Installation / Operation / Maintenance Manual

SCU 9iS AT

System Control Unit UAV - Autothrottle

Version: 5.0

Contents

1. Preface

Thank you for purchasing a System Control Unit from RS Flight Systems. We are pleased that you have chosen our product and are confident that it will meet all your expectations. In case of questions or problems with the unit, feel free to contact us:

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2. System Description

The System Control Unit (SCU) itself is based on the proven hardware of the second generation Engine Management Unit family (EMU 912iS evo and EMU 9xiS). The stand-alone main unit offers the following functionality:

- Automatic propeller speed control for Single Lever Power Control
  (in combination with optional MT Propeller governor)
- Automatic throttle valve control for helicopter or UAV applications
  (in combination with optional actuator system ML and DA)
- Automatic engine startup
- Connectivity to third party devices via CANaerospace
- Three optically isolated CANaerospace data bus interfaces for retained redundancy
- Engine Data transfer to CAN-based third-party avionics systems (e.g. by Garmin or Dynon)
- Continuous monitoring and health checking of both ECU display buses
- Seamless integration into the Rotax 912iS / 915iS / 916iS engine wiring harness
- Remote installation possible
- Georeferenced data recording of all parameters at 10 Hz over up to 2000 hours
- Simple data transfer and software update via an integrated memory card slot
- Sophisticated visualization and processing tool for recorded data (Windows, Linux, MacOS)
- Google Earth file export for recorded data including GNSS and engine data
- Several additional input and output channels for future system upgrades
- Suitable for 14 V and 28 V aircraft electrical systems
- Preassembled wiring harnesses available as accessories
- Highly customizable software (available on request)
- High level of manufacturing and quality control
- Engineering and production exclusively done in Germany

Figure 2-1: Top view of the SCU 9iS

Figure 2-2: SD Card Cover

Figure 2-3: Autothrottle Actuator ML Assembly

Figure 2-3: Autothrottle Actuator DA Assembly

This manual describes the installation, operation, and maintenance of the SCU 9iS AT and the Autothrottle Actuators ML and DA.

3. Technical Specifications

	SCU 9iS Main Unit
Mechanical Dimensions (width, height, depth)	120 x 149 x 34 mm 4.72 x 5.87 x 1.34 in
Mounting Hole Pattern (width, height)	4 screws up to M4 92.4 x 137.6 mm 3.64 x 5.42 in
Total Mass	0.62 kg 1.37 lbs
Housing	Aluminum, painted black and machined, IP30 (ISO 20653)
Supply Voltage	9 to 32 Volts DC, according to EN2282
Power Consumption	typ. 7.0 W (0.3 A at 14 V, 0.18 A at 28 V) without external load
CANaerospace Interfaces	According to ISO 11898-2, optically isolated two input channels, one output channel
Analog I/O	4 inputs (±10 V)
Digital I/O	5 low-side inputs, 5 high-side inputs 14 outputs (7 low-side, 7 high-side) driving up to 2.4 A each
Positioning	Combined GPS/Galileo Sensor (Navilock NL-603P), 4 Hz update rate
Electronics	Xilinx Spartan-3 FPGA with dual Microblaze processors
Storage	Single side mounted SD/SDHC-Card, up to 256 GB (FAT32)
Operating Temperature Range	-20 to +70 °C -4 to +158 °F
Operating Altitude	< 7,620 m < 25,000 ft
Humidity	< 95 %, non-condensing

Table 3-1: Technical Specification SCU 9iS Main Unit

	Autothrottle Actuator ML	Autothrottle Actuator DA
Mechanical Dimensions (width, height, depth)	153.9 x 177 x 82.6 mm 6.06 x 6.97 x 3.25 in	155 x 95 x 70 mm 6.10 x 3.74 x 2.76 in
Mounting	OE Throttle Valve mounting used	Modified OE Throttle Body included
Total Mass	0.72 kg 1.59 lbs	0.50 kg 1.10 lbs
Housing	Aluminum	Aluminum
Supply Voltage	13.5 V – 15.6 V nom.	12 VDC (12V Version) 24 VDC (24V Version)
Power Consumption	Standby < 7 W Peak 300 W	Standby < 1 W Peak 15 W
Connector	Flange mounted: AS212-35PN Harness mounted: AS612-35SN	Open wire end
Operating Temperature Range	-25 to +100 °C -13 to +212 °F	-30 to +70 °C -22 to +158 °F
Operating Altitude	< 7,620 m < 25,000 ft	< 7,620 m < 25,000 ft
Humidity	< 95 %, non-condensing	< 95 %, non-condensing

Table 3-2: Technical Specification Throttle Actuator

4. Mechanical Installation

Upon delivery, undertake visual inspection of the package contents for signs of transport damage and verify the information on the type plate sticker against your order. Do not open the device housing.

For longer storage of the device, select a dry and clean environment. Make sure that the device is not stored near strong heat sources and that no metal chippings or other dirt can get into the device or its connectors.

The SCU is mounted on a horizontal or vertical surface using four screws (max. diameter 4.0 mm) not included in the package. The hole positions can be taken from Figure 4-1. If you are using fixed female threads in the mounting surface instead of nuts, provide a minimum thread length of 4 mm. Always secure your mounting joint.

As waste heat is dissipated via free convection, leave at least a 5 mm gap from the exterior surfaces (excluding the mounting face) to any other object. Forced cooling is not necessary.

The installation must be in accordance with the appropriate guidelines approved by the respective aviation authority. The person installing the device is responsible for compliance with all applicable legislation. It is recommended to wear ESD gloves during maintenance work.

