InteliLite[NT]

InteliLite NT® VAutodetect

Modular Gen-set Controller

Compact Controller for Single Operating Gen-sets

(IL-NT MRS19 unit)

SW version 1.0, October 2007

ComAp

User guide

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General guidelines

What describes this manual?

This manual describes "IL-NT-VAutodetect"(MRS 19) software, which is designed for single set applications. This software supports CAN bus communication with Engine Control Unit (ECU) – e.g. EDC Volvo, Caterpillar EMCP3, Cummins CM570, DDC DDEC, Deutz EMR2, Iveco, John Deere, Perkins ECM, Scania S6 etc.

Firmware: IL-NT-MRS19-VA-1.0.mhx
Archive: IL-NT-MRS19-VA-1.0.ail

What is the purpose of the manual?

This manual provides general information how to install and operate InteliLite NT MRS19 controller.
This manual is dedicated for
- Operators of gen-sets
- Gen-set control panel builders
- For everybody who is concerned with installation, operation and maintenance of the gen-set

!! Warnings !!

Remote control

InteliLite^{NT} controller can be remotely controlled. In case of the work on the gen-set check, that nobody can remotely start the engine.
To be sure:
Disconnect remote control via RS232 line
Disconnect input REM START/STOP
or
Disconnect output STARTER and outputs GCB CLOSE/OPEN

Because of large variety of InteliLite^{NT} parameters settings, it is not possible to describe all combinations. Some of InteliLite^{NT} functions are subject of changes depend on SW version. The data in this manual only describes the product and are not warranty of performance or characteristic.

Text

PAGE	(Capital letters in the frame) buttons on the front panel
Break Return	(Italic) set points
Generator protections	(Bold) Set point group
REMOTE START/STOP	(Capital letters) binary inputs and outputs

Note:
ComAp believes that all information provided herein is correct and reliable and reserves the right to update at any time. ComAp does not assume any responsibility for its use unless otherwise expressly undertaken.

Note:
SW and HW must be compatible (e.g. IL-NT-MRS19 firmware and IL-NT MRS19 HW) otherwise the function will be disabled. If wrong software is downloaded, message HARDWARE INCOMPATIBLE appears on controller screen. In this case use Boot load (jumper) programming – close Boot jumper and follow instructions in LiteEdit, download correct software.

!!! CAUTION !!!

Dangerous voltage

In no case touch the terminals for voltage and current measurement!
Always connect grounding terminals!
In any case do not disconnect InteliLite^{NT} CT terminals !

Adjust set points

All parameters are preadjusted to their typical values. But the set points in the "**Basic settings**" settings group **!!must!!** be adjusted before the first startup of the gen-set.

!!! WRONG ADJUSTMENT OF BASIC PARAMETERS CAN DESTROY THE GEN-SET !!!

The following instructions are for qualified personnel only. To avoid personal injury do not perform any action not specified in this User guide !!!

General description

Description of the controller system (with all options)

InteliLite^{NT}-MRS19 is a comprehensive controller for single generating sets.
InteliLite^{NT} controllers are equipped with a powerful graphic display showing icons, symbols and bar-graphs for intuitive operation, which sets, together with high functionality, new standards in Gen-set controls.
InteliLite automatically starts the Gen-set, closes the Gen-set C.B. when all conditions are met, then stops the engine on external signal or by pressing push buttons.
The key feature of InteliLite^{NT} is its easy-to-use operation and installation. Predefined configurations for typical applications are available as well as user-defined configurations for special applications.

IL-NT VAutodetect V1.0 brief description

Engine Control Unit interface

IL-NT-VAutodetect-1.0 firmware supports J1939 interface to Engine Control Unit interface (e.g. EDC Volvo). Values RPM, Oil pressure, Water temperature, Fuel level can be measured on IL-NT terminals or received from engine ECU via CAN. For configuration use LiteEdit of version 3.1 or higher.
The IL-NT analog terminals can't be used for other measurement, if the appropriate value is read from the ECU.

Voltage autodetection

The setpoint group **Basic settings:** *Nominal voltage* and *Nominal current* no longer available.
Nominal voltage is detected once the engine is started and **Engine params**: *Stabil time* elapses.

Once the engine is started the connection type of the generator is detected
Single-phase measurement – 1PH
Three phase wye measurement – 3PY
Three phase delta measurement – 3PD.

1. Generator is considered as single-phase (1PH) if the L2-N voltage is lower than 20V and two other voltages are higher than 100VAC. The *Nominal voltage* is calculated as an average value out of L1-N and L3-N voltages only. In single-phase connection, L2-N, L1-L2 and L2-L3 are shown as 0V. It is recommended to connect phase L2 to N. Current unbalance checks only two currents in case of single-phase connection.

2. Generator is considered as three phase (3PY) if the L-N voltage in all three phases is higher than 100VAC. The *Nominal voltage* is calculated as an average value out of all three L-N voltages.

3. Generator is considered as three phase delta connection (3PD) if the L1-N and L3-N voltages are in the range 100-140V and L2-N are higher than 170VAC. The *Nominal voltage* is calculated as an average value out of L1-N and L3-N voltages only.

If neither of the above connections are detected, Over / Under Voltage failure is detected, the engine is cooled down and stopped.

Nominal current value is calculated from **Basic setting**: *Nominal power (1ph)* or *Nominal power (3ph),* depending on the type of generator connection.

Voltage protections

1Ph: The under voltage does not react on low voltage in L2, voltage unbalance checks only L1-N, L3-N voltages.
3PD: Voltage unbalance checks only L1-N, L3-N voltages. Standard Under/Over voltage protections are used for L1-N, L3-N. The nominal voltage for L2-N Under/over voltage protections is the existing nominal voltage*sqrt (3)

Mains / Bus voltage is considered OK:

1. When the engine is running and *Nominal voltage* and type of generator connection is detected.

2. When the engine is not running and *Nominal voltage* and type of generator connection is detected from the mains. Mains voltage must be higher than 100VAC and must be available in at least two phases.

Power protections

There are two different setpoints: Nom power (3ph) and Nom Power (1ph) in Basic settings group and the active one is chosen according to the type of connection.

Current calculation

Nominal current value is calculated from **Basic setting**: *Nominal power (1ph)* or *Nominal power (3ph),* depends on connection 1-ph, 3-ph.

3PY: Inom=Pnom(3ph)/Vnom/3/0,8 (e.g. 1000kW/277V/3/0,8 = 1504A)
3PD: Inom=Pnom(3ph)/(Vnom*2)/sqrt(3)/0,8 (e.g. 1000kW/(120V*2)/1,73/0,8 = 3010A) (Load in delta connection is expected. Then the power is calculated)
1Ph: Inom=Pnom (1ph)/(Vnom*2)/0,8 (e.g. 1000kW/(120V*2)/0,8 = 5208A)

The *Nominal current* is rounded to the closest ten. *Nominal voltage* and *Nominal current* are not visible in the list of setpoints but on generator measurement screen.

Analog inputs

Analog input AI2 has three level protection as opposed to AI1 and AI3 (two levels). The third AI2 warning protection is LowCoolantTemperature. The setpoint “Wrn Wtemp low” is added to Engine protect.. Because of this added setpoint analog input 2 must be configured as coolant temperature. The description that will appear in history and alarm list will be “Wrn EngTempLow”.

What is in the package?

Accessories	Description	Optional / Obligatory
IL-NT MRS19	InteliLite^{NT} central unit	Obligatory
IL-NT RS232	RS232 communication card	Obligatory
IL-NT AOUT8	Gauge driver card	Optional
IL-NT RD	Remote display	Optional
IGL-RA15	Remote annunciator	Optional
IG-IOM/PTM	I/O extension module	Optional
IG-IB	Internet communication bridge	Optional

IL-NT RS232 communication module

IL-NT RS232 is plug-in card (present in default configuration) to enable InteliLite^{NT} for RS232 communication. This is required for computer or Modbus connection. Card inserts into expansion slot back on the controller.

IL-NT AOU8 gauge driver module

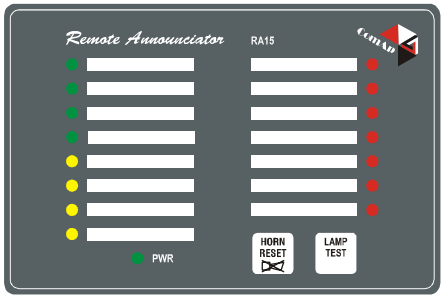
IL-NT AOUT8 is optional plug-in card. Through this card controller can drive up to 8 VDO style industrial/automotive gauges. Gauge type and value are configured in LiteEdit software. Any analog value from controller may be shown in that way.

