



Marine Digital System

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MARINE DIGITAL CONTROL SYSTEM

A) System components, technical description of components

1. Components:

The generator control unit is designed to monitor motor data and generator data on Fischer Panda Diesel generators. It consists of the components listed below:

- **CT-Board**
This component senses AC-Voltage, AC-current, Frequency and power factor. It will send all this data for further processing to the VCS. Furthermore this component will engage the booster if required.
- **Panel**
This graphic panel with resolution 128x64 dots is the user interface to the complete system. It will display all the actual generator data. Via the keypad the user may start and stop the generator or access various data in the VCS (actual readings, stored alarms, stored operation data, program data)
- **VCS**
This is the main component that controls the peripherals mentioned above. It records various temperature and pressure readings as well as digital status reading.

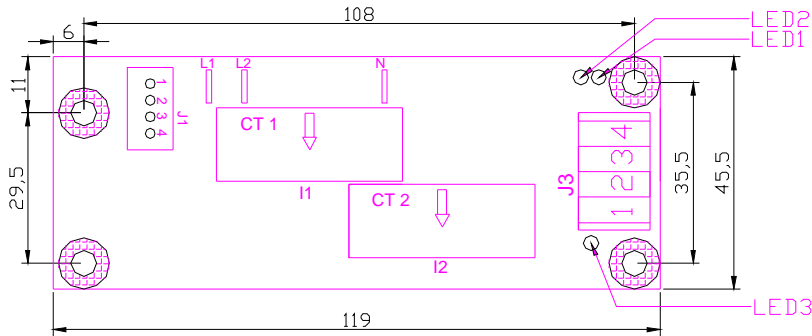
2. Communication between components:

Communication between all components is done via serial data bus according to RS485. It should be noted that due to timing requirements, two independent buses are used. One is communicating with the CT-board only, to ensure fast response. The other data bus is serving the panels and PC with graphic user interface.

3. Technical specification of components:

The system is designed for DC power supply, either 12V or 24V nominal. Supply voltage may vary between 9-18V DC for 12V nominal power supply and between 18-36V DC for 24V nominal supply. Detailed specification on all I/O of each component is given in the description below.

3.1 CT-board GC147001



J1, Connector to VCS board
 1: Supply voltage from VCS
 2: Ground
 3: Serial bus data +
 4: Serial bus data -

J3, Booster control output
 1: Booster on, +15V/max 100mA
 2: Booster on, reference
 3: Booster on, +15V/max 100mA
 4: Booster on, reference

L1: Sensing input generator voltage leg 1
 L2: Sensing input generator voltage leg 2
 N: Neutral, reference for voltage sensing signals
 CT1: Current sensing device. Power output cable L1 must be brought through this device
 CT2: Current sensing device. Power output cable L2 must be brought through this device

Fig. 1 CT-Board GC147001 / all dimensions in mm

When connecting the output lines of the generator, it must be ensured that the arrow on top of the CT-board will point in the direction of power flow (FROM generator TO consumer). If the cables are inserted in the opposite direction the power factor reading and also the power reading may be erratic.

Status of the CT-board may be monitored on the 3 LED-lamps LED1, LED2 and LED3:

- LED1, green LED. Must be blinking to indicate communication with the VCS is normal. If this LED is on continuously the CT-board is not communicating with the VCS. If this LED is completely off the CT-board is not working.
- LED2, red LED. If on, this LED indicates that the booster is actually disabled. This may be due to time restriction (once engaged, the booster needs to stay off a certain time, see VCS programming for more details) or due to low voltage.
- LED3, green LED. This LED shows the actual status of the booster. It will be on while the booster is engaged.

The connector to the VCS (J1) needs to have a 1:1-connection to the corresponding plug on the VCS (see below). The total length of the cable between VCS and CT board should not exceed 100ft.

3.2 Panel GP155001:

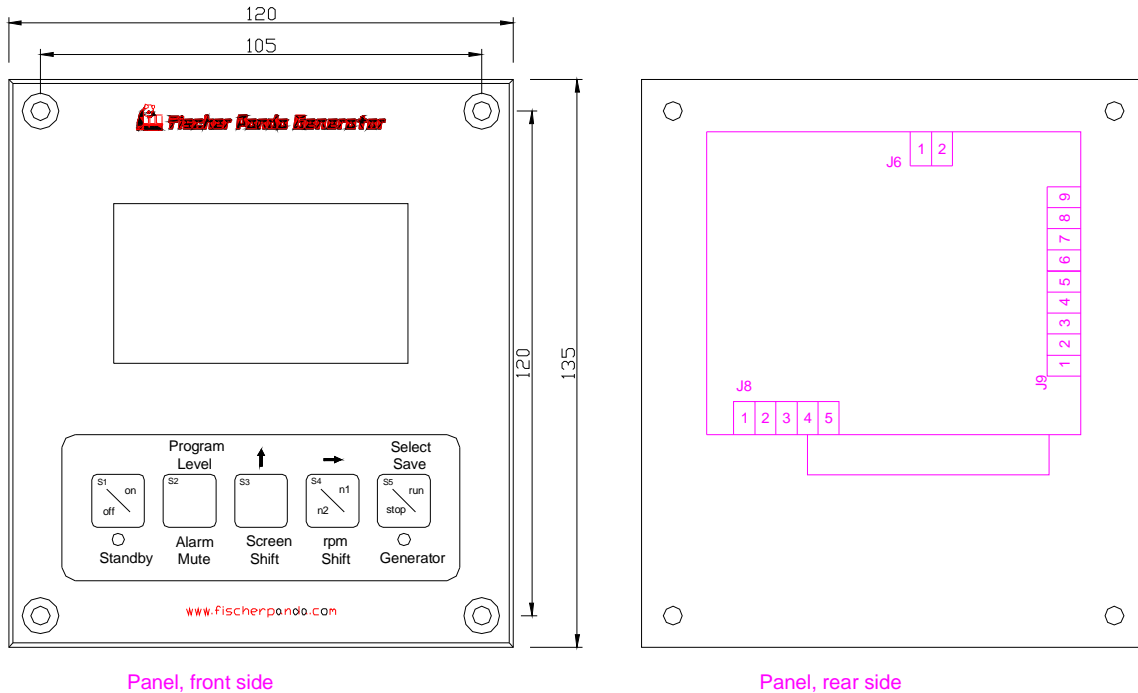


Fig. 2: Panel GP155001 / all dimensions in mm

The panel needs to be connected to the VCS on connector J8, using a 1:1-connection. The signals on the 5 wires are:

- Terminal 1: Positive power supply from VCS
- Terminal 2: Negative power supply from VCS
- Terminal 3: Will give a positive signal to turn on the VCS
- Terminal 4: Serial data line, Data +
- Terminal 5: Serial data line, Data –

The power supply is fused 0,5A on the VCS via a self-resetting fuse. The return signal to turn on the VCS is floating when the system is turned off and goes to positive when the system is turned on. This terminal must not be connected to any other monitoring device. Due to its EMI-proof circuit it may be overloaded if doing so.

Connector J6 provides power supply to the panel backlight and must also not be used for other purposes. Panel J9 has additional I/O that is not enabled in current software version.

3.3 VCS 158001:

- J9: Binary output:
 1: Supply output battery voltage / 1 A
 2: Supply output battery voltage / 1 A
 3: Output "Motor start"
 4: Output "Glow plugs"
 5: Output "Fuel pump"
 6: Output "Motor stop"
 7: Output "Sea water pump"
 8: Output "Ground separation relay"
 9: Output "Ignition"
 10: Output "Ready"
 11: Output "Actuator +"
 12: Output "Actuator -"
- J6: Panel connector:
 1: Supply battery voltage / 1A
 2: Reference (Ground)
 3: Trigger signal "VCS on"
 4: Serial IO "Data +"
 5: Serial IO "Data -"
- J7: CT board connector
 1: Supply battery voltage / 1A
 2: Reference (Ground)
 3: Serial IO "Data +"
 4: Serial IO "Data -"
- J5: Power supply
 1: +9...18 or +18...36V DC
 2: Reference (Ground)
- J2: Analogue input:
 1: Temperature seawater inlet
 2: Temperature cooling water inlet
 3: Temperature cylinder head
 4: Tank sensor
 5: Temperature coil 1
 6: Temperature coil 2
 7: Temperature bearing
 8: Reference (Ground)
- J3: Analogue / binary input:
 1: Oil pressure analogue
 3: Oil pressure switch
 4: Temperature sea water outlet
 5: Temperature cooling water outlet
 6: Temperature exhaust manifold
 7: Temperature diode heat sink
 8: Reference (Ground)
- J4: Analogue / binary input:
 1: Supply output Battery voltage / 2.5A
 2: Supply output 5V / 1A
 3: Binary input air intake
 4: Analogue input sea water pressure
 5: Binary input engine oil level
 6: Binary input bearing oil level
 7: Binary input coolant level
 8: Binary input water leakage
 9: Binary input alternator signal
 10: Reference (Ground)
- J10: Digital / binary input:
 1: Supply output battery voltage / 0.5A
 2: Do not connect
 3: Sensing input external stop
 4: Reference (Ground)

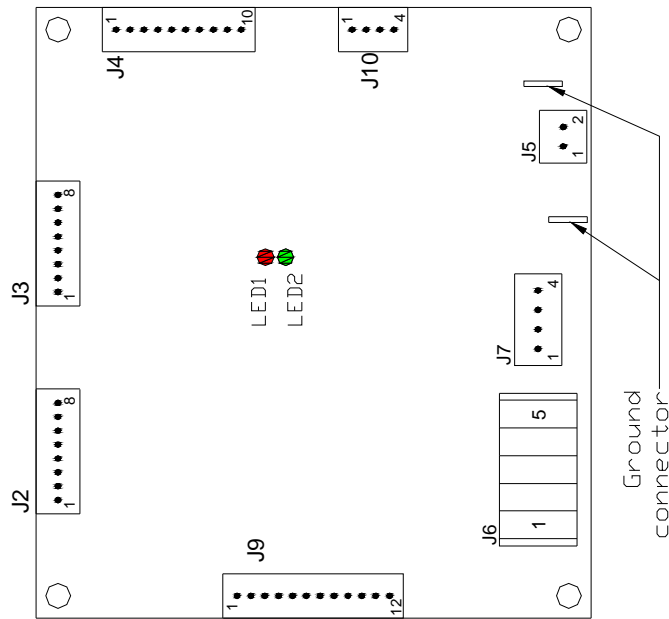


Fig.3: VCS 158001

When connecting the VCS to the generator the following notes must be considered:

- J5, Power supply:
 - This is a required connection. Power supply to the panel and CT-board will also be drawn from this input.
 - Make sure this input is fused 2,5 Amps. It is recommended to use cables AWG18 to AWG16 (1 to 1,5mm²)
 - In noisy environment, shielded cables may be required. In such case the shield should be connected to one of the ground connectors
 - Reverse polarity will not damage any hardware
- J7, Connector to CT-board:
 - This is a required connection. Power supply is internally fused. It is recommended to use cables AWG18 to AWG16 (0,75 to 1,5mm²)
 - In noisy environment and / or if cable length exceeds 25ft, usage of shielded cable is recommended. Connect the cable shield to one of the ground connectors.
 - Wiring towards the CT-board needs to be 1:1, i.e. terminal 1 of J7/VCS must be connected to terminal 1 of J1/CT-board, and so on.
 - **Reversing this wiring may damage the VCS and the CT-board!**
- J6, Connector to the panel:
 - This is a required connection. Power supply is internally fused. It is recommended to use cables AWG18 to AWG16 (0,75 to 1,5mm²).
 - In noisy environment and / or if cable length exceeds 100 ft, shielded cable is recommended. Due to lower timing requirements, this serial link is less sensitive to EMI. If shielded cable is used, the shield must be connected on both ends to the negative (terminal 2)
 - If a PC with data converter is used instead of a panel, the "On"-signal may be set by jumping the positive (terminal 1) to terminal 3 of this connector. The VCS will be on as long as terminal 3 is kept positive (9...18V on 12V-systems or 18...36V on 24V-systems with respect to negative reference).
- J9, Binary output:
 - Depending on the generator configuration, some of the outputs on this connector might be not required. These outputs are floating if not activated and will switch to negative when active. The coils of the relays that are controlled by this outputs need to be connected to positive supply voltage on one end. The other end must be connected to the output on J9.
 - Positive supply voltage is provided on J9, terminals 1 and 2, both fused with 0.8A. The fuses are located closed to the terminal (F3 and F4), each have a red LED that will be on if the fuse is burned.
 - Any of these outputs may also be activated manually by pressing the corresponding switch. The function of each switch is printed on the PCB.