4.1 Drawings SCU 9iS Main Unit

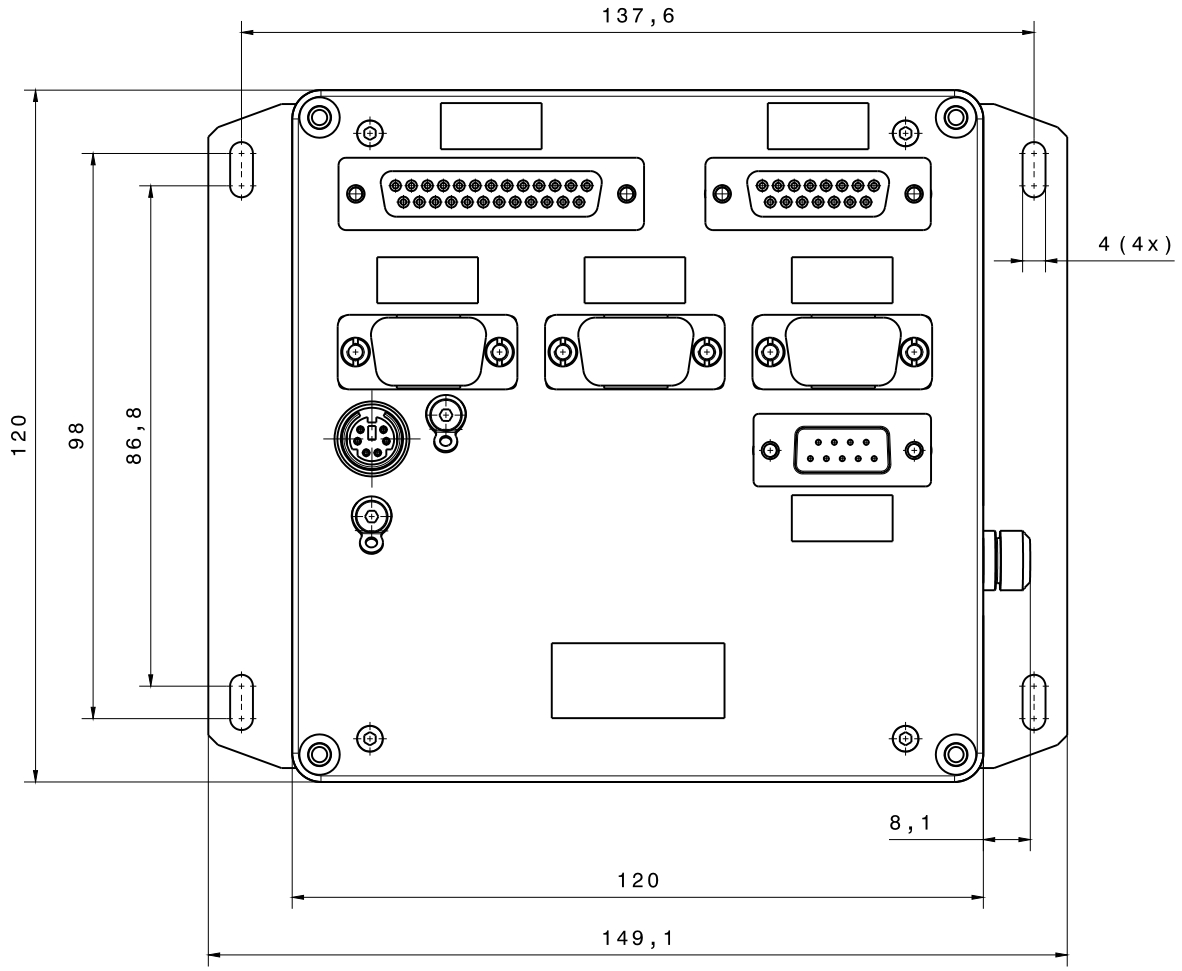

Figure 4-1: SCU 9iS Main Unit (front view)

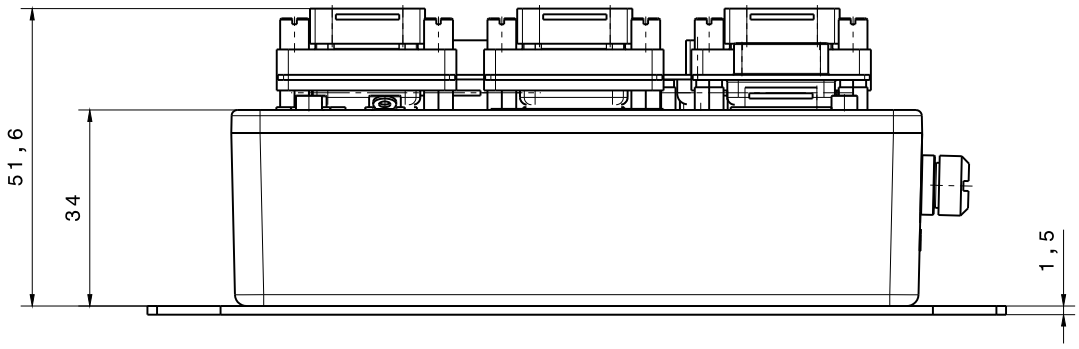

Figure 4-2: SCU 9iS Main Unit (side view)

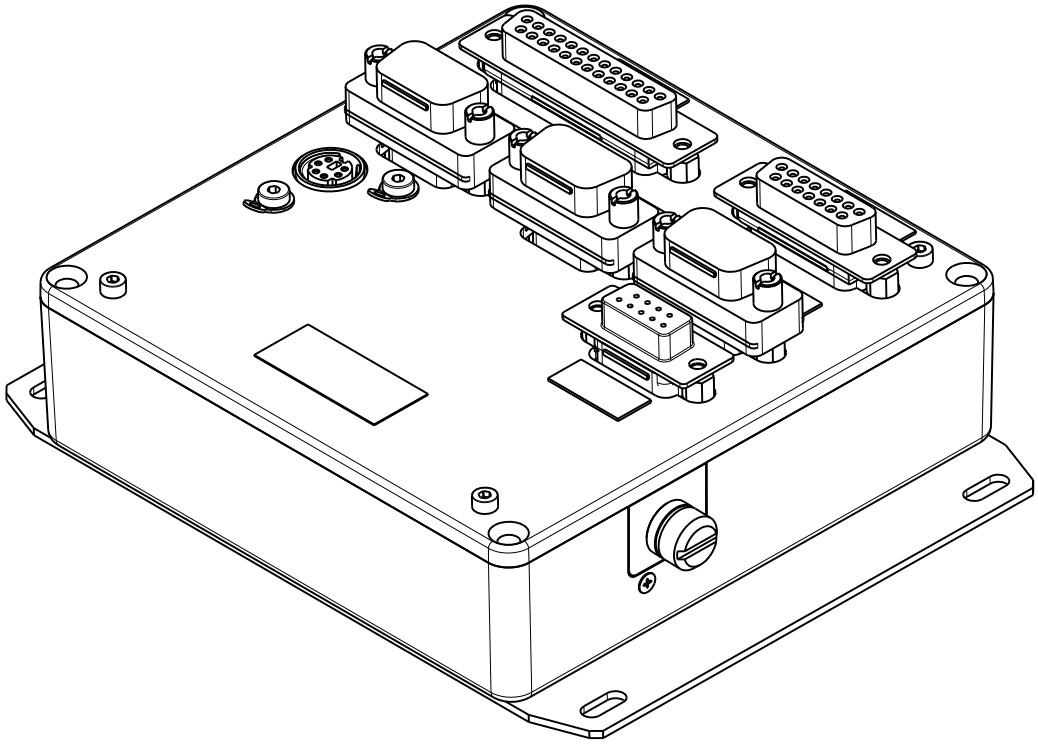

Figure 4-3: SCU9iS Main Unit (isometric view)

4.2 Drawings Throttle Actuator ML Assembly

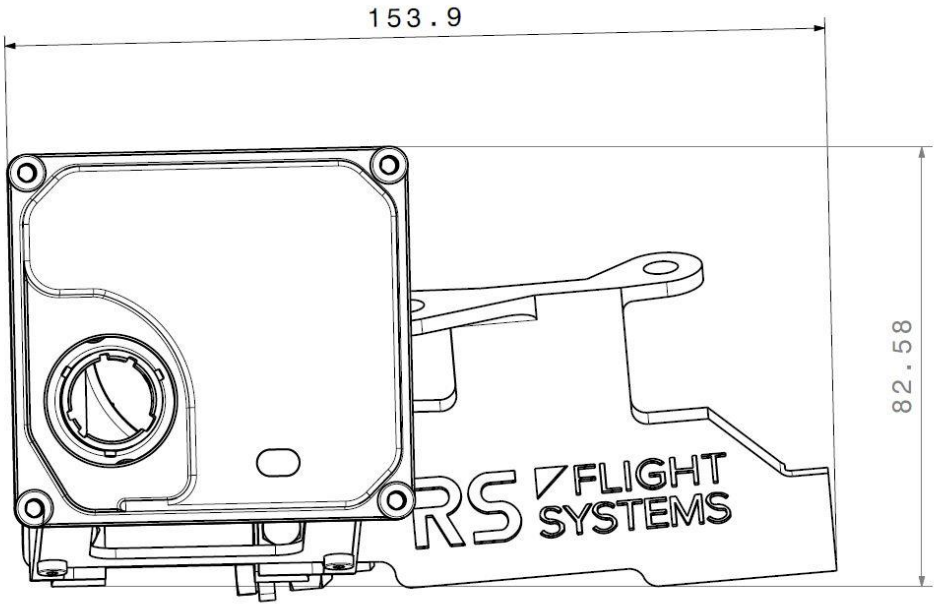

Figure 4-4: Throttle Actuator ML Assembly (top view)

