

SHOT OVER | GEAR-750 ARS-750



GEAR 750 / ARS 750 INSTALLATION MANUAL

**SHOT
OVER**
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All information depicted in this manual, including hardware and software names, versions, and part numbers, is subject to change and may not be up to date.

About This Manual

This manual provides instructions for installing SHOTOVER Systems GEAR-750 / ARS-750 and covers the physical, mechanical, and electrical components of the ATOM 2 mission computer. Every effort has been made to ensure completeness and accuracy of this document.

The following symbols for warnings, cautions, and notes are used throughout this manual.



Warning

The warning symbol indicates that if the approved procedure is not followed, there is a potential hazard that could result in injury to personnel or damage to equipment.



Caution

The caution symbol indicates that failure to follow the instructions could result in equipment damage or a reduction in mission capability.



Note

The note symbol is used to identify essential information for installers / operators. While not directly related to safety or protection of equipment from damage, the note symbol identifies information to which attention should be paid during the installation and/or operation of the equipment.



Product Guarantee & Warranty Information

For details about the SHOTOVER Systems warranty, please contact SHOTOVER Systems support - support@shotover.com.



This document contains information that was current as of the printing of this manual. To obtain always up-to-date installation drawings, ICDs, and much more, visit: shotover.com/specifications.

Section 1: Background

Description

GEAR-750 / ARS-750 is the next-generation mission platform developed by SHOTOVER Systems. At the core of the GEAR-750 / ARS-750 platform is the ATOM 2 mission computer. The ATOM 2 provides the hardware optimized to run SHOTOVER Systems' Augmented Reality Mapping software (ARS or GEAR) and to deliver high quality, digital video recording. The GEAR-750 / ARS-750 can interface with a wide variety of external mission equipment, data feeds, and video sources providing an incredibly powerful, yet compact mission solution.

Components

ATOM 2 Mission Computer

The GEAR-750 / ARS-750 platform is based on the ATOM 2 mission computer, which combines a compact, lightweight design and the latest graphics processor for maximum computing power and the lowest latency AR available. Designed for durability, the ATOM 2 mission computer is optimized to run the next generation of SHOTOVER Systems' Augmented Reality Mapping Software (ARS) and the Gimbal Earthscape Augmented Reality Mapping Software (GEAR). It offers a wide range of interface options, HD recording capabilities, and support for 4K output.



ATOM 2 Mission Computer

Installation Components & Connectors

Each GEAR-750 / ARS-750 will ship with the connectors necessary for proper installation. This includes connectors for Ethernet, power, and serial connections.



Technical Characteristics & Specifications

Specification	Characteristic
Product Designation/Description	SHOTOVER Systems GEAR-750 / ARS-750 with ATOM 2 Mission Computer
Physical Dimensions	7.25" L x 5.75" W x 1.875" H (184.2 mm x 146.1 mm x 47.6 mm)
Weight	2.75 Lbs. (1.25 Kg) with +/- .05 LBS [0.02 kg]
Environmental Qualifications	DO-160 Qualified
Operating Temperature Range	-20°C to +70°C
Maximum Operating Altitude	+45,000 feet [+13,716m]
Power	
Input Voltage	28VDC (normal operating range: 18 - 30VDC)
Input Current	2.3A on 28VDC
Power Consumption	AVERAGE POWER DRAW IS 59 WATTS (2.1A ON 28VDC) MAXIMUM POWER DRAW IS 95 WATTS (3.4A ON 28VDC)
Circuit Breaker Requirement	Recommended 5.0A rated
Connection Types, Protocols, and Standards	LEMO (1x) J1 – Power LEMO (1x) J2 – Ethernet LEMO (1x) J4 – Serial COM port BNC (1x) J5 – BNC HD-SDI (secondary video out) BNC J6, J7 – HD-SDI 1 & HD-SDI 2 (video in) BNC J8, J9 – HD-SDI 1 & HD-SDI 2 (video out)
Video-in Support	SDI Input (x2) - up to 1080p (60 fps)
Video-out Support	SDI Out #1 (mirrored x2) - up to 4K (60 fps) SDI Out #2 (x1) - up to 1080p (30 fps)
Video-out Supported Resolutions	720p (50 fps) 720p (60 fps) 1080p (25 fps) 1080p (30 fps) 1080i (50 fps) 1080i (60 fps) 1080p (60 fps) 4k (60 fps) 20p (59.94 fps) 1080p (29.97 fps) 1080p (59.94 fps) 1080i (59.94 fps) 4K (25 fps) 4K (30 fps)
Metadata Standard	KLVS MISB/STANAG 4609 compliant
Video Codecs	H.264 (MPEG-4 AVC) H.262 (MPEG-2)

ATOM 2 Front Panel Features

The front connections and features of the ATOM 2 are described below.



- 1 USB 3.2 (charging capable)
- 2 USB 3.2 (charging capable)
- 3 USB 2.0

ATOM 2 Rear Panel Features

The rear connections and features of the ATOM 2 are described below.



- 1 J1: POWER/GPIO
- 2 J2: ETHERNET
- 3 J3: CHASSIS GROUND
- 4 J4: Serial Communications (USB, PS/2, RS232, RS422, Audio IN/OUT)
- 5 J5: HD-SDI VIDEO 2 OUT
- 6 J6: 3G-SDI VIDEO 1 IN
- 7 J7: 3G-SDI VIDEO 2 IN
- 8 J8: 12G-SDI VIDEO 1 OUT*
- 9 J9: 12G-SDI VIDEO 1 OUT*

**Primary video output, cloned*

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Section 2: Installation Guidelines

Description

This section contains information and instructions for the unpacking and correct installation of the SHOTOVER Systems' GEAR-750 / ARS-750 hardware.

Equipment Packaging

Prior to installation, carefully inspect all supplied hardware. Note any damage that may have occurred in transit and contact the parcel carrier if necessary to file a claim. If possible, retain the original packaging to ease in the claim or return process.

Check that all items listed below are present prior to proceeding with the installation. Report any missing items to your supplier.

- (1) ATOM 2 Mission Computer
- (1) GEAR-750 / ARS-750 Connector Kit
- Product manuals and guides



To ensure adequate airflow to the unit, SHOTOVER Systems recommends a minimum of 4 inches / 100mm between the back of the ATOM 2 and any adjacent surface.

Installation Location Considerations

The ATOM 2 is intended for DZUS mount (or similar) installations. If you are unsure of the installation location, please contact SHOTOVER Systems. If possible, GEAR-750 / ARS-750 mission equipment, displays, and the camera gimbal should be installed on a mission bus separate from avionics and/or master power.

Remote Support

As part of its installation procedures, SHOTOVER Systems typically conducts a remote verification process aimed at identifying any wiring-related anomalies. In order to facilitate remote assistance, a USB Wi-Fi adapter is included in the connector kit. Upon successful completion of the installation, it is advised that the Wi-Fi adapter be transferred to the end user to enable further remote support as required.

GEAR-750 / ARS-750 Connector Kit

Each GEAR-750 / ARS-750 includes a Connector Kit. This kit contains all recommended connectors needed for installation. Additional connectors are available for purchase from SHOTOVER Systems or direct from the manufacturers.