- J2 and J3, Sensor input:
 - The only required input on these terminals is the oil pressure switch (J3/2). This switch must be normally closed. Opening this switch will immediately stop the engine. Warning “Oil pressure low” and “Binary oil sensor tripped “ will be shown (see “Warning and alarm messages from VCS”)
 - All temperature sensors are optional. Temperature sensors are suitable for NTC sensors with R/T-characteristic as per Epcos specification. More detailed description on temperature sensors may be provided upon request. Any sensor giving invalid reading will be displayed “---“ in the panel. Invalid reading of any temperature sensor(s) will be ignored (i.e. this will not cause an engine stop).
 - All temperature readings except sea water inlet and sea water outlet are monitored. If any temperature reading exceeds the programmed alarm or shutdown level, the corresponding warning or shutdown message will be displayed in the panel. To ignore a sensor, the alarm- and/or shutdown trigger must be set to 455°F/235°C.
 - The exhaust gas manifold-sensor will be monitored only after the engine has achieved nominal speed.
 - If analogue oil pressure sensor is connected, it must be enabled in software (see “Programming the VCS”). The input is suitable for a sensor with R/P characteristic as per VDO-specification. More detailed description on pressure sensor may be provided upon request. If enabled, this sensor must provide reading that will correspond to sufficient oil pressure (see “Programming the VCS”) otherwise the engine will be stopped and the message “Oil pressure low” will be displayed.
 - If tank sensor is connected, it must be enabled in software (see “Programming the VCS”). The Input is suitable for reading level sensors with output resistance ranging from 0-5000Ohm. The exact range as well as the alarm trigger may be programmed by the user.
- J4, Analogue/binary input:
 - All inputs listed hereunder are optional.
 - Analogue sea water sensor expects the same sensor characteristic as mentioned under analogue oil pressure sensor
 - All binary inputs are designed to read Positive supply voltage. Any input having positive supply voltage will be considered active
 - Binary input alternator signal is not supported in current software.
- J10, Digital / binary input:
 - This input will read an external stop (emergency stop) input. In order to keep the engine running, terminals 1 and 3 must be jumped at any time. Emergency stop switches may be connected to this input. If one of these switches is activated, a message that has been entered during programming (see “Programming the VCS”) will be displayed. The engine will be stopped immediately.

Status of the VCS may be additionally monitored by the LEDs 1 (red) and 2 (green). After powering up the system, the green LED will go on. The VCS will now try to

communicate with the CT-board and then with the panel. After successfully initializing these components, the VCS will adapt the LED status to actual system status.

During initialization of CT-Board and panel the green LED will be on, regardless of actual VCS status!

After initialisation, these LEDs will show:

- Continuous green: System status is ok
- Blinking green: System status is o.k. but some sensors are not connected or give invalid reading.
- Blinking red: Some non-critical error(s) have been found. This error(s) will be displayed on the panel or PC.
- Continuous red: Some critical error(s) have been found. This will lead to immediate shutdown of the engine. If engine is stopped, it will not be possible to start it due to this error(s)

B) Starting up the system using the panel

1. Buttons used in normal operation:

In normal operation mode, the buttons S1, S2, S3 and S5 will be used. To adjust panel settings, button S4 will also be used. To power up the complete system, press button S1 (on/off, Standby). Now the VCS, the panel and the CT-board will be turned on.

- The CT-board will first show continuous green light on LED1, then this will go to blinking green, indicating that serial communication with VCS is working. The red LED will go on, since booster is disabled due to low voltage.
- The VCS will show either green or red LED, upon actual status
- The panel will go on showing normal display # 1 (see page 10)
- The LED underneath S1 will go on, indicating that the system is powered on.

By pressing S3, different panel displays may be selected (see page 10).

Normal display # 1 will show:

- Total operating time of the engine
- Actual panel temperature
- Actual VCS temperature
- Additional messages (if any) in the bottom line of the panel

Normal display # 2 will show:

- Actual display mode (US-Standard or metric)
- Actual backlight setting, 0 (off) to 10 (brightest)
- Actual contrast setting, 0 (light) to 10 (dark)
- Actual panel address (Only required if more than 1 panel is used)

Additional messages will not be displayed in this display mode. The blinking item may be modified by pressing S2 & keeping it pressed and then pressing S3.

Actual settings will be saved when going to the next display (pressing S3). Turning off the panel in this mode will not save actual settings!

Normal display # 3 will show:

- Engine speed
- Voltage L1 to neutral (U1)
- Voltage L2 to neutral (U2)
- Voltage L1 to L2 (U3)
- Power factor (PF) followed by “i” for inductive load or “c” for capacitive load
- Total power output (kW)
- Apparent power output (kVA)
- Frequency of AC-Voltage
- Current on L1
- Current on L2
- Battery voltage
- Tank level (if sensor is enabled and gives a valid reading) as a vertical bar with resolution 1/8 (12,5%)
- Additional messages (if any) in the bottom line of the panel

Normal display # 4 will show:

- Cylinder head temperature (Cyl. H:)
- Exhaust manifold temperature (exh. M:)
- Cooling water inlet temperature (Cool. in:)
- Cooling water outlet temperature (Cool. out:)
- Coil temperature 1 or 2. The higher temperature will be shown
- Alternator bearing temperature (Alt. B:)
- Sea water inlet temperature (S.W. i:)
- Sea water outlet temperature (S.W. o:)
- Engine oil temperature (Oil t:)
- Engine oil pressure (Oil p:) if analogue oil pressure sensor is enabled and gives a valid reading
- Additional messages (if any) in the bottom line of the panel