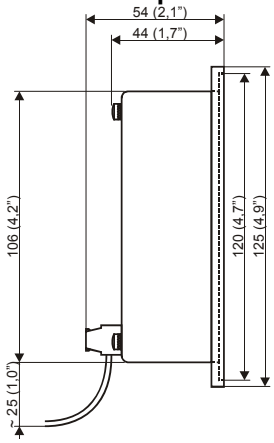
IL-NT RD Remote display

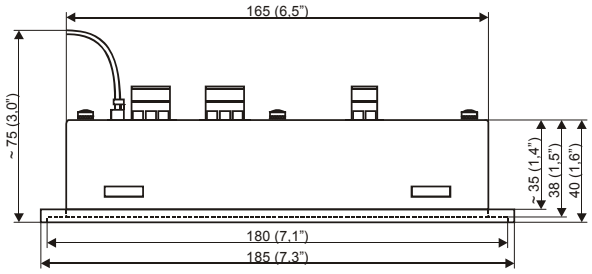
IL-NT RD is remote display for controller. Remote display provides the same control and monitoring functions as controller itself. No programming of the display is required – unit is self configurable from main controller. It is connected with controller via RS232 line. Longer distances (up to 1200m) are possible when RS232/RS485 converters are used.

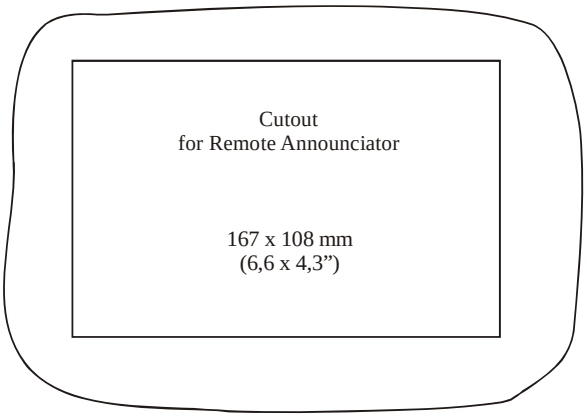
Remote annunciator IGL - RA15

The remote annunciator IGL-RA15 can be connected to the IL-NT unit via CAN bus. Any of the binary outputs can be configured (using LiteEdit software) to each LED diode on the RA15. The module can be also enabled or disabled using LiteEdit software.
See the documentation of RA15 for the technical and function description.









IG IOM/PTM module

IG-IOM and IGS-PTM modules are I/O extension modules equipped with 8 binary inputs, 8 binary outputs, 4 analogue inputs and one analogue output. The module can be used for AMF25 only.

- Binary inputs and outputs are configurable the same way like inputs and outputs on InteliLite.
- Analogue inputs are configurable like InteliLite with the limitation that the binary and tristate mode can not be used on PTM module.

- The protection of analogue IOM/PTM inputs is activated by overcrossing the limits, active only when the engine is running.
- IG-IOM analogue inputs are resistive (the same parameters like IL-NT) 0 Ω-2,4 kΩ. The module IOM is designed for especially VDO resistive sensors.
- IGS-PTM analogue inputs are configurable by jumpers to ranges 0-250Ω, 0-100mV, 0-20mA. The module can be used especially for Pt100 sensors and current sensors. The module PTM is not suitable for VDO temperature sensor.

See the documentation of IGS-PTM for the technical and function description.

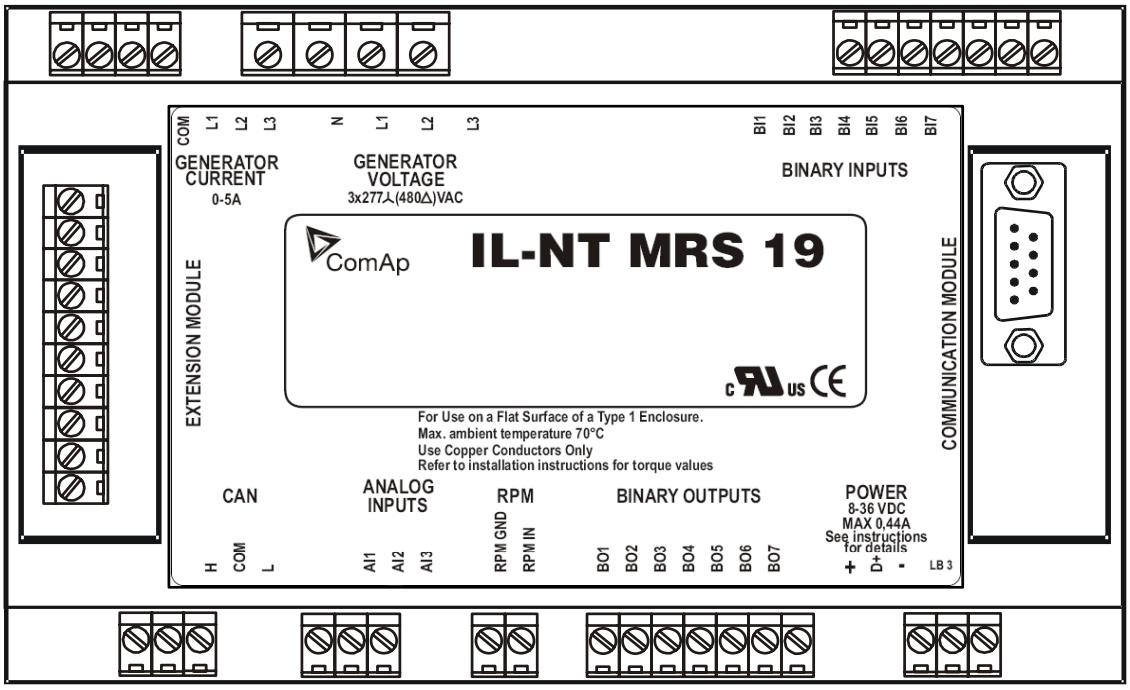
IG-IB Internet bridge

IG-IB Internet bridge enables InteliLite^{NT} for Ethernet/Internet communications. It is connected to controller via RS232 line.

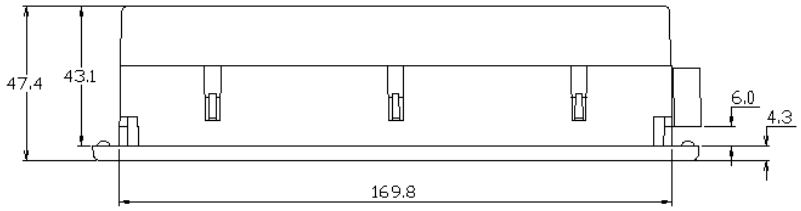
See the InteliCommunication guide for further details.