The connector kit includes the following:

SHOTOVER P/N	Manufacturer P/N	Description	Qty
US001-0002	LEMO FGN.1M.308.XLCM	PLUG, STRAIGHT, 1M, 8 MALE, BLU, SHELL THRD	1
	Amphenol M85049/38-9N	BACKSHELL, STRAIN RELIEF CLAMP, STRAIGHT, SZ 9, NICKEL	1
US001-0007	LEMO FGU.1M.308.XLCM	PLUG, STRAIGHT, 1M, 8 MALE, GRN, SHELL THRD	1
	Amphenol M85049/38-9N	BACKSHELL, STRAIN RELIEF CLAMP, STRAIGHT, SZ 9, NICKEL	1
US001-0004	LEMO FGN.3M.330.XLCM	PLUG, STRAIGHT, 3M, 30 MALE, BLU, SHELL THRD	1
	Amphenol M85049/38-13N	BACKSHELL, STRAIN RELIEF CLAMP, STRAIGHT, SZ 13, NICKEL	1
US002-6192	PICWire P/N 190712	CONN, BNC, PLUG, STRAIGHT, 75 OHM (V73263)	5
US002-6121	Amphenol 112123	CONN, BNC, PLUG, STRAIGHT, 75 OHM (RG-59)	5
US002-6122	Amphenol 112133	CONN, BNC, PLUG, STRAIGHT, 75 OHM (RG-179)	5
US002-6001	Extron 101-020-01	BRACKET, CABLE LACING	3
HW-SCREW-S-0440-0188-SS-000RH-HE	McMaster-Carr 92949A105	SCREW, 4-40 X 3/16", SS 18-8, ROUND HEAD	2
US002-6015	TE Connectivity 34104	RING TERMINAL, #4 STUD, 16-22 AWG, CRIMP	1
HW-NUT-S-0440-0063-0188-SS	McMaster-Carr 90730A005	NUT, 4-40, 1/16", 3/16" HEX, SS 18-8	1
002-63490	USB433WACDB	ADAPTER, NETWORK, WIFI, DUAL BAND, USB 2.0	1

Required Tools *(Check with SHOTOVER Systems for availability)*

You will need the correct crimping tool for the connectors selected. A few examples are listed below and are available from SHOTOVER Systems or from their respective manufacturers.

SHOTOVER P/N	Manufacturer P/N	Description
US002-8004	Amphenol RF 47-10070	TOOL - CRIMPER, HAND, COAX, DIE SIZE 0.068/0.213/0.255
US002-8005	Amphenol RF 47-10150	TOOL - CRIMPER, HAND, COAX, DIE SIZE 0.068/0.128/0.178
US002-8006	DMC Tools M22520/5-01	TOOL - CRIMPER, HAND, CIRCULAR, M22520/5-01
US002-8007	DMC Tools M22520/5-41	TOOL - DIE, M22520/5-41
US002-8008	LEMO DPC.91.701.V*	TOOL - CRIMPER, HAND, CIRCULAR, LEMO DPC.91.101.A
US002-8009	LEMO DCE.91.070.5MVC	TOOL - POSITIONER, CIRCULAR, LEMO DCE.91.070.5MVC
US002-8010	LEMO DCF.93.070.4LT*	TOOL - CRIMPER, HAND, CIRCULAR, LEMO DPC.91.701.V*

**Or alternate*

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Voltage Requirements

The ATOM 2 operates on 28-volt DC power and consumes a maximum of 95 watts (3.4 amps on 28VDC). However, the hardware will remain operable with voltages ranging from 18-30VDC. SHOTOVER Systems recommends using 28VDC with a minimum 5.0A circuit breaker.

Ground Considerations

The ATOM 2 is case grounded through the mounting rails and a 4-40 UNC ground stud on rear of case. Use a minimum of 16 gauge wire to ground the mission computer to aircraft chassis ground prior to operation. Exposed aluminum is chromated. Do not chemically coat or cover with any non-conductive material. All ground pins except 28V return are ground continuous to case.



Failure to properly ground the units may result in damage to the hardware or other installed electrical components.

Temperature Considerations

Ambient air where ATOM 2 is installed should never exceed 70° C. Ample room is required in front and rear of ATOM 2 for proper airflow. If enclosed, space around ATOM 2 shall be actively ventilated or have sufficient space to cool average power listed above.

Service Loop

Install all cables with at least an 8 inch [203 mm] service loop to allow for easy removal for servicing.

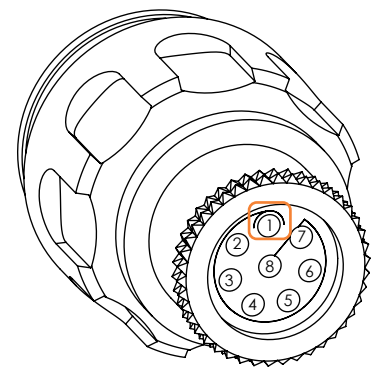
Section 3: Cabling & Connectors

Description

The cabling descriptions included in this section are highly recommended. Any variation will be at the sole responsibility of the installer. Detailed installation diagrams are provided in this manual and are available at shotover.com/specifications/.

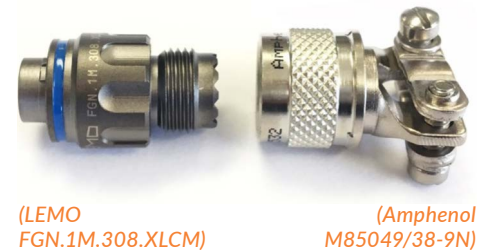


When populating LEMO connectors, please follow the pattern on the rear of the male LEMO. On most connectors, the number 1 pin will be identified by a semi-circular shape around the pin as shown to the right.

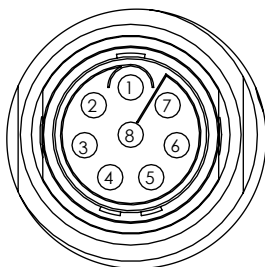


J1: Power

Install the J1 Power connector using the parts supplied in the connector kit, SHOTOVER Systems p/n US001-0002. The Amphenol strain relief connector backshell should be installed on the corresponding cable **before** installing the LEMO connector. The connection to 28VDC input and 28VDC GND is highly recommended to be a twisted pair. Use of 22 AWG wire size is also recommended.



Power Pinout



Pin	Function
1	No Contact
2	No Contact
3	No Contact
4	No Contact
5	28V (+)
6	28V GND (-)
7	28V (+)
8	28V GND (-)

Power Connector Backshell

SHOTOVER Systems recommends using the supplied Amphenol strain relief connector backshell **for all installations**. Always install this connector before the LEMO connector.

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J2: Ethernet

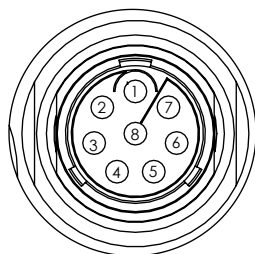
Camera gimbal position data connectivity requires either J2 Ethernet connection or J4 Serial COM connection. Please contact your gimbal manufacturer if you are unsure which is the preferred method for your setup. Install the J2 Ethernet connector using the parts supplied in the connector kit, SHOTOVER Systems p/n US001-0007. SHOTOVER Systems recommends using either Pic Wire & Cable PIC E50824 or EMTEQ D100-0824-006 4-pair Ethernet cable. Either can be purchased directly from their respective manufacturers at <http://www.picwire.com> or <http://www.emteq.com>.



(LEMO FGU.1M.308.XLCM)

(Amphenol M85049/38-9N)

Ethernet Pinout



Pin	Function	Wire Color
1	Bi_DA-/TX-	Orange
2	Bi_DA+/TX+	Orange/White
3	Bi_DB-/RX-	Green
4	Bi_DB+/RX+	Green/White
5	Bi_DD-	Brown
6	Bi_DD+	Brown/White
7	Bi_DC+	Blue
8	Bi_DC-	Blue/White

Ethernet Backshell

SHOTOVER Systems recommends using the supplied Amphenol backshell strain relief connector **for all installations**. Always install this connector before the LEMO connector.

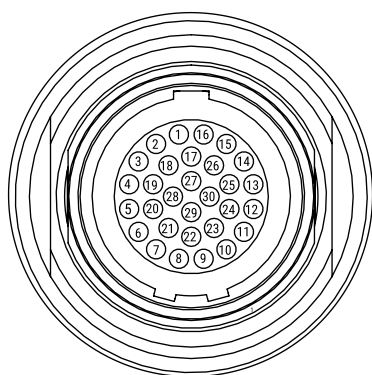
J4: COM

Install the J4 COM connector using the parts supplied in the connector kit, SHOTOVER Systems p/n US001-0004.