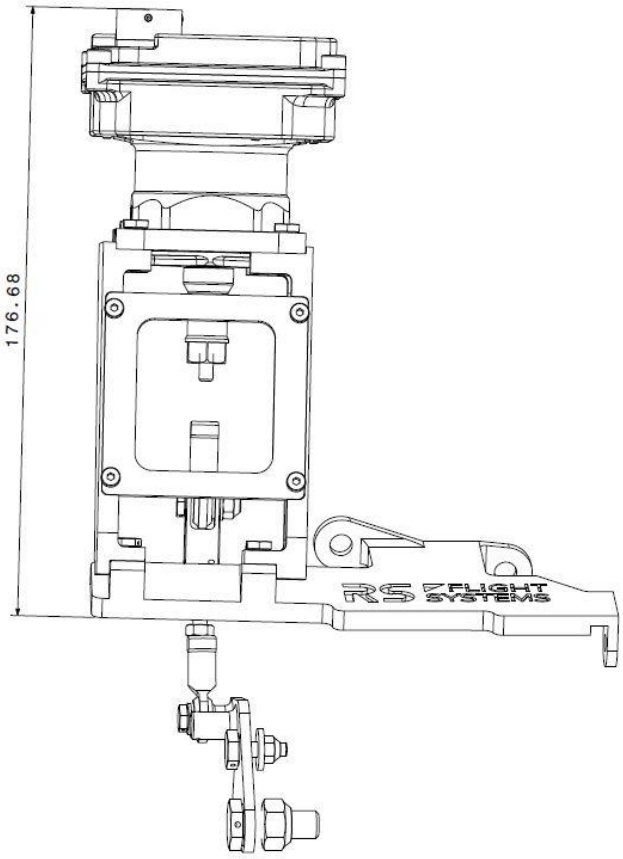

Figure 4-5: Throttle Actuator ML Assembly (side view)

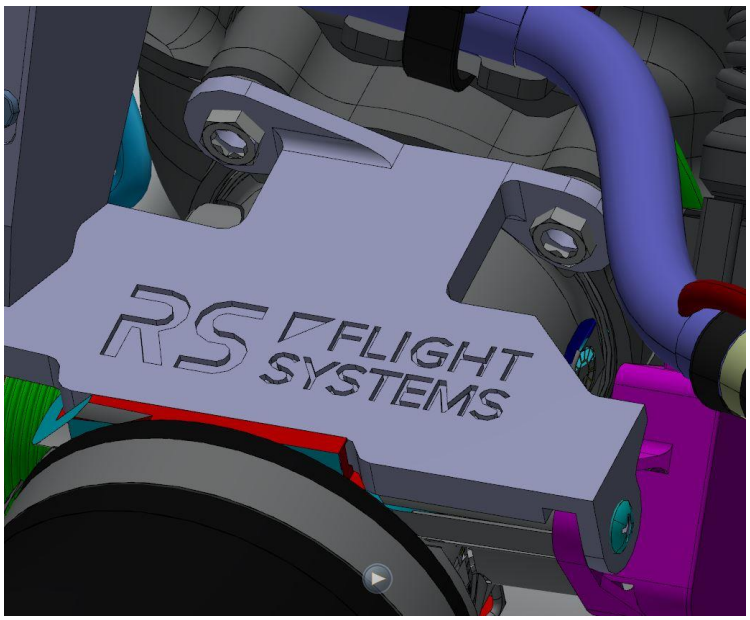

Figure 4-6: Mechanical Assembly ML

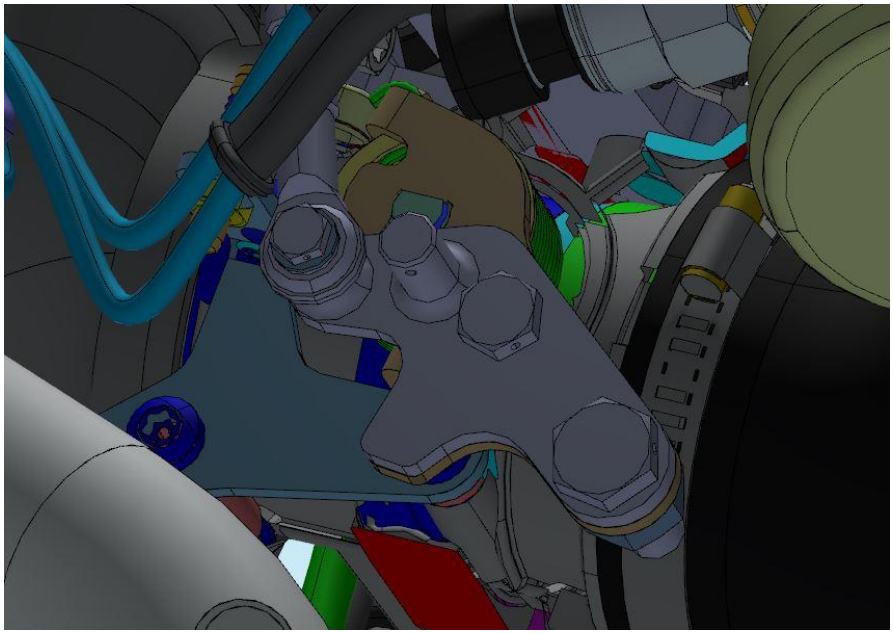

Figure 4-7: Throttle valve interface ML

4.3 Drawings Throttle Actuator DA Assembly

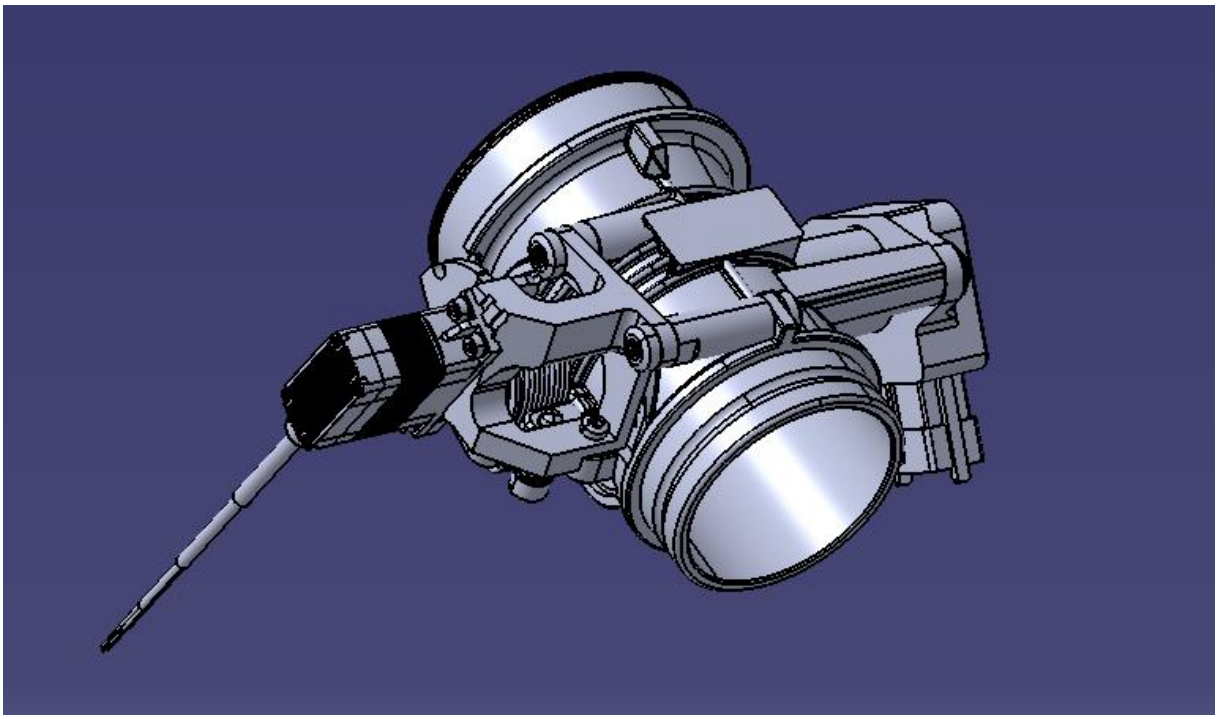

Figure 4-7: Throttle valve interface DA

4.4 Mechanical Installation Actuator ML Assembly

Install the Throttle Actuator ML using the OE screws of the throttle valve. Therefor loosen the upper two screws from the throttle valve and mount the Throttle Actuator Assembly as shown in Figure 4-6.

