

Functions and features

- Auto start sequence control
- Auto start fuel limiting / EHT activation
- Propeller RPM beta mode limiting / EHT activation
- Start declines for bus voltage, residual ITT, and EHT
- Simple and distinct motor and start cycle initiation
- Start abort and exceed guidance via an annunciator
- Anti flame-out operation capability for flight
- Engine monitoring source for main instrumentation
- Tracking of start cycles, hours, exceeds and more

Simple install. Simple operation.

Since the Walter M601 first appeared in the late 60's, digital control have advanced in strides. As system performance improved, the installations became less complex, and so too operator interaction. Press an engine "start" button to begin an automatic start sequence. Press a "motor" button for a motor/vent cycle. Pull the fuel shut-off (condition) lever to abort a start, or leave it in the start position to continue.

Auto start sequence

Beginning a start cycle the TSLM system engages the starter, the igniters and cyclically actuates the torch fuel valve that pulses atomized fuel out the torches. After combustion (light-off) the engine accelerates through 50% RPM at which point the starter, igniters and torch fuel valve are de-energized, with engine speed then stabilizing at idle. The start sequence can be aborted using the fuel shut-off (condition) lever at any time whether for failure to light-off within the allotted 10 seconds, a hung/stagnant start, or to prevent a hot start. The start cycle automatically terminates whether aborted or successful.

Limiting via the EHT

The TSLM system actuates the EHT valve to limit fuel to the combustion chamber after light-off during the acceleration phase of an engine start sequence to regulate ITT (inter turbine temperature) close to optimum. In addition the TSLM will actuate the EHT valve when the propeller is in beta (reverse) mode in order to limit propeller (N2) speed to 1900 RPM.



Start declines

The TSLM system is able to decline a start before engaging the starter if bus voltage is too low, residual turbine temperature is too high, or if the EHT (limiter) valve is disconnected. An error code will indicate via the TSLM light which the pilot can reset. These start decline checks are there to aid and may be entirely overridden if needs be.

Operator guidance

To further aid operation even in a small way the TSLM system can provide guidance/cues to a pilot through an EXCEED annunciator. During engine start cycles it will suggest an abort to prevent any hot start. It will also suggest reducing engine power during normal operation should either ITT, N1, prop RPM, or torque (if connected) exceed the operational limits set for the engine model.

Motor/vent cycle

Depressing the motor button/switch begins a motor or vent cycle which engages the starter for 8 seconds. No ignition or fuel is introduced so that the engine can be cleared of residual fuel or vapors. By depressing the engine stop or motor button/switch again terminates the motor/vent cycle.

Anti flame-out measures

While in flight AFO (anti flame-out operation) may be activated at will via the TSLM system to combat and/or prevent flame-out. In this mode the igniters are engaged and the torch fuel valve actuated continuously. Its selection is made via the start and motor button/switches. Holding

one or the other for a second will cycle the system through the modes - normal (OFF), and anti flame-out (AFO). Engagement of AFO is indicated via the TSLM light.