(LEMO FGN.3M.330.XLCM) (Amphenol M85049/38-13N)

COM Pinout



Pin	Function	Pin	Function
1	AUDIO IN CH 2 LO/GROUND	16	AUDIO IN CH 2 HI
2	USB D-	17	AUDIO IN CH 1 HI**
3	USB D+	18	AUDIO OUT HI
4	USB 5V	19	GROUND (USB)
5	PS/2 5V	20	PS/2 DATA MOUSE
6	PS/2 CLOCK MOUSE	21	GROUND (PS/2)
7	PS/2 DATA KEYBOARD	22	GROUND (232A)
8	PS/2 CLOCK KEYBOARD	23	RS232C TX
9	RS232A TX	24	RS232B RX
10	RS232A RX	25	RS422 TX-*
11	RS232C RX	26	GROUND (422)
12	RS232B TX	27	AUDIO IN CH 1 LO/GROUND**
13	RS422 TX+*	28	AUDIO OUT GROUND
14	RS422 RX -*	29	GROUND (232C)
15	RS422 RX +*	30	GROUND (232B)

* Twisted pair required.
Pair RS422 TX+ with TX-, and RS422 RX+ with RX-

** Use CH 1 for single channel audio.

COM Backshell

SHOTOVER Systems recommends using the supplied Amphenol backshell strain relief connector **for all installations**. Always install this connector before the LEMO connector.

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USB

For USB applications using J4 COM, SHOTOVER Systems recommends the following:

Option A: Carlisle 1031-215A-22

<https://www.carlisleit.com/prod-info/usb-cable-offerings/>

Option B: Gore RCN8800-22D-22P-H

<https://www.gore.com/system/files/2021-11/ACS-0454-R1-DAT-US-MAY21.pdf>



USB performance cannot be guaranteed at cable lengths greater than 6ft (1.83m). Contact SHOTOVER Systems for additional information.



PS/2

Installers can connect peripherals that use the PS/2 communications protocol to the ATOM 2. This provides the recommended interface to the ATOM 2 and accepts a wide variety of aviation-specific and consumer-grade keyboards. Keyboards sold by SHOTOVER Systems use this protocol. Multiple keyboards/mice are not possible with PS/2, use USB for additional keyboards beyond the first one. USB will have much shorter cable range (6 ft max).

Audio

The ATOM 2 audio can accept a wide range of signal impedance. Behind the ATOM 2 cover, there are physical knobs to adjust the levels. The gain can be adjusted from -22 to 22 db, with the default being 2 db gain. For unbalanced audio wire, connect the gnd/common into the corresponding “low” pin on the ATOM 2. For balanced audio wire, connect both hi and lo.

Single audio channel recording

Wire into the Channel 1 (Right) pins (17, 27 on J4). Do NOT split a single audio wiring into both channels.

Dual audio channel recording

Wire into the Channel 1 and 2 separately with separate lows/grounds.

ATOM 2 can be configured to record stereo audio as two separate channels: ICS as channel 1 and aircraft radios as channel 2, for example. To do this, separate audio-in via J4 pin 16 and J4 pin 17.

Serial COM – RS232, RS422

J4 contains connection provisions for RS232 and RS422 serial communications. Twisted pairs should be used for RS422 TX+ / RS422 TX- and RS422 RX+ / RS422 RX-. Camera gimbal geospatial (positional) data connectivity requires either J2 Ethernet connection or J4 Serial COM connection. Please contact your gimbal manufacturer if you are unsure which is the preferred method for your setup.

The maximum speed for cable runs of less than 25 feet [7.62m] is 256 kbit/s for RS232 and 8 Mbit/s for RS422.



J6 & J7: HD-SDI Video In

ATOM 2 has two HD-SDI IN connections. When used with gyro-stabilized gimbals, HD-SDI video 1 (J6) is typically used for Video In Command (VIC) and HD-SDI video 2 (J7) is typically used for a hoist camera, etc. All BNC connectors use the center pin for the signal and the shell as the ground.

For nearly all applications, SHOTOVER Systems recommends using the PIC Wire PIC V73263 with 75Ω HD-SDI BNC Plug – SHOTOVER Systems p/n US002-6192 (manufacturer p/n 190712). This connector is available directly from SHOTOVER Systems or at <http://www.picwire.com>.

If an installation requires alternative cabling, please use the following:

Alternative A: RG59 can be used in place of PIC Wire PIC V73263. The proper connector is SHOTOVER Systems p/n US002-6121 (manufacturer p/n Amphenol Connex 112123). These are available from SHOTOVER Systems or <https://www.amphenolrf.com/112123.html>.

Alternative B: If RG179 is required by other equipment (ex. MX-10 gimbal), then for EMI purposes, DOUBLE high performance 360-degree EMC individual braid shielding must be done to RG179 cable from end to end. The proper connector is SHOTOVER Systems p/n US002-6122 (manufacturer p/n Amphenol Connex 112133), available from SHOTOVER Systems or <https://www.amphenolrf.com/112133.html>.



Routing SDI cables near avionics including the transponder, antennas, receivers, etc., may result in noise in the SDI line which will cause various issues on recording, downlink, and displays exhibited by dropouts, alarms, or freezes.

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J8 & J9: HD-SDI Video Out

J8 & J9 provide a primary video output and are clones of each other. Max resolution is 4K60.

J5: HD-SDI VIDEO 2 Out

J5 provides a secondary video output. Max resolution is 1080p30. This can be clone of J8 & J9 or an independent output.

For nearly all applications, SHOTOVER Systems recommends using the PIC Wire PIC V73263 with 75Ω HD-SDI BNC Plug — SHOTOVER Systems p/n US002-6192 (manufacturer p/n 190712). This connector is available directly from SHOTOVER Systems or at <http://www.picwire.com>.

If an installation requires alternative cabling, please use the following:

Alternative A: RG59 can be used in place of PIC Wire PIC V73263. The proper connector is SHOTOVER Systems p/n US002-6121 (manufacturer p/n Amphenol Connex 112123). These are available from SHOTOVER Systems or <https://www.amphenolrf.com/112123.html>.

Alternative B: If RG179 is required by other equipment (ex. MX-10 gimbal), then for EMI purposes, DOUBLE high performance 360-degree EMC individual braid shielding must be done to RG179 cable from end to end. The proper connector is SHOTOVER Systems p/n US002-6122 (manufacturer p/n Amphenol Connex 112133), available from SHOTOVER Systems or <https://www.amphenolrf.com/112133.html>.



Routing SDI cables near avionics including the transponder, antennas, receivers, etc., may result in noise in the SDI line which will cause various issues on recording, downlink, and displays exhibited by dropouts, alarms, or freezes.

Cabling Requirements and Best Practices

In order to ensure a properly working ATOM 2 system, these cabling requirements are highly recommended and any variations will be at the sole responsibility of the installer.

Power Cable

The connection to 28V input on the ATOM 2 and 28V GND are highly recommended to be spirally laid.

75 Ω HD-SDI COAX Cable

Option A: PicWire PIC V73263 is highly recommended for 3G-SDI and higher data rate signals (6G-SDI, 12G-SDI). The proper connector is PicWire P/N 190712 - SHOTOVER Systems p/n US002-6192.

<https://www.picwire.com/pic-cables/v73263/>.

Option B: RG59 is also recommended for 3G-SDI and higher data rate signals (6G-SDI, 12G-SDI). The proper connector is Amphenol Connex P/N 112123 - SHOTOVER Systems p/n US002-6121.

<https://www.amphenolrf.com/112123.html>.