Install the connection to the throttle valve interface as shown in Figure 4-7.

Proceed after bringing actuator into service with read out of throttle position on CAN Lane C ID 692. Compare transmitted actuator position to throttle valve position and adjust the setting screw with left and right thread to match the values for all actuator positions. Be aware, that there is no actuator movement between 0% - 30%.

4.5 Mechanical Installation Actuator DA Assembly

The Throttle Actuator DA is an integral assembly with the OE throttle body. The OE throttle body is modified and included in the kit. Demount the original throttle body. Therefor loosen the three screws and remove the original throttle body. Install the Actuator DA in the same way. Insert the Actuator in the airbox and tighten the 3 screws.

5. Electrical Installation

The SCU Main Unit has seven connectors on the front side. Six of them are standard density D-Sub connectors with 4-40 UNC threaded fastening. All three CAN Connectors ("Lane A", "Lane B" and "Lane C") are equipped with a filter adapter to enhance signal quality. Do not remove these filters. The remaining DIN-style connector for the GNSS Antenna is secured with two safety wires.

Connector	Label	Connector Type	Usage
AUX	"AUX"	DA15S (female 15-pin D-Sub)	I/O
I/O	"EXT"	DB25S (female 25-pin D-Sub)	I/O
CANaero_A	"LANE A"	DE9P (male 9-pin D-Sub)	CAN Bus Input, Power Supply
CANaero_B	"LANE B"	DE9P (male 9-pin D-Sub)	CAN Bus Input
CANaero_C	"LANE C"	DE9P (male 9-pin D-Sub)	CAN Bus Output
FP	"PANEL OUT"	DE9S (female 9-pin D-Sub)	Connection to Extension Units
GNSS	"GPS INPUT"	Female Mini-DIN 6	GNSS Antenna

Table 5-1: Main Unit connectors

Place the GNSS antenna in a spot where it has maximum optical visibility of the sky, e.g. beyond any airframe structure facing up, which is not made of metal or carbon fiber. Poor GNSS reception has no adverse impact on the operation of the unit yet may impair recordings of position, ground speed and UTC data.

Only use self-extinguishing cables suitable for installation in aircraft, e.g. SAE-AS22759 or SAE-AS27500. AWG22 (0.34 mm²) is a sufficient cross section for power supply of the SCU. Preassembled wiring harnesses are available as accessories for simplifying the installation. For part numbers see Chapter 5.6 or contact RS Flight Systems directly.

Ensure that proper grounding connections are made and that the various ground potentials are not connected outside of the Main Unit. This is especially important for the analog reference ground.

Figure 5-1 shows an overview of all standard connections.

Carefully check your wiring before powering up the unit for the first time.

For the Throttle Actuator ML a proper power supply must be available. Due to high-speed travel possibilities a peak current of 20 A could occur. Normal operation consumes up to 3 A.

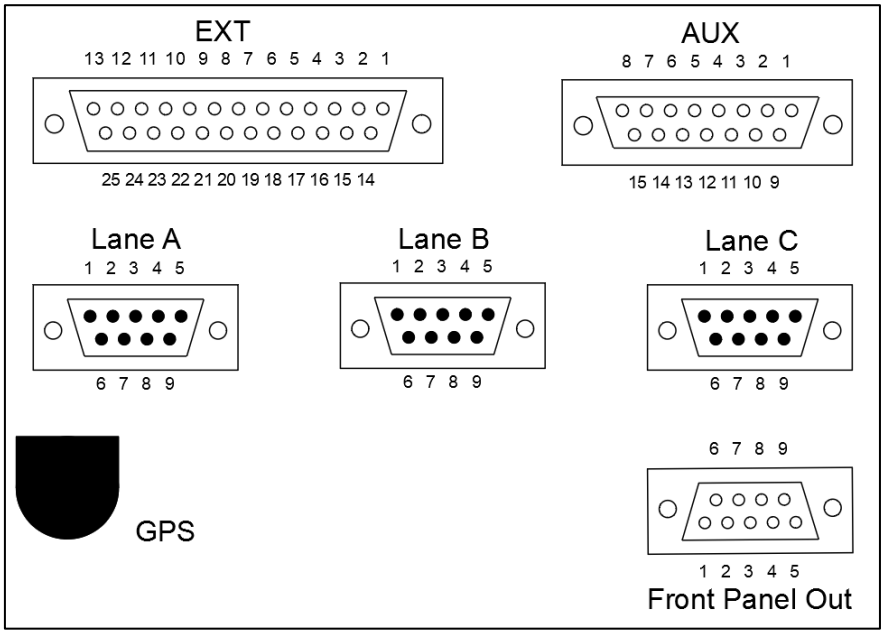

Figure 5-1: SCU Sub-D connector pin numbering

5.1 Lane A / Lane B / Lane C Connector

The Lane A Connector carries the power supply pins of the SCU (Pins 1 and 5) and Display CAN Lane A (Pins 2 and 7). Table 5-2 specifies its pinout. Reverse polarity and voltage surge protection are implemented on the Lane A connector, therefore power must be supplied there. Install a 3 A circuit breaker or quick fuse in the positive supply line. Lane A power supply voltage is monitored. For CAN wiring, use shielded twisted pair cables with an impedance of 120 Ω. Do not connect either of the CAN Ground Pins available on the two Harness Interface Connectors. Since termination resistors are built into the ECU as well as the SCU, no additional resistors are necessary.

Pin Number	Signal Name	Function
1	PWR_IN	positive SCU power supply
2	CANL_A	CAN Low, connect to HIC A, Pin 5
3	EXT_PWR_ACT	do not connect
4	EXT_DIN2	do not connect
5	AC_GND	negative SCU power supply, ground
6	EXT_DIN0	do not connect
7	CANH_A	CAN High, connect to HIC A, Pin 6
8	EXT_DIN1	do not connect
9	LS_OUT1	do not connect

Table 5-2: Lane A pinout

The Lane B Connector carries the second Display CAN Lane of the ECU on Pins 2 and 7. This setup guarantees full redundancy of all data paths to the SCU. Table 5-3 specifies its pinout. For redundancy

in power supply connect an alternative power supply e.g. separate fused (3A) power. A Schottky diode on the SCU PCB prevents reverse current at any time.

Pin Number	Signal Name	Function
1	PWR_IN	redundant positive SCU power supply
2	CANL_B	CAN Low, connect to HIC B, Pin 7
3	EXT_PWR_ACT	do not connect
4	EXT_DIN5	do not connect
5	GND	negative SCU power supply, ground
6	EXT_DIN3	do not connect
7	CANH_B	CAN High, connect to HIC B, Pin 8
8	EXT_DIN4	do not connect
9	SPARE	do not connect

Table 5-3: Lane B pinout

The Lane C Connector carries the third CAN Lane for the isolated output of the combined data from Lanes A and B to a third-party display via the CANaerospace protocol. Also, the throttle actuator is controlled via LANE C.

Pin Number	Signal Name	Function
1	RS422RXA	do not connect
2	CANL_C	CAN Low, connect to external display
3	RS422RXB	do not connect
4	RS422TXA	do not connect
5	RS422TXB	do not connect
6	GND	do not connect
7	CANH_C	CAN High, connect to external display
8	DEBUG_TXD	do not connect
9	DEBUG_RXD	do not connect

Table 5-4: Lane C pinout

5.2 Auxiliary Connector

The Auxiliary Connector is used for general I/O purposes. It offers regulated 12 V (Pin 13) and 5 V (Pin 11) reference voltages for sensors and can supply a maximum of 100 mA each. Both supplies are referenced to a common ground (Pins 5 and 12) isolated from the aircraft supply potentials. The analog inputs also refer to the same potential. The maximum analog input voltage is ±10 V. Note that higher voltages can permanently damage the unit as no protection is implemented on these inputs. It is recommended to use the analog inputs as shown in Table 5-5 and Figure 5-3.