From any of the above mentioned displays the user may:

- Toggle engine status (Start/Stop) by pressing S5
- Turn off the system by pressing S1

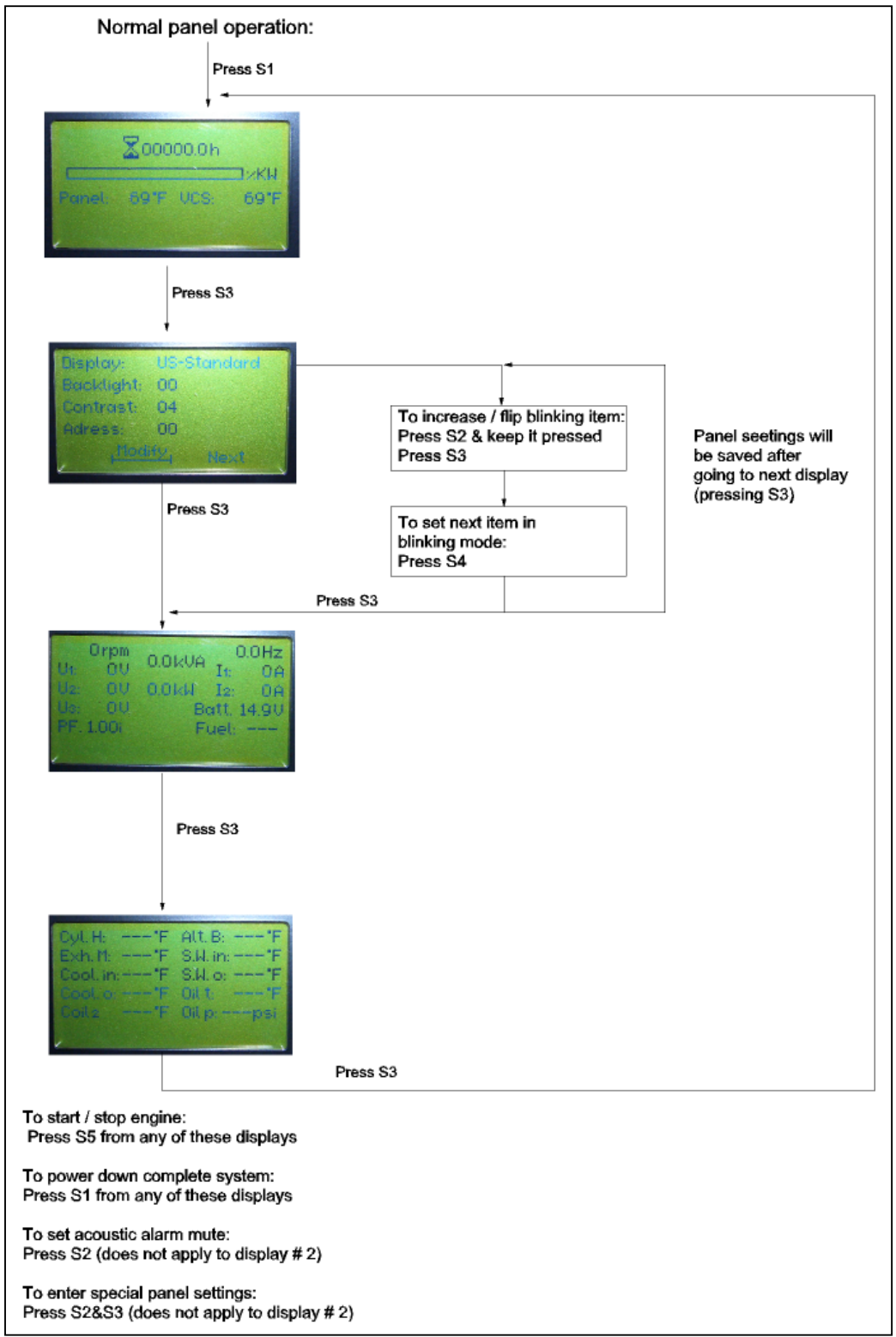
From any of the above mentioned displays, except # 2, the user may:

- Go to special panel settings by pressing S2 and S3 together
- Set the acoustic alarm mute by pressing S2

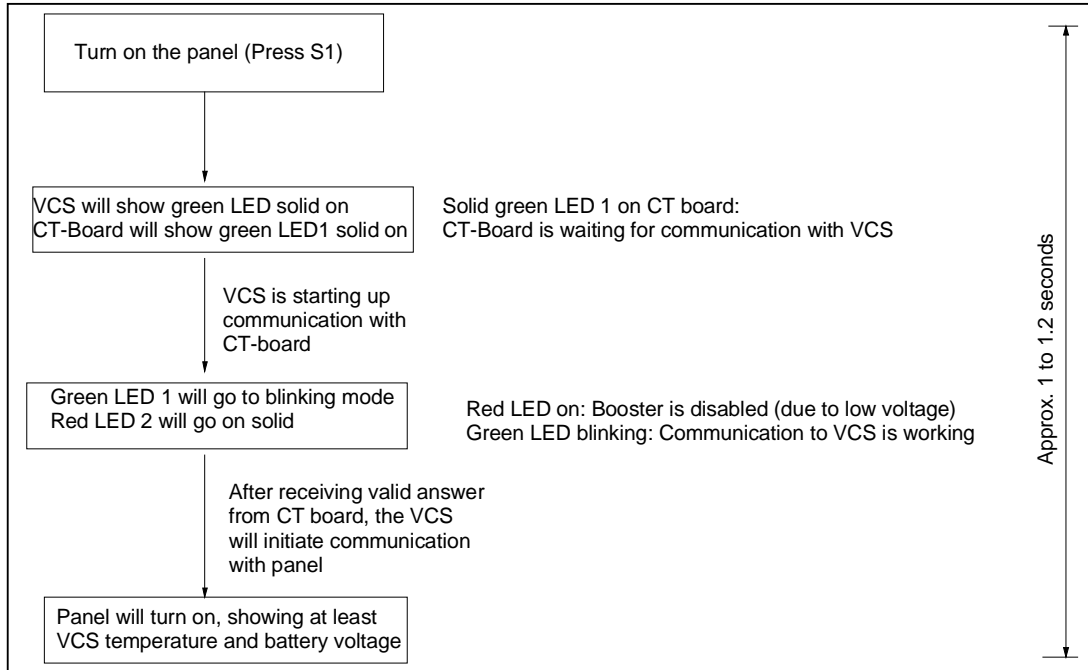
When starting /stopping the engine:

- The LED underneath S5 will start blinking
- This LED will go on steady when the engine is running
- This LED will go off when engine comes to complete stop and oil pressure switch is opening (never jump the oil switch!)