Option C: If RG179 is required by other equipment (ex. MX-10 gimbal), then for EMI purposes, DOUBLE high performance 360 degree EMC individual braid shielding must be done to RG179 cable from end to end. The proper connector is Amphenol Connex P/N 112133 - SHOTOVER Systems p/n US002-6122.

<https://www.amphenolrf.com/112133.html>.

Crimping Tool

Correct crimping tools are needed for the connectors selected. A few examples are listed below. **Check with SHOTOVER Systems for availability.**

CONNECTOR	CONTACT PIN		FERRULE	
	Tool	Crimp	Tool	Crimp
PICWIRE 190712	M22520/2-01	SELECTOR #6	M22520/5-01	M22520/5-41 B HEX
AMPHENOL 112123	47-10070	HEX 0.068"	47-20000	HEX 0.255"
AMPHENOL 112133	47-10150	HEX 0.068"	47-20004	HEX 0.178"

ALL LEMO CONNECTORS

CRIMP TOOL	DPC.91.701.V
PIN POSITIONER	DCE.91.070.5MVC
PIN EXTRACTOR	DCF.93.070.4LT

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USB Cable

USB 2.0 cabling is sufficient for all ATOM 2 functions. USB performance cannot be guaranteed at cable lengths greater than 6ft. **Contact SHOTOVER Systems for further details.**

Option A: Carlisle 1031-215A-22

<https://www.carlisleit.com/prod-info/usb-cable-offerings/>

Option B: Gore RCN8800-22D-22P-H

<https://www.gore.com/system/files/2021-11/ACS-0454-R1-DAT-US-MAY21.pdf>

Ethernet Cable

Picwire PIC E50824 is highly recommended.

<https://www.picwire.com/pic-cables/e50824/>

EMTEQ D100-0824-006 is also highly recommended.

https://www.collinsaerospace.com/-/media/CA/product-assets/marketing/0-9/50-75-ohm-coaxial-cables/1_50-74-coaxial-cables/10_d100-0824-006_cat_6a_10_gbit_ethernet_cable_datasheet

All Other Cables

All other cable can be selected by installer and all cables **MUST BE SHIELDED**, including power cables.

Section 4: Aircraft Post-Installation Testing

Description

The following tests should be performed post-installation to confirm the correct operation of the ATOM 2 Mission System in airborne applications. Additionally, these tests will identify any interference that the ATOM 2 installation may cause with existing aircraft systems. If the installed system passes all applicable EMI tests, then no further action is required. If interference is observed, then the interference must be assessed against the appropriate standards of airworthiness for the system in question.

Methodology

Most EMI tests can be conducted on the ground unless otherwise noted. Testing recommendations for various aircraft system tests are provided below. During all tests, it is recommended that users switch the ATOM 2 unit on and off as often as required to evaluate potential EMI in all phases of ATOM 2 operation.

ADF	If possible, set the ADF to a nearby navigation station and monitor for interference.
Autopilot	If the aircraft is equipped with an autopilot or a stability augmentation system, test fly the aircraft and verify that operation of the ATOM 2 does not have adverse effects on these systems.
GPS	The GPS should be operational and navigating with at least the minimum compliment of satellites. Observe the GPS for any degradation in satellite status, loss of RAIM, or warning messages/flags.
Transponder / ADS-B	The transponder and encoder should be monitored with ramp test equipment. Set the output of the transponder test set to 3db above the output necessary to achieve 90% reply. Confirm no erroneous ADS-B messages and connectivity if using Bluetooth/Wi-Fi equipped ADS-B transponder.
VHF Comm Radio	The VHF comm radio should have the squelch open. Listen for any noise or detected audio signals on the VHF comm radio(s).
Navigation Radios	Operation of the Navigation radios (VOR/LOC/GS/DME receiver(s)) should be tested using known operational facilities. Listen for any noise or detected audio signals on the VOR/LOC/GS receiver audio; look for any moment of flags or needles on the VOR/LOC/GS navigation display(s).

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Power-on Checks

Prior to performing any other tests, the user should confirm the basic operation of the ATOM 2 unit. This can be conducted using ground power or in-air using aircraft power.

1. Power the ATOM 2 on with a display(s) connected and confirm the boot sequence.
2. Power the camera on and confirm video output to the ATOM 2.
3. Operate the keyboard and/or mouse (if installed) to ensure functionality.
4. Record to the unit's USB removable media front panel slots.
5. Confirm functionality with camera gimbal geospatial data during a test flight.

If unable to successfully complete any of these steps, begin by rechecking wiring, connections, and if necessary, contact SHOTOVER Systems Support for further troubleshooting.

EMI Test

List the powerplant, fuel, and other electric instruments not already in the chart provided and note any anomalies that occur due to operation of the ATOM 2. Assess the results.

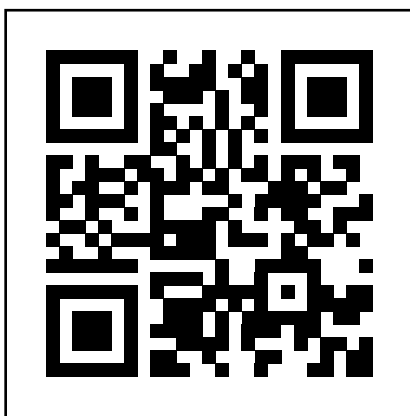
Aircraft Communications & Navigation Equipment Tests		Pass/Fail
Comm 1&2		
Transponder / ADS-B		
(XPDR Standby & Mode-C)		
ADF 1 & 2		
Glideslope 1&2		
VOR/LOC 1&2		
DME 1&2		
Compass		
Directional Gyro		
GPS		
Digital Clock		

Autopilot Tests		Pass/Fail
Autopilot Functionality		
Coupled Approach		
Stability Augmentation Systems		
Aircraft Engine Systems Tests		Pass/Fail
Fuel Pressure		
Oil Temperature		
Amps		
Bus Voltage		
Fuel %		
Ng		
TOT		
Torque %		
Annunciators		
Oil Pressure		
Other Systems Tests (as identified by the installer/operator)		Pass/Fail

Section 5: Technical Supplement & Product Support

Installation Diagram

Please scan the QR code below for the ATOM 2 installation diagrams and specific notes. Printed diagrams are included on the following pages.