It is recommended to place the optional fuel pressure sensor either as close as possible to the fuel pressure regulator on the fuel rail of the left cylinder bank (Cylinders 2 and 4) or on the outflow port of the fuel filter. The installation of the fuel pressure sensor on the fuel rail is marked in red in Figure 5-2. The available adapter (see Chapter 5.6) allows mounting it in both these places. A fuel pressure sensor with the following specifications is available as an accessory and supported by the standard software (see Chapter 5.6):

- Pressure range: 1 to 11 bar absolute pressure
- Supply voltage: 5 VDC
- Output voltage: 0.5 VDC to 4.5 VDC

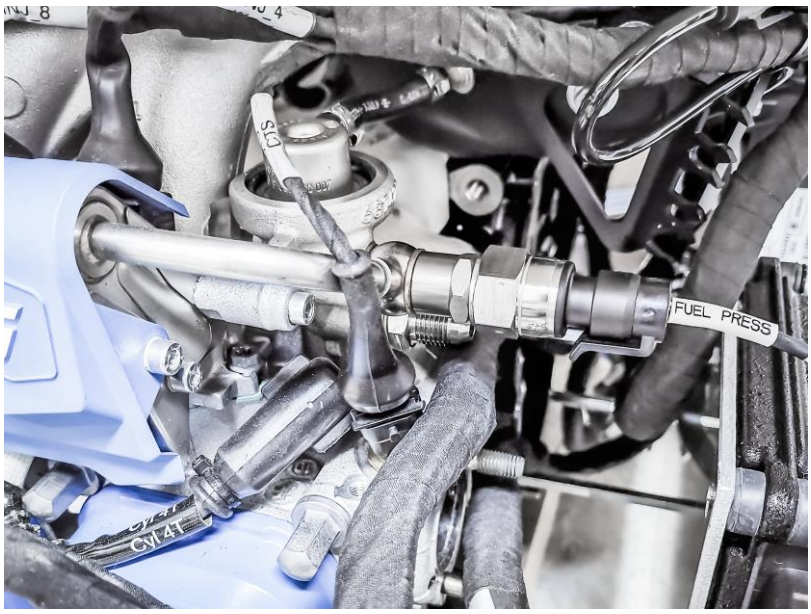

Figure 5-2: Fuel Pressure Sensor Installation

The standard hard- and software are designed to drive an electric MT-Propeller P-853 constant speed governor via the MOTOR+ and MOTOR- (Pins 7 and 8) outputs (function available on request). The exact variant of the governor depends on the specific aircraft configuration. Please contact RS Flight Systems for further details. A prewired harness is available as an accessory (see Chapter 5.6).

Pin Number	Pin Name	Function
1	AIN0	Analog Input 0 (Fuel Pressure)
2	DIN6	do not connect
3	DIN7	do not connect
4	AIN3	Analog Input 3 (Governor Limit)
5	GND	Analog Input Reference Ground
6	START_PWR	Start Power Relay Output
7	MOTOR+	Propeller Governor H-Bridge Driver Output (High Side)
8	MOTOR-	Propeller Governor H-Bridge Driver Output (Low Side)
9	DIN5	do not connect

10	STARTER	do not connect
11	5V	5 V Analog Reference Voltage
12	GND	Analog Input Reference Ground
13	12V	12 V Analog Reference Voltage
14	A/C_GND	Aircraft Ground
15	GND	Internal Ground

Table 5-5: Auxiliary Connector pinout

The START_PWR relay output drives up to 500 mA of inductive load and is referenced to the internal ground (Pin 15). The SCU uses this output to drive external start power to simplify or even automate the engine start procedure. Using the Start Power relay, the ECU is automatically connected to the battery power during engine startup as this command is transmitted via CAN Lane C. The function is activated for engine startup until the ECU is powered by one of the internal generators. An extinguishing diode across the relay coil is not needed and a suitable relay is available as an accessory (see Chapter 5.6).

Feel free to contact RS Flight Systems for different sensor and actuator configurations.

5.3 External Connector

The I/O connector offers filtered, but unregulated power output and further general I/O connections. The digital inputs are referenced to aircraft ground (Pin 3).

The low-side outputs are referenced to the internal ground and the high-side outputs are referenced to the power output.

Pin Number	Signal Name	Function
1	DIN9	do not connect
2	DIN10	do not connect
3	AC_GND	do not connect
4	LS_OUT2	do not connect
5	LS_OUT3	do not connect
6	LS_OUT4	do not connect
7	LS_OUT5	do not connect
8	LS_OUT6	do not connect
9	LS_OUT7	do not connect
10	GND	Internal Ground
11	GND	Internal Ground
12	GND	Internal Ground
13	GND	Internal Ground
14	GND	Internal Ground
15	LS_OUT0	do not connect
16	HS_OUT2	Lane A Relay Output

17	HS_OUT3	Lane B Relay Output
18	HS_OUT4	Main Fuel Pump Relay Output
19	HS_OUT5	Aux Fuel Pump Relay Output
20	HS_OUT6	Backup PWR Relay Output
21	HS_OUT7	Starter Relay Output
22	PWR	Power Output (9-32 V)
23	PWR	Power Output (9-32 V)
24	PWR	Power Output (9-32 V)
25	PWR	Power Output (9-32 V)

Table 5-6: External Connector pinout

Relay activation is controlled regarding the engine startup state machine. An extinguishing diode across the relay coil is not needed and a suitable relay is available as an accessory (see Chapter 5.6).

Feel free to contact RS Flight Systems for your needs regarding I/O applications.

5.4 Front Panel out Connector

The Front Panel out connector is the interface to the optional extension units. A suitable connection harness between the main unit and the extension unit is available as an accessory (see Chapter 5.6). The pinout of the Front panel out connector is listed in Table 5-7. An external display for UAV applications can be useful for debugging issues or as status information for UAV´s ground crew.

Pin Number	Signal Name	Function
1	PWR_IN 12V	positive Front Panel power supply
2	PWR_IN 3.3V	positive display power supply
3	OLED_SCK	Display control
4	OLED_MOSI	Display control
5	OLED_CS	Display control
6	TAST1	Button 1
7	TAST2	Button 2
8	TAST3	Button 3
9	GND	Internal Ground

