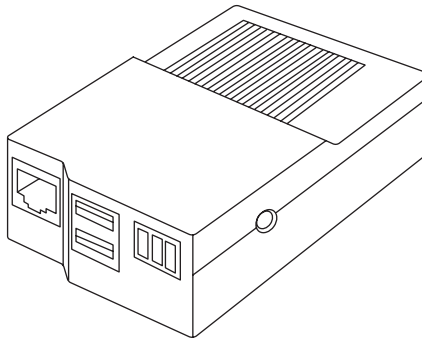**ICI** | **INFRARED CAMERAS** INC

Industry

SENSOR CONTROL MODULE
USER MANUAL

PLEASE READ THIS MANUAL BEFORE SWITCHING THE UNIT ON.
IMPORTANT SAFETY INFORMATION INSIDE.

ICI cameras fall under US Federal Law and Export Control.

Revision History

09.2022-001	Document created
09.2022-002	Added Pixhawk Cube FC (PX4 Firmware) section
01.2023-001	Technical updates to DJI Lightbridge 1 + A2 Setup. Spelling and grammar fixes.

Contents

1.   Disclaimers

1-1   Terms and Conditions

Warranty Terms and Condition of Sale are made available online at:

https://infraredcameras.com/support/terms-and-conditions-of-sale/

1-2   U.S. Government Regulations

This product may be subject to U.S. Export Regulations. Please send any inquiries to support@infraredcameras.com

1-3   Copyright

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1-4   Quality Assurance

Infrared Cameras, Inc. is committed to a policy of continuous development; therefore we reserve the right to make changes and improvements on any of the products without prior notice.

1-5   Customer Help

For customer help, visit:

https://infraredcameras.com/support/

E-mail:

support@infraredcameras.com

2.   User Notice

2-1   Calibration of Thermal Devices

Annual calibration of any thermal camera is recommended. Contact customer service to schedule maintenance.

2-2   Accuracy of Thermal Devices

For very accurate results, ICI recommends waiting a minimum of 5 minutes after starting a thermal camera before measuring a temperature.

2-3   Cybersecurity

After the products are connected to the Internet, they may face risks including but not limited to network attacks, hacker attacks, virus infections, etc. The company will not be responsible for the abnormal operation of the products and any loss or liability caused therefrom shall be at your own risk.

2-4   Disposal of Electronic Waste

Electrical and electronic equipment (EEE) contains materials, components and substances that may be hazardous and present a risk to human health and the environment when waste electrical and electronic equipment (WEEE) is not handled correctly.

Equipment marked with the below crossed-out wheeled bin is electrical and electronic equipment. The crossed-out wheeled bin symbol indicates that waste electrical and electronic equipment should not be discarded together with unseparated household waste, but must be collected separately.

All local authorities have established collection schemes under which residents can dispose of equipment at a recycling center or other collection points, or WEEE will be collected directly from households. More detailed information is available from the administration of the relevant local authority. Always dispose of waste in accordance with local, state, and federal regulations.

2-5   Intended Use

The Sensor Control Module (SCM) provides aerial thermographers with a live real-time camera feed, media capture capabilities, and the ability to manage cameras remotely. Fully radiometric image captures offer precise temperature data for analysis. Images taken can be used to create detailed mosaics. Its low weight, and low power design allows the SCM to be mounted on a variety of platforms.

Environment of use: industrial and petrochemical inspections, electrical plants, animal reserves as well as environmental conservatories, and aerial integrations, among others.

You agree that this product is for civilian use only, and shall not use applications that may infringe the rights of third parties, medical and safety devices or other applications where product failure may lead to life-threatening or personal injury, as well as weapons of mass destruction, chemical and biological weapons, nuclear explosions, unsafe use of nuclear energy, dangerous or humanitarian purposes. Any loss or liability caused therefrom shall be at the your own risk.

2-6   Manual Update

The user manual will be updated from time to time. To access the latest manuals, translations of manuals, and notifications, go to:

https://infraredcameras.com/product-resources/

The manufacturer reserves the right to alter the specifications of the product without prior notification. The manufacturer allows himself the right to modify without any preliminary opinion the technical specifications of the product.

2-7   Scope of Application

Infrared Cameras, Inc. issues generic manuals that cover several cameras within a model line.

This means that this manual may contain descriptions and explanations that do not apply to your particular camera model. This manual may contain technical inaccuracies or typographical errors.

2-8   Authoritative Versions

The authoritative version of this publication is English. In the event of divergences due to translation errors, the English text has precedence.

Any late changes are first implemented in English. Other languages may or may not be available.

2-9   Training

To read about infrared training, visit:

https://infraredtraininginstitute.com/

3.   Safety Information

- Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

- Do not disassemble or modify the device.

- Do not use the device in an ambient temperature outside of the operation range. High/low temperatures can cause damage to the device.

- Only use the correct equipment to with the device. Using the incorrect equipment can decrease the performance or the life cycle of the device. Using the incorrect equipment can cause the device to exceed operational temperatures and cause damage to the device.

- Do not put holes in the device with objects. Damage to the device may occur.

- Do not hit the device with a hammer or apply strong impacts or electric shocks to it. Damage to the device may occur.

- Do not put the device in or near a fire, stove or other high-temperature locations. Damage or ignition of the device may occur.

- Do not put the device in direct sunlight or other high-temperature locations. Damage or device of the battery may occur.

- Do not get water or salt water on the device or permit the device to get wet. Damage to the device may occur.

- Remove any water or moisture on the device before using. Damage to the device may occur.

- Always dispose of device in accordance with local, state and federal regulations.

- Do not use the device if, when used or placed in storage, there is an unusual smell, changes color, changes shape, or is in an unusual condition. Speak with a sales office if one or more of these problems occurs.

- Clean the case with a damp cloth and a weak soap solution. Do not use abrasives, isopropyl alcohol, or solvents to clean the case.

- Avoid condensation. Taking the device from cold to hot may cause condensation. To protect the device, power on the device and wait until it becomes warm enough for the condensation to evaporate.

- Keep device out of reach of children.

- Storage: If you do not use the device for a long period of time, put the device in a cool and dry environment. The device should be stored in an ambient temperature of -40 °C to 70 °C (-40 °F to 158 °F).

THE ENCAPSULATION RATING IS ONLY APPLICABLE WHEN ALL THE OPENINGS ON THE CAMERA ARE SEALED WITH THEIR CORRECT COVERS, HATCHES, OR CAPS. THIS INCLUDES THE COMPARTMENTS FOR DATA STORAGE, BATTERIES, AND CONNECTORS.

4.   Technical Specifications

Operating System	Linux
Processor	GHz i.MX6 Dual core ARM Cortex-A9
GPU	3D GPU GC2000 OpenGL ES1.1, 2.0
RAM	1 GB
Operation Range	-10 °C to 50 °C (14 °F to 122 °F)
Storage Range	-20 °C to 60 °C (-4 °F to 140 °F)
Humidity	5% to 95% non-condensing
Shock/Vibration	25 G/2 G
Dimensions	95 mm x 60 mm x 28 mm (L x W x H ± .5 mm) (3.74" x 2.36" x 1.10" (L x W x H ± 0.02"))
Ethernet	10/100/1000 Mbps
Host Ports	2x USB 2.0
Power	DC 5V, standard Micro USB power connector
Weight	161 g (5.68 oz)
Interface	5 or 7 Channel SBUS
Video Out	HDMI, 1080P
Memory	MicroSD card (16 G)
mSATA Connector	26 pin header, Raspberry Pi compatible
GPS	DJI NAZA, A2, A3, Here2, Here3
Zoom	Camera dependent
Compatibility	8320/8640 P-Series USB cameras 9320/9640 P-Series USB cameras SWIR 128 P-Series USB cameras SWIR 320/SWIR 640 P-Series USB cameras Mirage series Visible and NIR cameras
Enclosure	Aluminum
Trigger Cable	

5.   Structure

5-1   Appearance and Definitions of Housing Interface

1.   Ethernet port

2.   USB ports

3.   sBus port

4.   C-Bus port

5.   TRIG port

6.   Micro SD slot

7.   Micro USB port

8.   HDMI Port
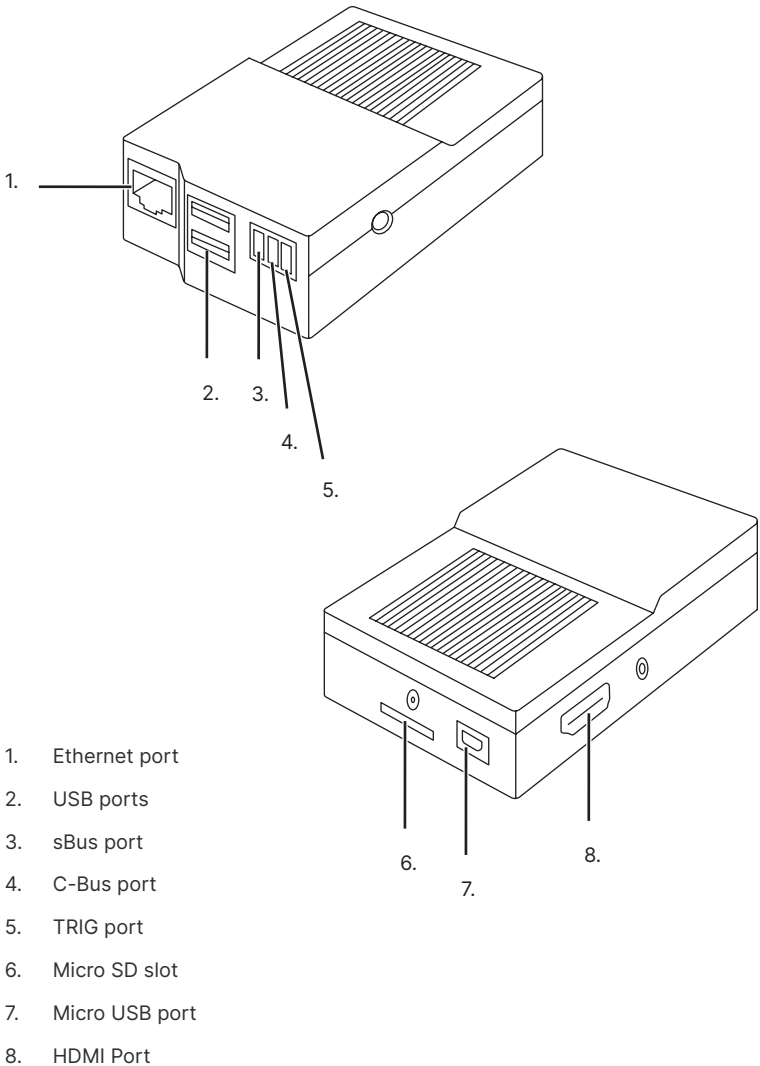
6.   Package Includes

6-1   SCM Cables and Accessories
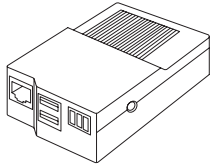
SCM device
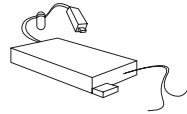
UBEC Power
Interface Cable

Memory card

6-2   Optional Cables and Accessories
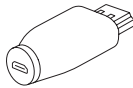
HDMI Adapter
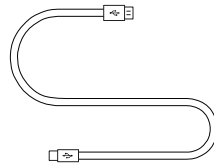
Micro HDMI Cable

CANBUS Cable

5/7 Channel SBUS
Interface Cable

ENSURE ALL SYSTEM EQUIPMENT AND COMPONENT ITEMS ARE PRESENT BEFORE BEGINNING INSTALLATION. PACKAGES MAY CONTAIN CUSTOM CABLES AND ACCESSORIES.