Common ICD's/Diagram Locations

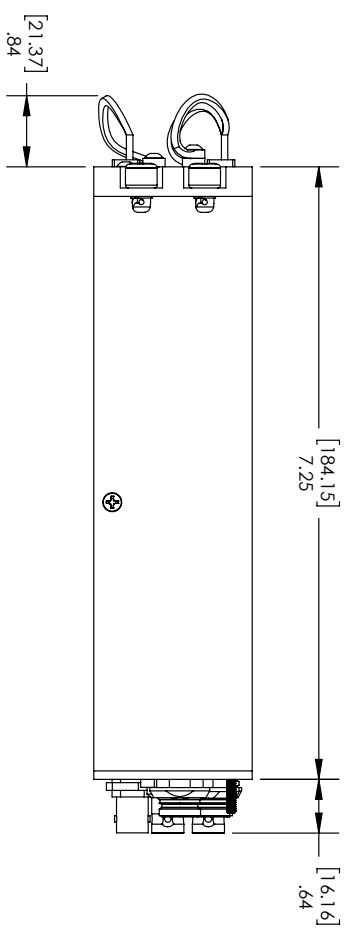
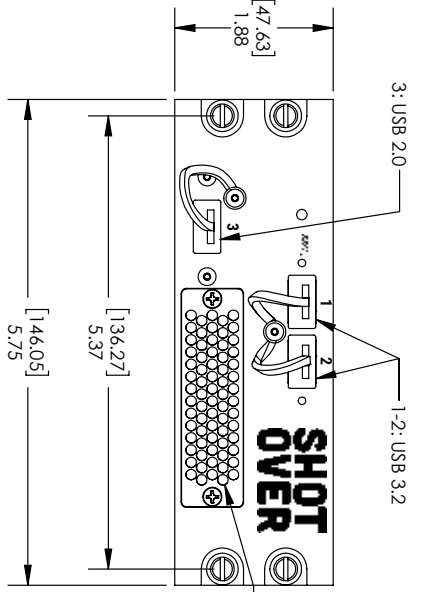
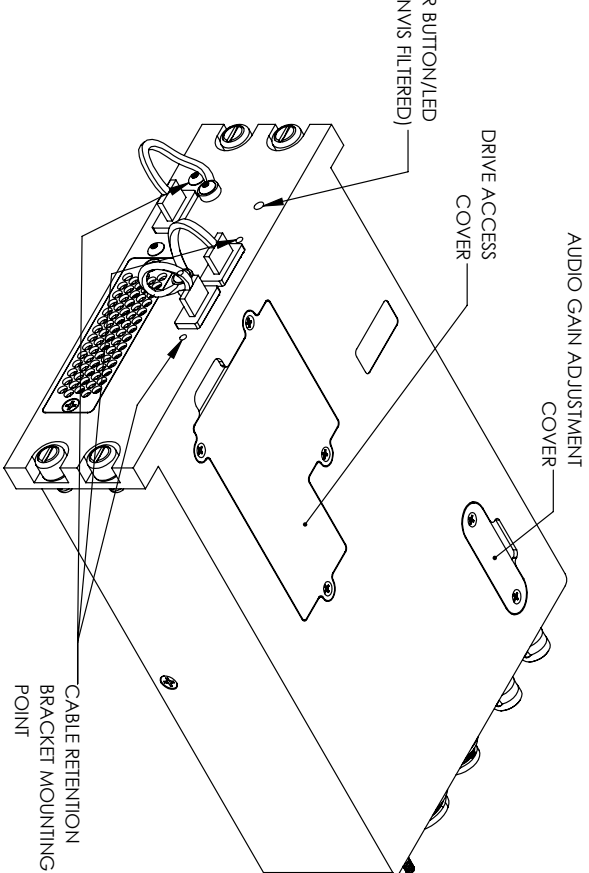
<http://shotover.com/specifications>

SHOTOVER Systems Support

Phone	+1 (720) 744-3300
Email	support@shotover.com

REVISONS			
REV	EPN	DESCRIPTION	DATE
3	N/A	UPDATED HARDWARE REVISION, HD-SDI CABLE OPTION A & ENGRAVING, ADDED GROUND STUD THREAD NOTE	11/06/23
4	N/A	UPDATED PART NUMBERS FOR CONNECTOR KITS	3/5/2026

1. INSTALLATION NOTES:
ATOM 2 IS CASE GROUNDED THROUGH MOUNTING RAILS AND GROUND STUD ON REAR OF CASE. USE A MINIMUM OF 16 GAUGE WIRE TO GROUND THE MISSION COMPUTER TO AIRCRAFT CHASSIS GROUND PRIOR TO OPERATION.
2. EXPOSED ALUMINUM IS CHROMATED. DO NOT CHEMICALLY COAT OR COVER WITH NON-CONDUCTIVE MATERIAL.
3. ALL GROUND PINS ARE GROUND CONTINUOUS TO CASE (EXCEPT AUDIO).
4. INPUT POWER IS REVERSE-POLARITY PROTECTED.
5. RECOMMENDED POWER WIRE SIZE: 22AWG. ALL POWER PINS MUST BE WIRED.
6. INPUT POWER: 28VDC (OPERATING RANGE: 18-30VDC)
7. AVERAGE POWER DRAW IS 59 WATTS (2.1A ON 28VDC).
8. MAXIMUM POWER DRAW IS 95 WATTS (3.4A ON 28VDC).
9. AMBIENT AIR WHERE ATOM 2 IS INSTALLED SHOULD NEVER EXCEED 70° C. AMPLE ROOM IS REQUIRED IN FRONT AND REAR OF ATOM 2 FOR PROPER AIRFLOW. IF ENCLOSED, SPACE AROUND ATOM 2 SHALL BE ACTIVELY VENTILATED OR HAVE SUFFICIENT SPACE TO COOL AVERAGE POWER LISTED ABOVE.



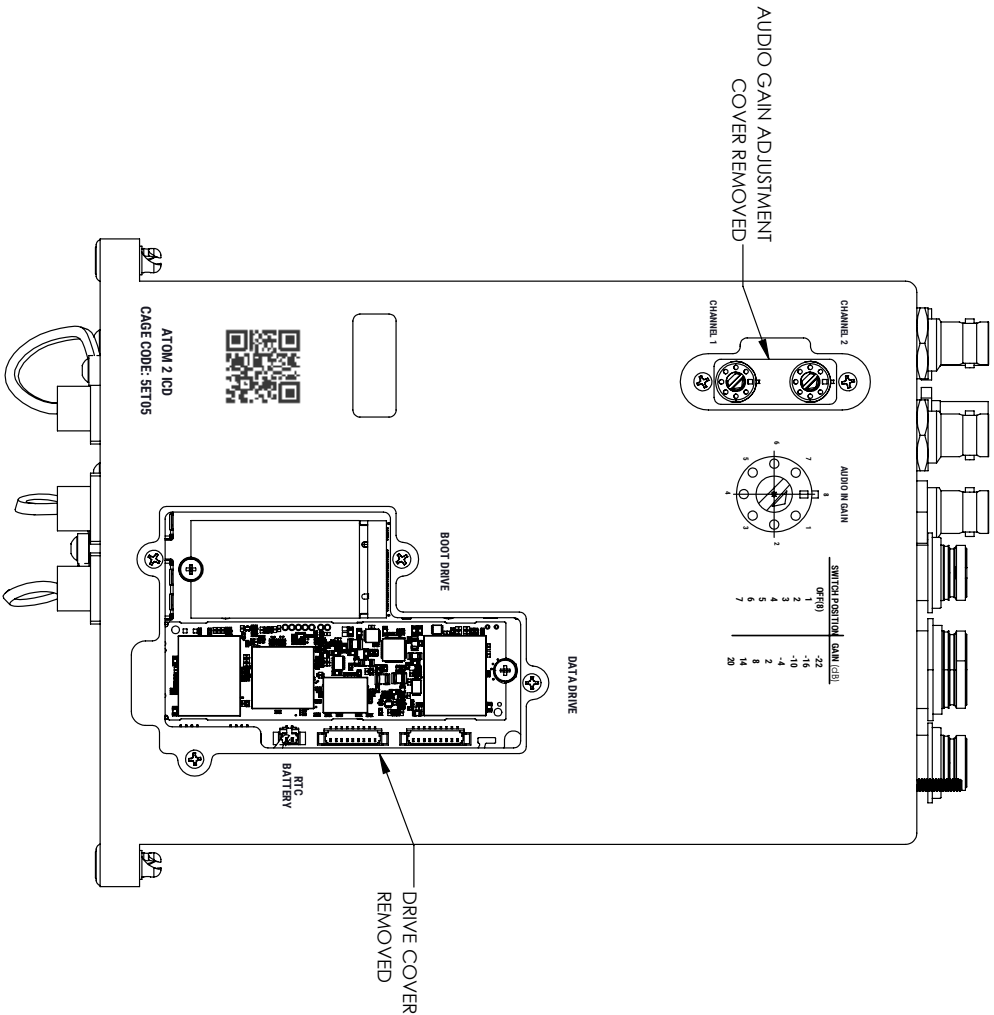
SYSTEM WEIGHT: 2.70 LBS [1.22 KG] ±0.10 LBS [0.05 KG]

UNLESS OTHERWISE SPECIFIED			
TOL LINEAR DIM. XX ±0.15 XX ±0.05		THIRD ANGLE PROJECTION	
DRAWN	NAME	DATE	TITLE:
CHECKED	KWH	03/15/23	ATOM 2 MISSION COMPUTER
STATE:	NOM	03/16/23	ARS-750, GEAR-750, ARS-ATOM 2
APPROVED		SHEET 1 of 7	Hardware DWG
		SCALE: 1:2	DWG:
		REV: 1.3 4	US007-0001

SHOT OVER

NOTES:
1. USE LOCTITE 222 PURPLE LOW STRENGTH THREADLOCKER ON ALL SCREW COVERS.