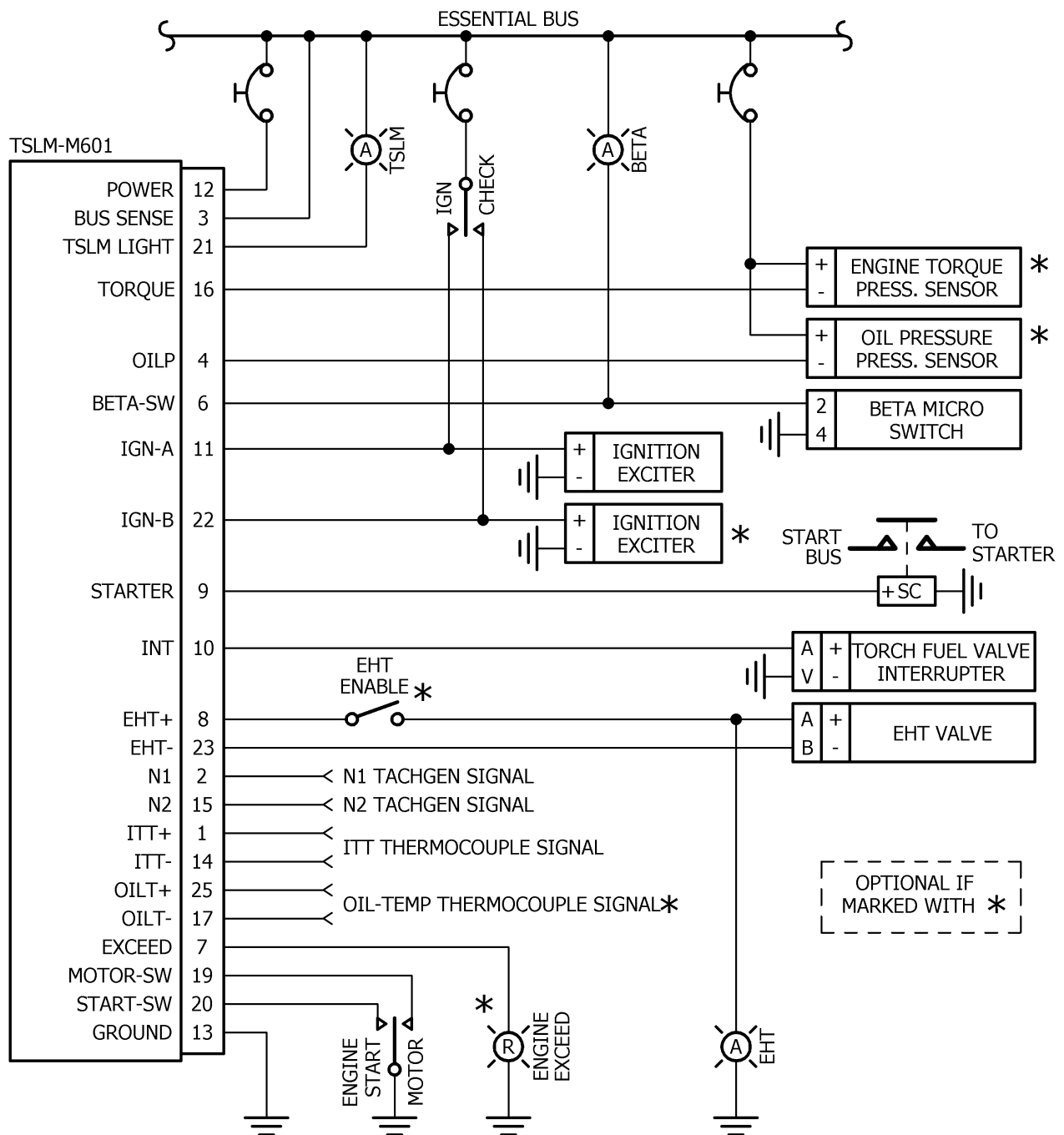
Engine monitoring

The TSLM system reads various sensors to extract engine parameters. Engine ITT, N1, N2, bus voltage, and beta switch are required to function as an auto start and limiter, but engine torque, oil pressure, oil temperature are optional extras that can be connected to provide a complete set of main engine instrument data to a second device such as our DX-1 display unit. The information streamed out in this way has been engineered to be both accurate and responsive to

realize fit-to-fly-with engine gauges.

Tracking and logging

The TSLM tracks various operational data such as start cycles, engine hours above 70% RPM (flight). In addition it holds the performance data of the last start or motor/vent cycle executed such as starter time to 50% RPM, minimum bus voltage, and maximum inter turbine temperature. The TSLM is further fully supported by our LSI logger interface that can record everything the system does throughout its life-time.



Pin-outs (male 25-pin d-sub)