Table 5-7: Front Panel Out Connector pinout

5.5 Wiring Diagram SCU

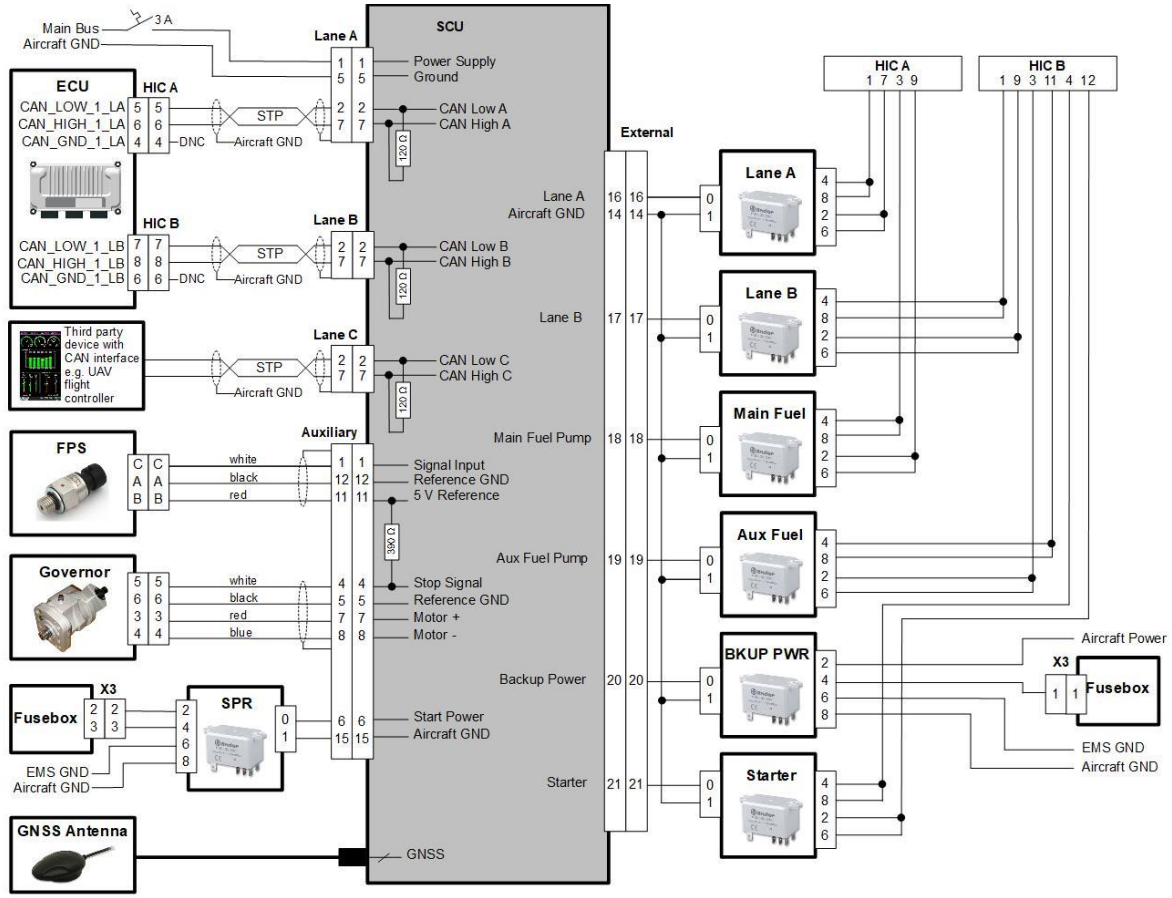

Figure 5-3: Wiring Diagram

5.6 Available Accessories

Part No.	Name	Description
10-135	Connection Harness SCU	Shielded cables for the connection of the SCU Lane A, B and C to BRP Rotax 912/915 iS engines. Including power supply wires. Open wire ends at the side of the ECU. Length 2 m / 6.5 ft.
10-148	SCU Extension Unit Harness	Prewired shielded harness for the connection of the Front Panel or the Display Panel to the SCU. Length 1 m / 3.3 ft.
01001-132	SCU Front Panel	Display Unit for use with SCU including switches
01001-134	SCU Display Panel	Display Unit for use with SCU
10-110	Start Power Relay Kit	Kit for integration of the start power relay Includes relay and cables for connection to the EMU Open ends on EMU side to allow for custom integration Length 1 m / 3.3 ft.
10-072	Fuel Pressure Sensor Kit	Includes the following items: • 10-070 (Harness Fuel Pressure Sensor) • 10-806 (Hollow Screw) • 664365 (Fuel Pressure Sensor)
664365	Fuel Pressure Sensor	Original BRP Rotax Fuel Pressure Sensor with a range of 1 to 11 bar.
10-070	Harness Fuel Pressure Sensor	Prewired shielded harness for fuel pressure sensor. Open end on EMU side to allow for custom integration. Length 2 m / 6.5 ft
10-806	Hollow Screw	Adapter to mount the fuel pressure sensor on the fuel rail.
10-085	Auxiliary Connector	Manufacturing kit for Auxiliary connector Includes shell, connector housing and contacts Requires M22520 crimping tool
21008-716	SLPC Connection Harness	Prewired shielded harness for governor control Open end on SCU side to allow for custom integration. Length 3 m / 10 ft.
10-140	Start Key Switch 9iS	Starter Key Switch for Rotax 912iS / 915iS engines. Switching of: LANE A / LANE B, Fuel Pumps MAIN and AUX, EMU/SCU, Ground Shortcut (OFF) and Starter
10-111	Auxiliary Harness	Custom harness for the auxiliary connector Fully prewired on both ends Cable length and configuration information needed
10-193	Power Supply Unit	Power Supply Unit for the EMU and SCU, Input: 100 - 230 VAC, Output: 12 VDC, 5A. Connector for EMU/SCU
P-853-12	Governor 912iS	Gear ratio 0.54:1, 12 VDC, Oil pressure for pitch increase. Max. RPM: 3132 +-10, Min. RPM: 2300 +-50
P-853-95	Governor 915iS	Gear ratio 0.52:1, 12 VDC, Oil pressure for pitch increase. Max. RPM: 3010 +-10, Min. RPM: 2445 +-20

Table 5-8: Harnesses and Accessories

6. Operation

6.1 Engine Startup

For all CAN commands please also refer to the “SCU_UAV_ICD_CAN” document provided by RSFS. The SCU runs the complete engine startup procedure according to the SCU state machine as shown in figure 6-1. For startup, a CAN communication on Lane C between SCU and third-party controller must be established with 1 Mbit/s in the standard software.

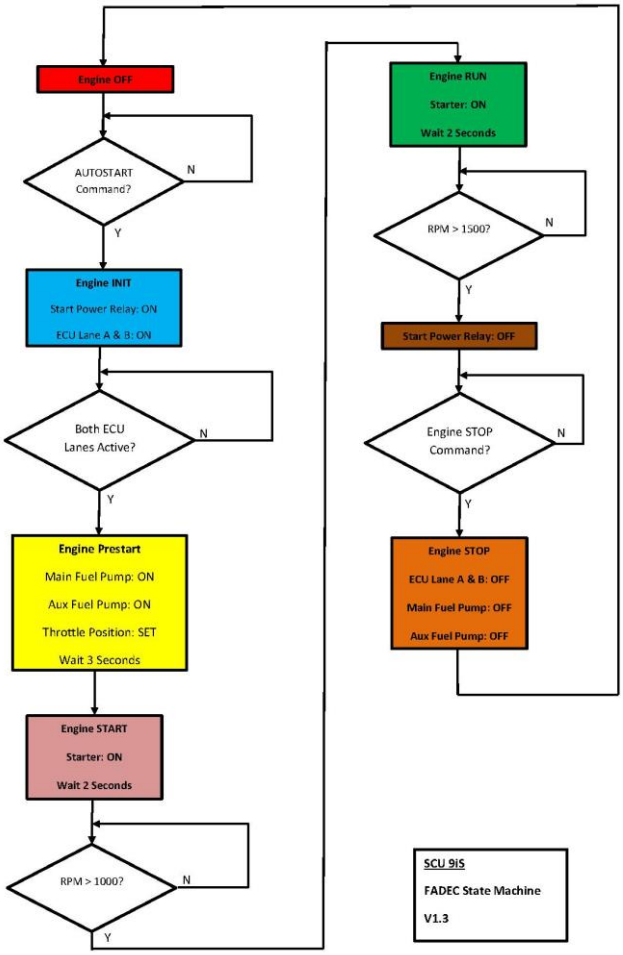

Figure 6-1: SCU State Machine

The engine startup procedure can be observed on CAN ID 2011. On this CAN ID the SCU transmits the status of the SCU state machine. The auto-start can be canceled at all times by setting back the auto-start command to zero. The SCU switches all engine functions with relays. The aircraft installation of the relays with reference to the BRP-Powertrain documentation is shown in Figure 5-3. The SCU receives all engine data and is setting the throttle position respective the BRP-Rotax recommendation regarding temperature and engine load.

For customized software versions please refer to the ICD and VDD documents.

6.2 Engine Control

Engine control can be done by transmitting the throttle position on the respective CAN ID.

Depending on the SCU firmware version an RPM governor is also available, which can be activated on the respective CAN ID.

For customized software versions please refer to the ICD and VDD documents.

6.3 Engine Shutdown

Engine shutdown can be commanded all the time and in each state of the engine. Therefor the auto-start command must be set back to zero. For shutting down the engine, the SCU switches off the ECU power supply, which will stop the ignition and injection. In parallel the fuel pumps were switched off too.

