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ASTi ACU2 Technical User Guide

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Product Name: ACU2

ASTi ACU2 Technical User Guide

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ASTi

500-A Huntmar Park Drive

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1.0. ACU2

The ACU2 is a compact 48kHz digital and audio distribution device that connects remotely located operator headsets, speaker, control panels, etc. to a central Target via the ACENet architecture. The ACU2 expands on the family of 2, 4, and 6 channel ACU devices with stereo support and reduced size.

Features

Stereo Support: Stereo operation (independent left and right output) is supported on a single connector, which reduces cabling complexity and installation footprint for applications requiring stereo operators.

Reduced Footprint: Each device supports four configurable mono/stereo operator positions in a single compact unit. The ACU2 fits easily on a desktop or rackmount two devices side-by-side in 1U 19" rack space.

High Fidelity Audio: 48k digital audio and balanced pro-audio interfaces

Software Configurable: Adjustable amp/preamp gains and mic power for easy, direct connection to military and commercial headsets and a wide variety of audio/communications systems and peripherals.

Serial Data Ports: Provide convenient control interface for ASTi Hand-held Terminals, simulated panels, and live radio control.

Integrated I/O: Configurable digital and analog I/O for direct connection of PTT units, volume controls, switch detection, radio PTT activation, and other control applications.

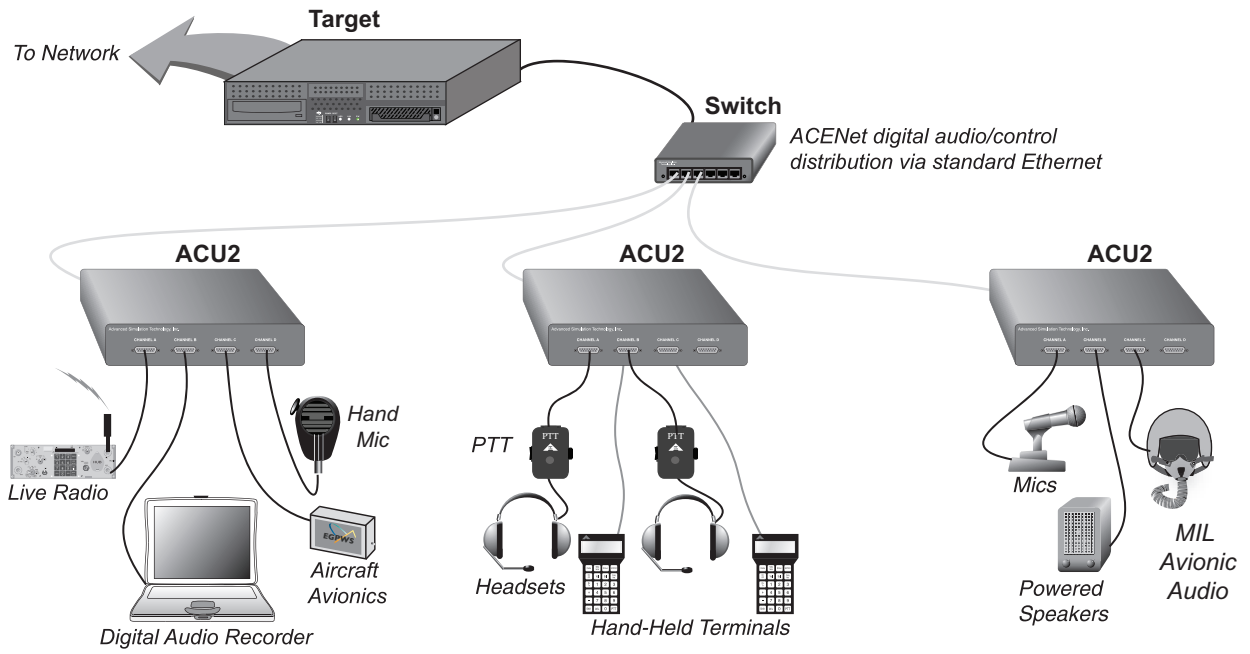


Figure 1: ACU2 Hardware Layout Diagram

2.0. Physical Specifications

The hardware is available with a 19", 1U high rackmount bracket, each bracket holds two ACU2s.

Note: Removing the attached bezels voids the CE certification.