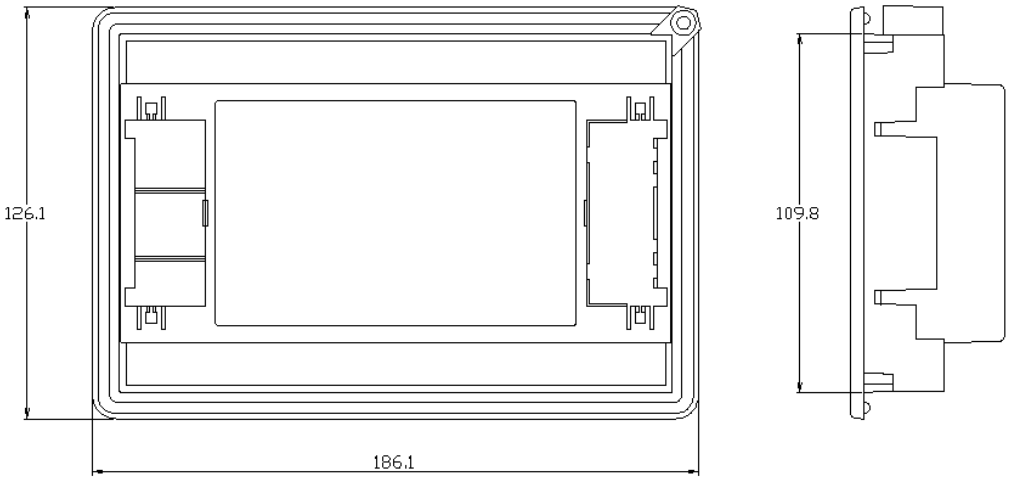
IL-NT Terminals and Dimensions

IL-NT Terminals



IL-NT Dimensions

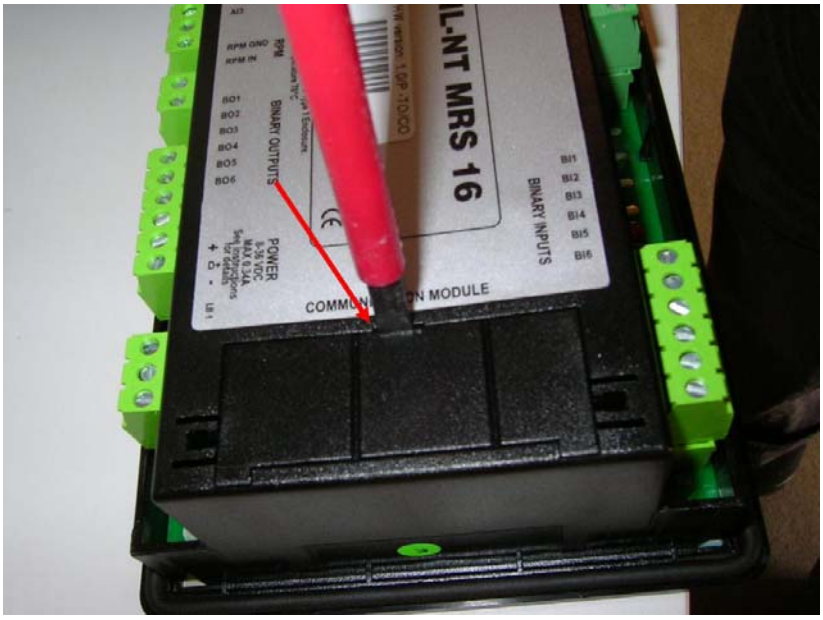




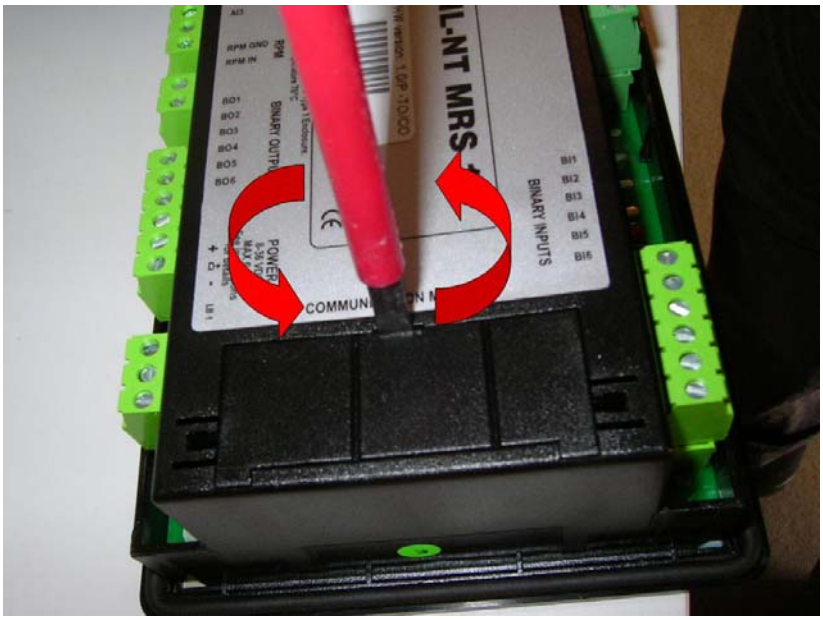
Installing RS 232 Communication Module

To install RS 232 communication module:

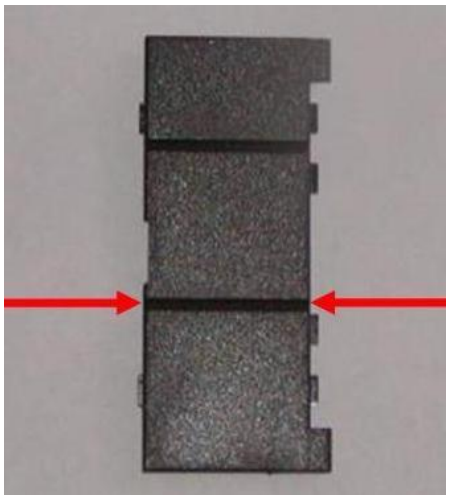
1. Insert a screwdriver into the slot of the cover.

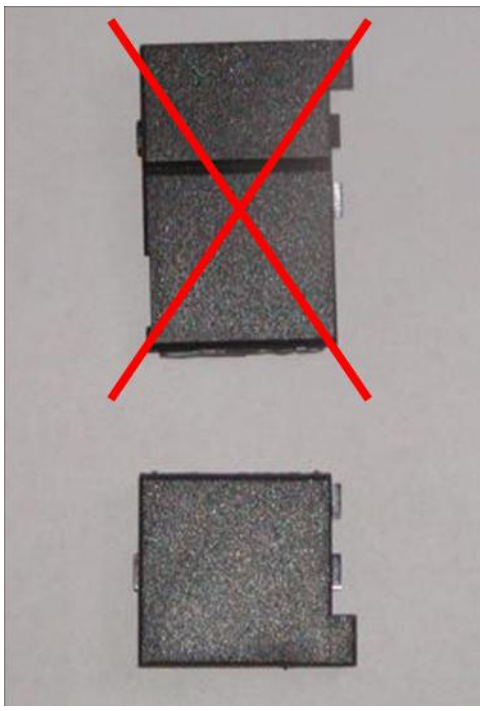


2. Move the screwdriver to set apart the small cover. **Be careful!**

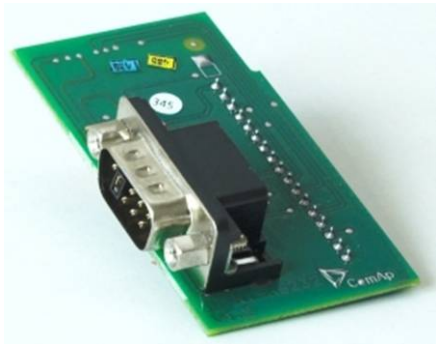


3. Remove the small cover.
4. Break apart the small cover into two pieces. **Do not throw away the smaller part!**





5. Take RS 232 communication module.

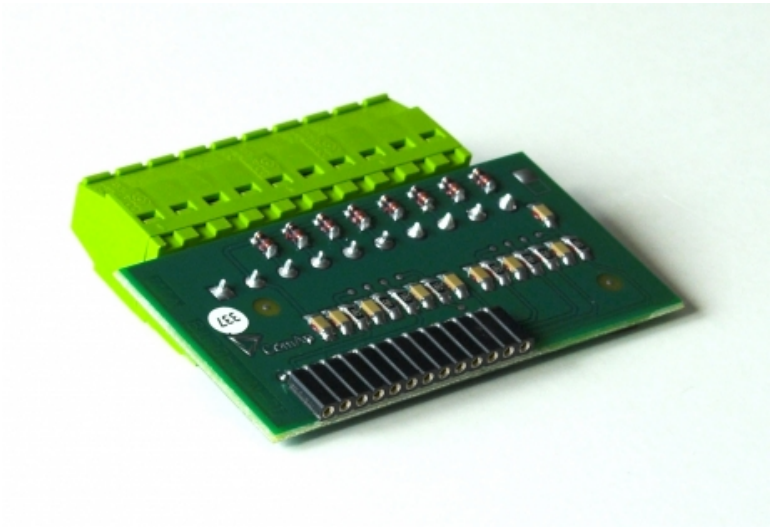


6. Plug RS 232 communication module into the slot of the controller.
7. Put back the small cover.

Installing IL-NT AOUT8 Module

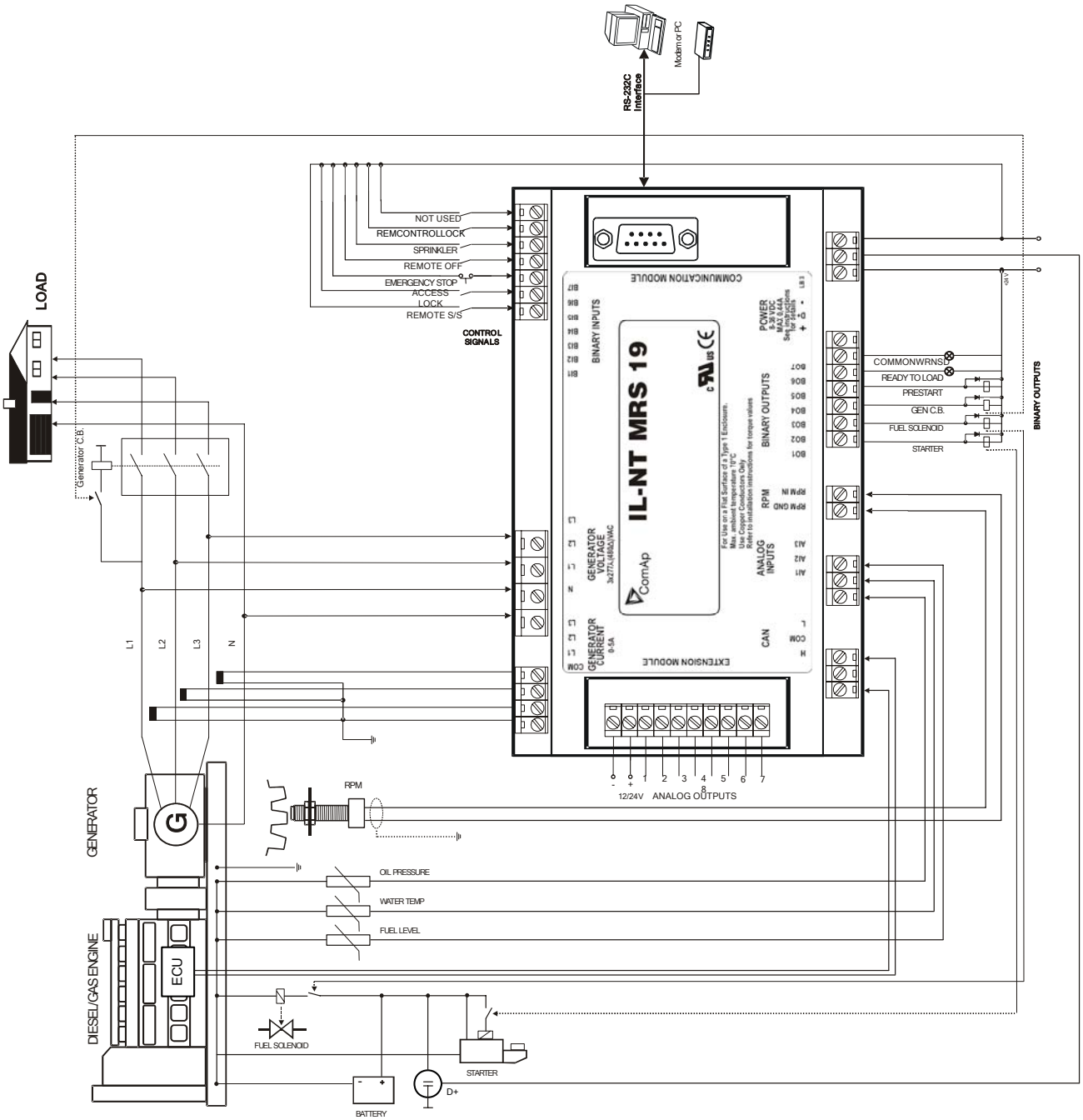
Installing IL-NT AOUT8 module is similar to installing RS 232 module. The difference is that after installing IL-NT AOUT8 you do not put back the small cover.