7.   Interface Diagram

5V Micro USB Input

Power — Data Storage

PWR   SD

HDMI Video Output

ICI

Sensor
Control
Module

HDMI

GIGE   USB

SBUS
CMUS
TRIG

Prism   Matrice 600 Pro

DJI A3
DJI N3

Hex Pixhawk 2.1 - Cube Orange

API Port
CAN 1 Bus

Mavlink, Via TELM 2 Port

PWM Input Trigger
for image capture

S. Bus I/O

Echosky-Mobile

DJI Lightbridge 2

S. Bus Input for Pan, Tilt,
and Gimbal Mode

4 Port USB Hub

USB Sensor Options   (Capable of Simultaneously Managing 4 Sensors)

Sony R10C

ICI SWIR 320
or
ICI SWIR 640

T.D.L.A.S.

ICI 9320

Sony QX30U

Mirage Series

ICI 8320
or
ICI 8640

ICI 9640

8.   Installation

8-1   Sensor Payload Options

ICI offers many sensor options For the Sensor Control Module (SCM) across the visible, near infrared (NIR), short-wave infrared (SWIR), mid-wave infrared (MWIR), and long-wave infrared (LWIR) spectrums.

All sensors are mounted with a standard ¼"-20 screw to the gimbal tray. The sensor is plugged into the USB hub that is mounted above the tray for power and data transmission. In some cases an additional power plug must be attached, e.g for the ICI Mirage HC. This additional 12V supply is also located on the USB hub.

As many as 4 sensors simultaneously can be connected to ICI's Sensor control module when a Powered USB hub is used in conjunction .

SEE CHAPTER 7 INTERFACE DIAGRAM FOR A FULL SPECTRUM OF AVAILABLE SENSOR PAYLOAD OPTIONS. CALL CUSTOMER SERVICE TO INQUIRE ABOUT MORE OPTIONS AND CUSTOM INTEGRATIONS.

8-2   Generic UAV Setup

The steps shown below will demonstrate the basic steps when installing the SCM on a generic UAV package.

8-2-1   Mount the SCM

When mounting the SCM keep in mind cable lengths and load balance of the UAV. Depending on mounting techniques, servo extensions may be needed for the various connections on the SCM. ICI recommends soft mounting SCM to isolate it from vibrations.

8-2-2   Connect the UBEC Power Module

Attach the UBEC to the UAV's main power source. This can be done by soldering the power source's connector to the exposed wires of the UBEC.

DO NOT PLUG THE USB POWER CONNECTOR INTO THE SCM UNTIL THE INSTALLATION IS COMPLETE AND THE SYSTEM IS READY FOR OPERATION.

8-2-3   Connect the Camera

1. First, find a suitable place on the gimbal to mount the sensor(s). This can be done by using the camera's tripod mounting hole.

2. After the sensor(s) have been mounted, use the provided USB cable to connect the camera(s) to the SCM.
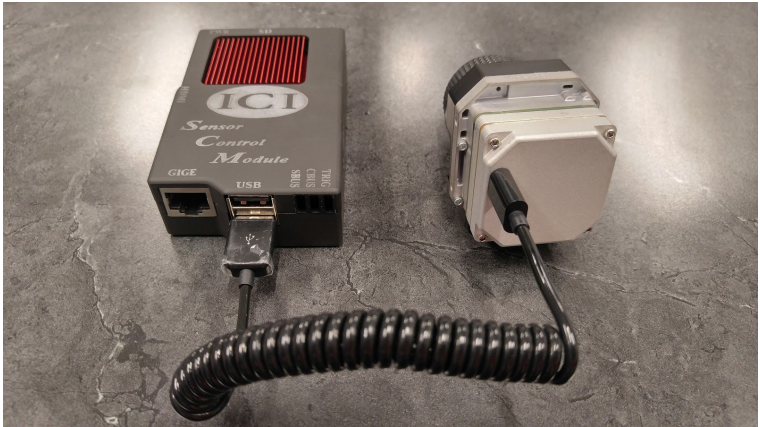
8-3   DJI Lightbridge 1 + A2 Setup

The steps shown below demonstrate the basic steps when installing the Lightbridge1 (LB1) + A2 package.

8-3-1   Connect the A2

1. Take the SBUS Y cable and connect the 3 pin connector labeled SBUS to the SBUS port labeled on the SCM.
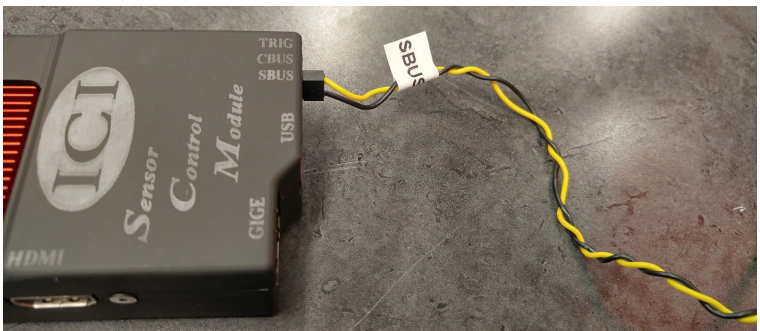
2. Connect the 3 pin white connector to the DBUS port on the Lightbridge.
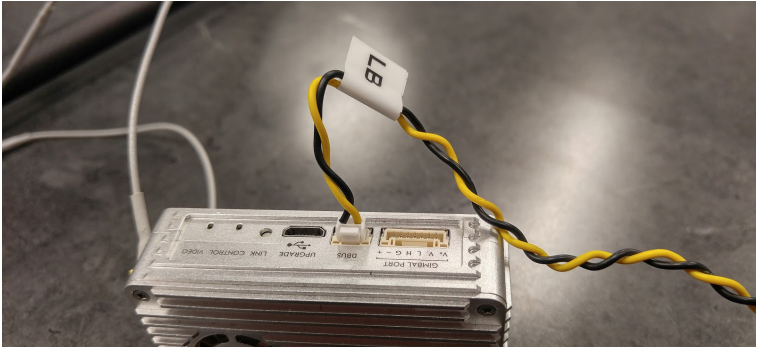
3. The final connector labeled (A2) connects to the X2 port on the A2 flight controller.
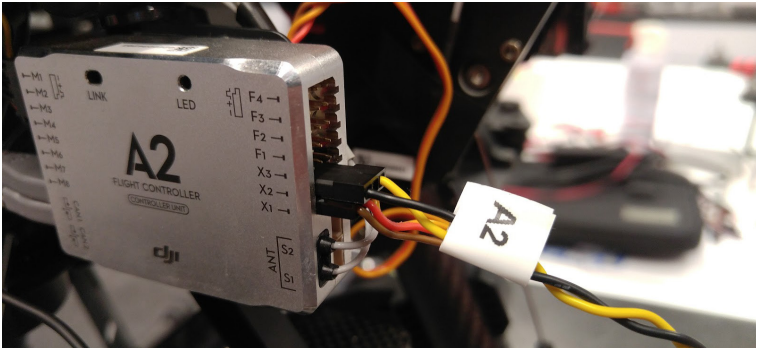
4. Connect the CANBUS cable to an open CAN port on the A2, and the 3 pin connector connects to the C-Bus port on the SCM.
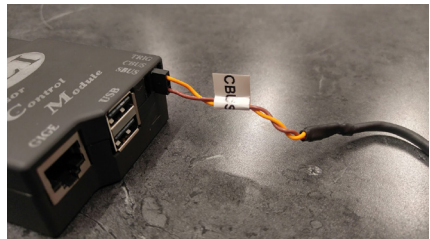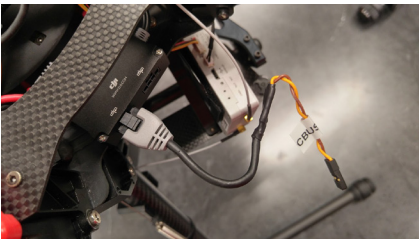
5.   For automation, connect any 3 pin servo cable to the flight controller. To configure automation use ground station software.

8-3-2   Controller Channel Setup

1.   To map the extra 5 channels necessary for controlling the SCM, plug the Lightbridge into a computer and refer to the Remote Control Channel Settings instructions found in the user manual issued by the manufacturer of the controller.

2.   With the 14 channel Futaba transmitter go into the functions tab and set switches to the 5 channel 812.
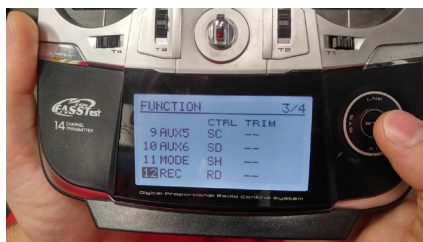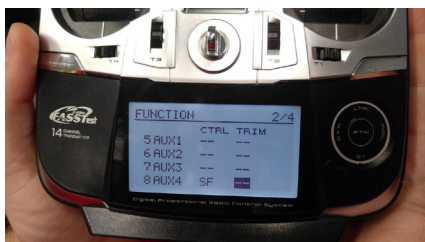
3.   Go into the trainer tab and turn the 812 channels to "function." This will allow the transmitter and the Lightbridge to communicate over those channels, through the training port.
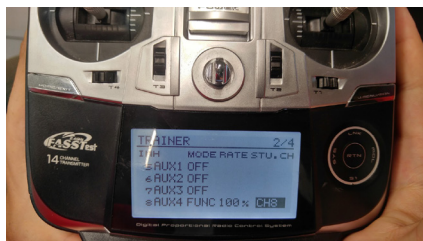
THE USER MUST MAP THE EXTRA 5 CHANNELS TO CONTROL THE SCM. PLUG THE LIGHTBRIDGE INTO A COMPUTER AND FOLLOW THE INSTRUCTIONS ISSUED BY THE MANUFACTURER OF THE CONTROLLER.

8-3-3   Connect R7008SB with Futaba 18/14sg

1. Make sure the R7008SB SBUS receiver is in mode 2 for SBUS use.

2. Take a Servo Y Cable and plug it into the 8 channel or SBUS port on the R7008SB.
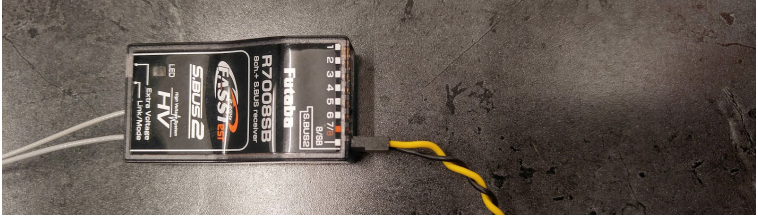
3. Connect one end of the Y Cable to the SBUS port of the SCM. See picture in step 1 of **DJI Lightbridge 1 + A2 Setup**.