For customized software versions please refer to the ICD and VDD documents.

6.4 Fuel Pump Control

The SCU controls in the UAV version the fuel pumps. For engine startup both fuel pumps are activated. When engine is running the AUX pump gets deactivated. According to the Rotax 915iS manual the SCU activates the AUX pump in flight if the flight altitude is above 2500m (8200ft) and deactivates it below 2400m (7874ft).

For customized software versions please refer to the ICD and VDD documents.

6.5 External Relay Control

The SCU controls the engine functions via relays either automatic regarding the given commands or on external command. So, for pre-flight checks, the functions can be activated manually.

If the engine is running the SCU prevents an unintended engine shutdown with a safety mechanism. In this case it is only possible to deactivate one ECU Lane or one fuel pump at a time.

For customized software versions please refer to the ICD and VDD documents.

6.6 Flight Data Recording

The SCU records all data transmitted by the ECU over all three lanes and their respective CANaerospace interfaces. This function is only active if an SD card is inserted. For each restart of the SCU or every 6 minutes (0.1 recording hours) of runtime, a new file is created and the previous one is closed. The file naming convention is:

DAT00001.CAN

with 00001 being the decimal number, which is incremented by one for each new file and allows for 99,999 different files to be created, named and stored. The number of the last file which has been closed and written to the SD card is stored as a 4-character ASCII string in the file "TOPDAT.CFG", which is also written to the card. Most of the data is transmitted 10 times per second and a typical data rate is 12 kilobytes per second. Using a 128 GB SDHC memory card, this results in a maximum recording time of 2000 hours.

A powerful Engine Management Debriefing Station (EMDS) software for the Microsoft Windows, SuSE Linux and Apple MacOS X operating systems is delivered with the SCU. This tool (see Figure 6-2 to Figure 6-4) allows for visualization and post-processing of the recorded data as well as a three-dimensionally georeferenced data conversion to Google Earth compatible files.

The latest EMDS software is available on the RS Flight Systems website.

For customized software versions please refer to the ICD and VDD documents.