IL-NT AOUT8 module



Recommended wiring

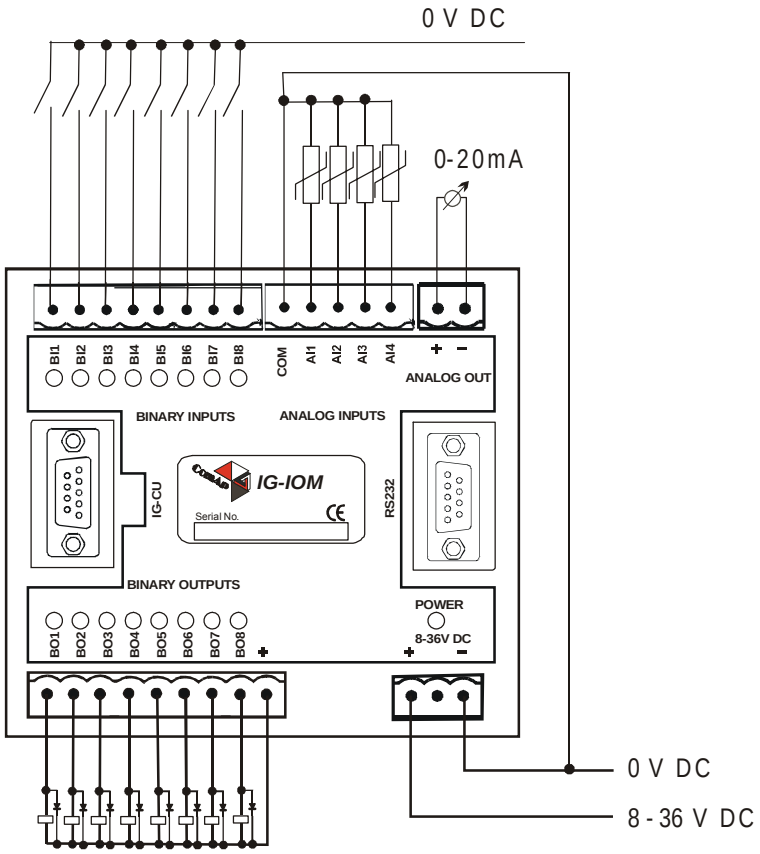
MRS – Wiring Diagram – standard connection



Hint:

It is possible to start Volvo, Scania (and some other) engines equipped with ECU via CAN bus. See Engines started via CAN bus (and Comap Electronic Engines Support.pdf).

IG-IOM Wiring



Hint:

Analog inputs COM terminal has to be connected to minus power supply.

Getting started

How to install

General

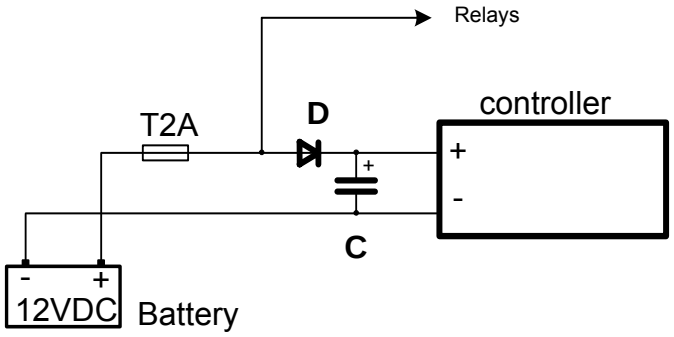
To ensure proper function:

Wiring for binary inputs and analog inputs must not be run with power cables.
Analog and binary inputs should use shielded cables, especially when length >3m.

Power supply

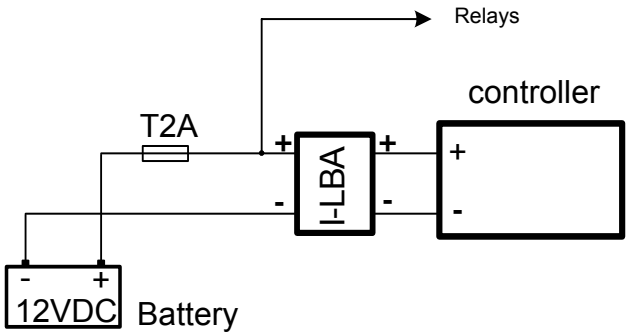
To ensure proper function:
Use min. power supply cable of 1.5mm^2
Maximum continuous DC power supply voltage is 36VDC. Maximum allowable power supply voltage is 39VDC. The InteliLite's power supply terminals are protected against large pulse power disturbances. When there is a potential risk of the controller being subjected to conditions outside its capabilities, an outside protection devise should be used.
Hint:
The InteliLite^{NT} controller should be grounded properly in order to protect against lighting strikes!!
The maximum allowable current through the controller's negative terminal is 4A (this is dependent on binary output load).

For the connections with 12VDC power supply, the InteliLite^{NT} includes internal capacitors that allow the controller to continue operation during cranking if the battery voltage dip occurs. If the voltage before dip is 10V, after 100ms the voltage recovers to 7 V, the controller continues operating. During this voltage dip the controller screen backlight can turn off and on but the controller keeps operating. It is possible to further support the controller by connecting the external capacitor and separating diode:



The capacitor size depends on required time. It shall be approximately thousands of microfarads. The capacitor size should be 5 000 microfarad to withstand 150ms voltage dip under following conditions. Voltage before dip is 12V, after 150ms the voltage recovers to min. allowed voltage, i.e. 8V

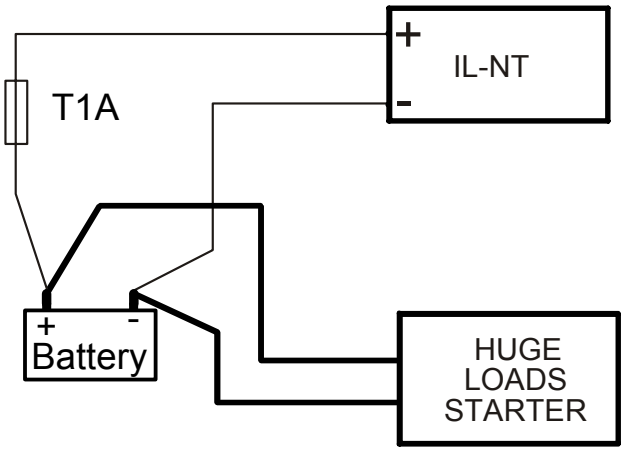
Or by connecting special I-LBA module:



Note:
I-LBA may not eliminate voltage drop when used with low temperature (-40°C) version of controller and display heating element is on (below 5°C). Current drain of heating element exhausts LBA capacitors very fast.

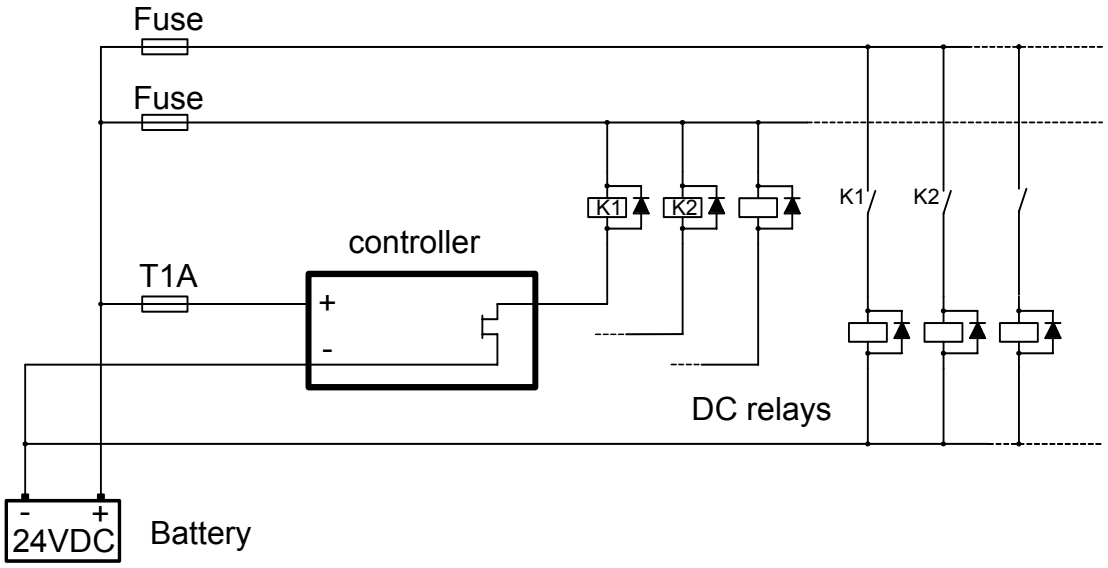
Power supply fusing

A one-amp fuse should be connected in-line with the battery positive terminal to the controller and modules. These items should never be connected directly to the starting battery.
Fuse value and type depends on number of connected devices and wire length.
Recommended fuse (not fast) type - T1A. Not fast due to internal capacitors charging during power up.