4. Connect the last Y Cable connector to your flight controller if you want single controller functionality with the SCM and flight platform. See picture in step 2 of **DJI Lightbridge 1 + A2 Setup**.

5. Power on your 18/14sg and connect it to the R7008SB receiver. Then set your 18/14sg to FASSTTEST14.

Connection to Lightbridge should now be complete. Contact customer service for technical issues and troubleshooting.

8-4   DJI Lightbridge 2 + A3 Pro Setup

The steps shown below demonstrate the basic steps when integrating SCM with Lightbridge 2 (LB2) + A3 package.

8-4-1   Flight Controller Assembly

The flight controller is designed to work with a "smart" flight pad such as a phone or tablet. The decision is left strictly to user preference. Both iOS and Android are supported. Download the DJI Go app to get started.

8-4-2   Connect the A3

1. Connect USB to the TTL Serial adapter from the bottom USB port of SCM to the labeled DJI A3 API port. Reference the most up-to-date version of the DJI A3/A3 Pro User manual.

2. Connect a powered USB 2.0/3.0 hub to the top port of the SCM.

3. Connect a supported camera to the USB hub.

4. Connect the HDMI output from SCM to the LB2 HDMI input.

5. Connect the SCM C-bus port to any DJI A3 CAN1 port using the SCM to DJI Canbus interface cable. The C-bus cable is keyed; do NOT force the connection; if the user encounters resistance they should realign the cable and try again.

6. Insert ICI proprietary SD card into SCM.

ONLY USE THE ICI PROPRIETARY SD CARD PROVIDED IN THE SCM PACKAGE. NEVER FORMAT THE ICI PROPRIETARY SD CARD.

7. Connect 5V 3A Micro USB power cable to SCM Micro USB Labeled PWR port. The power should be off.

8. Connect the DJI A3 flight controller to a computer.

9. Use the appropriate version of the DJI assistant 2 software for the utilized A3 flight controller to enable API port option. Check the box to enable the feature. It is worth noting the M600 Pro requires its own version of DJI assistant 2 software.

10. Set the baud rate is set to 115200.

11. Before powering on the system have a tablet connected to Wi-Fi as well as have the LB2 RC via USB with DJI GO app running as the API needs permissions when the system first boots.

12. Power on the system.

13. Allow API port control through the DJI GO app.

8-4-3 Lightbridge 2 RC Channel Map

Front View		Master	Slave
	1	Antenna	Antenna
	2	Flight Pad Mounting Point	Flight Pad Mounting Point
	3	Pitch/Roll Control	Gimbal Pitch Control
	4	Failsafe Button	NA
	5	Gear Control Switch	NA
	6	Power Level Indicator	Power Level Indicator
	7	Connection Indicator	Connection Indicator
Top View	8	Power Button	Power Button
	9	Throttle/Yaw Control	Gimbal Yaw Control
	10	Select Up/Down (wheel) Gimbal Mode (button)	Select Up/Down (wheel) Gimbal Mode (button)
	11	Sensor Select	Sensor Select
	12	Capture/Record	Capture/Record
	13	GPS/Attitude/Flight Mode	NA
	14	Sensor Mode	Sensor Mode
	15	Gimbal Pitch Control	Gimbal Pitch Control
Back View	16	USB Upgrade Port	USB Upgrade Port
	17	Serial Digital Interface	Serial Digital Interface
	18	HDMI	HDMI
	19	USB Interface for Flight Pad	USB Interface for Flight Pad
	20	GPS Receiver	GPS Receiver
	21	Select Up	NA
	22	Select Down	NA
	23	Charging Port	Charging Port

USER SHOULD BE WELL ACQUAINTED WITH THE CHANNEL MAP BEFORE FLYING. REVIEW THE MANUAL FULLY BEFORE OPERATION.

8-4-4   Mapping Channels for Gimbal Controls

The lowest pin on the SCM SBUS out port is the SBUS signal, the top pin is the SBUS input for old method of control input, and the middle is empty. There is no gnd pin on the SBUS port of SCM; if the user needs to ground the SBUS cable they can create a harness that takes it from the trigger port GND which is the lowest pin in relation to the SCM case.

SCM SBUS out channel numbers for controlling tilt and pan (also mode if the user has enough physical controls and channels) are currently hard coded on the SCM output. RC channels reach the SCM over the referenced MAVLink Inspector RC channel monitor and are mapped to the gimbal functions via the SCM MAVLink Configuration OSD user interface.

8-4-4-1   Mapping the Channels

Gimbal control needs to be configured for SBUS control input and the channels need to be set accordingly:

- SBUS channel for controlling Tilt = CH 8
- SBUS channel for controlling Pan = CH 13
- SBUS channel for controlling Mode = CH 14

The following channels are not being referenced from DJI Canbus. ICI generates these standalone 'Dummy' channels during the old firmware days on Gremsy gimbals. The roll channel had to be assigned when using SBUS otherwise it would move on its own; therefore, ICI created a channel to map the roll movement control in order to ensure it is always centered. Later firmware for Gremsy gimbals allowed the channel to be set to 0 and alleviated the need for these extra 'Dummy' channels; however, the channels are still there.

Example of Gremsy gimbal SBUS channel controlling Tilt = CH 8:

SBUS channel for dummy channel = CH 11. The 'Dummy' channels center at 1500 ms ppm value for instances where the gimbal roll function requires a channel to be assigned in the neutral state otherwise the roll is not level.

SBUS channel for dummy channel 2 = CH 12. These 'Dummy' channels have no correlation to any channels that are received over MAVLink.

8-4-5   Preflight Options

The SCM and each attached sensor have preflight settings outside of in-flight operational controls. Preflight options should be configured prior to the mission. If using Lightbridge 2, press and hold the right dial button to access preflight options. For the Pixhawk 2 cube setup press and hold the camera switch button.

Settings are available through the Settings Menu which can be accessed by holding the right dial button for several seconds.

8-4-5-1   User Interface Settings

8-4-5-1-1   Controller Type

Select the controller type as follows:

1.   Access the user interface (UI) tab of the Settings Menu.

2.   Select controller type: Standard or Lightbridge 2

3.   Exit the Settings Menu to confirm the settings.

8-4-5-1-2   SBus Channel Mapping

Sensor selection and CSD modes are controlled externally. Set the capture button mode as follows:

1.   Access the UI tab of the Settings Menu.

2.   Select capture mode: Click to turn on, click to turn off or Press to turn on, release to turn off

3.   Exit the Settings Menu to confirm the settings.

8-4-5-1-3   Gimbal Type

Choose gimbal type as follows:

1.   Access the UI tab of the Settings Menu.

2.   Select gimbal type: GAUI Crane or Gremsy H3. Other gimbal types may or may not be available for selection.

3.   Exit the Settings Menu to confirm the settings.

8-4-5-2   General Settings

In the General tab capture intervals can be set along with basic information such as date, time, and software version.

8-4-5-2-1   Capture Settings

The capture settings allow users to adjust the interval at which images are captured and stored to the memory card. Change the capture interval as follows:

1.   Access the General tab of the Settings Menu.

2.   Define an integer in the range of 1 to 3600 seconds.

3.   To enable auto-capture Check the box: Turn on auto-capture mode.

4.   Exit the Settings Menu to confirm the settings.

8-4-5-2-2   Video File Playback Screensaver

The playback screensaver is disabled by default on each boot. The feature is unavailable if no video file is found.

8-4-5-2-3   Date and Time Settings

Users can elect to use the date and time gathered from the GPS by checking the box next to: Use date and time from GPS if available. The current date and time displays in the General tap of the Settings Menu under Date and Time.

8-4-5-2-4   Software Information

The most up-to-date software version displays in the General tap of the Settings Menu under Software Version.

8-4-5-3   IR Settings

The IR tab allows users to change the basic infrared settings of the camera connected to the SCM.
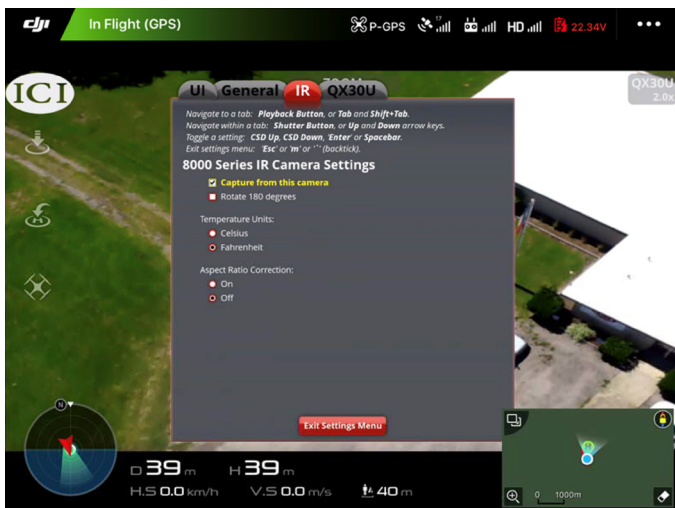
8-4-5-3-1   Capture Settings

If multiple cameras are attached each camera shows in its own tab. The user can assign a camera to be in charge of media capture as follows:

1.   Access the IR tab of the Settings Menu.

2.   Check the box: Capture from this Camera.

3.   Exit the Settings Menu to confirm the settings.

8-4-5-3-2   Temperature Units

Celsius and Fahrenheit units are available for measurements. Select a unit of temperature as follows:

1.   Access the IR tab of the Settings Menu.

2.   Select a temperature unit: Celsius or Fahrenheit.

3.   Exit the Settings Menu to confirm the settings.

8-4-5-4   Visible Settings

8-4-5-4-1   Capture Settings

The capture settings allow users to adjust the interval at which images are captured and stored to the memory card. Change the capture interval as follows:

1.   Access the visible camera tab of the Settings Menu. The visible camera tab is named as the camera model, e.g. R10C for Sony R10C.

2.   Define an integer in the range of 1 to 3600 seconds.

3.   To enable auto-capture Check the box: Turn on auto-capture mode.

4.   Exit the Settings Menu to confirm the settings.

8-4-5-4-2   Capture Resolution

Depending on available lenses users can select lens type as follows:

1.   Access the visible camera tab of the Settings Menu. The visible camera tab is named as the camera model, e.g. R10C for Sony R10C.

2.   Select a resolution: 2592×1944 (5MP) or 640×480 (VGA).

3.   Exit the Settings Menu to confirm the settings.

8-4-5-4-3   Aspect Ratio Correction

Adjust the aspect ratio of the Sony camera as follows:

1. Access the visible camera tab of the Settings Menu. The visible camera tab is named as the camera model, e.g. R10C for Sony R10C.