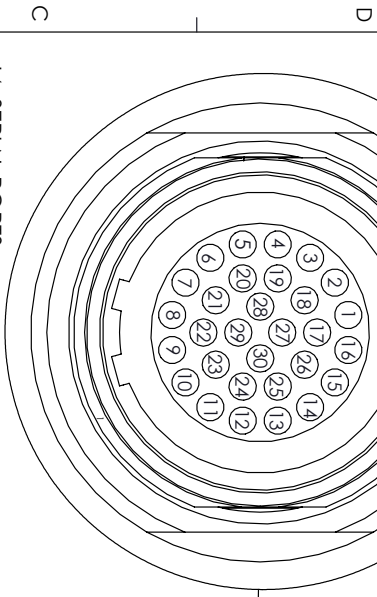
REVISIONS			
REV	EPN	DESCRIPTION	DATE
3	N/A	UPDATED HARDWARE REVISION, HD-SDI CABLE OPTION A & ENGRAVING, ADDED GROUND STUD THREAD NOTE	11/06/23
4	N/A	UPDATED PART NUMBERS FOR CONNECTOR KITS	3/5/2026



UNLESS OTHERWISE SPECIFIED			
±TOL LINEAR DIM.	NAME	DATE	THIRD ANGLE PROJECTION
XX ±0.15	DRAWN	KWH	03/15/23
XX ±0.05	CHECKED	NOM	03/16/23
SURFACE FINISH	STATE:	SHEET	2 of 7
Ro 1.6	APPROVED	SCALE:	1:1.5
AUT DIM IN INCHES (mm) WEIGHT IN LBS (KG) DO NOT SCALE	TITLE: ATOM 2 MISSION COMPUTER ARS-750, GEAR-750, ARS-ATOM 2		
Hardware DWG		DWG:	US007-0001
REV: 1.3 4		REV: 1.3 4	

**SHOT
OVER**

REVISIONS			
REV	EPN	DESCRIPTION	DATE
3	N/A	UPDATED HARDWARE REVISION, HD-SDI CABLE OPTION A & ENGRAVING, ADDED GROUND STUD THREAD NOTE	11/06/23 KWH
4	N/A	UPDATED PART NUMBERS FOR CONNECTOR KITS	3/5/2026 KWH



J4: SERIAL PORTS

- 1: AUDIO IN CH 2 LO/GROUND

11: RS232C RX
- 2: USB D-

12: RS232B TX
- 3: USB D+

13: RS422 TX+
- 4: USB 5V

14: RS422 RX-
- 5: PS/2 5V

15: RS422 RX+
- 6: PS/2 CLOCK MOUSE

16: AUDIO IN CH 2 HI
- 7: PS/2 DATA KEYBOARD

17: AUDIO IN CH 1 HI
- 8: PS/2 CLOCK KEYBOARD

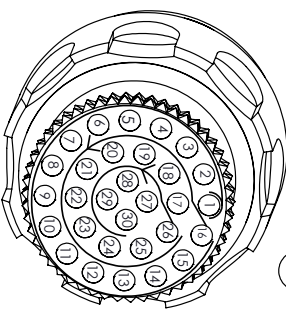
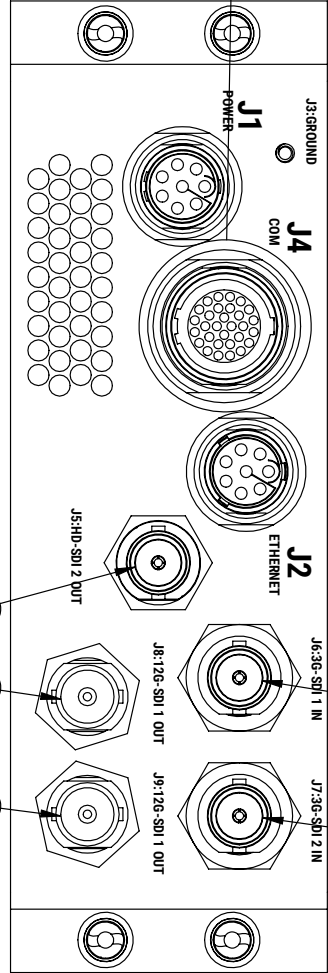
18: AUDIO OUT HI
- 9: RS232A TX

19: GROUND (USB)
- 10: RS232A RX

20: PS/2 DATA MOUSE

NOTES:

- 1 TWISTED PAIR REQUIRED.
2. DO NOT SPLIT AUDIO INTO BOTH CHANNELS.
- 3 USE CHANNEL 1 FOR SINGLE CHANNEL AUDIO.
4. MAXIMUM SPEEDS FOR CABLES LESS THAN 25':
RS232: 256 KBPS
RS422: 8 MBPS



MATING CONNECTOR
US001-0004 / FGN.3M.330.XLCM

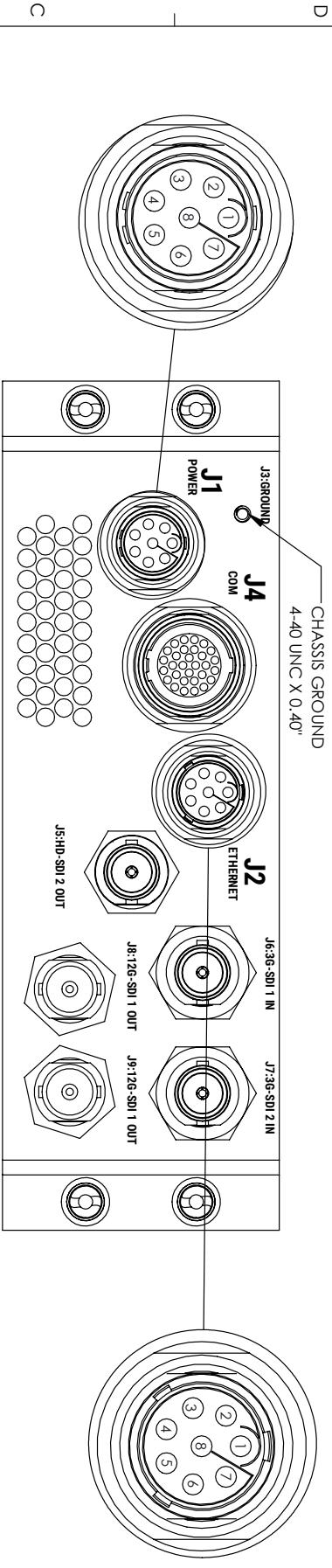
FOLLOW THE PATTERN ON THE REAR
OF THE MALE LEMO WHEN
POPULATING LEMO CONNECTORS.