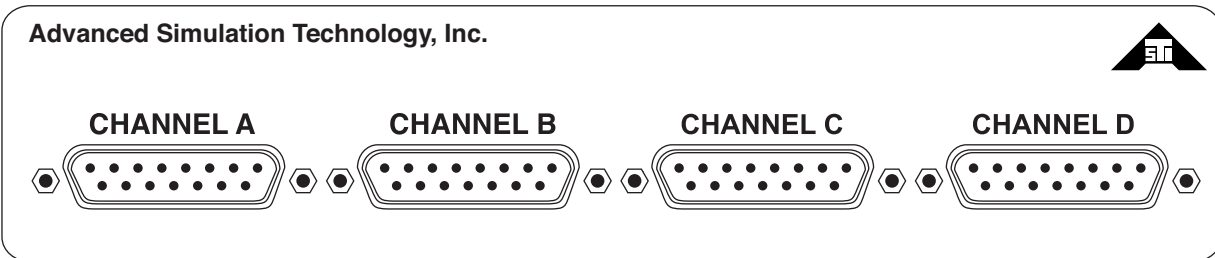


Figure 2: Front Panel

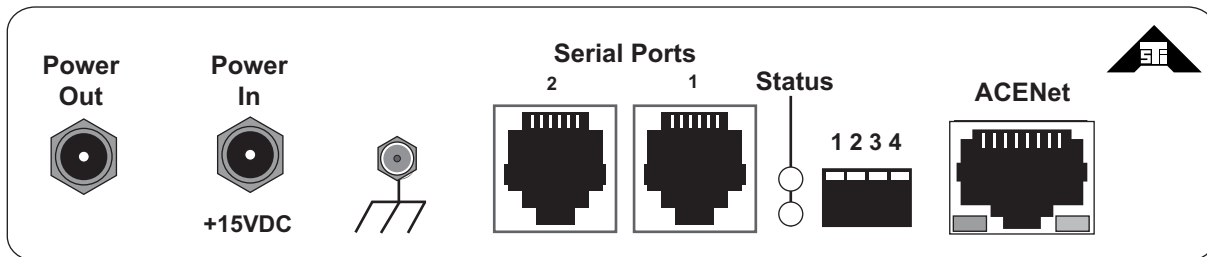


Figure 3: Rear Panel

Dimensions

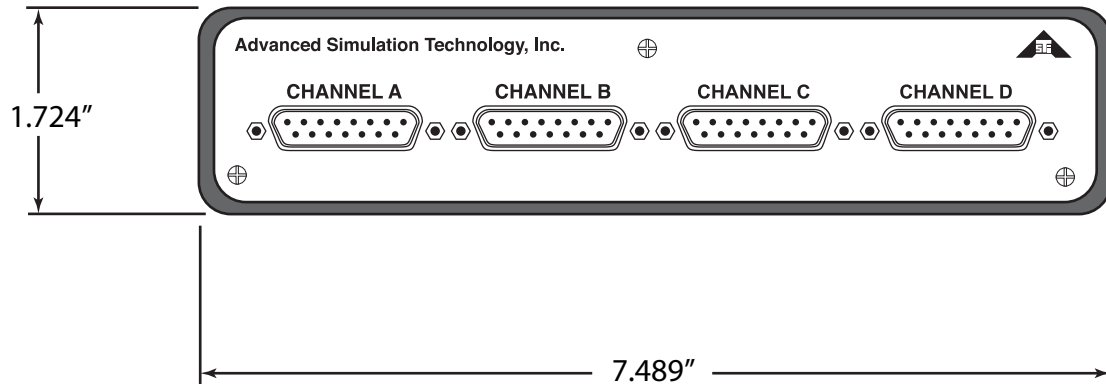


Figure 4: Front Panel with Bezel

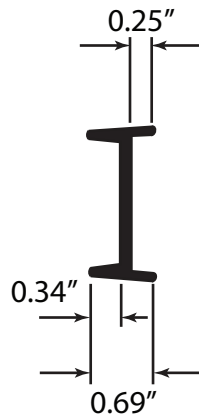


Figure 5: Side View of Bezel

Dimensions without Bezels

7.5" length x 7" width x 1.55" height

Weight

A packaged ACU2 weighs 2 lbs. The power supply included with the ACU2 weighs 0.5 lbs.

The ACU2 has two attached bezels. The bezels encompass the front and rear panel. This ACU2 is CE/ROHS certified. Removing the bezels will void the CE certification.

Note: Older versions of the ACU2 do not have attached bezels.

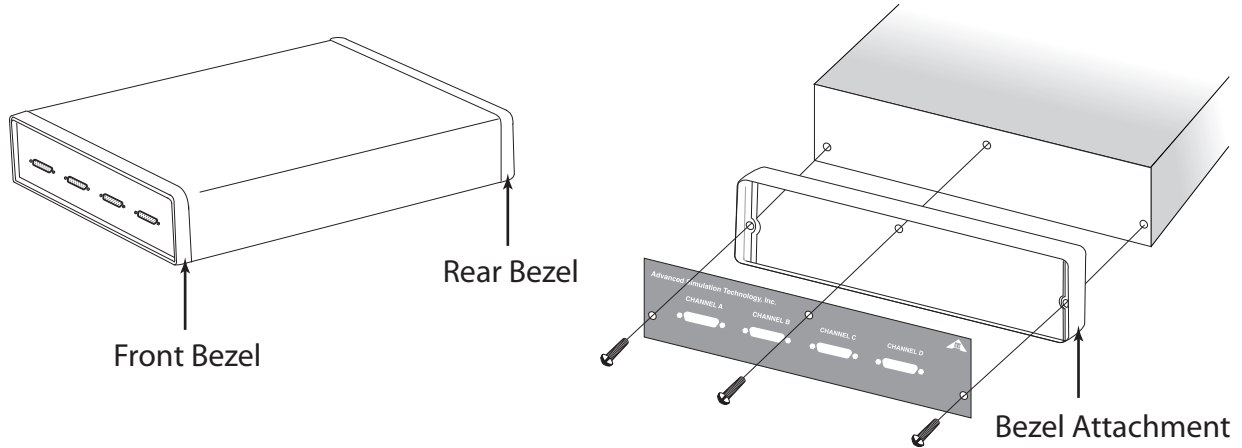


Figure 6: Bezel Placement

Power Requirements

The hardware is powered by a power supply included with the ACU2 shipment. Power is applied individually or through a daisy chain connection allowing operation of two ACU2 units from a single power supply. Daisy chain connection requires a different power supply, contact ASTi for details.

Only plug the AC power supply into a grounded outlet and leave access to the AC adapter to allow easy power disconnection.

Input to PSL-UM-001	100-240 VAC, 50-60Hz, 1.5Arms (120VAC), 0.75 Arms (240VAC)	
Power In Connector	Inside Diameter 0.100", Outside Diameter 0.218", locking, center positive	
	Connector Part #	Switchcraft 712RA supplied with P2439 Hex Nut (5/16-32) and P2441 Washer
	Mating Connector Part #	Switchcraft 760k
Power Out Connector	Inside Diameter 0.080", Outside Diameter 0.218", locking, center positive	
	Connector Part #	Switchcraft 722RA supplied with P2439 Hex Nut (5/16-32) and P2441 Washer
	Mating Connector Part #	Switchcraft S765k
Power Consumption	+15VDC, 2 A (plug-in AC/DC converter supplied with each unit)	

The power adapter inlet connector is an IEC320 type C14 or C8, requiring a matching cordset equipped with an IEC320 C13 or C7 connector (female line cord). Country-specific power connectors must be acquired separately for international use.

3.0. Installation

Serial Connection

The serial ports permit connection of user interface devices to the ACU2.