Binary output protections

Do not connect binary outputs directly to DC relays without protection diodes, even if they are not connected directly to controller outputs.

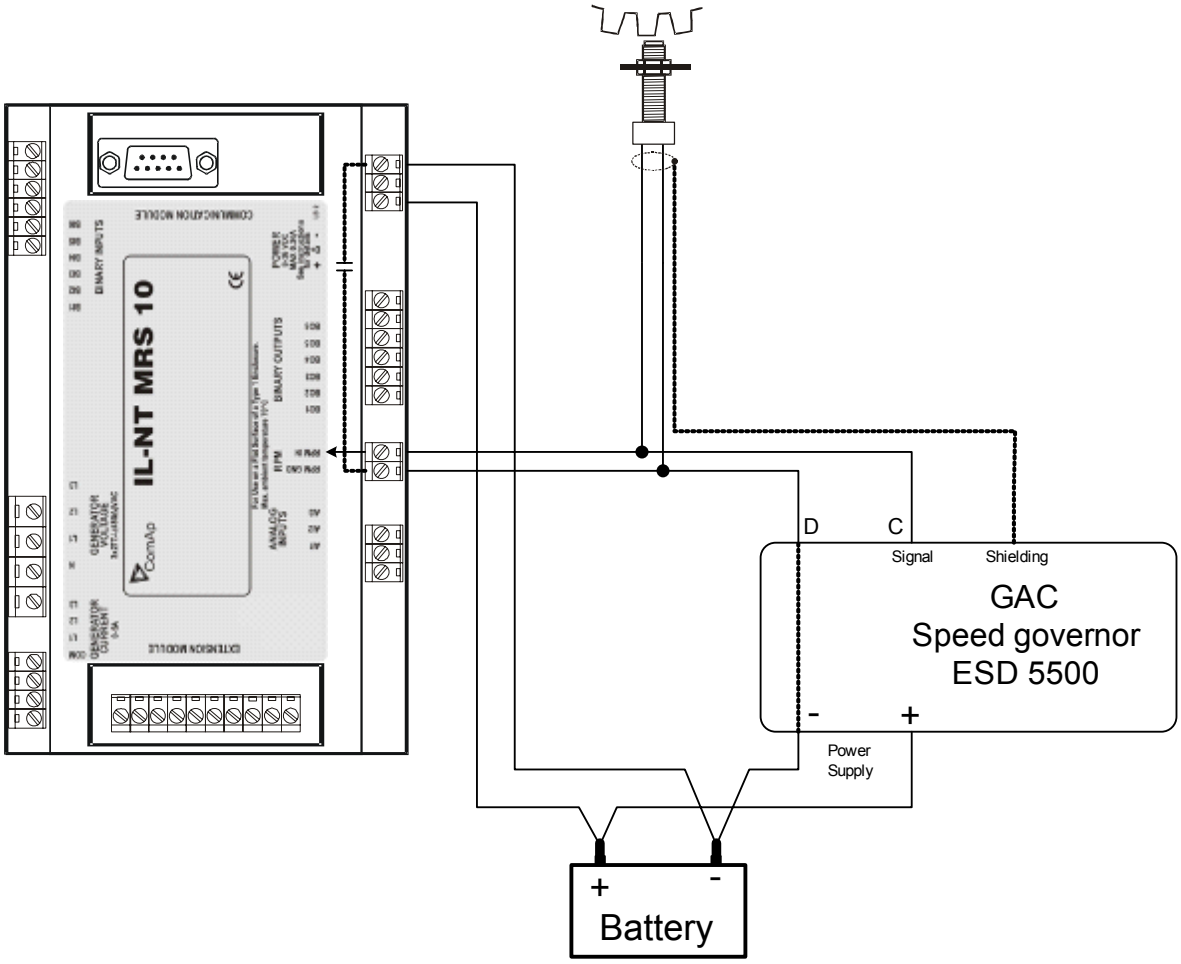


Grounding

To ensure proper function:
Use as short as possible cable to the grounding point on the switchboard
Use cable min. 2,5mm^2
The "-" terminal of the battery has to be properly grounded

Magnetic pick-up

To ensure proper function:
Use a shielded cable



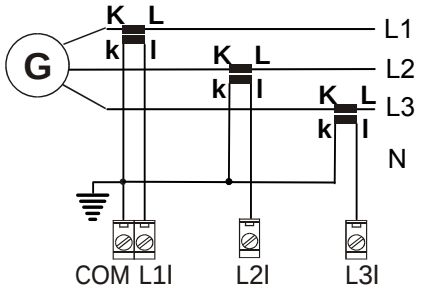
Be aware of interference signal from Speed governor when one speed pick-up is used.
If engine will not start:

- Check ground connection from pick-up to controller and governor, eventually disconnect ground connection to one of them
- Galvanically separate InteliLite RPM input using ComAp separation transformer RPM-ISO (1:1)
- Use separate pick-up for Speed governor and InteliLite^{NT}
- Check pick-up shielding connection – should be connected to the governor shielding point or to the sensor body

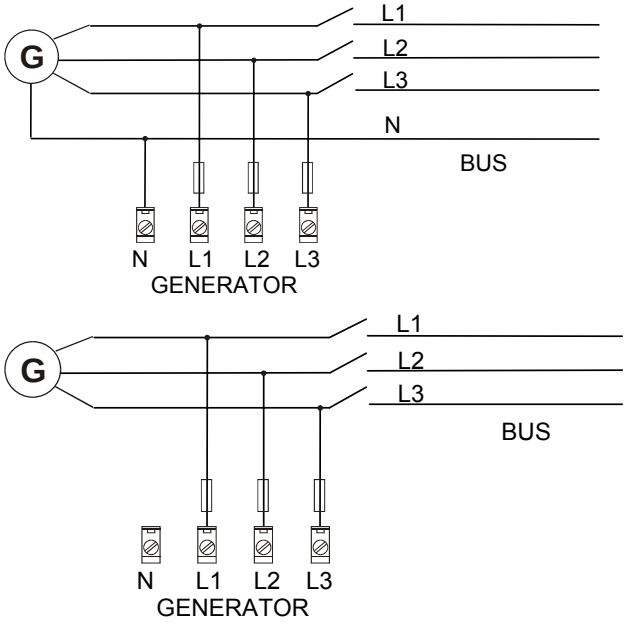
Hint:
In some cases the controller will measure a RPM value even though the gen-set is not running:
RPM is measured from the generator voltage (Gear teeth = 0)
IL-NT is measuring some voltage value on input terminals due to open fusing.
If RPM > 0 the controller will be put into a "Not ready" state and the engine will not be allowed to start.

Current measurement

To ensure proper function
Use cables of 2,5mm^2
Use transformers to 5A
Connect CT according to following drawings



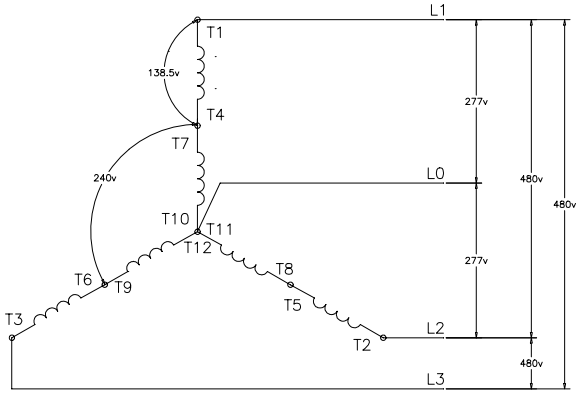
Voltage measurement



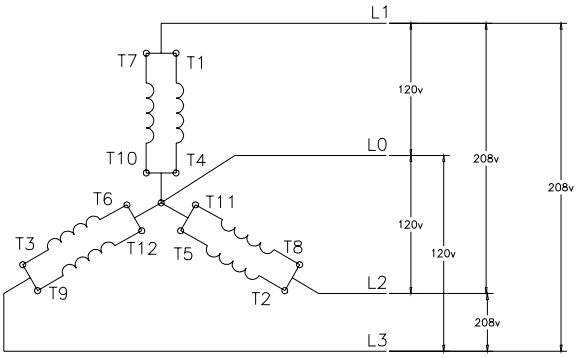
Hint:
No separation transformers for three wires voltage connection (without N) are needed.
Switchboard lighting strikes protection according standard regulation is expected!!!