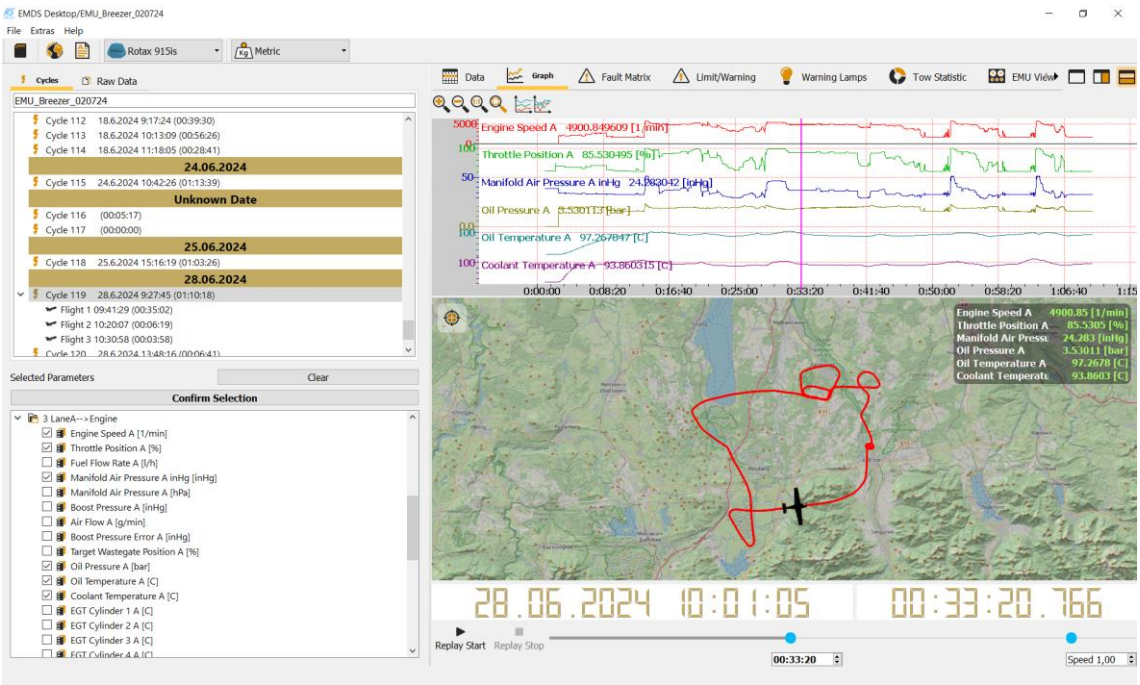

Figure 6-2: Engine Management Debriefing Station (EMDS) Software

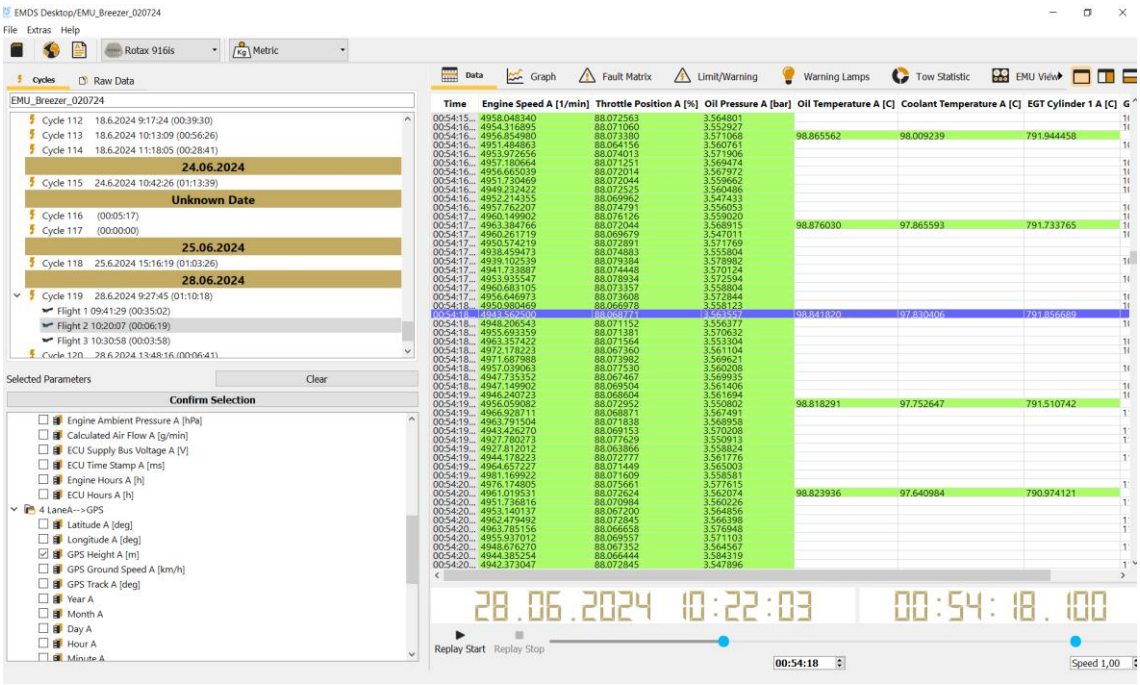

Figure 6-2: Engine Management Debriefing Station (EMDS) Software

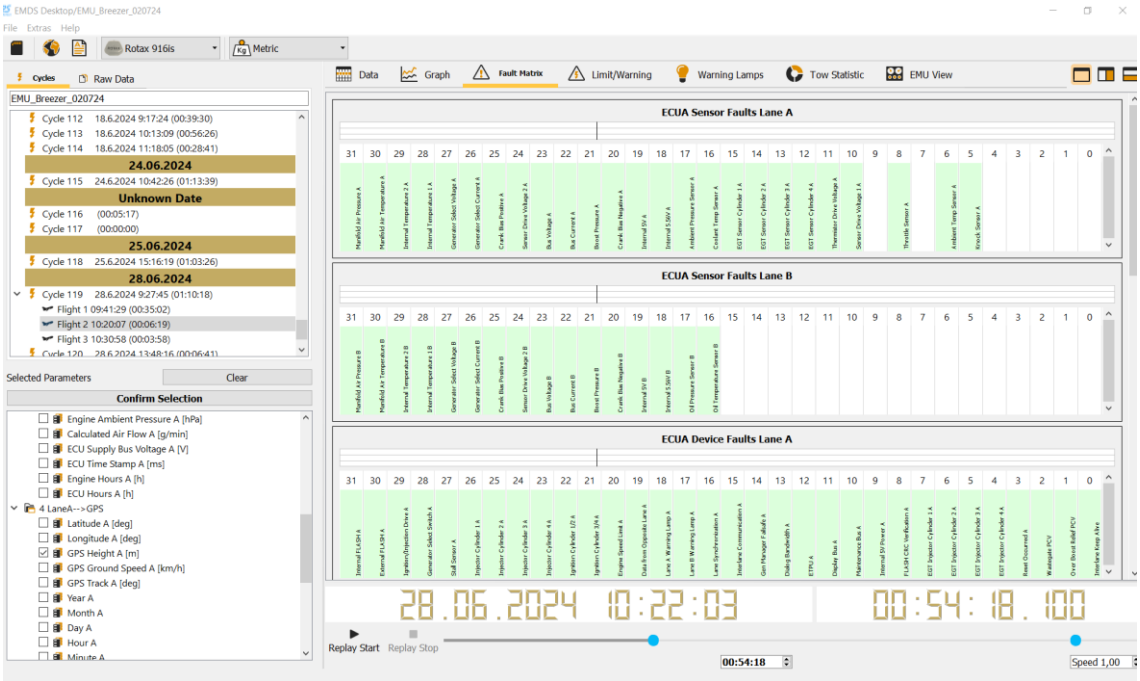

Figure 6-2: Engine Management Debriefing Station (EMDS) Software

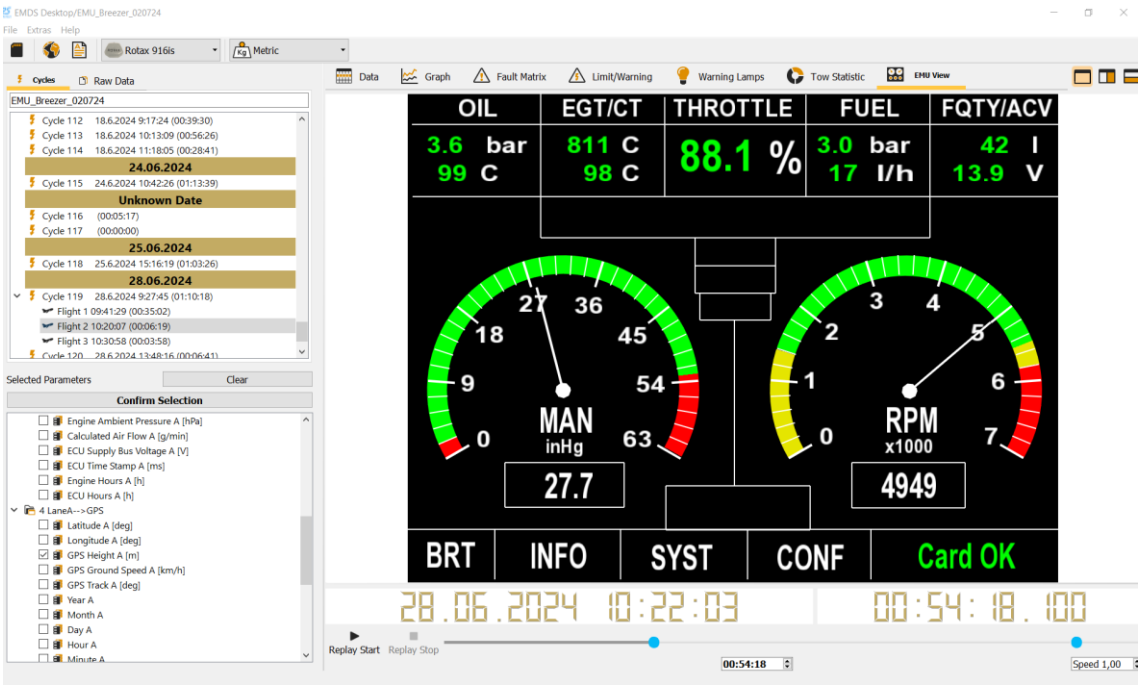

Figure 6-3: EMDS Instrument View (imitates EMU indications)

Figure 6-4: EMDS generated Google Earth view

7. Maintenance

7.1 Software Update

The SCU allows for easy conduction of software updates through the SD memory card interface. The software is delivered in compressed .zip-files with the following exemplary structure:

SCU_SW_1.6.zip -> SCU_SW_1.6 -> mb0.srd, mb1.srd

The binary software upgrade files (mb0.srd, mb1.srd) must be stored in the root folder of a SD memory card which is then inserted (contacts up) in the slot in the main unit. The binary files are recognized by the SCU each time power is applied, and the device boots up. When update files are detected, the content is automatically programmed into flash memory and the device starts up using the new software. This process takes approx. 45 seconds. The SCU must not be disconnected from the power supply during the update. An installation logfile (“INSTALL.LOG”) is created and stored on the memory card and the update files are deleted.

For customized software versions please refer to the ICD and VDD documents.

7.2 Regular Maintenance tasks

There are no specific regular maintenance tasks. The device is operated on concondition. It is recommended to check all mechanical and electrical connections during every regular 100 h engine / aircraft maintenance. It is recommended to store all recorded data from the SCU during this aircraft maintenance task on a file server. Make sure the micro SD card is installed correctly in the SCU after the copy of the data.

It is recommended to wear ESD gloves during maintenance work.

7.3 Remove / Change of the SCU

Please refer to chapter 4 and proceed the the points in reverse row.

7.4 Remove / Change of the Throttle Actuator

Please refer to chapter 4.4 and 4.5 and proceed the the points in reverse row.

8. Abbreviations and Terms

Abbreviation	Description
ACT	Active
ACV	Aircraft Voltage
AUX	Auxiliary
AWG	American Wire Gauge
BKUP PWR	Backup Power
BRP	Bombardier Recreational Products
BRT	Brightness
CAD	Computer Aided Design
CAN	Controller Area Network
CHT	Cylinder Head Temperature
CONF	Configuration
CT	Coolant Temperature
DC	Direct (non-alternating) Current
DNC	Do Not Connect
ECU	Engine Control Unit
ECV	ECU Voltage
EGT	Exhaust Gas Temperature
EMDS	Engine Management Debriefing Station
EMU	Engine Management Unit
EN	European Norm
FPGA	Field Programmable Gate Array
FPS	Fuel Pressure Sensor
GB	Gigabyte
GEN	Generator
GND	Ground
GNSS	Global Navigation Satellite System (e.g. GPS, Galileo, GLONASS)
HIC	Harness Interface Connector
ISO	International Organization for Standardization
I/O	Input/Output
LCD	Liquid Crystal Display
LED	Light Emitting Diode
MAN	Manifold Pressure
MCR	Master Caution Reset
PCB	Printed Circuit Board
RET	Return
RPM	Revolutions per Minute (Engine Speed)
RS-232	Recommended Standard 232
RX	Reception
SAE	Society of Automotive Engineers
SBY	Standby
SCU	System Control Unit
SD	Secure Digital (type of memory card)
SDHC	Secure Digital – High Capacity (type of SD card)
SLPC	Single Lever Power Control
SPR	Start Power Relay
STP	Shielded Twisted Pair
SYST	System
TFT	Thin Film Transistor (type of LCD)
TX	Transmission

UAV	Unmanned Aerial Vehicle
UNC	Unified National Thread - Coarse
UTC	Coordinated Universal Time

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