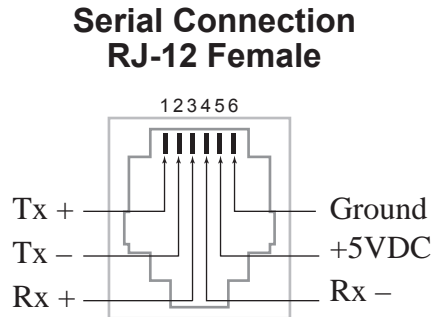


Figure 7: RJ-12 Pinout for RS-422 mode

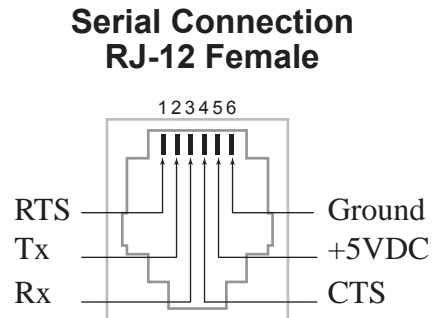


Figure 8: RJ-12 Pinout for RS-232 mode

Audio Interface Pinout

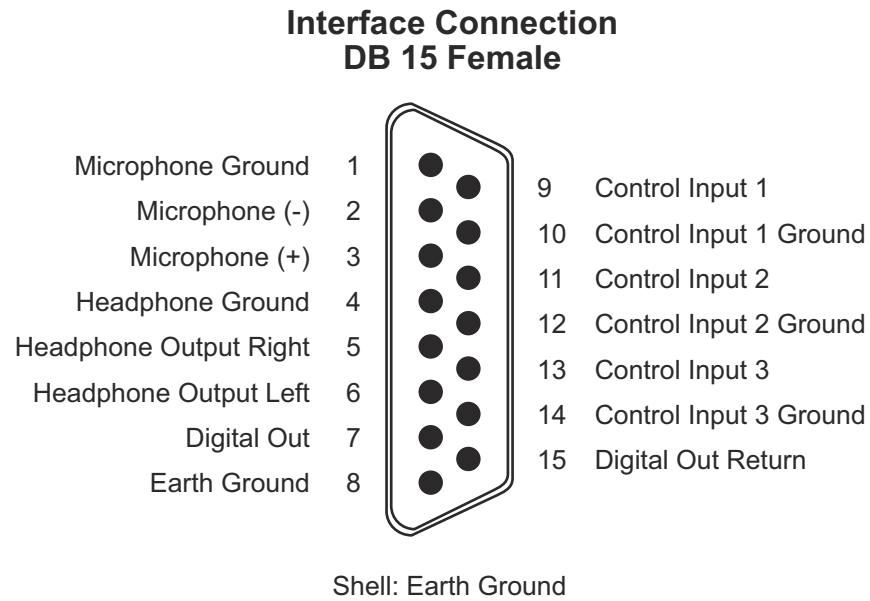


Figure 9: DB-15 Connector Pinout Diagram

ACENet Connection

The ACU2 connects to the ACENet network via an ACENet port on the back panel of the ACU2 using a Category 5e or better cable.



Caution: Customer made cables are the number one reason for product failure. ASTi recommends using manufactured Category 5e cables.

Maximum Cable Length to ACENet Switch	
ACU2	100 meters (328 feet)
Target	100 meters (328 feet)

Direct connection from the ACU2 to the Target is supported and requires a cross over cable.

The ACENet network supports mixing the ACU2, ACU and ACE-RIU on the same switch. All ASTi ACENet devices can interact on the same ACENet network. All ACENet devices on the network must have the same firmware version.

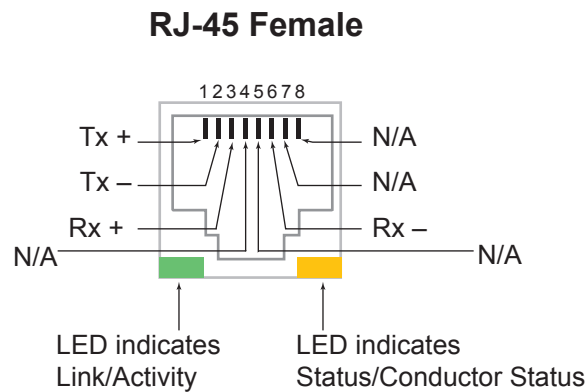


Figure 10: RJ-45 Pinout Diagram

ACENet Indicator Lights

The ACENet LED indicator lights display the port status.

LED Light		Status
Green (left)	Solid	A solid light indicates a network link.
	Flashing	A flashing light indicates network activity.
Amber (right)	Solid/ Flashing	One ACENet device per network will function as the ACENet master, and will be identified with a flashing amber light. All other ACENet devices should report a solid amber light.

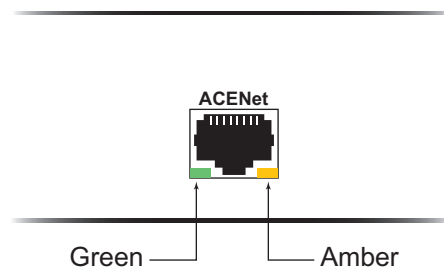


Figure 11: ACENet Port LED Lights

Status Indicator Lights

The ACU2 LED indicator lights display ACU2 status.

LED Light	Status
Red (top)	A solid red light indicates internal board failure.
Solid Green (bottom)	A solid green light indicates the ACU2 started up properly but the ACENet connection cannot be found.
Flashing Green (bottom)	A flashing green light indicates normal operation.

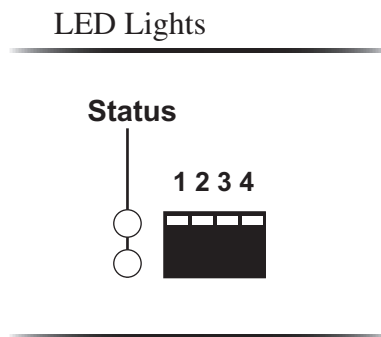


Figure 12: ACU2 Status LED Lights

4.0. Audio Input and Audio Output

Audio Input

Characteristic	Value
Input Impedance	4.6 k
Input Level	3.25 V _{pp} max. (6.5V _{pp} differential)
Input Gain	-8dB, +2dB to +57dB, software configurable (see Note 1)
Microphone Power	+12.5 VDC, software enabled
Frequency Response	20 Hz to 20 kHz, +/-1.5dB

Note 1: The ACU2 gain covers a total gain range of 65dB, with the range +2dB to +57dB being settable in 1dB steps, with -8dB being available for input signals of greater than line-level. The range -8dB to +2dB CANNOT be selected as a function of design.

WARNING! Do not plug a microphone requiring phantom power into an ACU2 device, this will cause damage to the microphone! If you are unsure of the difference between mic-power and phantom power, please contact the microphone manufacturer or ASTi before connecting equipment. Note: Most military headsets use mic-power.