2. Select On or Off.

3. Exit the Settings Menu to confirm the settings.
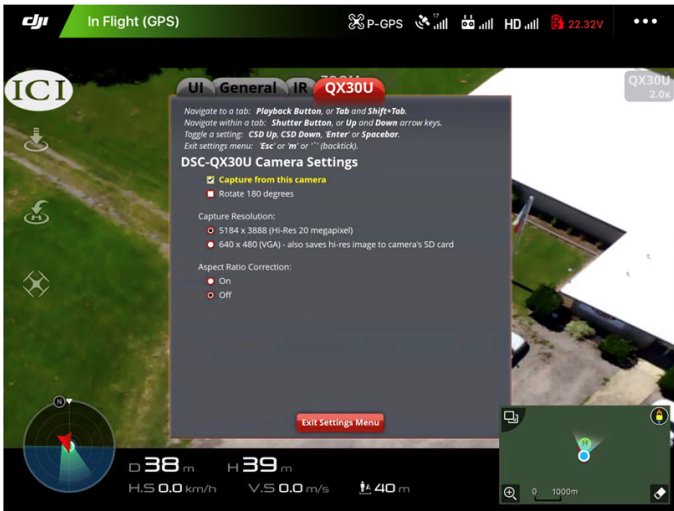
8-4-5-5   TDLAS Settings

The Methane tab allows users to change settings for UAS packages carrying the ICI TDLAS.

8-4-5-5-1   Threshold Settings

Users can define the detection thresholds as follows:

1. Access the Methane tab of the Settings Menu.

2. Select the box labeled: Low; then, define an integer in the range of 1 to 40000 PPM.m.

3. Select the box labeled: Moderate; then, define an integer in the range of 1 to 40000 PPM.m.

4. Select the box labeled: High; then, define an integer in the range of 1 to 40000 PPM.m.

5. Exit the Settings Menu to confirm the settings.

8-4-5-5-2   File Logging Settings

Set the frequency at which log entries are saved as follows:

1. Access the Methane tab of the Settings Menu.

2. Select the file logging box; then, define an integer in the range of 0.16 to 1.00 second.

3. Exit the Settings Menu to confirm the settings.

8-4-5-5-3   Aiming Sight

The aiming sight assists users in aligning the laser. Enable the aiming sight while the detector is being utilized as follows:

1. Access the Methane tab of the Settings Menu.

2. Check the box: Show while detector is enabled.

3. Press Adjust Position; then, adjust the settings accordingly.

4. Exit the Settings Menu to confirm the settings.
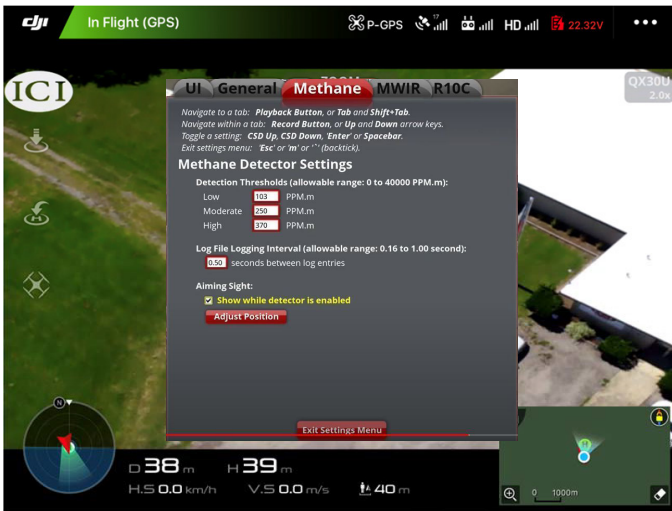
8-4-5-5-4   Enable/Diable the TDLAS

Use sensor mode button to change modes to Methane PPM.m then use (select up/down) buttons to toggle methane laser on/off.

8-4-6   In-flight Sensor Controls

Thanks to the Sensor Control Module, the UAS has many unique features that allows for control of the sensor payload via the flight controller.

Pressing the "Sensor Select" button toggles through the connected sensors. Each sensor has its own unique list of available control options.

Pressing the "Mode" button, while observing the live image in the DJI Go app, cycles through the available control options for the selected sensor. Once an option is selected, users can manipulate the system using the two buttons "Select Up" and "Select Down" on the rear of the controller or by rolling the right wheel up or down.

When Automatic Gain Control (AGC) is disabled, additional options for max and min values is added to the control options list. This provides level and span adjustment controls for the infrared based sensors.

The Capture/Record button captures a single image, triggers a set of images captures, or records a video. Configured the button in the Payload Settings Interface. Capturing secures a frame of data from all connected sensors.

8-4-6-1   User Interface Settings

- Visible (QX30U/R10C)
    - Zoom (Optical/Digital In/Out)
    - Mode (Auto/Manual AF/Manual)
    - Exposure (+/-)
    - White Balance (+/-)
    - Focus (In/Out)
- Short-Wave Infrared (SWIR 320/SWIR640)
    - Zoom (Digital In/Out)
    - Palette (Normal, Inverse)
    - AGC (On/Manual)
    - Max Pixel (+/-)
    - Min Pixel (+/-)
- Mid-Wave Infrared (Mirage/Mirage BB/Mirage HC)
    - Zoom (Digital)
    - Palette (White Hot, Black Hot, Iron, ICI, Rainbow)
    - Spot Temp (Center Spot, Hot Spot, Cold Spot)
    - AGC (On/Enhanced/Manual/Manual Enhanced)
    - Max Temp (+/-)
    - Min Temp (+/-)
- Long-Wave Infrared (8320/8640/9320/9640)
    - Zoom (Digital In/Out, Optical available with CZ Lens)
    - Focus (Only available with CZ Lens)
    - Palette (White Hot, Black Hot, Iron, ICI, Rainbow)
    - Spot Temp (Center Spot, Hot Spot, Cold Spot)
    - AGC (On/Manual)
    - Max Temp (+/-)
    - Min Temp (+/-)
- TDLAS (tunable diode laser absorption spectrometer)
    - Methane PPM.m - (On/Off)

8-4-7   In-Flight Gimbal Control

Gimbal Pitch is controlled with the left dial. Gimbal Mode (Follow/Lock) is controlled with the right dial button. The slave controller can manage both Pitch and Yaw (when in lock mode) with precise stick control.

8-4-8   Autonomous Flight

Reserved for future development.

8-5   Pixhawk 2 (Ardupilot Firmware)

The steps shown below demonstrate how to interface the SCM with the Pixhawk 2 cube flight controller (ardupilot firmware). This setup requires SCM Firmware Version 2.80 and a minimum of two USB ports.

8-5-1   SCM Firmware Version 2.80

This setup requires SCM Firmware Version 2.80. Click or scan the QR code to download the firmware update.

Click or Scan to Download

THE PIXHAWK 2 SETUP REQUIRES SCM FIRMWARE VERSION 2.80. CLICK OR SCAN THE QRC CODE TO DOWNLOAD THE UPDATE.

THE HUB REQUIRES A MINIMUM OF TWO USB PORTS.

8-5-2   Connect the Pixhawk 2

1.   Connect USB to TTL Serial adapter from the bottom USB port of the SCM to the Pixhawk 2 Serial 1 port labeled TELM1 on standard cube carrier board.

2.   Connect a powered USB 2.0/3.0 hub to the top USB port of SCM.

3.   Connect a supported camera to the USB hub.

4.   Connect a wired keyboard to the USB hub.

5.   Connect HDMI output from SCM to a display of choice.

6.   Connect SCM to Pixhawk 2 interface cable from SCM lower USB port relative to the SCM case to TELM1 port on cube carrier board.

7.   Insert proprietary SCM SD card into SCM.

8.   Connect Pixhawk 2 flight controller to a computer running Mission Planner software, and configure the Pixhawk 2 flight controller pram SERIAL1_ BAUD parameter to 57600, then save and power off. The user should also disconnect from the USB to ensure the SCM has fully powered down.

9. Plugin power on both SCM and Pixhawk cube at the same time.

10. Reconnect Pixhawk 2 to Mission planner and open radio controller channel monitor via MAVLink Inspector. From here, the user is able to monitor each of the radio controller channels, the buttons they are mapped to, and their current value state. If using HereLink, the user can monitor and configure these within the HereLink settings app.
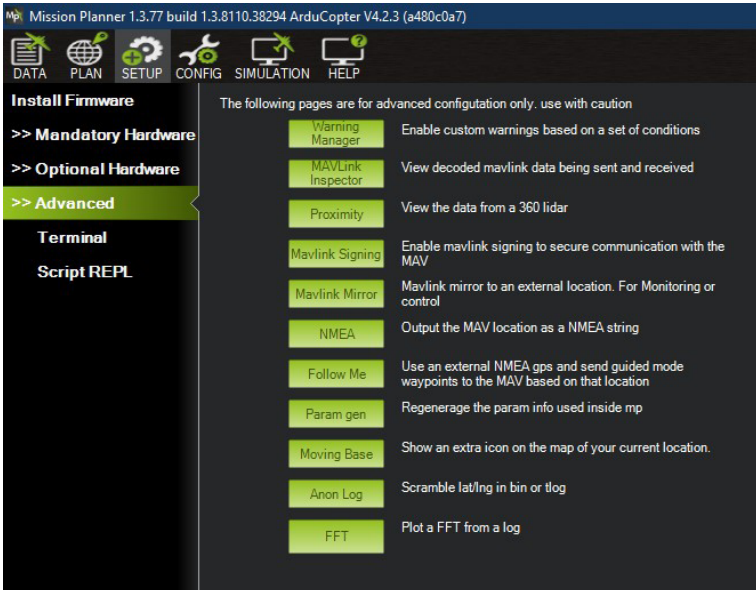
8-5-3   Controller Channel Mapping

8-5-3-1   HereLink Controller Channel Mapping

ICI has a custom channel map that can be sideloaded to the HereLink controller unit and opened with HereLink settings app. The map allows for full control of ICI sensor payloads as well as the following flight modes: Loiter, Stabilize, and RTH.

Configure the channel map as follows:

1. Connect the HereLink controller unit to a computer.

2. From the notification dropdown of HereLink, swipe to the bottom and set USB mode for file transfer.

3. Download and copy the ICI Sensor Payload Controls + Flight modes.ini file to the KeyConfigs directory.

   Example: This PC\Optimus\Internal shared storage\Android\data\org. cubepilot.herelinksettings\files\KeyConfigs

Alternatively, the user can manually recreate the control profile from referencing the following images:
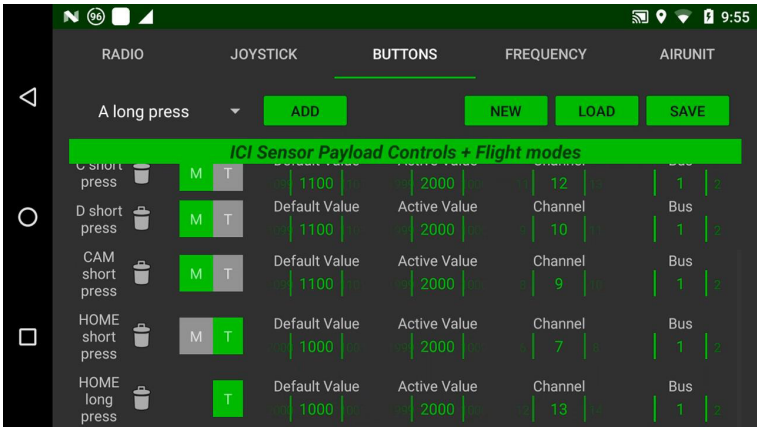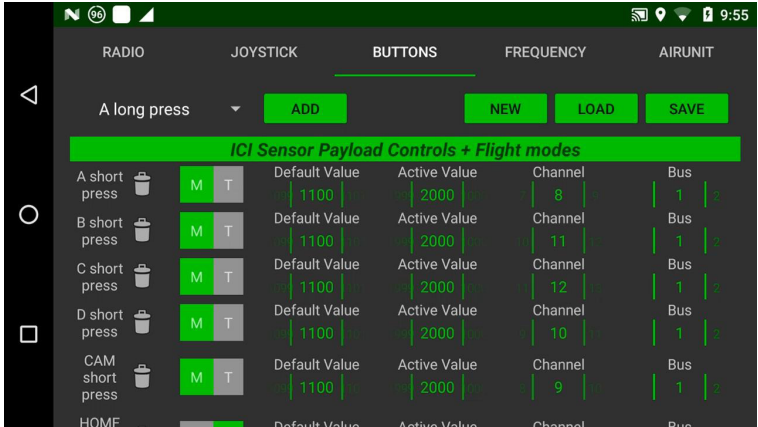
THE USER CAN EITHER DOWNLOAD AND COPY THE MODES.INI FILE TO THE KEYCONGFIGS DIRECTORY OR MANUALLY RECREATE THE CONTROL PROFILE. EITHER WAY THE RC WHEEL NEEDS TO BE SET TO CHANNEL 5. VISIT THE JOYSTICK TAB TO SET THE RC WHEEL CHANNEL.