Expected generator connections

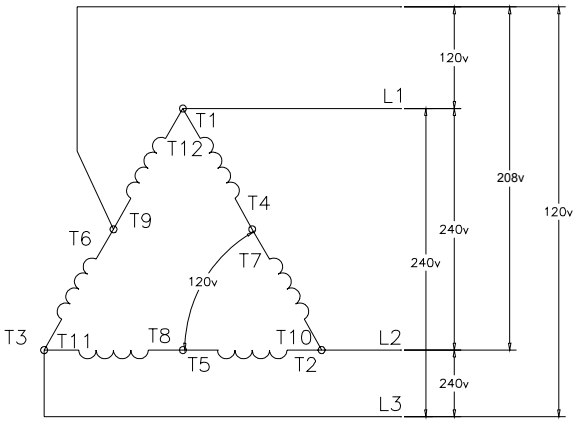
Three phase “wye” 3x277/480 v measurement – 3PY



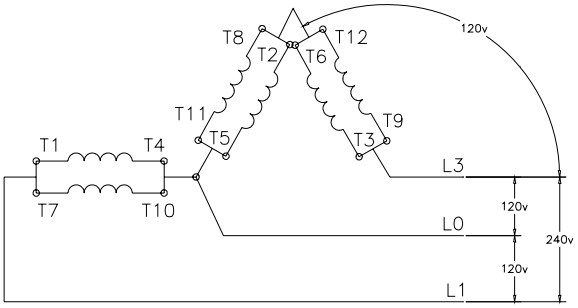
Three phase “wye” 3x120/208 v measurement – 3PY



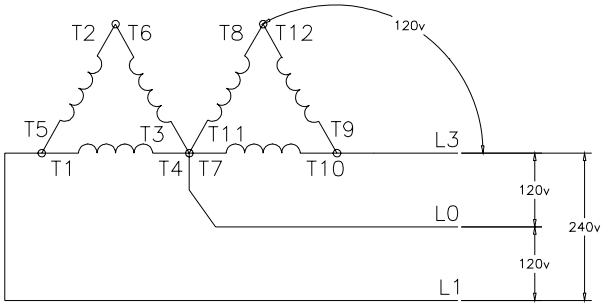
Three phase “delta” 3x240v measurement – 3PD



Single-phase 1x240v measurement – 1PH



Single-phase 1x240v measurement – 1PH



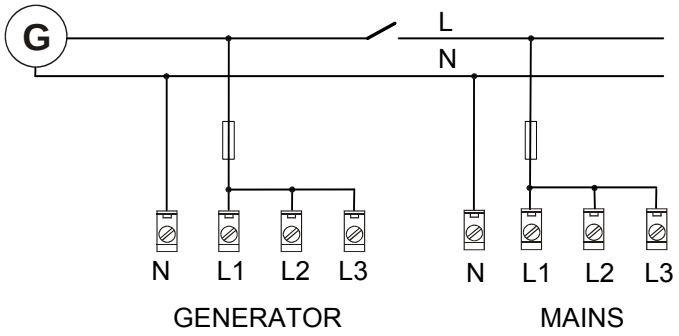
Single phase applications

There is not a separate archive file for single-phase applications. Use standard ail archives.

Recommended wirings

Generator (and mains) single-phase voltage has to be connected to all three-voltage terminals L1, L2 and L3. Generator current has to be connected to L1I and COM terminals only.

Voltage measurement



Hint:

Switchboard lighting strikes protection according standard regulation is expected!!!

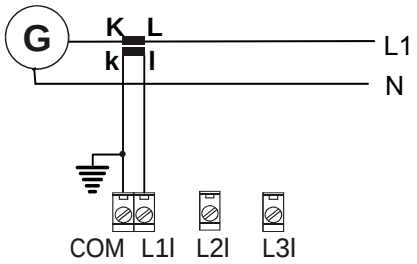
Current measurement

To ensure proper function

Use cables of 2,5mm^2

Use transformers to 5A

Connect CT according to following drawings. Terminals L2I and L3I are opened.



Set points adjustment

To run a single-phase application, the following set points have to be set:

Gener protect: *Curr unbal* to 200 %

Gener protect: *Curr unbal del* to 60,0 s

Analog inputs

Three analog inputs are available on the IL-NT

Configuration

Each analog input can be configured by LiteEdit software following way.

Analog input item	LiteEdit		Possibility
Type	Type	Not used	Analog input isn't used
		Alarm	Analog input is used
Analog input name	Name		Up to 14 ASCII characters

Config of input	Config	Analog		Analog measuring in specified range.
		Binary (not supp. by PTM)		Binary: open/close - threshold 750 Ω.
		Tri-state (not supp. by PTM)		Three-state: open/close - threshold 750 Ω, Failure <10 Ω or > 2400 Ω
Physical dimension	Dim	bar,%,°C, …		Up to 3 ASCII characters (Valid only for analog inputs)
Polarity	Contact type	NC		Valid only for binary and three-state inputs
		NO		Valid only for binary and three-state inputs
Protection direction	Protection	Over		Overstep. Sensor fail does not activate protection.
		Over+Fls		Overstep and Sensor fail activates protection.
		Under		Under step. Sensor fail does not activate protection.
		Under+Fls		Under step and Sensor fail activates protection.
Sensor characteristic	Sensor	Curve A Curve B Curve C PT 1000 NI 1000 VDO Temp VDO Press VDO Level 4-20mA/100 4-20mA/ 60 Pt100 Ni100 0-20mA/100 4-20mA/100 0-100mV/100	IL, IOM,PTM IL, IOM,PTM IL, IOM,PTM IL, IOM IL, IOM IL, IOM IL, IOM,PTM IL, IOM,PTM IL, IOM IL, IOM PTM PTM PTM PTM PTM	User curve A User curve B User curve C IEC 751, range -20 to 120 °C DIN 43760, range -20 to 120 °C See chapter sensor specification 20mA/10.0Bar, ext. R 120 Ω 20mA/6.0Bar ext R 120 Ω 0-20mA/10.0Bar 4-20mA/10.0Bar
Decimal points	Dec	0, 1, 2		Number of decimal points (Valid only for analog inputs)

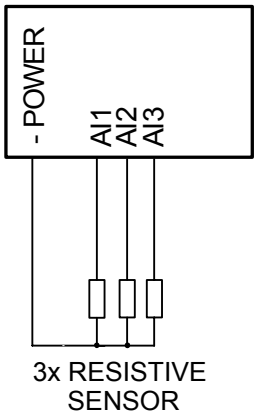
User Curve A, B, C are adjustable in LiteEdit.
Each Analog input has separate set points for two level alarm setting. Analog input alarm levels and delay adjust in **Protection** or **Engine protection** group.

Default current sensor characteristic with external resistor 120 ohms

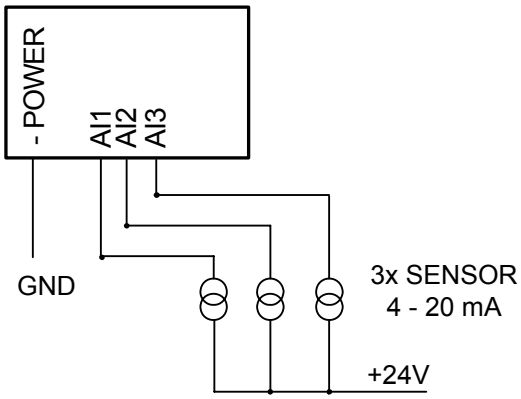
	4-20mA/100		0-20mA/100		0-20mA/-20 - 120°C
Primary	Converted	Note 1	Note 2	Note 3	Note 4
120			0 mA	0%	-20°C
170	0	0%	4 mA	20%	8°C
200	13				22°C
230	25	25%	8 mA	40%	36°C
280	38				50°C
330	50	50%	12 mA	60%	64°C
390	63				78°C
460	75	75%	16 mA	80%	92°C
560	88				106°C
690	100	100%	20 mA	100%	120°C

Note 1 - % range for 4-20 mA input
Note 2 - range 0-20 mA
Note 3 - % range for 0-20 mA input
Note 4 - characteristic 0-20 mA / -20 - +120 °C

Connection of IL-NT analog inputs

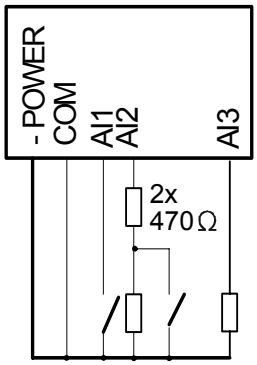


Standard connection of three resistive sensors to analog inputs.



Three current output sensors connection to InteliLite.

Set jumpers for current measurement



Mixed connection of InteliLite analog inputs:

AI1 – binary input
AI2 – three state input
AI3 – analog resistive input

Analog inputs are designed for resistive sensors with resistance in range of 0Ω to 2,4kΩ.
To ensure a proper function use shielded cables, especially for length over >3m. Shielding should be connected to the sensor body.

Current output transducers

IL-NT analog inputs are mainly designed for resistor sensors.
In special case transducers to 4-20mA output can be used for oil measuring (10.0Bar or 6.0Bar). Use predefined 4-20mA/100 or 4-20mA/60 sensors.
This method reduces the input resolution by less than 50%. Some types of transducers are not suitable for connection to InteliLite analog inputs because of influencing by InteliLite analog input.

As binary input

Open, close state are detected, threshold level is 750Ω.

As three state input

Open, close and failure state are detected. Threshold level is 750Ω, failure is detected when circuit resistance is <10Ω or > 2400Ω.

