2U DACS. Visit our web site to download platform-specific procedures. The DACS Operation and Maintenance Manual provides cold start procedures for various DACS platforms. The Operation and Maintenance manual can be found from the documentation section of the ASTi web site (http://www.asti-usa.com/support/document/index.html).

APPENDIX C: SAFETY and HANDLING

A. Safety Precautions

This section must be read completely and understood before using the Digital Audio Communication System. If you are unsure of any information presented please contact ASTi. Methods of contact are listed at the end of this chapter.

The following safety precautions must be observed when performing any operation and maintenance tasks associated with the ASTi Digital Audio Communication System (DACS). These safety precautions are necessary to prevent injury to personnel and damage to equipment.

***** WARNING *****

Potentially fatal voltages are present in the Digital Audio Communication System. Before removing, handling, or replacing any DACS component, ensure that ALL electrical supplies have been turned off and electrical power cords disconnected from the Digital Audio Communication System.

The following disclaimer is provided regarding use of the DACS. The disclaimer applies to all parties using the DACS in any situation or configuration. This disclaimer should be read and understood completely before using the Digital Audio Communication System.

***** DISCLAIMER *****

The DACS is a sound production device. The user, by the act of installing and using the DACS and any associated equipment such as external amplifiers, headsets, speakers, etc., warrants and represents that he/she is aware that excessive audio levels can cause permanent hearing impairment and that he/she assumes full responsibility for configuring all equipment including hardware and software to achieve safe operating sound pressure levels under all conditions.

B. Equipment Handling

All Digital Audio Communication System Circuit Boards and Modules are sensitive to electrostatic discharge (ESD). To avoid damage to DACS equipment, proper ESD procedures should be followed when handling all Digital Audio Communication System equipment. If it is necessary to remove and/or replace a circuit board or module, follow the procedures listed in Chapter 5, Test and Maintenance.Ensure that all work is performed at a properly grounded ESD work station. In addition, all personnel handling DACS equipment should be properly grounded.

When transporting or shipping individual modules, equipment should be fully enclosed in an antistatic bag. ***ASTi is not responsible for equipment damage due to improper handling.***

APPENDIX D: WARRANTY and CUSTOMER SUPPORT

A. Warranty

ASTi provides a one year limited warranty on all ASTi equipment covering all parts and labor.

In the case of equipment upgrades, warranty applies to original date of shipment of individual components.

Other commercial equipment purchased or provided such as monitors, amplifiers, speakers, fiber optic links, etc. are also covered under the one year warranty unless otherwise stated.

The warranty does not cover improper equipment handling or improperly packaged returns.

Extended warranties are available. Contact ASTi for details.

B. Returns

When returning damaged or broken equipment please contact ASTi for proper RMA# and return instructions. Equipment will not be received without proper return authorization.

Items out of warranty will require a purchase order to cover repair. If you are unsure if a particular item is covered under warranty, contact ASTi for assistance. At a minimum please have part number and serial number of equipment available.

Note that in many cases items returned will take some time to repair. If downtime is a concern, spares should be purchased to cover this possibility.

C. Customer Support

Customer support is a major part of the ASTi digital communications solution. If you have any questions about our product, how it can be used for your application, or suggestions for future enhancements, you can contact ASTi in the following ways:

1. By E-mail. Send an email any time to us at info@asti-usa.com.

2. By Web. You can reach us through the World Wide Web at www.asti-usa.com.

3. By Fax. Include your name, company, fax number, phone number where you can be reached, and your specific question. The fax number for ASTi is (703) 471-2108

4. By Phone. Call the technical support line 9:00am to 5:00pm (Eastern) weekdays with your question. Someone will be happy to assist you. The number is (703) 471-2104.

5. By Mail. Include your name, company, fax number, phone number where you can be reached, and your particular question. Mail to the following address:

ASTi
500A Huntmar Park Drive
Herndon, VA 20170
U.S.A.

APPENDIX E: RMA PROCEDURE

If it becomes necessary to return equipment to ASTi for repair, please observe the following instructions:

A. Request an RMA number by either calling ASTi or by using the form available in the Support section of the ASTi web site. The receiving department at ASTi will not receive a repair without an RMA number.

B. When packaging the equipment in question, make sure it is well protected. ***ALWAYS DOUBLE BOX***. Individual cards or modules should be properly enclosed in antistatic bags to prevent possible ESD damage. ***DO NOT*** ship monitors unless they are the item to be evaluated. Failure to properly package equipment could void warranty.

C. Do not include the accessory pieces, such as power cords, software and mounting brackets. Only return items that do not work.

D. The shipping label must include the RMA number.

E. Include a description of the problem including the serial number for the unit in question and a point of contact. Failure to include a point of contact at your company could delay return of equipment.

F. Note that if equipment is not under warranty, a purchase order will be required to cover any repairs. ASTi will provide a quote for all non-warranty items.

G. Equipment will be shipped back via UPS-Ground unless otherwise directed. If it is a non-warranty repair, shipping charges will be billed.

APPENDIX F: FURTHER READING

For detailed operational information about the RTs see:

1. US ARMY, Operator's Manual, SINCGARS Ground Combat Net Radio. RT-1523C/D (SIP) and RT-1523E (ASIP) Versions.

2. AN/PRC-117F(v)(c) Operations Manual, Number 10515-0109-4100, March 2000, Rev. C.