4. Assign the physical RC wheel to Channel 5:
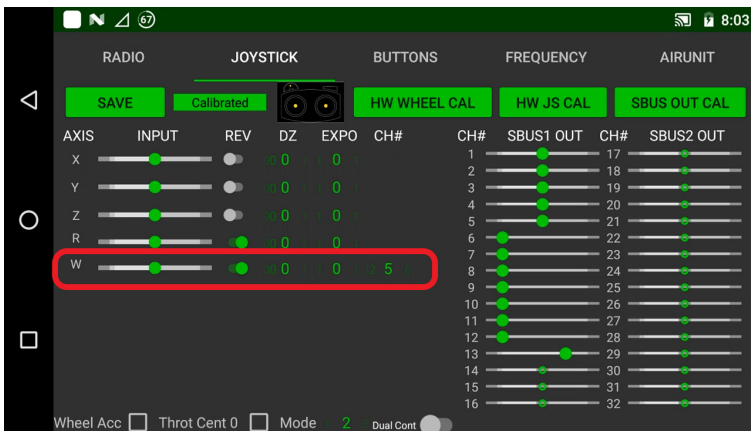
8-5-3-2   Other Radio Controller Types

For all other radio control units, reference the manufacturer's user manual for the configuration of channels aboard the remote controller. Alternatively, use default channels within the SCM user interface. As long as the RC channels are assigned to physical buttons and switches user should be able to observe these within the Mavlink inspector.

Channel 1 from any radio controller may be different when monitored within MAVLink Inspector. Map the channels to SCM from MAVLink Inspector channel monitor to avoid channel map confusion. If users have the ability to set channel switch and button controls they may do so to promote channel consistency through the system.

ALWAYS REFERENCE THE USER MANUAL FROM THE MANUFACTURER OF THE RADIO CONTROLLER TO PROPERLY CONFIGURE CHANNELS FOR REMOTE CONTROLLERS. CONTACT CUSTOMER SUPPORT IN THE EVEN ISSUES ARISE.

THE USER SHOULD SET CHANNEL SWITCH AND BUTTON CONTROLS WHENEVER POSSIBLE TO PROMOTE CHANNEL CONSISTENCY.

8-5-3-3   Wired Keyboard Mapping

Map input control channels to functions for SCM via SCM OSD UI menu system using wired keyboard as follows:

1. Press the Esc key; then, navigate to the MAVLink Configuration using arrow keys.

2. Once highlighted, press the Enter key. Instructions for navigating are displayed on screen

3. Map channels and their PPM values as shown below:
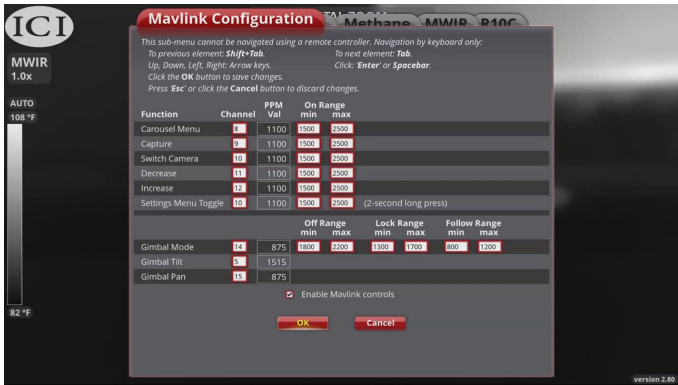
8-5-4   Autopilot Camera Trigger

There are alternative ways to set camera trigger function

8-5-4-1   Camera Trigger Option #1

Setup the camera trigger as follows:

1. Connect the 3 pin male to the male jumper cable from Aux 1 servo output from the Pixhawk 2 (by default this is Servo 9) to the PWM trigger port of SCM. The SCM PWM signal trigger wire (typically yellow or orange colored) is towards the top of SCM case when plugged in correctly.

2. Connect the 3 pin male to the male jumper cable from Aux 1 servo output from the Pixhawk 2 (by default this is Servo 9) to the PWM trigger port of SCM. The SCM PWM signal trigger wire (typically yellow or orange colored) is towards the top of SCM case when plugged in correctly.

3. Within the Mission Planner, click the Setup tab.

4. Click Optional Hardware; then, select Camera Gimbal for Camera Shutter.

5. Use servo9.

6. Set the servo limits to Min 1100.

7. Set the Push Value to 2000.

8.   Leave remaining settings unchanged.

8-5-4-2   Camera Trigger Option #2

Click Config; then, under the Full Parameter List set the values for CAM_SER-VO_OFF as 1100 and the value for CAM_SERVO_ON as 2000.
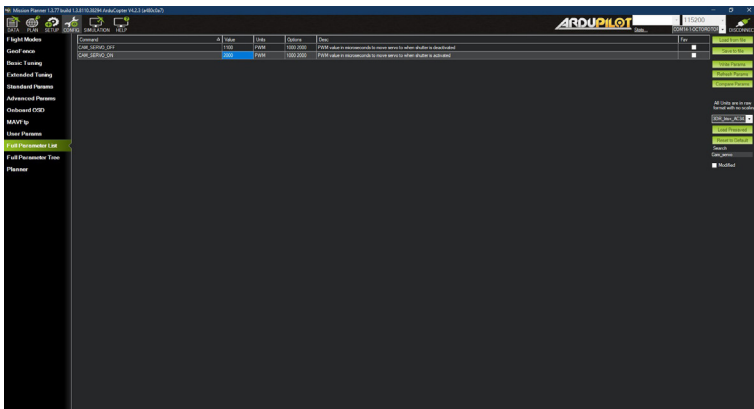
8-5-4-3   Camera Trigger Option #3

Click the Setup tab; then, click Mandatory hardware. Set the values as follows:
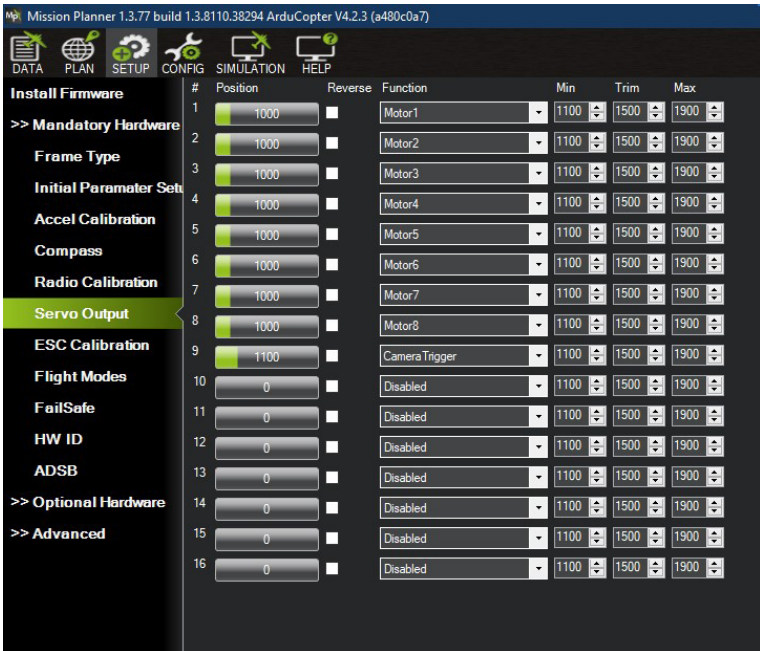
8-5-4-4   Test the Camera Trigger

Right-click on the map; then, click 'Trigger Camera NOW'.
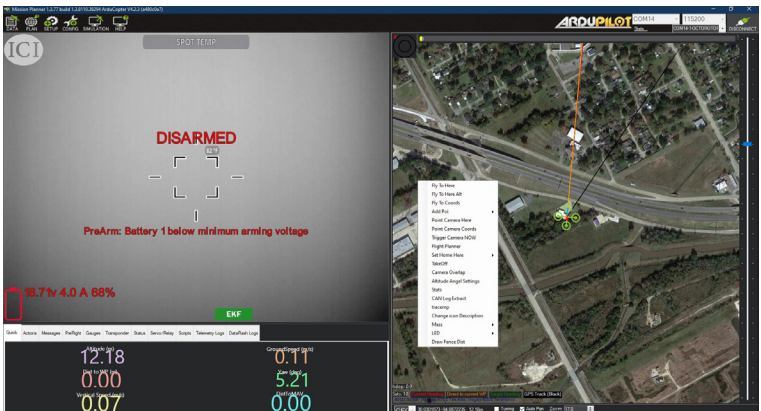
8-5-5   Flight Modes with HereLink

ICI has configured 3 flight modes on a single button: Loiter, Stabilize, and Return to Home (RTH).

UAS OPERATORS SHOULD PAY SPECIAL ATTENTION TO AND BE AWARE OF HOW FLIGHT MODE BUTTONS FUNCTION AS USERS CAN LOCK THE UAS INTO LOITER/STABILIZE MODES AND PREVENT THE DEVICE FROM RETURNING HOME. SEE SECTION 8-3-5-1-1 LOITER/STABILIZE LOCK.

8-5-5-1   Loiter and Stabilize

Users can press the Return home button on HereLink, which is mapped to channel 7 in our profile, to switch between Loiter and Stabilize modes. Confirm the setting is switching correctly in the Mission Planner by ensuring the Flight Mode Switch toggles between 1000-2000.

8-5-5-1-1   Loiter/Stabilize Lock

UAS operators should pay special attention to and be aware of how the flight mode buttons function as a Loiter/Stabilize Lock is built into the system. When the Loiter/Stabilize Lock is enabled quick pressing the RTH button switches back and forth between the Loiter and Stabilize flight modes. This means the Return to Home feature is disabled until the Loiter/Stabilize Lock is disabled.

Enable Loiter/Stabilize Lock as follows:

1.   While in Loiter flight mode, press and hold the RTH button to send the UAS into Return to Home mode.

2.   Press the RTH to send the UAS into Loiter/Stabilize flight mode. Any additional quick presses of the RTH button switches back and forth between Loiter and Stabilize flight modes.