Electret Microphones

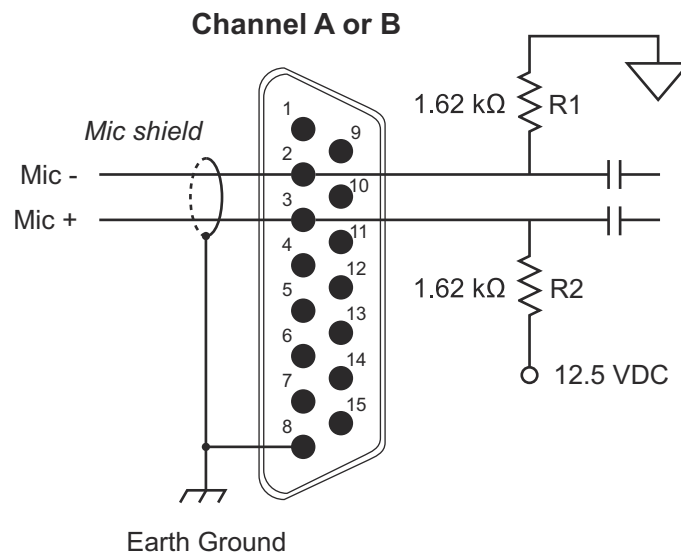


Figure 13: Mic-Power Circuit for Electret Microphones

Note: R1 and R2 connections are only active when power mode is enabled in the software.

Mic-power is selectable in software (see warning above). Input may be selected between line mode and microphone mode in software.

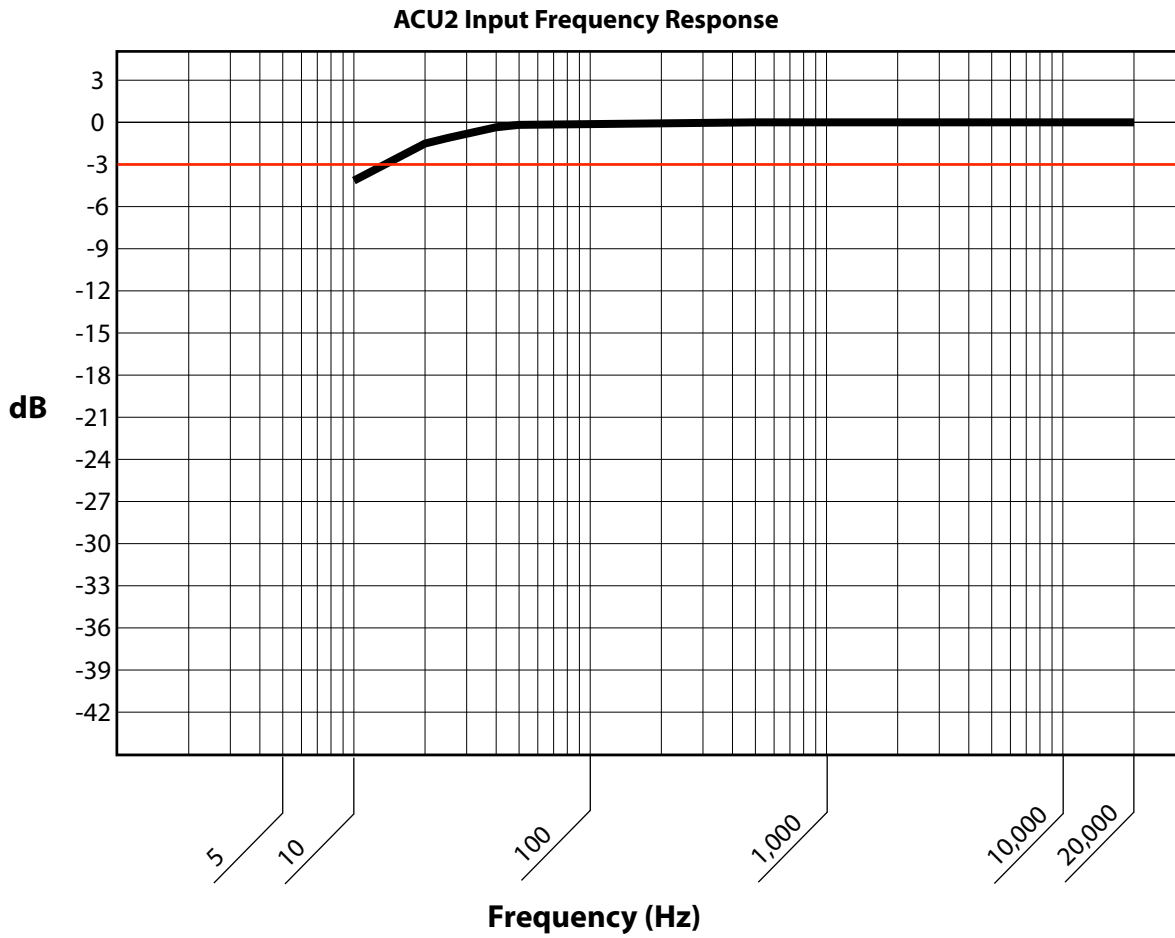


Figure 14: Input Frequency Response

Audio Output

Characteristic	Value
Output Impedance	10 Ohms
Output Current	0.201 A at 8 Ohms
Output Gain	-25dB to + 10dB
Output Level	1.61 VAC runs 8 Ohms
Output Power	0.32 W at 8 Ohms
Frequency Response	20 Hz to 20 kHz
Max. Output Signal	10 Vpp

Audio Isolation Characteristics

Between	Isolation	Frequency
Ch.1 Left to Ch.1 Right output channels	-81dB at +4dBu	20 Hz to 20 kHz
Ch.1 to Ch.2 output channels	-77 dB at +4dBu	20 Hz to 20 kHz
Ch.1 output to Ch.1 input	> -100 dB at +4dBu	20 Hz to 20 kHz
Ch.1 output to Ch.2 input	> -100 dB at +4dBu	20 Hz to 20 kHz
Ch.1 input to Ch.2 input	> -100 dB at +4dBu	20 Hz to 20 kHz