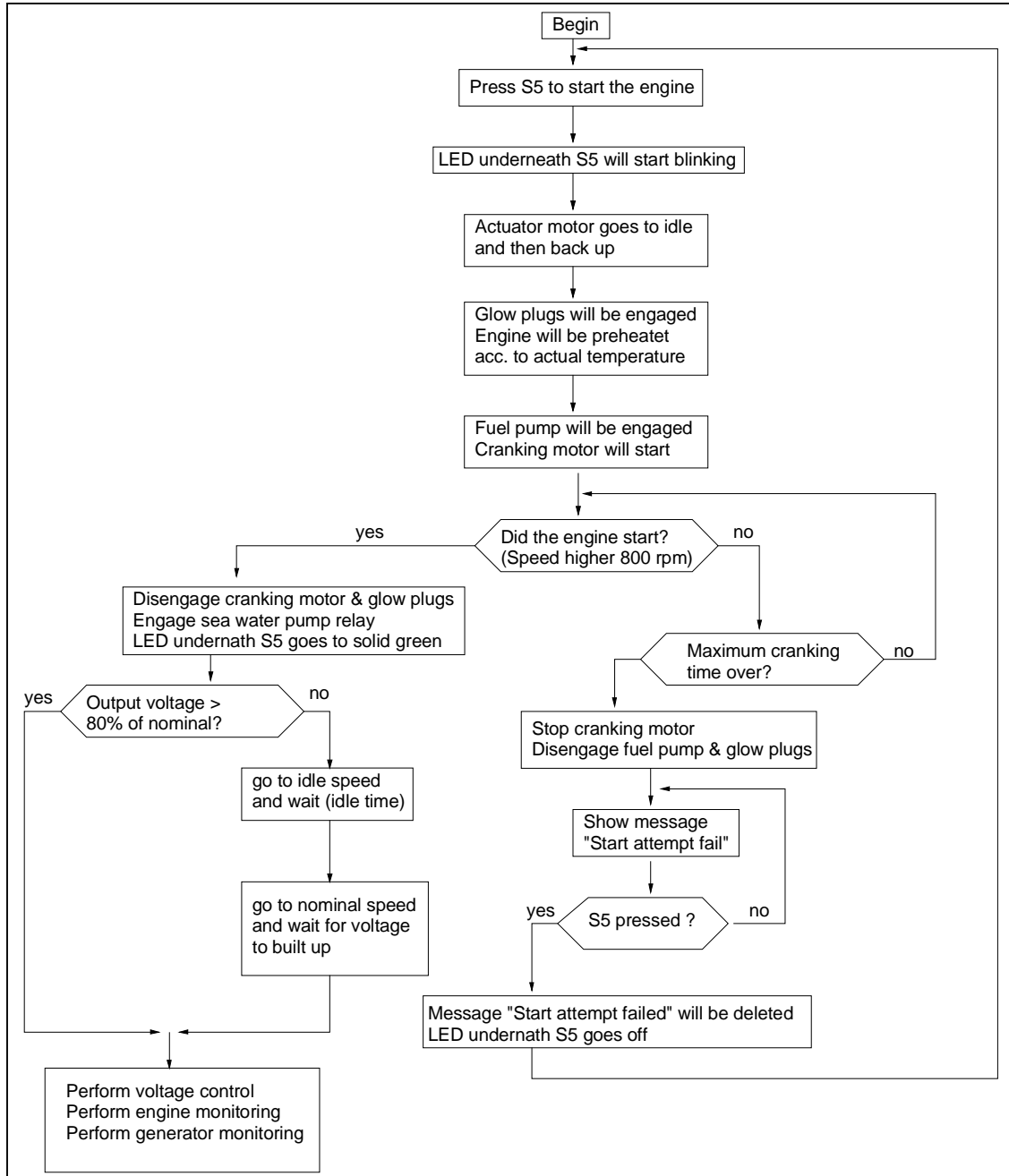
The following pages will give a flowchart of the actions that take place during start-up and during starting / stopping the engine.



Sequence when powering the panel

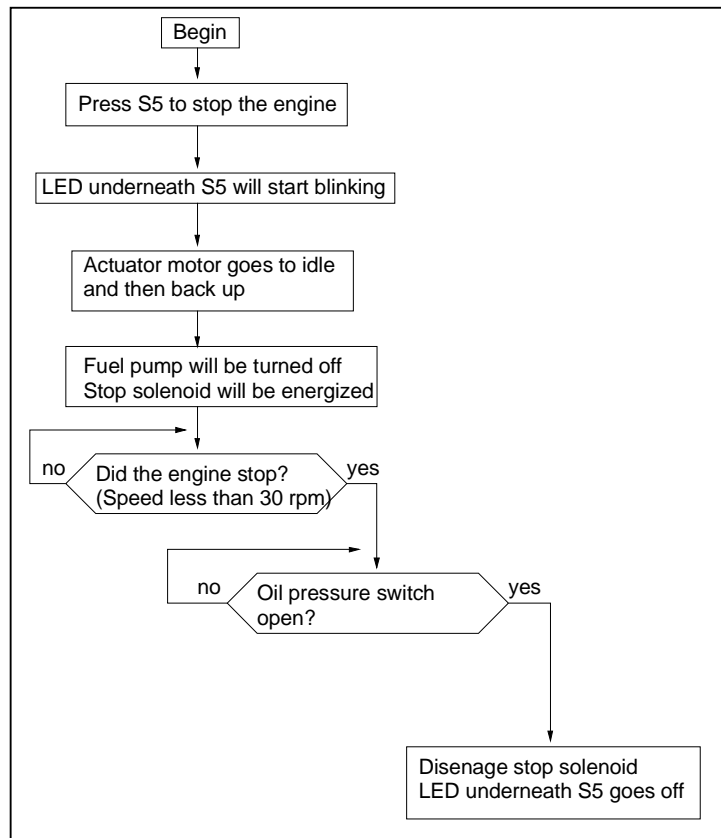


Sequence when starting the generator



If any shutdown message is active it will be displayed in the bottom line of the panel. Starting the engine will not be possible in such case. The reason for that message needs to be eliminated.