Disable Loiter/Stabilize Lock by long pressing the RTH button twice.

8-5-5-2   Return to Home (RTH)

The Return to Home (RTH) button is mapped to channel 13 and is configured for a long press. The Mission Planner parameter RC13_OPTION is set to a value of 4 which is RTH. Users can also set the channel 13 switch options within the QGC app under flight modes

KNOWN BUG: UNDER THE FLIGHT MODES TAB OF THE QGC APP, WHEN RTH IS TRIGGERED CHANNEL 12 MAY LIGHT UP INSTEAD OF 13. PLEASE DISREGARD.

8-5-5-2-1   Cancel Return to Home (RTH) Mode

Cancel RTH mode by pressing and holding the RTH button once. Performing this action returns the UAS to the previously used flight mode: either Loiter or Stabilize.

8-5-6   Mapping Channels for Gimbal Controls

The lowest pin on the SCM SBUS out port is the SBUS signal, the top pin is the SBUS input for old method of control input, and the middle is empty. There is no gnd pin on the SBUS port of SCM; if the user needs to ground the SBUS cable they can create a harness that takes it from the trigger port GND which is the lowest pin in relation to the SCM case.

SCM SBUS out channel numbers for controlling tilt and pan (also mode if the user has enough physical controls and channels) are currently hard coded on the SCM output. RC channels reach the SCM over the referenced MAVLink Inspector RC channel monitor and are mapped to the gimbal functions via the SCM MAVLink Configuration OSD user interface.

8-4-6-1   Mapping the Channels

Gimbal control needs to be configured for SBUS control input and the channels need to be set accordingly:

- SBUS channel for controlling Tilt = CH 8
- SBUS channel for controlling Pan = CH 13
- SBUS channel for controlling Mode = CH 14

The following channels are not being referenced from MAVLink. ICI generates these standalone 'Dummy' channels during the old firmware days on Gremsy gimbals. The roll channel had to be assigned when using SBUS otherwise it would move on its own; therefore, ICI created a channel to map the roll movement control in order to ensure it is always centered. Later firmware for Gremsy gimbals allowed the channel to be set to 0 and alleviated the need for these extra 'Dummy' channels; however, the channels are still there.

Example of Gremsy gimbal SBUS channel controlling Tilt = CH 8:

SBUS channel for dummy channel = CH 11. The 'Dummy' channels center at 1500 ms ppm value for instances where the gimbal roll function requires a channel to be assigned in the neutral state otherwise the roll is not level.

SBUS channel for dummy channel 2 = CH 12. These 'Dummy' channels have no correlation to any channels that are received over MAVLink.

8-6   Pixhawk Cube FC (PX4 Firmware)

The steps shown below demonstrate how to interface the SCM with the Pixhawk Cube FC (PX4 Firmware). This setup requires SCM Firmware Version 2.80 and a minimum of two USB ports.

8-6-1   SCM Firmware Version 2.80

This setup requires SCM Firmware Version 2.80. Click or scan the RC controller code to download the firmware update.

Click or Scan to Download

THE PIXHAWK 2 SETUP REQUIRES SCM FIRMWARE VERSION 2.80. CLICK OR SCAN THE QRC CODE TO DOWNLOAD THE UPDATE.

THE HUB REQUIRES A MINIMUM OF TWO USB PORTS.

8-6-2   MAVLink Settings

When the SCM is connected to TELEM 1 Port of the flight controller set MAV_0_CONFIG = TELEM 1.

When using herelink set MAV_1_CONFIG = TELEM 2.

Setting MAV_1_MODE = Normal fixes an HDMI bug with the PX4 Firmware and is required if users are using the SCM with herelink.

8-6-3   Flight Mode Settings

Mode Channel = 7

Return switch channel = 13

8-6-4   Serial Settings

The baud rate for the TELEM 1 Serial Port that the SCM is connected to is SER_TEL1_BAUD = 57600 8N1.

The baud rate for the TELEM 2 Serial Port that the Herelink is connected to SER_TEL1_BAUD = 115200 8N1.

8-6-5   Flight Modes with HereLink

ICI has configured 3 flight modes on a single button: Loiter, Stabilize, and Return to Home (RTH).

UAS OPERATORS SHOULD PAY SPECIAL ATTENTION TO AND BE AWARE OF HOW FLIGHT MODE BUTTONS FUNCTION AS USERS CAN LOCK THE UAS INTO LOITER/STABILIZE MODES AND PREVENT THE DEVICE FROM RETURNING HOME. SEE SECTION 8-3-5-1-1 LOITER/STABILIZE LOCK.

SETTING UP PIXHAWK2 AUTOPILOT CAMERA TRIGGER IS NOT CURRENTLY AVAILABLE. IT IS BELIEVED LIES WITH THE PX4 FIRMWARE OR ITS CONFIGURATIONS FOR THE PIXHAWK CUBE ORANGE.

8-6-5-1   Loiter and Stabilize

Users can press the Return home button on HereLink, which is mapped to channel 7 in our profile, to switch between Loiter and Stabilize modes. Confirm the setting is switching correctly in the Mission Planner by ensuring the Flight Mode Switch toggles between 1000-2000.

PX4 FIRMWARE DOES NOT ALLOW A CHANGE IN FLIGHT MODE TO OVERRIDE OUT OF RTH. MONITOR THE FLIGHT MODES WITHIN QGC.

8-6-5-1-1   Loiter/Stabilize Lock

UAS operators should pay special attention to and be aware of how the flight mode buttons function as a Loiter/Stabilize Lock is built into the system. When the Loiter/Stabilize Lock is enabled quick pressing the RTH button switches back and forth between the Loiter and Stabilize flight modes. This means the Return to Home feature is disabled until the Loiter/Stabilize Lock is disabled.

Enable Loiter/Stabilize Lock as follows:

1.   While in Loiter flight mode, press and hold the RTH button to send the UAS into Return to Home mode.

2.   Press the RTH to send the UAS into Loiter/Stabilize flight mode. Any additional quick presses of the RTH button switches back and forth between Loiter and Stabilize flight modes.

Disable Loiter/Stabilize Lock by long pressing the RTH button twice.

8-6-5-2   Return to Home (RTH)

The Return to Home (RTH) button is mapped to channel 13 and is configured for a long press. The Mission Planner parameter RC13_OPTION is set to a value of 4 which is RTH. Users can also set the channel 13 switch options within the QGC app under flight modes

KNOWN BUG: UNDER THE FLIGHT MODES TAB OF THE QGC APP, WHEN RTH IS TRIGGERED CHANNEL 12 MAY LIGHT UP INSTEAD OF 13. PLEASE DISREGARD.

8-6-5-2-1   Cancel Return to Home (RTH) Mode

Cancel RTH mode by pressing and holding the RTH button once. Performing this action returns the UAS to the previously used flight mode: either Loiter or Stabilize.

8-6-6   Mapping Channels for Gimbal Controls

The lowest pin on the SCM SBUS out port is the SBUS signal, the top pin is the SBUS input for old method of control input, and the middle is empty. There is no gnd pin on the SBUS port of SCM; if the user needs to ground the SBUS cable they can create a harness that takes it from the trigger port GND which is the lowest pin in relation to the SCM case.

The SBUS output for controlling a gimbal is currently under construction, despite that, it's working. Users need to understand how it works. Map the gimbal functions via the SCM MAVLink Configuration OSD user interface.

8-6-6-1 Mapping the Channels

Gimbal control needs to be configured for SBUS control input and the channels need to be set accordingly:

- SBUS channel for controlling Tilt = CH 8
- SBUS channel for controlling Pan = CH 13
- SBUS channel for controlling Mode = CH 14

The following channels are not being referenced from MAVLink. ICI generates these standalone 'Dummy' channels during the old firmware days on Gremsy gimbals. The roll channel had to be assigned when using SBUS otherwise it would move on its own; therefore, ICI created a channel to map the roll movement control in order to ensure it is always centered. Later firmware for Gremsy gimbals allowed the channel to be set to 0 and alleviated the need for these extra 'Dummy' channels; however, the channels are still there.

Example of Gremsy gimbal SBUS channel controlling Tilt = CH 8:

SBUS channel for dummy channel = CH 11. The 'Dummy' channels center at 1500 ms ppm value for instances where the gimbal roll function requires a channel to be assigned in the neutral state otherwise the roll is not level.

SBUS channel for dummy channel 2 = CH 12. These 'Dummy' channels have no correlation to any channels that are received over MAVLink.

8-6-7 Other Settings

The following setting may or may not cause communication errors over MAVLink:

BRD_SER1_RTSCTS = 2

This parameter is for advanced users. Have a qualified technician adjust settings. A reboot required after changing parameters.

9. Configuration

The guide below will demonstrate how to make common configurations with the Sensor Control Module.

9-1 Keyboard Interface

The Sensor Control Module is packaged with a RII keyboard to navigate the SCM interface.

9-2 Hotkeys

M/TAB/ESC - display the settings menu

F - display frame rate and GPS data

R - reload calibration files

9-3 SCM Menu

9-3-1 SBUS Settings

9-3-1-1 Channel Mapping

Map channels in the SBUS by pressing M/TAB/ESC to enter the menu interface. By default the user is greeted with the SBUS Channel Mapping menu (next page).

INSTRUCTIONS ARE AVAILABLE ON-SCREEN TO ASSIST WITH MAPPING AND SETTINGS ADJUSTMENTS.

Here users have the option to change Channel Mode and the channels of simple SCM functions such as capturing an image, switching to different sensors, or mode of the software.

Change a channel value as follows:

1. Navigate to the desired options by using the UP and DOWN arrow keys.

2. Once a value has been selected, input an available channel. Available channels are dependent on the existing channel settings and type of radio system utilized.

3. Press ENTER to confirm the settings.

9-3-2   General Settings

In the General tab capture intervals can be set along with basic information such as date, time, and software version.

9-3-2-1   Capture Settings

Change a capture interval as follows:

1. Navigate to the desired options by using the UP and DOWN arrow keys.

2. Define an integer in the range of 1 to 3600 seconds.

3. Press ENTER to confirm the settings.

9-3-2-2   Date and Time Settings

Date and time settings are automatic.

9-3-2-3   Software Information

The most up-to-date software version is shown.