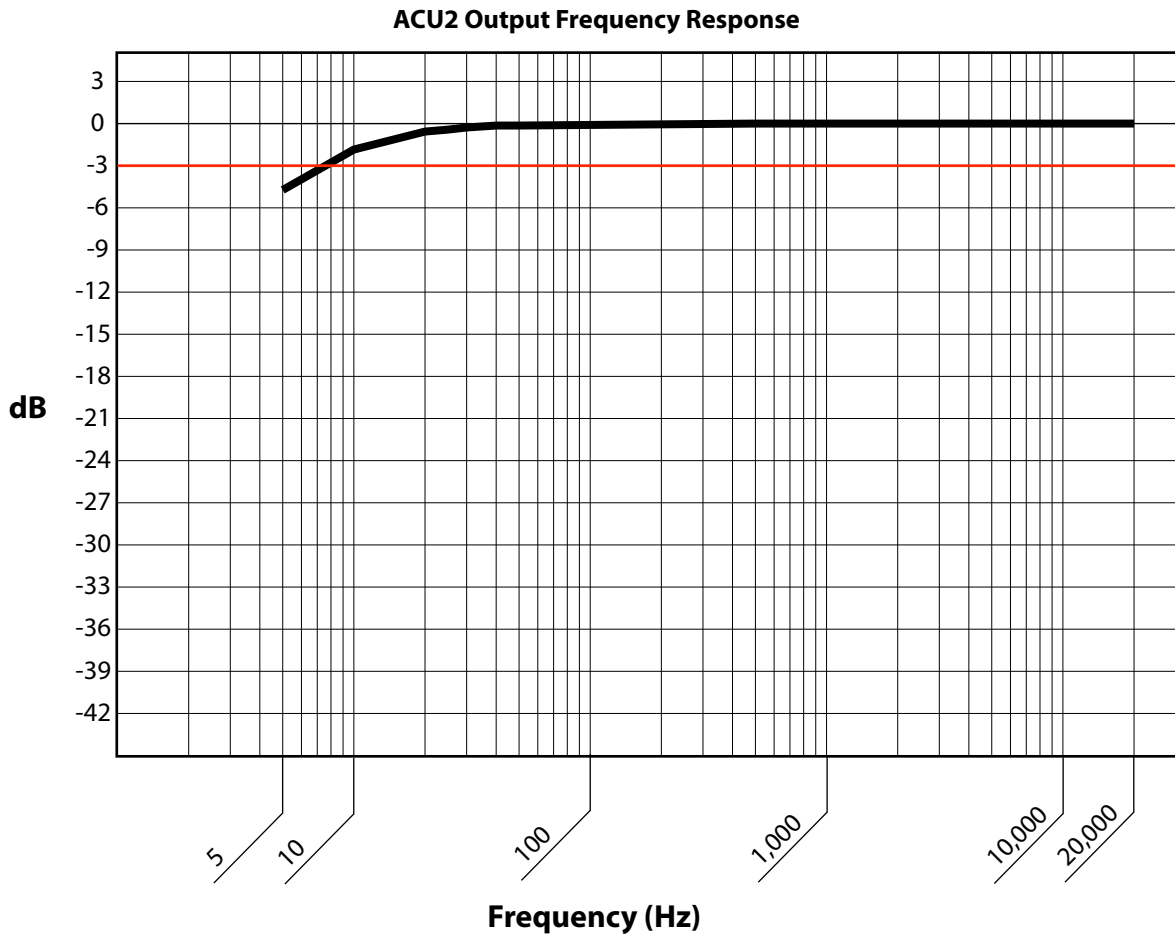


Figure 15: Output Frequency Response

5.0. Control Input and Digital Output

Control Input

The control inputs are contact sensing; no voltage is required. Simply connect the control input and control input ground lines together using a switch or other suitable device, such as a press-to-talk (PTT) device. The control input can logically function in one of two ways. The first is as a digital input and the second is as an analog input. In both cases, the ACU2 component in the model will be able to read the control input value and use this value as required for the application.

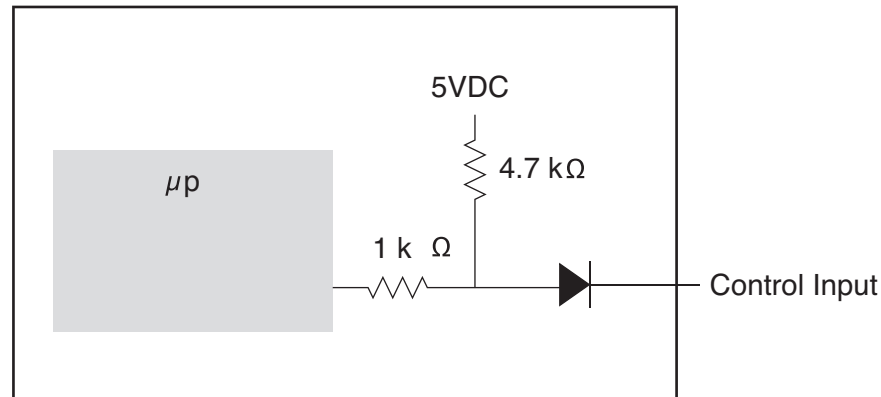


Figure 16: Control Input Circuitry

Control Input used as a Digital Input

To use the Control Input as a Digital Input simply short or open the required pins. For example, if you short pins 9 and 10 Control Input 1 will be True. If the pins are open Control Input 1 will be False. In this example the control input acts like an on/off switch.