Sequence when stopping the generator



When starting up the engine, the actions listed below will take place:

- The LED underneath S5 will go in blinking mode
- The actuator motor will turn down to low limit and then go up again for a certain time, as specified when programming the VCS (see “Programming the VCS”)
- Glow plugs will be engaged. Preheating time will be calculated according to the temperature sensed on cooling water outlet. If this sensor is broken, then preheating time will be calculated based on cylinder head temperature. If this sensor is also broken it will be calculated based on VCS temperature.
- After preheating the engine, the fuel pump and the cranking motor will be engaged. The glow plugs will stay on.
- If the engine does not start within the maximum cranking time:
 - Glow plugs, fuel pump and cranking motor will be disengaged
 - The message “Start attempt failed” will be displayed in the bottom line of the panel
 - The user needs to press again button S5 to release the panel from this status. Now another attempt to start may be performed
- After successful start, glow plugs and cranking motor will be disengaged.
- The VCS will bring the engine to idle speed and keep it there for the idle time (see “Programming the VCS”).
 - If the VCS will sense a voltage equal to or greater than 80% of the nominal voltage during idle time, then idling will be aborted and the VCS will go straight to voltage regulation.
 - Having this high voltage may be caused by driving the actuator motor up too long (setting “Actuator back”, see “Programming the VCS”). Try decreasing this parameter to avoid high voltage at start-up.
- After idle time, the VCS will bring the engine to nominal speed and check the voltage reading. As soon as voltage is at 80% of nominal voltage, the VCS will start voltage regulation.
- The output for electrical sea water pump will be engaged.

When shutting down the engine, either by manual shutdown or by automatic shutdown due to any alarm:

- The actuator will go down to lowest engine speed and then back for 1 sec.
- The fuel pump will be turned off
- The stop solenoid will be engaged
- The LED underneath S5 on the panel will go to blinking mode After complete engine stop (no frequency signal for at least 1.5 seconds and oil pressure switch open) the LED underneath S5 on the panel will go off (manual stop only!)
 - If the stop was caused by automatic shutdown, the message(s) for that stop will be shown in the bottom line of the panel in inverse printing. Messages will flip around every 2 seconds. The LED underneath S5 will keep blinking.
 - To enable the engine for next start-up, press S5 to acknowledge stop. Depending on their source, the message(s) on the bottom of the screen will disappear or not. Oil pressure warning will disappear anyway, since low oil pressure is normal with the engine stopped.

C) Messages displayed by the panel

The VCS will display various information about current system status in clear text in the bottom line of the display when operated from the panel. When operated from the computer, the messages will be displayed in the message window. If more than one message is active, then the messages will scroll down on the panel with an update rate of 2 seconds. The message window on the computer display has scroll bars allowing manual scrolling. Any new incoming message will activate the acoustic alarm on the panel. The user may set this mute by pressing S2. The acoustic alarm will go off if no message is active. Any message that goes off and comes on again is considered a new message and will again trigger the acoustic alarm on the panel. This alarm may be doubled / amplified by using the alarm output of the panel.

There are two different types of messages

- Warnings
- Shutdowns

When shutdown message is active, the corresponding warning message will not be displayed.

Warning messages are displayed in plain text, shutdown messages are displayed in inverse. Any message will be displayed as soon as it is detected. This applies also to shutdown messages. The generator may keep running, if that shutdown message is associated to a delayed shutdown.

When a shutdown occurs, all shutdown messages will be displayed in the panel. The user needs to press S5 (manual stop). After pressing S5, only those messages that are still active will be displayed.

If no shutdown has occurred, messages will be displayed only as long as the reason for that message persists.

The following listing shows all possible messages and their description.

- Message mstxt001:
 - Message: "Oil pressure is low"
 - Message type: Warning and shutdown
 - Message caused by: Low oil pressure reading either on analogue pressure sensor input or on binary oil pressure input
- Possible Causes
 - Low oil level
 - Degraded oil (can increase viscosity)
 - Engine damage
 - Faulty oil pressure sensor

- Message mstxt002:
 - Message: "Engine speed is high"
 - Message type: Warning and shutdown
 - Message caused by: Engine speed higher than warning / shutdown level
- Possible Causes
 - Actuator spindle locked on "jam nut"
 - Damaged capacitors
- Message mstxt003:
 - Message: "Exh. m. temp. is high" (Exhaust manifold temperature is high)
 - Message type: Warning and shutdown
 - Message caused by: Exhaust manifold temperature sensor
- Possible Causes
 - low raw water flow caused by
 - Restricted sea strainer
 - Collapsed or kinked water hoses
 - damaged raw water pump
 - Faulty temperature sensor
- Message mstxt004:
 - Message: "Bearing temp. is high" (Bearing temperature is high)
 - Message type: Warning and shutdown
 - Message caused by: Alternator bearing temperature sensor
- Possible Causes
 - Low oil level in back-end bearing reservoir
 - Faulty temperature sensor
- Message mstxt005:
 - Message: "Cyl. head temp. is high" (Cylinder head temperature is high)
 - Message type: Warning and shutdown
 - Message caused by: Cylinder head temperature sensor
- Possible Causes
 - Low coolant level
 - Air in the coolant system
 - Damaged engine coolant pump
 - Broken or damaged (loose) engine water pump belt
 - Faulty heat exchanger
 - Generator overload
 - Damaged engine
 - Faulty temperature sensor
- Message mstxt006:
 - Message: "Oil temp. is high" (Engine oil temperature is high)
 - Message type: Warning and shutdown
 - Message caused by: Engine oil temperature sensor
- Possible Causes
 - Low oil level
 - Incorrect oil filter (non Kubota)