9-3-3   IR Settings

The IR tab allows users to change the basic settings of the camera connected to the SCM.
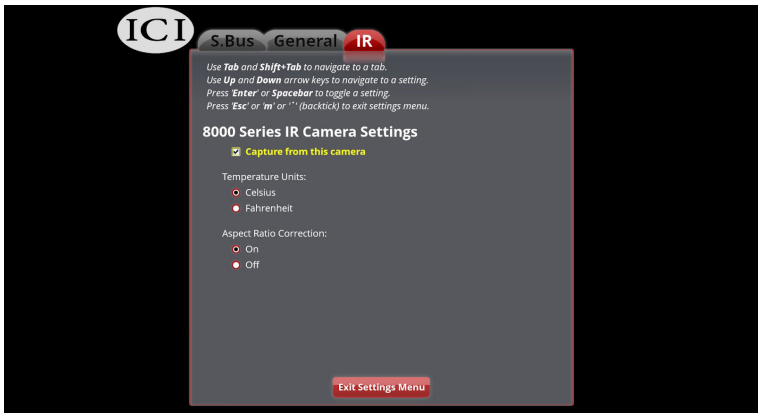
9-3-3-1   Enable Capture Media

If multiple cameras are attached each camera shows in its own tab. The user can assign a camera to be in charge of media capture as follows:

1.   Navigate to the desired options by using the UP and DOWN arrow keys.

2.   Check the box: Capture from this Camera.

3.   Exit the Settings Menu to confirm the settings.

9-3-3-2   Temperature Units

Celsius and Fahrenheit units are available for measurements. Select a unit of temperature as follows:

1.   Navigate to the desired options by using the UP and DOWN arrow keys.

2.   Select a temperature unit: Celsius or Fahrenheit.

3.   Exit the Settings Menu to confirm the settings.

9-3-3-3   Aspect Ratio Correction

Adjust the aspect ratio as follows:

1.   Navigate to the desired options by using the UP and DOWN arrow keys.

2.   Select On or Off.

3.   Exit the Settings Menu to confirm the settings.

9-3-4   Sony Cameras Settings

Users who purchased an IR/Visible SCM package with a Sony camera have an additional tab in their settings menu.

Consult the Interface Diagram for more information.

9-3-4-1   Enable Wi-Fi

Sony cameras operate on Wi-Fi to communicate with the SCM. Enable as follows:

1.   Navigate to the Sony Wi-Fi password field; then, enter the provided password.

2.   Confirm these settings by pressing ENTER.

After the Sony Wi-Fi status shows as connected the user can capture images and change additional settings.

9-3-4-2   Enable Capture Media

Enable media capture from the Sony camera as follows:

1.   Navigate to the desired options by using the UP and DOWN arrow keys.

2.   Check the box: Capture from this Camera.

3.   Exit the Settings Menu to confirm the settings.

9-3-4-3   Image Rotation

Check the box to rotate the image from the Sony Camera 180 degrees.

1.   Navigate to the desired options by using the UP and DOWN arrow keys.

2.   Check the box: Rotate 180 Degrees.

3.   Confirm these settings by pressing ENTER.

9-3-4-4   Aspect Ratio Correction

Adjust the aspect ratio of the Sony camera as follows:

1.   Navigate to the desired options by using the UP and DOWN arrow keys.

2.   Select On or Off.

3.   Exit the Settings Menu to confirm the settings.

9-3-5   Visible/Near IR Camera Settings

Visible and Near IR (NIR) tap may show with certain packages. If users purchased the ICI TIS1 the menu defaults shown the TIS1 tab.

9-3-5-1   Enable Capture Media

Enable media capture from visible and NIR cameras as follows:

1.   Navigate to the desired options by using the UP and DOWN arrow keys.

2.   Check the box: Capture from this Camera.

3.   Exit the Settings Menu to confirm the settings.

9-3-5-2 Lens Settings

Depending on available lenses users can select lens type as follows:

1. Navigate to the desired options by using the UP and DOWN arrow keys.

2. Select lens type: Visible (Vis) or Near Infrared (NIR).

3. Exit the Settings Menu to confirm the settings.

9-3-5-3 Capture Resolution

Depending on available lenses users can select lens type as follows:

1. Navigate to the desired options by using the UP and DOWN arrow keys.

2. Select a resolution: 2592×1944 (5MP) or 640×480 (VGA).

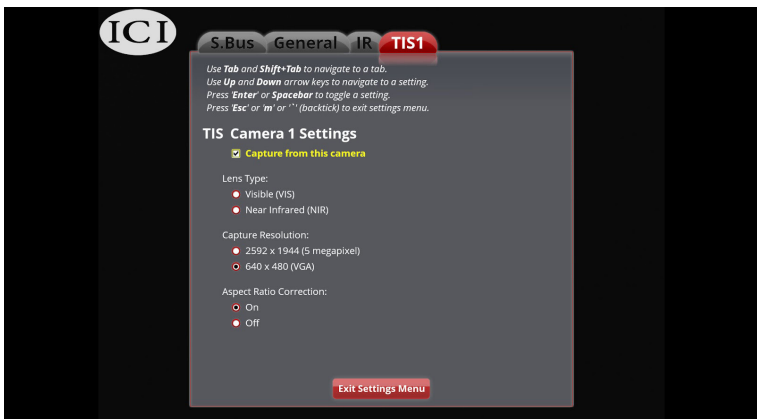3. Exit the Settings Menu to confirm the settings.

9-3-5-4 Aspect Ratio Correction

Adjust the aspect ratio of the Sony camera as follows:

1. Navigate to the desired options by using the UP and DOWN arrow keys.

2. Select On or Off.

3. Exit the Settings Menu to confirm the settings.

10.   Operation Instructions

After the user has mapped the SBUS channels in the Channel Mapping menu, operation should be as simple as correlating the mapped channels with your radio control system button mapping.

ICI recommends the Futaba Fasst Series of 18 channel radio systems.

10-1 Capture an Image

Taking images should be a easy-to-perform task. ICI recommends mapping this function to a simple switch or toggle. Once the corresponding action is performed the following message appears on-screen:
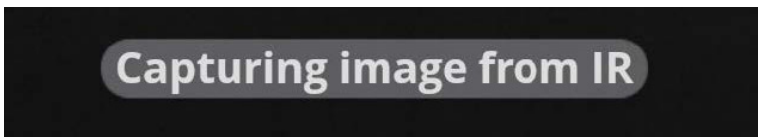
Depending on Capture Interval settings this message stays at the bottom of the Heads-up Display (HUD) until the capture interval is over.

10-2 Sensor Selection

In a multi camera system, Sensor Selection is very important. It gives users the ability to switch to various sensors while operating the aerial system. Map the function to a two way toggle if the UAS has two sensors; map the function to three if there are three sensors. If the UAS has more than three sensors ICI recommends a one way toggle to scroll through the available sensors.

Example: A regular IR sensor and a Sony Camera package. Performing a sensor selection should appear as follows:
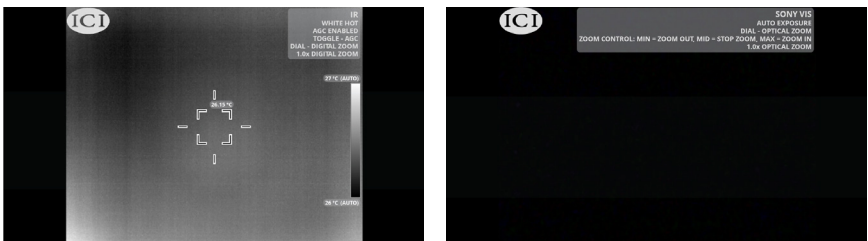
In the top right portion of the HUD, one can see that the sensor label changes from IR to the visible camera.

10-3 Mode

The SCM operating system has three modes: AGC, Radiometry, and Color Palette. It is recommended to map the mode function to a 3-way switch. The mode is indicated by the fourth status in the right hand portion of the HUD.

Example: changing the mode from Radiometry to AGC.
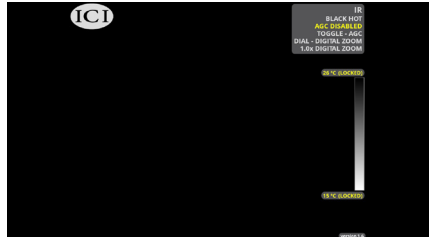
10-4 Toggle

In every mode of the SCM's operating system there are toggles. AGC, for example, has AGC enabled, AGC disabled, Adjust Min Pixel, and Adjust Max Pixel. It is recommended to have toggle mapped to a one way switch. This will function as if the user is scrolling through the options.

Example: toggling Color Palettes
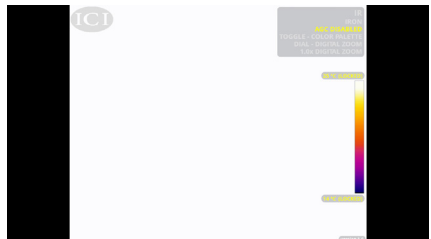
After mapping the color palette to the toggle switch, it can be used to change polarity from Black Hot to Iron.

USER SHOULD BE WELL ACQUAINTED WITH THE CHANNEL MAP BEFORE FLYING. REVIEW THE MANUAL FULLY BEFORE OPERATION.

10-5 Dial

The dial function is used in a variety of ways, one being AGC. When mapping the dial function ICI recommends the user map it to an actual dial for more precise control.

Example:

In the example, above the Min Pixel Value was changed from 22C to 28C using a function mapped to a dial. It is best practice to map the Adjust Min Pixel and Adjust Max Pixel to separate knobs for greater control.

11.   Image Processing

11-1   IR Flash Pro

IR Flash Pro is a professional software used to capture infrared images and videos for thermal analysis. The software also has features for correcting radiometric data and imaging parameters.

Documentation can be found online on the IR Flash Pro web page under the Downloads section or at this address:

https://infraredcameras.com/ir-flash-pro-manual/

11-1-1   Recommended System Requirements

Processor: i5 or above
RAM: 4 GB or above
OS: Windows XP/7/8/8.1/10
Hard Drive: 256 GB or above
Resolution: 1920 × 1080

SOFTWARE DISPLAYS BEST ON A 1920 X 1080 DISPLAY.

12.   Cleaning and Maintenance

12-1   Cleaning the Germanium Lens

Do not use corrosive chemicals on optical glass components. The germanium window surface is coated with anti-reflection coating. Dust, grease, and fingerprints will produce harmful substances and lead to a decline in performance, or cause scratches. If dirt is found, please use the following methods:

1.   Use a blown balloon or a soft brush to clean the lens surface to avoid dust particles scratching the anti-reflection film on lens surface during the wiping process.

2.   Use a soft cotton or microfiber cloth or lens wiping paper and dip in distilled water. Gently wipe the lens surface from the middle to the edge, paying attention to not crack the lens, or use too much liquid. If the lens is still not clean, replace the cloth and repeat the wiping process.

12-2   Disinfecting the Camera Surface

Do not use corrosive cleaning solutions on the optical glass components. It is recommended to disinfect the camera surface regularly with a non-corrosive sanitizing product. Follow the directions provided by the manufacturer of the cleaning solution. Adhere to the sanitation protocols and cleaning schedule set forth by the employer.

12-3   Device Calibration

It is recommended to have the device(s) re-calibrated annually. Contact customer service to schedule maintenance.

12-4   Storage

When the equipment is not in use, the device should be placed in a dust-free and moisture-free environment with a stable temperature and humidity.

DO NOT USE CORROSIVE CLEANING SOLUTIONS ON THE OPTICAL GLASS COMPONENTS. DISINFECT THE CAMERA SURFACE REGULARLY WITH A NON-CORROSIVE SANITIZING PRODUCT.

CALIBRATE YOUR DEVICES ANNUALLY. CONTACT CUSTOMER SERVICE TO SCHEDULE MAINTENANCE.

13.   Troubleshooting

If the user encounters any problems while using the imager, refer to the following options. If the problem persists, disconnect the power and contact the customer support department.

13-1   No live feed from cameras (ICI Logo)

- Ensure proprietary ICI memory card is inserted properly into SCM prior to booting the system The user may need to try a new SD card.