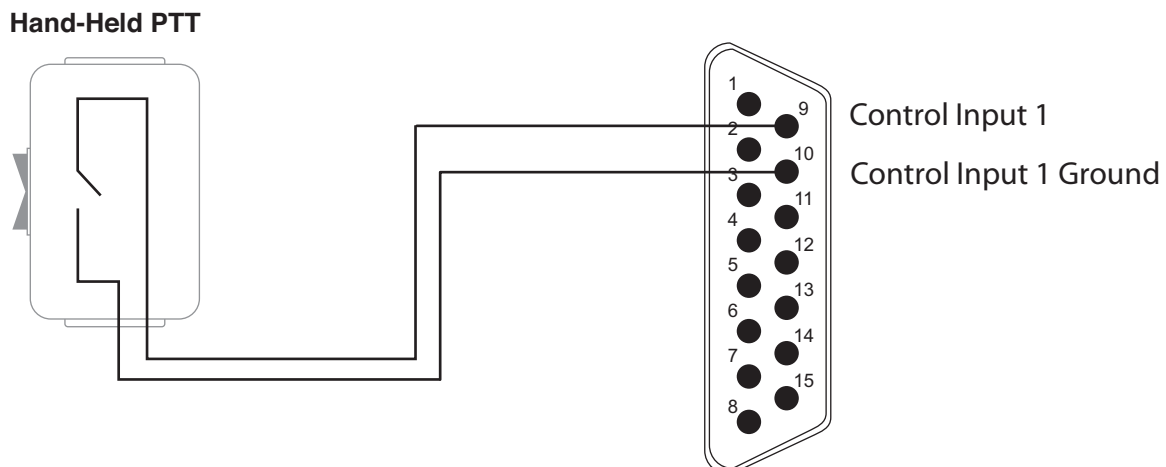


Figure 17: Digital Input Example

Control Input used as a Analog Input

The control input can be used as an analog input by inserting a resistance between the control input and control input ground pins. With this configuration the ACU2 component in the model will map the voltage to an uint8 value that can be used in modeling your application. The 4-channel selector knob, for example, contains a switch that is used to change the resistance between the control input and control input ground pins. The uint8 number read in the ACU2 software component will vary by a given percentage based on the tolerances of all of the components involved.

4-channel selector knob

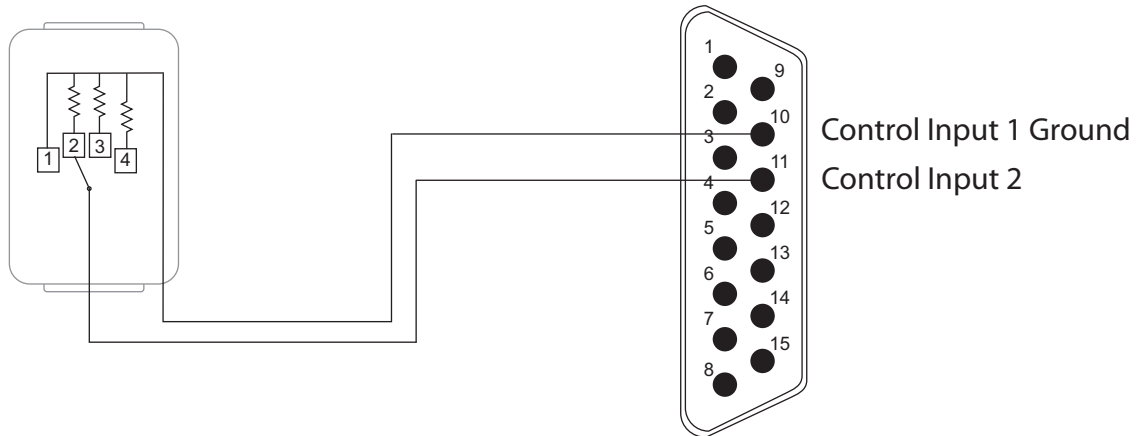


Figure 18: Control Input used as an Analog Input

Digital Output

The digital output circuitry consists of an opto-isolated, solid-state relay for switching power to external loads.

Type	Opto-isolated FET
Maximum Continuous Current Rating	120 mA
Maximum Power Dissipation	180 mW
Maximum Frequency Responses	500 Hz

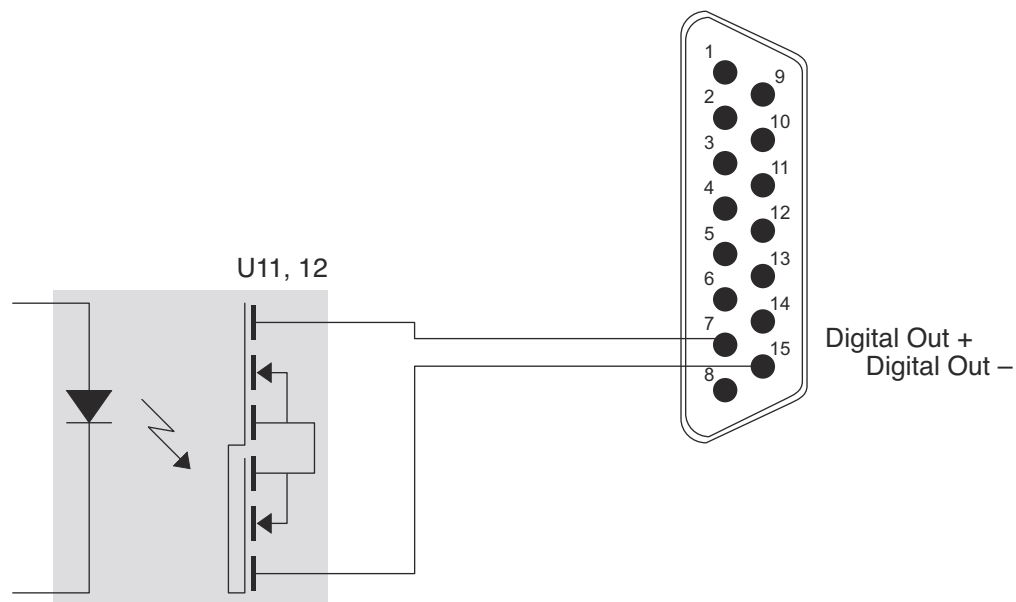
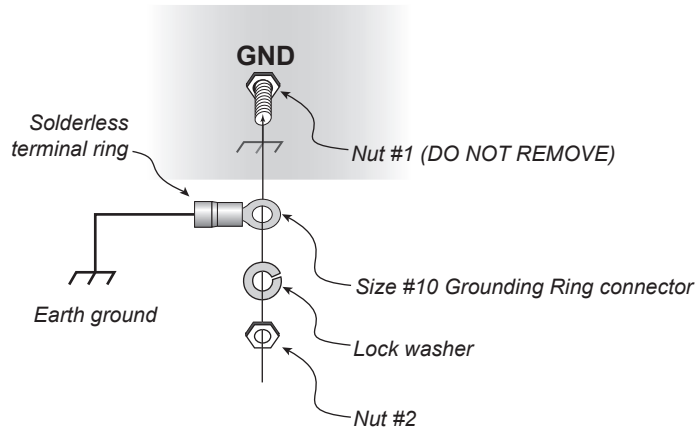


Figure 19: Digital Output Circuitry

6.0. Additional Information

Grounding

Connect earth ground to the rear panel of the ACU2. Earth ground should be as short as possible.



Note: Do not remove bolt #1 from the screw, removal will cause the screw to fall inside the ACU2 chassis.