- Generator overload
- Faulty temperature sensor

- Message mstxt007:
 - Message: “Cool. w. out temp. is high” (Cooling water outlet temperature is high)
 - Message type: Warning and shutdown
 - Message caused by: Cooling water outlet temperature sensor
- Possible Causes
 - High Coolant temperature in (see below)
 - Inadequate coolant flow
 - damaged or loose engine water pump belt
 - damaged engine water pump
 - damaged thermostat

- Message mstxt008:
 - Message: “Cool. w. in temp. is high” (Cooling water inlet temperature is high)
 - Message type: Warning and shutdown
 - Message caused by: Cooling water inlet temperature sensor
- Possible Causes
 - Faulty heat exchanger
 - Inadequate raw water flow due to:-
 - Restricted sea strainer
 - Collapsed or kinked water hoses
 - damaged raw water pump
 - Extremely high sea water temperature (enclosed shallow basin etc.)
 - Incorrect coolant mixture (ratio coolant to water)

- Message mstxt009:
 - Message: “Coil temp. is high” (Coil temperature is high)
 - Message type: Warning and shutdown
 - Message caused by: Any of the 2 generator coil temperature sensors
- Possible Causes
 - Inadequate cooling (raw water and fresh water-see above)
 - Locked on booster capacitors
 - Electrical overload
 - Damage connections (can result in false readings)

- Message mstxt010:
 - Message: “Power output is high”
 - Message type: Warning and shutdown
 - Message caused by: High output power
- Possible Causes
 - Generator Overload (Check consumers)

- Message mstxt011:
 - Message: "Frequency out of range"
 - Message type: Warning only
 - Message caused by: Generator frequency - too low or too high
- Possible Causes
 - Actuator spindle binding (either end)\
 - Fuel restriction (low frequency)
 - damaged run capacitors (high frequency)
 - Locked boost capacitors (low frequency)
- Message mstxt012:
 - Message: "Current output is high"
 - Message type: Warning and shutdown
 - Message caused by: Current reading on any leg
- Possible Causes
 - Generator Overload (Check consumers)
- Message mstxt013:
 - Message: "Rectifier temp. is high" (Rectifier temperature is high)
 - Message type: Warning and shutdown
 - Message caused by: Rectifier temperature sensors
- Possible Causes
 - This message should not appear on AC generators
- Message mstxt014:
 - Message: "No excitation" (Coil temperature is high)
 - Message type: Warning only
 - Message caused by: Frequency reading in a valid range, but voltage reading less than 25% of the nominal voltage.
- Possible Causes
 - Damaged capacitors or capacitor connections
- Message mstxt015:
 - Message: "AC-Voltage is high"
 - Message type: Warning and shutdown
 - Message caused by: Voltage reading on any leg of the generator legs
- Possible Causes
 - Actuator spindle binding
- Message mstxt016:
 - Message: "AC-Voltage is low"
 - Message type: Warning and shutdown
 - Message caused by: Voltage reading on any leg of the generator legs
- Possible Causes
 - Actuator spindle binding
 - Damaged capacitors
 - Fuel restriction
 - Engine overload

- Message mstxt017:
 - Message: “Nominal speed”
 - Message type: Warning only
 - Message caused by: Generator set to paralleling
- Possible Causes
 - Not applicable

- Message mstxt018:
 - Message: “Oil pressure switch”
 - Message type: Shutdown only
 - Message caused by: Oil pressure switch
 - Reference to programming: None
- Possible Causes
 - Damaged oil pressure switch
 - Loose oil pressure connections

- Message mstxt019:
 - Message: “DC-Voltage is high”
 - Message type: Warning and shutdown
 - Message caused by: Voltage reading on VCS supply voltage
- Possible Causes
 - Loose battery cable connections
 - K3 relay loose or damaged
 - Overcharge from a secondary battery source. (Preferred installation uses a dedicated battery. If not, recommended that generator voltage regulator be disconnected)

- Message mstxt020:
 - Message: “DC-Voltage is low”
 - Message type: Warning only
 - Message caused by: Voltage reading on VCS supply voltage
- Possible Causes
 - Will display momentarily as a self test when panel is turned on. (normal)
 - Low battery charge:-
 - Loose battery cable connections
 - Battery not charged

- Message mstxt021:
 - Message: “Actuator failure”
 - Message type: Warning only
 - Remark: Not supported in current VCS software.

- Message mstxt022:
 - Message: “Start attempt failed”
 - Message type: Warning only
 - Message caused by: Failing engine start within maximum cranking time
- Possible Causes

- Damaged K1 relay
- Damaged starter motor
- Loose or damaged starter motor cables
- Faulty fuel system (filters, pump, low fuel etc.)
- Damaged engine (compression etc)
- Message mstxt023:
 - Message: “Load is unbalanced”
 - Message type: Warning only
 - Message caused by: Voltage reading generator output
- Possible Causes (240V configuration only)
 - Unbalanced load between L1 and L2
- Message mstxt024:
 - Message: “Tank level is low”
 - Message type: Warning only
 - Message caused by: Tank level reading
- Possible Causes
(Only applies when VCS is configured for a dedicated fuel tank)
 - Low fuel level in dedicated tank
- Message mstxt025:
 - Message: “Unexpected stop”
 - Message type: Warning only / will confirm stop
 - Message caused by: Generator stop not initiated by the VCS
- Possible Causes
 - Fuel system problem:-
 - low fuel level
 - dirt or blocked fuel filters
 - leaks in fuel system
 - Damaged K3 relay
 - Damaged fuel pump or fuel pump connections
 - Back-up temperature switches.
(Operate independently of generator control system.)
 - Winding temperate switch.(connected with yellow wires)
 - Head temperature switch. (connected with yellow/blue wires)
- Message mstxt026:
 - Message: “Man. Stop on auto-run”
 - Message type: Warning only /will confirm stop
 - Not activated in current VCS software
- Message mstxt027:
 - Message: “Check backup-battery”
 - Message type: Warning only
 - Not activated in current VCS software
 -
- Message mstxt028:
 - Message: “Leakage in capsule”

