

# Manual Automatic Start Unit

for use with Titan UAV airstart systems

(v 2.09)



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## 1. Automatic Start-up Unit

The list of contents serves as a means to check the completeness and validity of this owners manual. With each update of this manual, the pages concerned will be sent to the owners, if necessary.

Each page can be recognised in the header by:

- chapter number and description
- page number in the chapter
- revision number

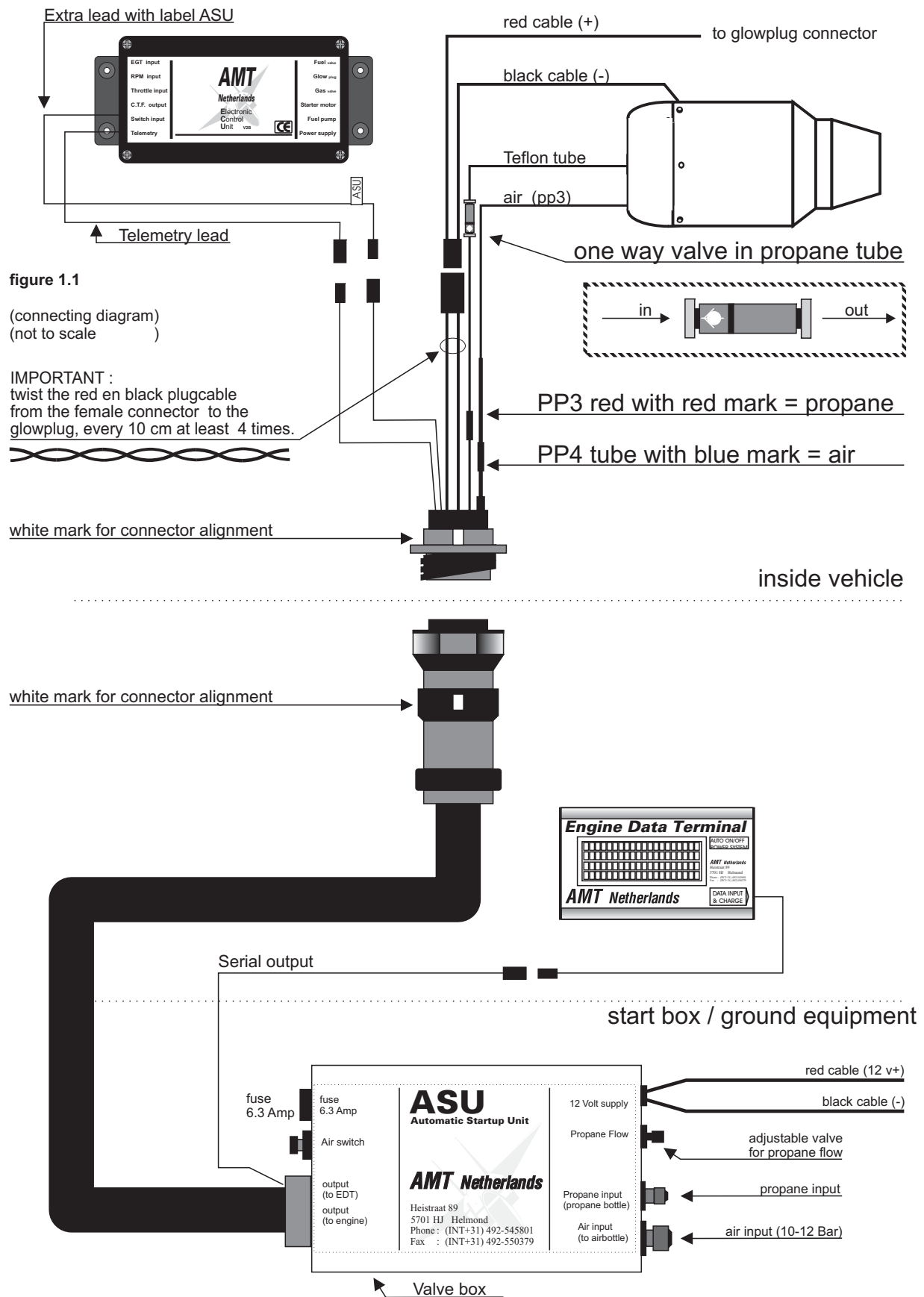
Text pages have been included as right-facing pages.

Pages with drawings have been included as left-facing pages and have usually been inserted opposite the relevant text. Pages with drawings have a reference to the matching text page in the header.