1. Remove bolt #2.
2. Slip ring connector onto the threaded end of jackscrew.
3. Insert bolt #2 onto the threaded end of jackscrew. **Caution:** Do not cross-thread or over-tighten bolt when reattaching.
4. The ground wire attached to the ring connector should be as short as possible.

Proper grounding and shielding are the keys to keeping unwanted signals separate from intended signals. The two most important factors of good shielding are conductivity and continuity/connectivity. By following a few basic guidelines, electro-mechanical (EMI) and radio frequency (RFI) interference can be minimized, especially over longer cable runs.

Conductivity of a shield is characterized by its ability to transfer signals which have been induced upon it. High conductivity, as found with copper shielding, allows for good transfer of unwanted signals to ground.

The second characteristic of good shielding is continuity/connectivity. In order to perform properly, a shield must completely enclose the signal carrying conductors. Compromises to the structural integrity of a shield can lead to holes or breaks which will allow interfering signals to reach the main conductors. Connectivity is also related to continuity; a cable's shield must make good contact with the chassis of the terminating equipment. A shield must make one continuous connection across all equipment and cables in order to provide a pathway to ground.

The D-Sub connectors on ASTi interface electronics have a dedicated pin, which is directly tied to the chassis ground. Cable connections (to headphones, power amplifiers, etc.) should have their shields tied directly to the chassis ground pin. By doing this, any extraneous signal, EMI and RFI, will be properly shunted to the ground.

Memory Devices

The ACU2 memory devices are summarized in the table below.

Volatile	
MCU Internal SRAM	69kb
Non-Volatile	
MCU Internal	256kb
Flash	8 Mb

Temperature & Humidity Ranges

The ACU2 temperature and humidity ranges are summarized in the table below.

Type of Range	Suggested Range
Operating Temperature Range	+10°C to +32°C (50°F to 90°F)
Operating Max. Temperature Gradient	20°C (68°F) per hour
Operating Humidity Range	10% to 70% non-condensing
Storage Temperature Range	0°C to 55°C (32°F to 135°F)
Storage Max. Temperature Gradient	30°C (86°F) per hour
Storage Humidity Range	5% to 95%

Reliability

The ACU2 is designed to use the minimal complexity of electronic hardware, using the highest quality components.

Typical System Mean Time Between Failure (MTBF)	
COTS	108,100.75 hours
MIL	48,390.23 hours

Mic-Power and Preamp

Please see the Telestra 4 Remote Management System 4 User Guide (DOC-01-TEL4-RMS4-UG-4) for instructions on setting the mic-power and preamp.

Dip Switch Positions

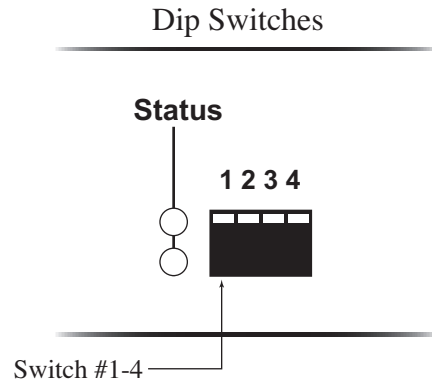


Figure 20: Dip Switches

Position	Outcome Result
<p>1 2 3 4</p>	Use for normal operation, this is the default position.
<p>1 2 3 4</p>	One down allows for firmware updates.

Updating the Firmware

Please see the Telestra 4 Remote Management System 4 User Guide (DOC-01-TEL4-RMS4-UG-4) for instructions on updating ACU2 firmware.