Hint:

Protections on binary and three state inputs are following:

IL-NT:	AI1	Shutdown	*IG-IOM*:	AI1	Shutdown
	AI2	Shutdown		AI2	Shutdown
	AI3	Warning		AI3	Shutdown
				AI4	Shutdown

Unused analog inputs

Configure Type = Not used

Example of analog input configuration

Configure Oil press input for measuring in Bar, VDO oil pressure sensor, range 0 to 10.0 bars. Alarm protection level set to 3.5 bars, shut down level 1.2 bars.
Start LiteEdit and select – Controller - Configuration – Modify – Oil Press.
Set configuration for Oil Press analog input:

Type: selection between Not used and Alarm
"Not used" – analog input isn't used
"Alarm" – analog input is used
Set to: Alarm

Config: selection between Analog, Binary Tri-state input.
"Analog" – resistor sensor is connected to Analog input.
"Binary" – open/close contact is connected between Analog input and COM terminal
Analog input detects only open/close state.
"Tri-state" – open/close contact is connected parallel to one of two serial resistors between Analog input and COM terminal.
Set to: Analog

Dim: Physical dimension of measured value (°C, %, Bar, ..) Maximal dimension length is three characters.
Set to: Bar

Contact type: selection of polarity only when analog input is configured as Binary or Tri-state. When is analog input configured as analog this setting has no sense.
„NC" – polarity of binary or tri-state input
„NO" – polarity of binary or tri-state input

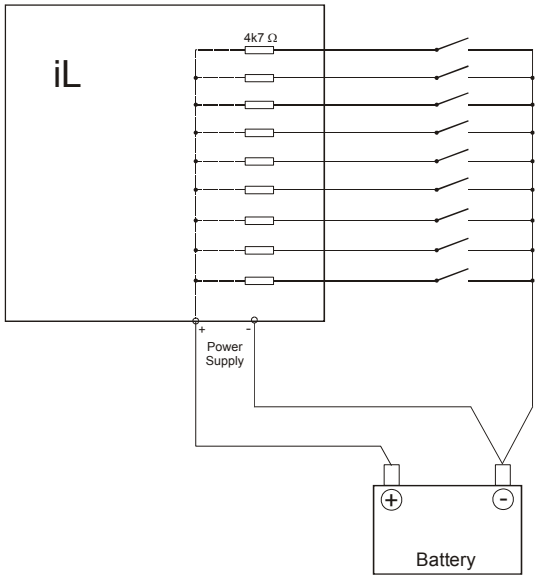
Sensor: selection of sensor characteristic
„Unused input" - when Analog input is not used. On the InteliLite screen is displayed „####" value, no alarm is detected.
„Curve A" – User curve A is defined in LiteEdit (default VDO temperature sensor)
„Curve B" – User curve B is defined in LiteEdit (default VDO pressure sensor)
„Curve C" – User curve C is defined in LiteEdit (default VDO fuel level sensor)
„Pt1000" – PT1000 sensor characteristic according to IEC 751
„Ni1000" – Ni1000 sensor characteristic according to DIN 43 760
„VDO temp" – VDO temperature sensor
„VDO press" – VDO pressure sensor
„VDO level" – VDO level sensor
„4-20mA/60" – current output sensor characteristic – requires external resistor 120 ohms between Analog input and COM terminal of Analog inputs

„4-20mA/100“ – current output sensor characteristic – requires external resistor 120 ohms between Analog input and COM terminal
Set to: VDO press

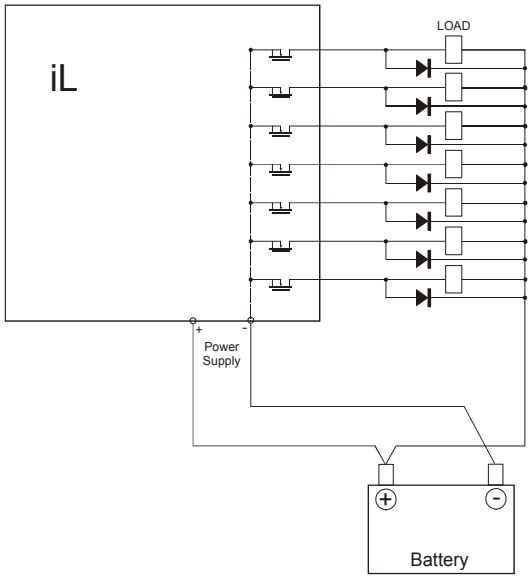
Decimals: setting of number of decimal points of measured value.
„0“ - e.g. 360 kPa, 100%, 50 °C
„1“ - e.g. 3.6 Bar
„2“ - e.g. 0.36 MPa
„3“ - e.g. 0.366 MPa
Set to: 1

When Analog input configuration is finished set the setpoints *Wrn Oil press, Sd Oil press, Oil press del* in **Engine protection** group.
Each Analog input has separate triplet of setpoints: *Wrn level*, *Sd level*, *Anl Inp del*. Names of these setpoints are fix defined
Number of decimal points of *Wrn level1* and *Sd level* is the same as the configured number of decimal points of measured value.

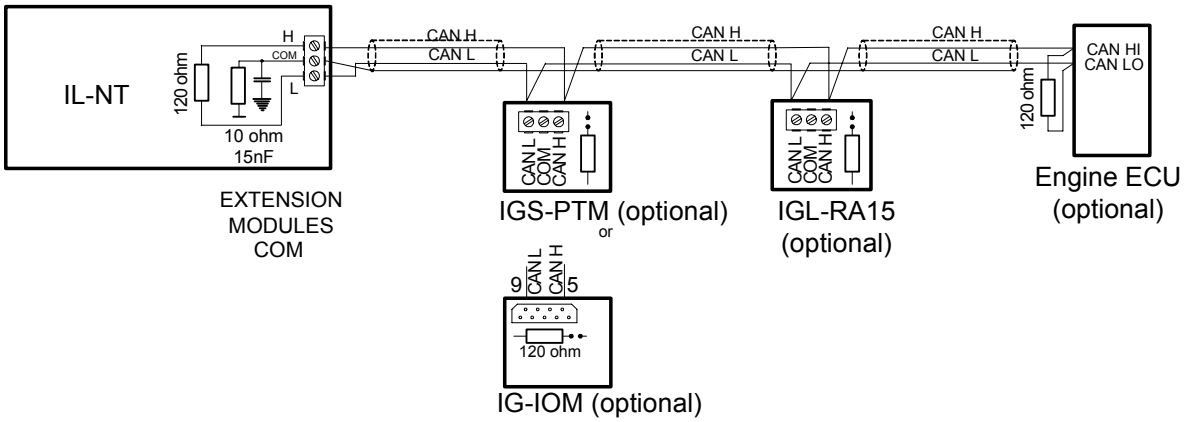
Binary inputs



Binary outputs



Extension modules (CAN bus) connection



Connection rules

CAN bus line must be connected in series, from one unit to the next (no star, no cable stubs, no branches) both ends must by the 120-ohm (internal or external) resistor terminated. Maximal CAN bus length is up to 200 meters.

For CAN data cables details see chapter Technical data – Communication interface. Connect CAN cable shielding to IL-NT COM terminal.

IL-NT contains internal fix 120-ohm resistor and must be located on the CAN bus end.

New IG-IOM and IGS-PTM units contain internal jumper removable 120-ohm resistor (in older IOM types are fix resistors). To be sure check resistor presence by ohmmeter. Unit with internal resistor connect to the end of CAN line.

Following connections are supported (IOM, PTM, ECU order is not important).

IL- NT – IG-IOM – IGL-RA15 – ECU
IL- NT – IGS-PTM – IGL-RA15 – ECU

It is possible to connect only one IG-IOM or IGS-PTM and one IGL-RA15 to IL-NT.

Use 

button in LiteEdit configuration window to activate CAN (J1939) interface.

Analog outputs

Optional plug in card IL-NT AOU8 provides eight Pulse-With-Modulation (PWM) outputs. These are intended to drive VDO style analog gauges. This is to provide visual indication of typically ECU values without installing additional sensors on the engine. PWM signal emulates sensor which would be typically mounted on the engine.
Any value from controller may be configured to the outputs. Use LiteEdit PC SW to configure corresponding sensor/gauge curve and value selection.

For more information about I/O configuration see LiteEdit-3.0.pdf (pages 21-28).

Inputs and outputs

Hint:
Any Binary input or output can be configured to any IL-NT controller terminal or changed to different function by LiteEdit software. There is fix 1 sec delay when any binary input is configured as protection.

Binary inputs IL-NT MRS19 - default

BI1 Rem start/stop

BI2 Access lock

BI3 Emergency stop

BI4 Remote OFF

BI5 Sprinkler

BI6 RemControlLock

BI7 Not used

Binary inputs – list

Not used

Binary input has no function. Use this configuration when Binary input is not connected.

Alarm

If the input is closed (or opened) selected alarm is activated.

Binary Alarm configuration items

Name		14 characters ASCII string
Contact type	NC	Normally closed
	NO	Normally opened
Alarm type	Warning	
	Shut down	
Alarm active	All the time	
	Engine running only	

Control:

Rem start/stop

External request for engine run. AUT mode only.