- Message type: Warning only
 - Message caused by: Water leak sensor in capsule
- DISABLED
- Message mstxt029:
 - Message: “Check sea water”
 - Message type: Warning only
 - Message caused by: Temperature difference sea water out to sea water in.
- DISABLED
- :
- Message mstxt030:
 - Message: “Eng. oil level is low”
 - Message type: Warning only
 - Message caused by: Engine oil level sensor
- DISABLED
- Message mstxt031:
 - Message: “Backend oil level is low”
 - Message type: Warning only
 - Message caused by: Backend oil level sensor
- DISABLED
- Message mstxt032:
 - Message: “Check air filter”
 - Message type: Warning only
 - Message caused by: Pressure sensor on air filter
- DISABLED
- Message mstxt033:
 - Message: “Invalid program data”
 - Message type: Warning only
 - Message caused by: unprogrammed VCS
- DISABLED
- Message mstxt034:
 - Message: “Invalid DC-Calibration”
 - Message type: Warning only
 - Message caused by: missing DC-Calibration
- DISABLED
- Message mstxt035:
 - Message: “Invalid AC-Calibration”
 - Message type: Warning only

- Message caused by: missing AC-Calibration
- DISABLED

- Message mstxt036:
 - Message: "Check CT-board"
 - Message type: Warning only
 - Message caused by: Communication problem between VCS and CT-board
 - Reference to programming: none
- Possible Causes
 - Damaged CT board
 - Damaged or loose VCS to CT cable

- Message - External (generated by an external source ie. Fireboy Halon etc)
 - Safety Stop
- Possible Causes
 - Halon/Fireboy system not engaged
 - Halon/Fireboy system discharged
 - Broken connection between VCS and Halon/Fireboy system

D) Reading data stored in the VCS

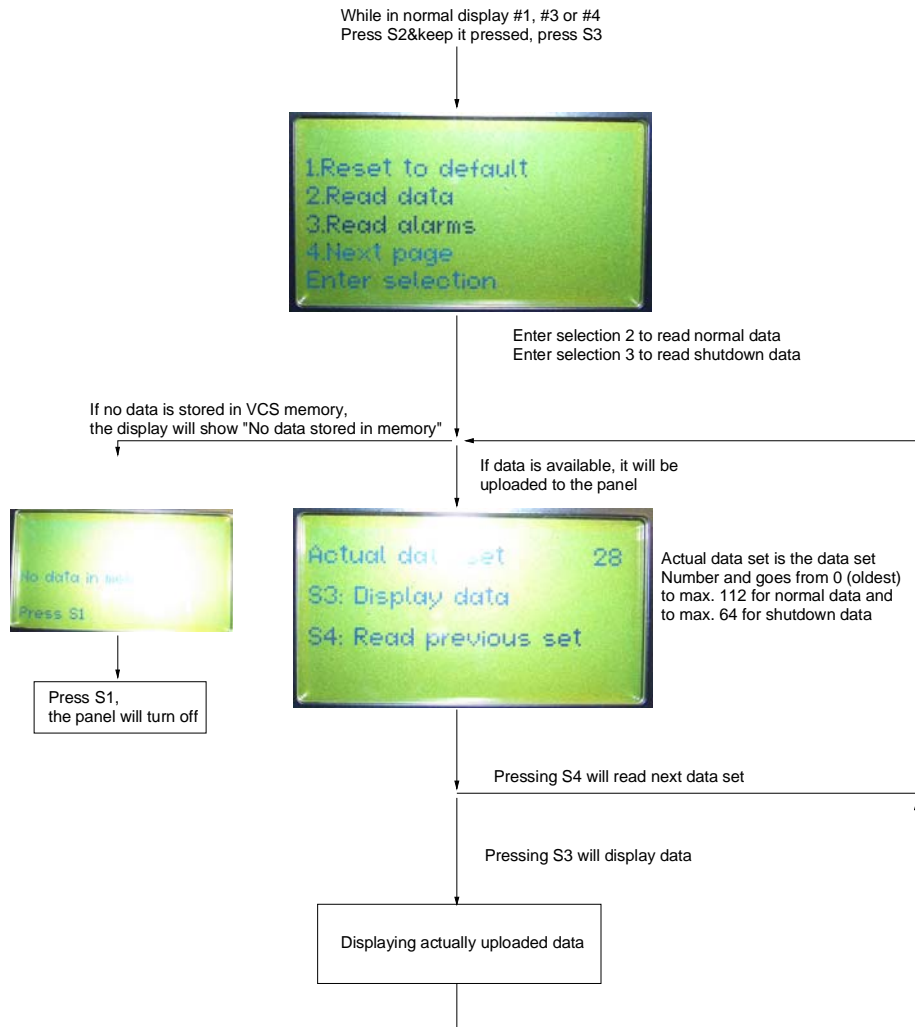
The VCS will store all readings available at the panel when the generator is operated. Readings are stored:

- Every 3 minutes in case of normal operation.
- Immediately, if an emergency shutdown occurs.

While the generator is stopped, no readings will be stored in memory. The VCS is capable of storing:

- 112 normal operating data, allowing to track back the generator status over the last 5.6 hours
- 64 shutdown readings

When reading the 113th normal data or 65th shutdown event, this will overwrite the oldest reading / shutdown in memory. To access this memory via the panel, follow the flowchart given below:



Displaying actual uploaded data will use similar displays as described under "Normal display #1" "Normal display #2" and "Normal display #3" pages 8-9 and diagram on page 10 with 3 exceptions:

- Any messages that were active when that data set was recorded will be displayed but will not activate the acoustic alarm
- Normal display #4 (setting contrast, backlight e.t.c) is not available when displaying uploaded data
- After displaying normal displays #1 to #3, pressing S3 will lead to the first selection menu, allowing to either read the previous data set or to display the actual data set again.

Displaying data may be terminated any time by pressing S1 which will turn off panel and VCS