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**1. Automatic Start-up Unit****1.1        Description Automatic Startup Unit**

The ASU is a device which automatically controls airflow, propane flow and ignition during the startup sequence. It is controlled by the second serial port of the ECU, the ASU port, only available on the Titan V2C Airstart ECU as an extra lead, marked ASU.

Depending on the data input received from the ECU, the ASU will startup the engine automatically, and when a powerdown sequence is activated, it will also cool down the engine after it has stopped.

**1.2        Connecting diagram**

The ASU package consists of 2 parts (fig 1.1). The first part is the ASU valve box with the male connector plug, which is part of the ground equipment. The second part is the female connector socket, which has to be mounted inside the vehicle. The plug and socket connectors are of the "quick-release" type about a turn to connect them together. The customer needs to supply the propane bottle, air bottle and 12 volt battery.

**1.3        ASU valve box**

This unit needs the following inputs:

- 1        Air input (pressure 10-12 Bar)
- 2        Propane input (starting gas)
- 3        12 volt input (minimum battery capacity 2 Amp/hour)

The output of the unit is a quick-release male connector plug. At startup and powerdown, this male connector must be plugged into the female connector socket in the vehicle. With the air switch, air can be switched "on" manually if needed.

The ECU serial output for EDT is available on the free lead, coming out of the ASU box.

**1.4        Female connector**

This connector has to be mounted inside the model and has the following outputs:

- 1        Air supply output to engine.    (blue mark)
- 2        Propane supply output to engine.    (red mark)
- 3        2 volt supply to engine glowplug.    (twisted wire)

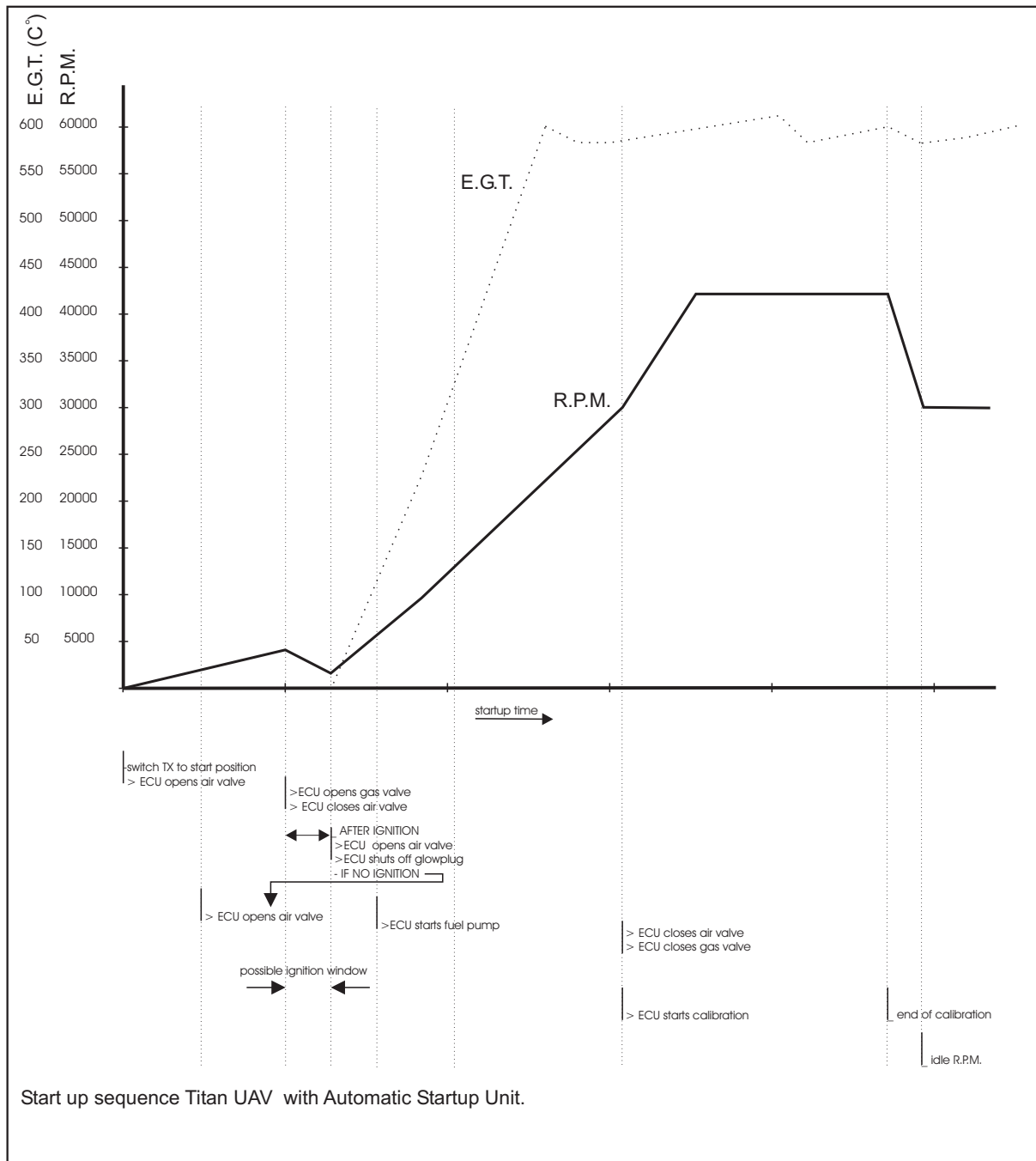
The female connector, which has to be mounted inside the vehicle, also has 2 cables, which have to be connected to the ECU:

- 1        ASU control lead, this needs to be connected to the ASU lead.
  - 2        Serial lead, once connected the serial telemetry output is available from the ASU. Normally the EDT is connected to this lead.
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figure 1.2

(ASU startup sequence)





### **1.5        Adjusting the propane flow**

As can be seen in figure 1.2, there is an ignition window between 1500 and 3500-rpm. In this window the ECU expects the engine to ignite, and for this to happen there has to be the correct mixture of propane and air in the combustion chamber. You can alter this mixture with the adjustable valve on the ASU. Preset this valve with 15 turns open (counter clockwise).

When you put the three-position switch in the "start" position after the 5 "count down beeps" the engine will spin up to 4500 rpm. Then the ECU closes the air-valve and opens the propane valve. If the engine does not ignite in the ignition window, open the propane valve 1 turn (counter clockwise).

When you open the valve, the ignition will take place at higher RPM. When you close the valve the ignition will take place at lower RPM. The ideal RPM is between 3000 RPM and 3500 RPM.

While the mixture valve is being adjusted the ASU will automatically continue to cycle the turbine between 1500 and 3500 rpm until ignition is achieved.

### **1.6        Starting**

To start the engine with the ASU, take the following steps:

- 1     Be sure the ASU is connected to the air supply, propane bottle and 12 volt battery. (open valves on both bottles completely)
- 2     Power up the flight management system and ECU (chapter 7.2) .
- 3     Connect the male connector to the female connector in the model, and check if there is "start clearance"

Note: In case the EDT gives the message " no start clearance" at sartup the Glowplug is not connected or faulty. (check glowplug)

- 4     Switch the three-position switch on the "start" position and after the count down beeps the ASU, (controlled by the ECU) automatically spins up the engine and brings it into the ignition window (fig. 1.2). If the engine does not ignite, adjust the propane flow. If the mixture ignites, the temperature will rise. This rising temperature (plus 25 °C from the moment you switch to start) is for the ECU the indication for ignition of the mixture. The ECU will now proceed with the startup sequence.
  - 5     When the internal calibrations of the ECU have been finished, it is best to throttle up for at least 3-4 seconds. Now you have maximum power for take off.
  - 6     Your automatic startup is now completed and you can remove the male connector.
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## 1. Automatic Start-up Unit

**1.7      Powerdown**

When you go to powerdown the engine, take the following steps:

- 1      Be sure the ASU is connected to the air supply and the 12 volt supply.
- 2      Connect the male connector to the model.
- 3      Switch the three-position switch into the middle position, now the powerdown sequence is activated.

After the ECU has stopped the engine, the ASU will cool down the engine with several short bursts of air until the exhaust temperature is below 88 °C.  
The engine is now ready for a new startup sequence.

**1.8      Possible errors****-Engine will not come into ignition window.**

When engine does not reach 3500 RPM check the following:

- > air pressure too low.
- > possible empty air supply.
- > possible bent air tube. (restricted flow)

**-Engine does not ignite.**

- > check the coil of the glowplug
- > possible empty propane bottle.
- > possible bent gas tube. (restricted flow)
- > adjust the propane flow.

**-Engine ignites but fuel pump does not start.**

When this happens the temperature is not over 88 °C and / or RPM does not reach 5500 rpm. (both conditions should be there)

- >check wiring of the system
- >check position of the thermosensor
- >a possible almost empty propane bottle (not enough pressure).
- >a possible almost empty air bottle (dangerous)

**\*\*\* Warning    \*\*\***

Never try to start a turbine motor with an almost empty air supply, because even if the engine starts up you may have not enough air for cooling the motor at shutdown.

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