7.0. Typical Headset Settings

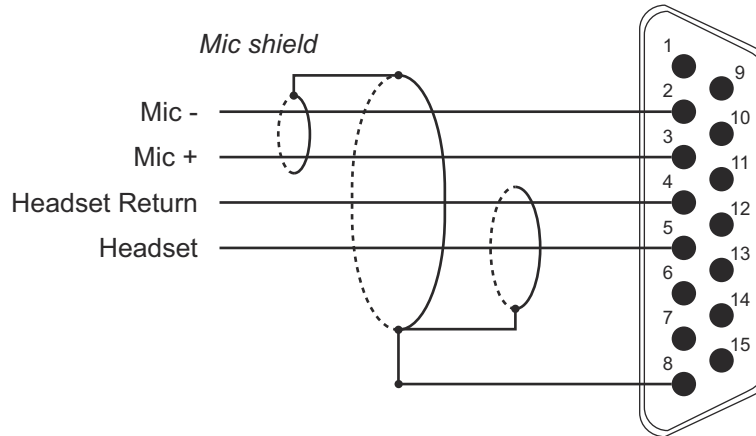


Figure 21: Typical Mono Headset Connection

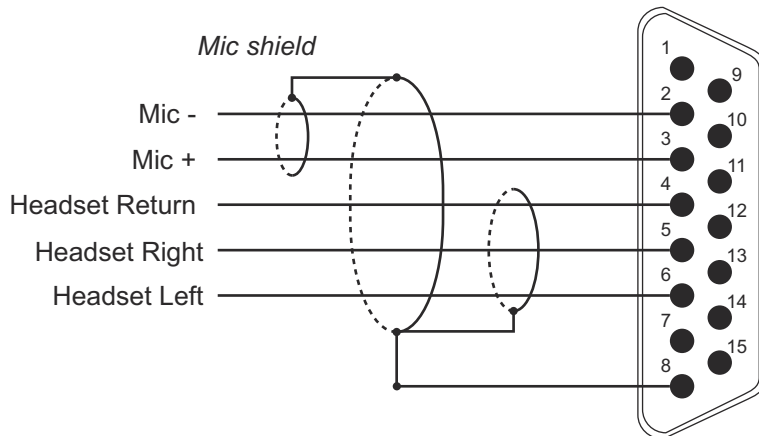


Figure 22: Typical Stereo Headset Connection

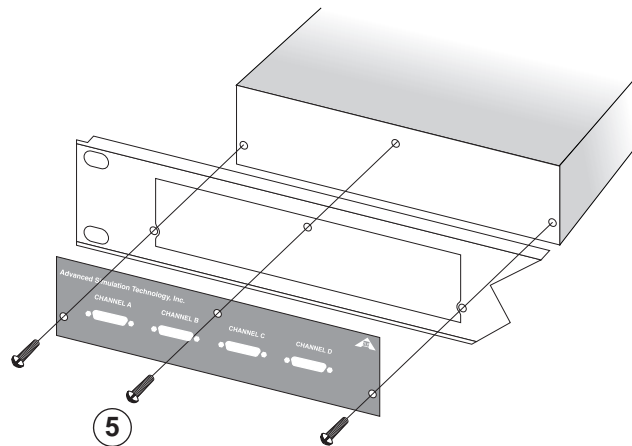
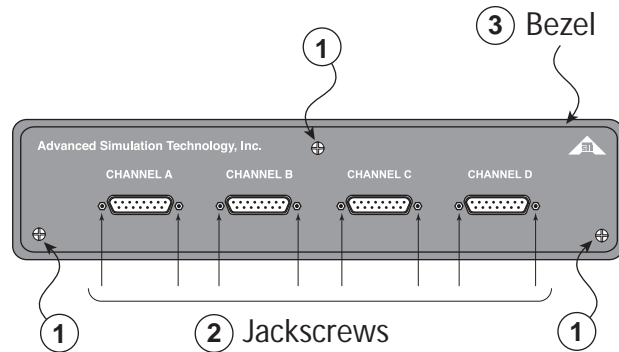
8.0. Rackmounting ACU2s

ACU2s may be rackmounted in a 1U high, 19" wide bracket. The bracket will accommodate two ACU2 devices.

Installing Rackmount Bracket

The following instructions are for mounting the ACU2 to the rackmount panel.

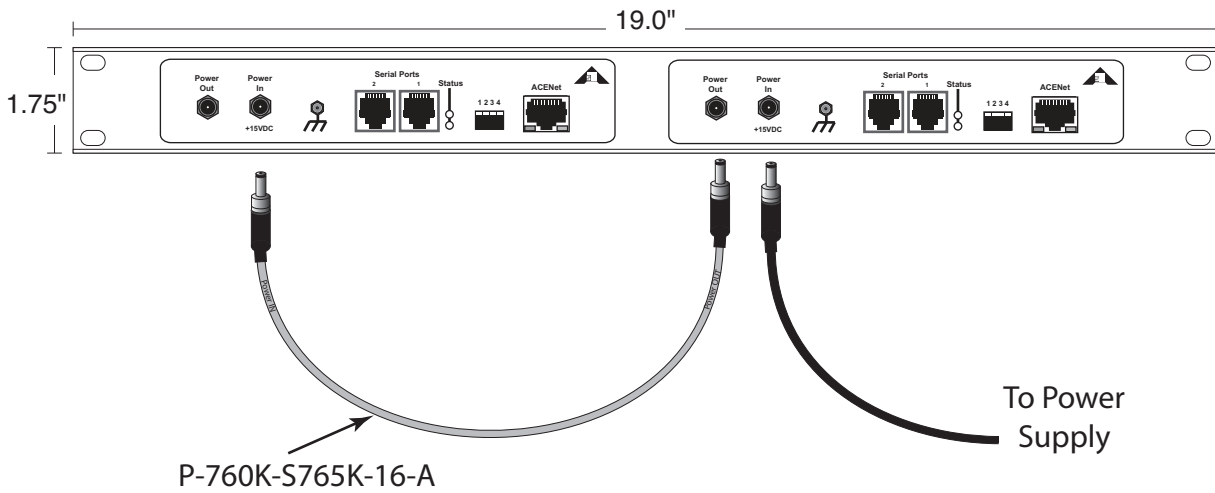
1. On the front of the ACU2, remove the two bottom corner screws and the top middle screw.
2. On each connector (4 total), use a nut driver (3/16 inch) to remove the two jackscrews from each side.
3. Remove the faceplate with the white lettering and the bezel. Save the bezel for when you remove the ACU2 from the rackmount.
4. Place the ACU2 into the backside of the rackmount. The rackmount goes in place of the bezel.
5. Place the faceplate on the front side of the rackmount. Install the three black screws, starting with the top middle screw first to line it up properly.
6. Then install the jackscrews on each side of the connector.



Power Daisy Chain

A power daisy chain connection allows operation of two rackmounted ACU2 units from a single power supply. Daisy chaining ACU2 power requires a different power supply. The required power supply is model number TR7 A15 from CINCON Electronic Co. LTD. Contact ASTi for details. The daisy chain cable (P-760K-S765K-16-A) is included with the upgraded power supply.

Power Daisy Chain Connections	
Power In Connector (Black)	Switchcraft 760K
Power Out Connector (Red)	Switchcraft S765K



9.0. Warranty Information

The equipment is warranted for a period of one (1) year following purchase. 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 (703) 471-2104.

Repairs and Returns

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

1. Request an RMA number through the form on the ASTi web site: <http://www.asti-usa.com/support/>

The receiving department at ASTi will not receive a repair without an RMA number.

2. When packaging the equipment in question, make sure it is well protected. ALWAYS DOUBLE BOX the equipment. The inner container should employ some semi-rigid, contour-fitting foam, while the exterior container should use a more pliant, shock-absorbing material such as styrofoam peanuts. The device should be properly enclosed in an anti-static bag to prevent possible ESD damage. Failure to properly package the equipment during shipping could void the warranty.
3. Do not send accessory pieces such as rackmount kits, power supplies or software. Only include items that do not work.
4. The shipping label must include the RMA number.
5. Include a description of the problem including the serial number for the unit in question. Include point of contact information including name, telephone number, and equipment return address. Failure to include this information could extensively delay the return of the equipment.
6. Evaluation of equipment is performed free of charge. No work will be done without prior customer approval.
7. Customer is responsible for shipping charges to ASTi for warranty and non-warranty repairs.
8. 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, including return shipping. Customer is responsible for return shipping charges on non-warranty equipment.
9. Equipment still under warranty will be shipped back via Federal Express, unless otherwise directed. ASTi is responsible for return shipping charges on domestic items under warranty.
10. If equipment is not received by ASTi within thirty (30) days of the RMA number issuing date, the request data and number issued will be closed and designated as unused.

11. Any items received from customers without RMA numbers or appropriate contact information included with shipment will not be tested. After sixty (60) days, ASTi reserves the right to scrap all hardware received in this condition.
12. **International customers** must include the correct product value on all shipping documents. Contact ASTi for proper harmonized tariff codes. The customer is responsible for duties, taxes and fees incurred in shipment of the equipment.