- Sony R10C lens has failed to initialize due to lens being a jarred. Test if the front of the lens optic inside moves freely when turning the lens over, i.e. it gravitates to one direction. If so, push the front of the lens back into place.

- Reset the gimbal.

- Clean the contact of the quick release.

- Replace the OGI IR camera USB cable.

- Boot cameras individually to see if a specific sensor is causing issues. Do this by unplugging relevant cables from the SCM hub; then, boot the system. Which ever system does not produce a feed is causing the issue.

- Replace the SCM.

- Replace the USB gimbal axillary cable.

- Shim the gimbal axillary cable to create a tighter fitting connection.

13-2   No Live image from payload during preflight (black screen)

- Open the lens cap.

- Ensure proprietary ICI memory card is inserted properly into SCM prior to booting the system.

- Reconnect iOS or android device if the DJI GO App live view banner says 'Disconnected'; then, Unplug and reconnect the iOS or android device to the Lightbridge 2 controller.

- Unplug and reconnect the HDMI to Lightbridge 2 Air module cable.

- Relink the Master Lightbridge 2 controller with the UAS.

- Uninstall and reinstall the DJI Go App.

- Unplug and reconnect HDMI to SCM cable.

- Replace Lightbridge 2 Air module.

DO NOT ATTEMPT TO FIX BROKEN PIECES AND PARTS ALONE. CONTACT ICI FOR WARRANTY REPAIRS OR REPLACEMENTS. ATTEMPTING TO FIX PARTS AND PIECES MAY VOID THE WARRANTY.

13-3   No Live image from payload after take off (black screen)

- Open the lens cap .

- Unplug and reconnect the HDMI to Lightbridge 2 Air module cable.

- Reconnect HDMI to SCM.

- Replace Lightbridge 2 Air module.

- Nonfunctional SCM HDMI port. Replace the SCM.

13-4   No live video from Sony R10C RGB camera

- Open the lens cap .

- Camera is in standby mode. Check for a yellow light and reset the camera by pressing and holding the pinhole reset button located next to the Micro USB port. Then, reset the UAS and see if the camera LED is green.

- Unplug and reconnect the USB data cable for the Sony R10C.

- Power has been disconnected. Reconnect the power.

13-5   Live image is breaking up, glitching

- Adjust the (Software/hardware) decoding settings within the DJI Go App.

- Tension Metal tabs of HDMI port on SCM. This requires opening the SCM which may void the warranty. Call customer support for over the phone instructions. Tools are required. SCM may require replacing.

- Soft mount the SCM. SCM may require replacing.

- Relink the radio controller.

- Replace iOS or android device.

- Shut down apps background apps. If this does not work, uninstall and reinstall the DJI Go App.

- Unplug and reconnect HDMI to SCM cable.

- Unplug and reconnect the HDMI cable of the SCM. If this does not work, replace the HDMI cable. Requires proprietary DJI HDMI cable and should not be performed in the field.

- Possible mismatch or glitch between the Lightbridge 2 radio controller and the Lightbridge 2 Air unit. Update the Lightbridge 2 radio controller firmware; then, update the Air unit.

- Replace Lightbridge 2 radio controller.

- Replace Lightbridge 2 Air module.

- Replace the USB hub.

- Replace the SCM.

13-6   Live image, no gimbal control with solid red light

- Check the balance. Restart the gimbal.

- Check movement or obstructions. Restart the gimbal.

- Prior to start up, tilt gimbal 45° down to force the gimbal to check for weight and balance.

13-7   Live image, no gimbal control with solid green light

- The gimbal firmware is corrupt. Restart the gimbal until it boots correctly.

13-8   Banding of the live OGI video when TDLAS is powered on

- Replace the USB sensor hub.

- Contact customer support.

13-9   Multi Error

The error may appear as follows:

Error: SOCC_ERROR_USB_TIMEOUT
Error: SOCC_ERROR_USB_ENDPOINT_HALTED
Error: SOCC_ERROR_USB_OVERFLOW

ERROR
Check the connection between the USB hub and the Sony camera,
Or check the camera battery if the camera is an R10C.
(SOCC_ERROR_USB_OTHER)

- The USB auxiliary cable bridging the SCM USB port to the HDMI hyper quick release is connected to the wrong USB port. Verify the cable is connected to the top USB port relative to the SCM. On M600 systems, the SCM is mounted upside down; therefore the user should plug in the cable relative to the M600 mounting procedures.

- Nonfunctional gimbal; this is most likely cause by a wreck which damaged the internal cables of the gimbal.

- Change the Micro USB cable that bridges the Sony R10C to the USB hub.

- Replace the SCM.

13-10 Sensor out of focus

- Adjust sensor focus.

13-11 Memory card error

The error may appear as follows:

ERROR! CAN'T CAPTURE IMAGES MICRO SD CARD NOT FOUND

- Ensure proprietary ICI memory card is inserted properly into SCM prior to booting the system.

- Error may occur if the SCM card reader loses connection to SCM before a momentary capture.

- Error will occur if the memory card is removed during a capture process before the system has completed process. Reinsert the memory card and restart the capture process. The error is most likely to occur when the capture button mode is set to 'press to turn on, press to turn off'.

13-12 Memory card sticking or not ejecting

- Apply a thin layer of lithium grease to the memory card. Ensure excess grease has been removed before inserting memory card into the device.

DO NOT YANK THE MEMORY CARD OUT OF THE DEVICE OR USE PLIERS TO PRY THE MEMORY CARD FROM THE SLOT. DAMAGE MAY OCCUR.

13-13 No control of SCM UI without error messages

- Replace the Canbus cable between the SCM C-Bus port and Can1 port of A3 flight control system.

13-14 Visible live feed is frozen

- Most likely cause by vibrations that disconnected the memory card during interval capture. Reconnect memory card.

13-15 OGI IR live feed is frozen

- Unplug and reconnect the USB cables.

13-16 Live video freezes after takeoff

- Unplug and reconnect the USB cables.

- If the USB hub is HOT after boot up there is an issue with the USB hub.

13-17 Loss of zoom control on visible camera

- Most likely cause by dust inside the lens. Tap on the lens during the power up to help break up the dust and allow the camera to cycle the lens.

- Replace the visible lens.

13-18 Loss of zoom control on OGI camera

- The TDLAS serial USB dongle is not detecting the TDLAS.

13-19 Sony Disconnect Error

The error appears as follows: **SOCC_ERROR_USB_OTHER**

- Power via the dummy battery is lost. Replace Main Sensor Power harness with the new version featuring the clamping barrel.

- Reconnect Sony R10C data USB cables.

- T3v2 only: Main gimbal harness failure due to melted fuse. Replace gimbal harness/fuse.

DO NOT ATTEMPT TO FIX BROKEN PIECES AND PARTS. CONTACT ICI FOR WARRANTY REPAIRS OR REPLACEMENTS. ATTEMPTING TO FIX PARTS AND PIECES MAY VOID THE WARRANTY.

13-20 GPS big error

*   The API Port cable became disconnected during operation.

*   If user loses control over the gimbal and carousel menu the GPS module is losing connection with the A3. Unplug and reconnect the connecting cables.

*   If the user maintains control of the gimbal and carousel menu the API port cable is either disconnecting from the A3 or SCM USB Port. Unplug and reconnect the connecting cables

13-21 GPS small error

*   Reboot the system.

*   When error is present, login to the DJI A3 flight controller and monitor connectivity of GPS modules and verify all are maintaining stable connection. If not, unplug and reconnect cables before trying again.

*   Shim the USB connection for the API port.

*   Soft mount the SCM.

13-22 No Canbus Detected Error

*   Replace GPS 1 unit. The M600 requires 3 GPS modules, each with its own number: 1, 2, and 3. These number can be seen on the modules via LED flashes. Connect to a PC with DJI Assistant 2 software in order to verify the GPS 1 unit is operating normally. A flickering unit requires replacement.

*   C-Bus cable is not plugged in or the connection is forced reversed into SCM. Unplug and reconnect the cable.

*   C-Bus cable is plugged into the wrong port type. Plug the cable into the can1 port.

*   A3 flight control system with single GPS has been mis-assigned by the factory.

*   SCM SOM (System on Module) needs replacement. A good sign of this fault is multiple reboots to achieve a working canbus. A canbus error every few boot ups is also an indicator of a nonfunctional SCM SOM. Contact ICI customer service for repairs and replacements as this part can only be fixed in-house. Attempting to fix the SCM SOM may void the warranty.

DO NOT ATTEMPT TO FIX BROKEN PIECES AND PARTS. CONTACT ICI FOR WARRANTY REPAIRS OR REPLACEMENTS. ATTEMPTING TO FIX PARTS AND PIECES MAY VOID THE WARRANTY.

13-23 Temperature readings are incorrect

- Turn off the system; then, turn it back on.

- Ensure selected sensor is in focus.

- To ensure the accuracy of temperature measurement, you are recommended to wait for 5 to 10 minutes after turning on the thermal imager and before measuring temperatures.

CALIBRATE YOUR DEVICES ANNUALLY. CONTACT CUSTOMER SERVICE TO SCHEDULE MAINTENANCE.

13-24 Unclear or dark visible images from attached camera

- Image at times when there is plenty of light.

- If lens is foggy, use professional equipment to clean the lens. Do not use abrasive chemicals on the germanium lenses as this will damage the anti-reflective coating.

14.   Glossary

14-1   Abbreviations

API - Application Programming Interface

AUX - Auxiliary

GPS - Global Positioning System

HC - Hydrocarbon

IR - Infrared

LB1 - Lightbridge 1

LB2 - Lightbridge 2

LWIR - Long-wave Infrared

MWIR - Mid-wave Infrared

MP - Mission Planner

NIR - Near Infrared

OGI - Optical Gas Imaging

PPM - Parts per Million; can be expressed as milligrams per liter (mg/L)

SBUS - Serial Bus

SCM - Sensor Control Module

SOM - System On Module

SWIR - Short-wave Infrared

RMA - Return Manufacturer Authorization

SD - Secure Digital

TDLAS - Tuned Diode Laser Absorption Spectrometer

UAS - Unmanned Aerial System

UAV - Unmanned Aerial Vehicle

UBEC - Universal Battery Eliminator Circuit

UI - User Interface

USB - Universal Serial Bus

15.   About ICI

ICI manufactures complete systems and software. We can provide complete engineering, software, and OEM solutions. Our Fortune 500 clients rely on us for infrared equipment and thermography training (which we offer through the Infrared Training Institute).

In addition to providing custom germanium, silica, and sapphire optics, we also build windows for enclosures, as well as custom pan and tilt units. We can even provide customizable explosion-proof systems.

Our knowledge and experience stems from years of using infrared imaging and temperature measurement instruments to provide solutions to: managers, engineers, scientists, inspectors and operators in space, power companies, medical, pulp and paper, food industry, research and development, and various process industries. You can see our products and services used in industrial, commercial, and government applications worldwide. Additionally, our ICI 7320 was awarded "Product of the Month" by NASA*. Originally named Texas Infrared (still DBA), Infrared Cameras, Inc. has been in business since March, 1995.

Thank you for your dedicated and continued support.

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