- J5: HD-SDI VIDEO 2 OUT
- J6: 3G-SDI VIDEO 1 IN
- J7: 3G-SDI VIDEO 2 IN
- J8: 12G-SDI VIDEO 1 OUT*
- J9: 12G-SDI VIDEO 1 OUT*
- * PRIMARY VIDEO OUTPUT, CLONED
- BNC CONNECTION
CENTER PIN: SIGNAL
SHELL: GROUND

UNLESS OTHERWISE SPECIFIED			
*TOL LINEAR DIM.	NAME	DATE	THIRD ANGLE PROJECTION
XX ±0.15	KWH	03/15/23	SHEET SIZE: A
XX ±0.05	NOM	03/16/23	SHEET 3 of 7
SURFACE FINISH	STATE:	APPROVED	SCALE: 1:1
Ro1.6			REV: 1.3 4
AUDIA INCHES (mm) WEIGHT IN (LB) (KG)			US007-0001
DO NOT SCALE			

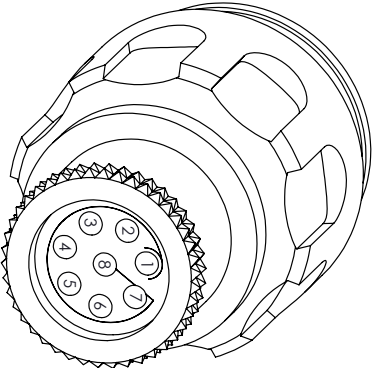
SHOT
OVER

REVISONS			
REV	EPN	DESCRIPTION	DATE
3	N/A	UPDATED HARDWARE REVISION, HD-SDI CABLE OPTION A & ENGRAVING, ADDED GROUND STUD THREAD NOTE	11/06/23
4	N/A	UPDATED PART NUMBERS FOR CONNECTOR KITS	3/5/2026



- J1: POWER*
- 1: NO CONTACT
 - 2: NO CONTACT
 - 3: NO CONTACT
 - 4: NO CONTACT
 - 5: 18-30VDC (+)
 - 6: POWER GROUND (-)
 - 7: 18-30VDC (+)
 - 8: POWER GROUND (-)

* ALL POWER PINS MUST BE WIRED.



MATING CONNECTOR
US001-0002 / FGN.1M.308.XLCM
US001-0007 / FGU.1M.308.XLCM

FOLLOW THE PATTERN ON THE
REAR OF THE MALE LEMO WHEN
POPULATING LEMO CONNECTORS.

- J2: ETHERNET*
- 1: Bi_DA-/TX- (ORANGE)
 - 2: Bi_DA+/TX+ (ORANGE/WHITE)
 - 3: Bi_DB-/RX- (GREEN)
 - 4: Bi_DB+/RX+ (GREEN/WHITE)
 - 5: Bi_DD- (BROWN)
 - 6: Bi_DD+ (BROWN/WHITE)
 - 7: Bi_DC+ (BLUE)
 - 8: Bi_DC- (BLUE/WHITE)

*FOR 2 PAIR/4 WIRE ETHERNET (10 MBIT
AND 100 MBIT) Bi_DA AND Bi_DB WILL
AUTOMATICALLY ADJUST TO BE TX OR RX
IN RUNTIME BUT INSTALLERS SHOULD MAKE
SURE THAT POLARITY IS CORRECT.

UNLESS OTHERWISE SPECIFIED			
TOL LINEAR DIM. X.X ±0.15 X.XX ±0.05		NAME	DATE
SURFACE FINISH Rz 1.6		DRAWN	03/15/23
ALL DIM IN INCHES (mm) WEIGHT IN LBS (KG) DO NOT SCALE		CHECKED	NOM 03/16/23
STATE:		SHEET 4 of 7	
APPROVED		SCALE: 1:1	
TITLE:		THIRD ANGLE PROJECTION	
ATOM 2 MISSION COMPUTER		SHEET SIZE: A	
ARS-750, GEAR-750, ARS-ATOM 2		Hardware DWG	
REV: 1.3 4		DWG: US007-0001	

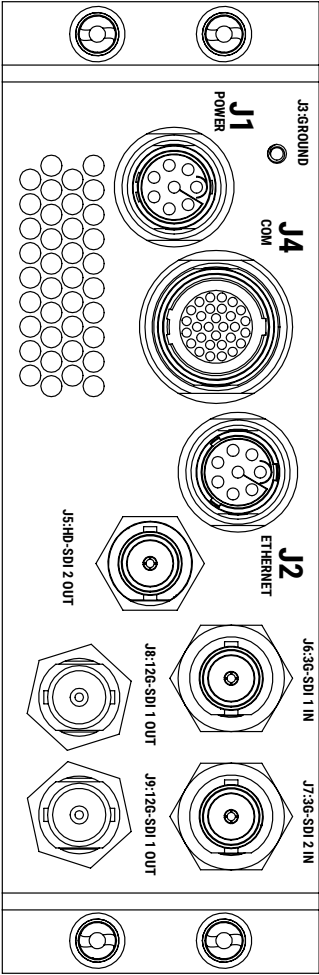
SHOT
OVER

REVISIONS			
REV	EPN	DESCRIPTION	DATE
3	N/A	UPDATED HARDWARE REVISION, HD-SDI CABLE OPTION A & ENGRAVING, ADDED GROUND STUD THREAD NOTE	11/06/23
4	N/A	UPDATED PART NUMBERS FOR CONNECTOR KITS	3/5/2026

CABLE TERMINATION: MATING CONNECTOR PLUGS

ONE PROVIDED WITH EACH ATOM 2

REAR INTERFACE	CABLE	CONNECTOR
J1	SEE NOTES, PAGE 6	LEMO FGN.1M.308.XLCM
J2		LEMO FGU.1M.308.XLCM
J3		TE CONNECTIVITY 34104
J4		LEMO FGN.3M.330.XLCM
J5	PICWIRE V73263	PICWIRE 190712
	RG59	AMPHENOL 112123
	RG179	AMPHENOL 112133
J6	PICWIRE V73263	PICWIRE 190712
	RG59	AMPHENOL 112123
	RG179	AMPHENOL 112133
J7	PICWIRE V73263	PICWIRE 190712
	RG59	AMPHENOL 112123
	RG179	AMPHENOL 112133
J8	PICWIRE V73263	PICWIRE 190712
	RG59	AMPHENOL 112123
	RG179	AMPHENOL 112133
J9	PICWIRE V73263	PICWIRE 190712
	RG59	AMPHENOL 112123
	RG179	AMPHENOL 112133



UNLESS OTHERWISE SPECIFIED:
•TOL LINEAR DIM.
XX ±0.15
X.XX ±0.05
SURFACE FINISH
Ra 1.6
ALL DIM IN INCHES (mm)
WEIGHT IN LBS (KG)
DO NOT SCALE

DRAWN
CHECKED
STATE:

NAME
KWH
NOM

DATE
03/15/23
03/16/23

THIRD ANGLE
PROJECTION
SHEET SIZE: A

APPROVED

SCALE: 1:1

TITLE:
ATOM 2 MISSION COMPUTER
ARS-750, GEAR-750, ARS-ATOM 2

Hardware DWG
REV: 1.3 4

DWG:
US007-0001

SHOT
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CABLING REQUIREMENTS:

In order to ensure a properly working SHOTOVER Systems ATOM 2 system, these cabling requirements are highly recommended and any variations will be at the sole responsibility of the installer. Each cable must have an 8 inch service loop for easy removal and replacement of unit.

REVSIONS			
REV	EPN	DESCRIPTION	DATE
3	N/A	UPDATED HARDWARE REVISION, HD-SDI CABLE OPTION A & ENGRAVING, ADDED GROUND STUD THREAD NOTE	11/06/23
4	N/A	UPDATED PART NUMBERS FOR CONNECTOR KITS	3/5/2026

D

POWER CABLE

The connection to 28V input on the ATOM 2 and 28V GND are highly recommended to be spirally laid.

75 ohm HD-SDI COAX Cable

Option A

PicWire V73263 is highly recommended for 3G-SDI and higher data rate signals (6G-SDI, 12G-SDI). The proper connector is PicWire P/N 190712. (<https://picwire.com/Product/V73263>)

Option B

RG59 is also recommended for 3G-SDI and higher data rate signals (6G-SDI, 12G-SDI). The proper connector is Amphenol Connex P/N 112123. (<https://www.amphenorlt.com/112123.html>)

C

Option C

If RG179 is required by other equipment (ex. MX-10 gimbal), then for EMI purposes, DOUBLE high performance 360 degree EMC individual braid shielding must be done to RG179 cable from end to end. The proper connector is Amphenol Connex P/N 112133. (<https://www.amphenorlt.com/112133.html>)

CRIMPING TOOL

Correct crimping tool are needed for the connectors selected. A few examples are listed below. Check with SHOTOVER Systems for availability.