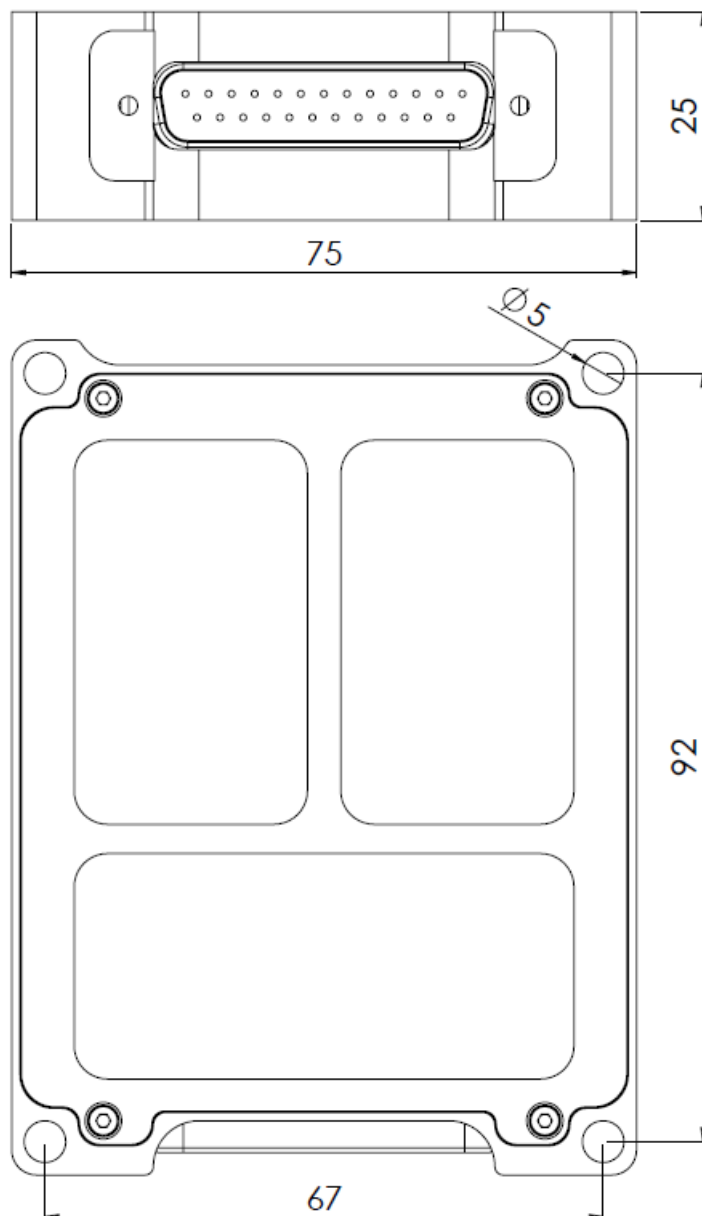
PINS	DIR	LABEL	DESCRIPTION
12,24	IN	POWER	AIRCRAFT POWER (28VDC)
13	GND	GROUND	AIRCRAFT GROUND
2	IN	N1	SENSES N1 ENGINE SPEED (TACHGEN)
15	IN	N2	SENSES N2 PROPELLER SPEED (TACHGEN)
16	IN	*TORQUE	SENSES ENGINE TORQUE (200/250PSI 4-20mA PRESSURE TRANSDUCER)
4	IN	*OILP	SENSES OIL PRESSURE (50PSI 4-20mA PRESSURE TRANSDUCER)
1	IN	ITT+	SENSES INTER TURBINE TEMPERATURE (K-TYPE THERMOCOUPLE +)
14	IN	ITT-	SENSES INTER TURBINE TEMPERATURE (K-TYPE THERMOCOUPLE -)
25	IN	*OILT+	SENSES OIL TEMPERATURE (K-TYPE THERMOCOUPLE +)
17	IN	*OILT-	SENSES OIL TEMPERATURE (K-TYPE THERMOCOUPLE -)
3	IN	BUS SENSE	SENSES BUS VOLTAGE
6	IN	BETA-SW	SENSES BETA (REVERSE PROPELLER) MODE
20	IN	START-SW	SENSES ENGINE "START" BUTTON PRESS
19	IN	MOTOR-SW	SENSES ENGINE "MOTOR" BUTTON PRESS
11	OUT	IGN-A	POWERS FIRST IGNITION EXCITER TO SPARK IGNITER(S)
22	OUT	*IGN-B	POWERS SECOND IGNITION EXCITER (IF NEEDED) TO SPARK IGNITER
10	OUT	INT	POWERS THE FUEL SHUTOFF VALVE TO OPEN FUEL
9	OUT	STARTER	POWERS THE START CONTACTOR THAT ENGAGES THE STARTER
7	OUT	*EXCEED	CONTROLS THE "EXCEED" ANNUNCIATOR
8	OUT	EHT+	POWERS EHT VALVE VIA AN OPTIONAL "EHT ENABLE" SWITCH
23	OUT	EHT-	SENSES CURRENT THROUGH EHT VALVE AND GROUNDS IT WHEN ACTIVATED.
21	OUT	TSLM	CONTROLS THE "TSLM" STATUS LIGHT
5	I/O	*CAN-H	CAN BUS HIGH LINE TO SECOND DEVICES LIKE THE DX-1, LSI, ETC.
18	I/O	*CAN-L	CAN BUS LOW LINE TO SECOND DEVICES LIKE THE DX-1, LSI, ETC.

* indicates optional connections

General Specifications

1	Operational Voltage Range	10 – 40 VDC
2	Operating Temperature Range	-40 to +85 °C
3	Max. Operating Altitude	55,000 feet
4	Dimensions	100 x 75 x 25mm
5	Weight	180 g
6	Power Consumption (no external loads)	50mA

Unit Outline



1. The TSLM uses a 25-pin DSUB (M24308 series) male connector. The recommended mating receptacle (female) for it is the M24308/2-3
2. The unit is secured through four 5mm holes on each corner accepting AN3 bolts