CONNECTOR	CONTACT PIN		FERRULE		ALL LEMO CONNECTORS		
	TOOL	CRIMP	TOOL	CRIMP	CRIMP TOOL	DPC:91.701.V	
PICWIRE 190712	M22520/2-01	SELECTOR #6	M22520/5-01	M22520/5-41 B HEX	PIN POSITIONER	DCE:91.070.5MVC	
AMPHENOL 112123	47-10070	HEX 0.068"	47-20000	HEX 0.255"	PIN EXTRACTOR	DCE:93.070.41T	
AMPHENOL 112133	47-10150	HEX 0.068"	47-20004	HEX 0.178"		DCC:07.04B.LAG	

USB CABLE

USB 2.0 cabling is sufficient for all ATOM 2 functions. USB performance cannot be guaranteed at cable lengths greater than 6ft without the use of an extender. Contact SHOTOVER Systems for further details.

B

Option A

Carlisle 1031-215A-22 (<https://www.carlisleit.com/prod-info/usb-c-cable-offerings/>)

Option B

Gore RCN8800-22D-22P-H (<https://www.gore.com/system/files/2021-11/ACS-0454-R1-DAT-US-MA'Y21.pdf>)

ETHERNET CABLE

Picwire PIC E50824 is highly recommended. (<https://www.picwire.com/pic-cables/e50824/>)

EMTEG D100-0824-006 is also highly recommended. (https://www.collinsaerospace.com/-/media/CA/product-assets/marketing/0-9/50-75-ohm-coaxial-cables/1_50-74-coaxial-cables/10_d100-0824-006_cat_6a_10_gbit_ethernet_cable_datasheet.pdf?rev=226ed3add9c8747deacf1afdb26c4de73&hash=D6A96AC1723D79D8C2878D637C0A6113)

A

ALL OTHER CABLES - MUST BE SHIELDED

All other cable can be selected by installer and all cables must be shielded, including power cables.

UNLESS OTHERWISE SPECIFIED				TITLE:			
*TOL LINEAR DIM.		NAME		DATE		THIRD ANGLE PROJECTION	
X.X ±0.15		DRAWN		KWH		03/15/23	
X.X ±0.05		CHECKED		NOM		03/16/23	
SURFACE FINISH		STATE:		SHEET		6 of 7	
Rd 1.6		APPROVED		SCALE: 1:1		REV: 1.3 4	
ALL DIM IN INCHES (mm)		Hardware DWG		DWG:		US007-0001	
WEIGHT IN LBS (kg)							
DO NOT SCALE							

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REVISIONS			
REV	EPN	DESCRIPTION	DATE
3	N/A	UPDATED HARDWARE REVISION, HD-SDI CABLE OPTION A & ENGRAVING, ADDED GROUND STUD THREAD NOTE	11/06/23
4	N/A	UPDATED PART NUMBERS FOR CONNECTOR KITS	3/5/2026

AVAILABLE FROM SHOTOVER SYSTEMS
US007-0007 KIT - CONNECTORS, ATOM 2
(INCLUDES ALL OF THE BELOW)

SHOTOVER Systems P/N	Manufacturer P/N	Description	QTY
US001-0002	LEMO FGN.1M.308.XLCM	PLUG, STRAIGHT, 1M, 8 MALE, BLU, SHELL THRD	1
	AMPHENOL M85049/38-9N	BACKSHELL, STRAIN RELIEF CLAMP, STRAIGHT, SZ 9, NICKEL	1
	LEMO FGU.1M.308.XLCM	PLUG, STRAIGHT, 1M, 8 MALE, GRN, SHELL THRD	1
	AMPHENOL M85049/38-9N	BACKSHELL, STRAIN RELIEF CLAMP, STRAIGHT, SZ 9, NICKEL	1
	LEMO FGN.3M.330.XLCM	PLUG, STRAIGHT, 3M, 30 MALE, BLU, SHELL THRD	1
	AMPHENOL M85049/38-13N	BACKSHELL, STRAIN RELIEF CLAMP, STRAIGHT, SZ 13, NICKEL	1
	PICWIRE P/N 190712	CONN, BNC, PLUG, STRAIGHT, 75 OHM (V73263)	5
	AMPHENOL 112123	CONN, BNC, PLUG, STRAIGHT, 75 OHM (RG-59)	5
	AMPHENOL 112133	CONN, BNC, PLUG, STRAIGHT, 75 OHM (RG-179)	5
	EXTRON 101-020-01	BRACKET, CABLE LACING	3
US002-6001	McMASTER-CARR 92949A105	SCREW, 4-40 X 3/16", SS 18-8, ROUND HEAD	2
US002-6015	TE CONNECTIVITY 34104	RING TERMINAL, #4 STUD, 16-22 AWG, CRIMP	1
US002-6121	McMASTER-CARR 90730A005	NUT, 4-40, 1/16", 3/16" HEX, SS 18-8	1
US002-6122	STARTECH USB433WACDB	ADAPTER, NETWORK, WIFI, DUAL BAND, USB 2.0	1

TOOLS (CHECK WITH SHOTOVER SYSTEMS FOR AVAILABILITY)

SHOTOVER Systems P/N	Manufacturer P/N	Description
US002-8004	AMPHENOL RF 47-10070	TOOL - CRIMPER, HAND, COAX, DIE SIZE 0.068/0.213/0.255
US002-8005	AMPHENOL RF 47-10150	TOOL - CRIMPER, HAND, COAX, DIE SIZE 0.068/0.128/0.178
US002-8006	DMC TOOLS M22520/5-01	TOOL - CRIMPER, HAND, CIRCULAR, M22520/5-01
US002-8007	DMC TOOLS M22520/5-41	TOOL - DIE, M22520/5-41
US002-8008	LEMO DPC.91.701.V*	TOOL - CRIMPER, HAND, CIRCULAR, LEMO DPC.91.701.V
US002-8009	LEMO DCE.91.070.5MVC	TOOL - POSITIONER, CIRCULAR, LEMO DCE.91.070.5MVC
US002-8010	LEMO DCF.93.070.4LT	TOOL - EXTRACTER, 24-26 AWG, LEMO DCF.93.070.4LT

* OR ALTERNATE

UNLESS OTHERWISE SPECIFIED

±TOL LINEAR DIM.
X.X ±0.15
X.XX ±0.05

CHECKED

DRAWN

DATE

NAME

THIRD ANGLE
PROJECTION

TITLE:

STATE:

APPROVED

SCALE: 1:1

REV: 1.3 4

US007-0001

SURFACE FINISH
Rz 1.6

ALL DIM IN INCHES (mm)
WEIGHT IN LBS (KG)
DO NOT SCALE

SHEET 7 of 7

Hardware DWG

DWG:

ATOM 2 MISSION COMPUTER
ARS-750, GEAR-750, ARS-ATOM 2

SHOT
OVER

SHOT OVER

SHOTOVER.COM

GEAR-750 ARS-750

SHOTOVER HQ
5660 Airport Blvd., Suite 101
Boulder CO, 80301

NEW ZEALAND
133 Glenda Drive
Queenstown, 9300

CANADA
286 Sanford Ave. N, Suite 403
Hamilton, ON L8L 6A1

UNITED KINGDOM
Unit A3 Belmore Hill Court, Belmore Lane, Owslebury
Hampshire, UK, SO21 1JW

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Version 2.1 (February 2026)