Emergency stop

If the input is opened, shut down is immediately activated. Input is inverted (normally closed) in default configuration.

Hint:
In case of controller hardware or software fail, safe stop of the engine doesn't have to be ensured. To back-up the Emergency stop function it is recommended to connect separate circuit for disconnection of Fuel solenoid and Starter signals.

Sprinkler

If the input is closed all alarms are disabled except the binary input EMERGENCY STOP and "engine overspeed protection".

- all IL-NT alarms are detected,
- IL-NT front panel gen-set RED LED blinks or lights,
- alarm is recorded on the IL-NT alarm list screen,
- BUT gen-set remains running.

Hint:
Warning *SprinklActive* is indicated in the AlarmList if sprinkler mode active to inform the operator that the engine is not protected.

Access lock

If the input is closed, no setpoints can be adjusted from controller front panel and gen-set mode (OFF-MAN-AUT) cannot be changed.
Hint:
Access lock does not protect setpoints and mode changing from LiteEdit. To avoid unqualified changes the selected setpoints can be password protected.

Remote OFF

If closed, controller is switched to OFF mode (there are four modes OFF-MAN-AUT-TEST). When opens controller is switched back to previous mode.
Hint:
This binary input should be connected to schedule timer switch, to avoid start of engine.

Remote MAN

If the input is active, MAN mode is forced to the controller independently on the position of the MODE selector.

Remote AUT

If the input is active, AUT mode is forced to the controller independently on the position of the MODE selector. If another of "remote" inputs is active, then the REMOTE AUT input has the lowest priority.

RemControlLock

If the input is active, setpoints writing or command sending from the external terminal is disabled.

Emerg. manual

Emergency manual. If the input is activated the controller behaves like when switched to OFF mode. Opens all binary outputs. There is one exception – STOP SOLENOID doesn't activate on this transition.

Detection of "running" engine and subsequent alarm message "Sd Stop fail" is blocked.
The controller shows "Emerg Man" state and the engine can not be started.
Generator current and power measurement is active in this mode, regardless of the actual state of the engine.

After the input is open again, the controller recovers to previous state and behaves according to the actual situation .
Function is active in any controller mode.

StartButton

Binary input has the same function as Start button on the InteliLite front panel. It is active in MAN mode only.

StopButton

Binary input has the same function as Stop button on the InteliLite front panel. It is active in MAN mode only.

FaultResButton

Binary input has the same function as Fault reset button on the InteliLite front panel.

HornResButton

Binary input has the same function as Horn reset button on the InteliLite front panel.

BattChrgFail

If the input is active longer then Engine protect: *BatChrgFailDel*, then alarm is activated and the following text is recorded into the History file: "Wrn BattChrgFail".

Binary outputs IL-NT MRS19 - default

BO1 **Starter**

BO2 **Fuel solenoid**

BO3 **GCB Close/Open**

BO4 **Prestart**

BO5 **Ready to Load**

BO6 **CommonWrnSd**

BO7 **Not Used**

Binary outputs - list

Not used

Output has no function.

Starter

The closed relay energizes the starter motor.
The relay opens if:

- the “firing” speed is reached or
- maximum time of cranking is exceeded or
- request to stop comes up

Fuel solenoid

Closed output opens the fuel solenoid and enables the engine start.
The output opens if:

- EMERGENCY STOP comes or
- Cooled gen-set is stopped or
- in pause between repeated starts

Stop solenoid

The closed output energizes stop solenoid to stop the engine.
The output is active at least for *Stop time*, if the stop lasts longer, it stays active until all symptoms say the engine is stopped.
The engine is stopped if:

RPM < 2 and
Generator voltage < 10V and
Oil pressure < **Engine params**: *StartingPoil.*

Hint:

The engine can be started anytime, if all symptoms say the engine is steady regardless of the fact the *Stop solenoid* can still be active (in that case it is deactivated before cranking).

Stop Pulse

Output is active for 1 second after *Stop solenoid* output activation. This signal is sent to ECU in case of engine stop request.

Ignition

The output closes after reaching value of CrankRPM, fixed 30RPM. Opens after stopping of the engine or in pause during repeated start.

Prestart

The output closes prior to the engine start (*Prestart*) and opens when *Starting RPM* speed is reached. During repeated crank attempts the output is closed too.
The output could be used for pre-glow, pre-heat or prelubrication.

Cooling pump

The output closes when gen-set starts and opens **Engine params**: *AfterCool time* after stop of the engine.

Idle/Nominal

The output *Idle/Nominal* closes after the timer *Idle time* elapses. The *Idle time* counter starts to countdown when *Start speed* reached. The *Underspeed* protection is not evaluated during idle period. A *Start fail* protection occurs if the RPM drop below 2RPM during idle.

Air valves

Closes together with *Prestart*. Opens after the engine is stopped.
Stopped engine conditions: RPM = 0, **Engine params**: *Starting Poil,* D+ (when enabled).

CommonWrnSd

The output closes if:

- any warning or shutdown comes up or
- the gen-set malfunctions

The output opens if

- FAULT RESET is pressed

The output closes again if a new fault comes up.

Horn

The output closes if:

- any warning or shutdown comes up or
- the gen-set malfunctions

The output opens if:

- FAULT RESET is pressed or
- HORN RESET is pressed or
- Max time of HORN is exceeded (*Horn timeout*)

The output closes again if a new fault comes up.

GCB Close/Open

The output closes automatically (in MAN or AUT mode) after engine is started, *Stabil time* elapsed, and generator voltage and frequency is in limits.

For more details see *GCB CloseDelay* and *Stabil time* Setpoints.

GCB ON coil

The output activates Generator Circuit Breaker coil.

GCB OFF coil

The output deactivates Generator Circuit Breaker coil.

GCB UV coil

The output controls Generator Circuit Breaker coil after voltage drop-out.

AnInIOM1..4 Wrn

Output closes if warning alarm on the appropriate IOM/PTM analog input activates.
The output opens, if

- alarm is not active and
- FAULT RESET is pressed

Ready/Auto

The output is closed if controller is ready in AUTO mode - no Shut down or Slow stop alarm is active.

Ready

The output is closed if following conditions are fulfilled:

- Gen-set is not running and
- No Shut down or Slow stop alarm is active
- Controller is not in OFF mode

Ready to load

The output is closed if gen-set is running and all electric values are in limits no alarm is active - it is possible to close GCB or it is already closed. The output opens during cooling state.

Not In Auto

The output closes in OFF and MAN mode.

Running

Output closes if the engine is in Running state.

Cooling

The output closes when gen-set is in Cooling state.

Supplying load

Closed when the generator current is > 0,5% of the CT ratio.
Exact formulas:
Output is closed when the current at least in one phase is for 1 sec over CT ratio/200+2
Output is opened when the current in all three phases is for 1 sec below CT ratio/200+2
Hint:
Values are truncated after division, not rounded.

Fault Reset

The output closes when the FAULT RESET is pressed.

GenParamsOK

The output is copy of generator status LED on InteliLite front panel. The output is closed if gen-set is running and all gen-set electric values are in limits.

ChrgAlternFail

Output closes if gen-set is running and D+ input not energized.
The output opens, if

- alarm is not active and
- FAULT RESET is pressed

Hint:
Threshold level for D+ input is 80% supply voltage.

Sd OverVolt

Output closes when shut-down over voltage alarm appears.

Sd UnderVolt

Output closes when shut-down under voltage alarm appears.

Vgen warning

The output closes if the generator over/under voltage warning alarm activates.

fgen warning

The output closes if the generator over/under frequency voltage warning alarm activates.

Vgen failed

The output closes if the generator over/under voltage shutdown alarm or voltage asymmetry shutdown alarm activates.
The output opens, if

- alarm is not active and
- FAULT RESET is pressed

fgen failed

Output closes if the generator over/under frequency shutdown alarm activates.
The output opens, if

- alarm is not active and
- FAULT RESET is pressed

Overload

Output closes if the generator overload shutdown alarm activates.
The output opens, if

- alarm is not active and
- FAULT RESET is pressed

Wrn Overload

Output closes if the generator overload warning alarm activates.

Stop failed

Output closes when the engine has to be stopped, but speed or frequency or voltage or oil pressure is detected. This protection goes active 60s after stop command.
The output opens, if

- alarm is not active and
- FAULT RESET is pressed

Overspeed

Output closes if the gen-set over speed alarm activates.
The output opens, if

- alarm is not active and
- FAULT RESET is pressed

Underspeed

Output closes if the gen-set under speed alarm activates.
The output opens, if

- alarm is not active and
- FAULT RESET is pressed

Start failed

Output closes after the gen-set start-up fails.
The output opens, if

- alarm is not active and
- FAULT RESET is pressed

Overcurrent

Output closes if the generator
IDMT over current or
current unbalance or
short current alarm activates.
The output opens, if
Alarm is not active and
FAULT RESET is pressed

Battery flat

Output closes when controller performs reset during start procedure (probably due to weak battery).
The output opens, if

- alarm is not active and
- FAULT RESET is pressed

V batt failed

Output closes when battery over/under voltage warning appears.
The output opens, if

- alarm is not active and
- FAULT RESET is pressed

Common Wrn

Output closes when any warning alarm appears.
The output opens, if

- No warning alarm is active and
- FAULT RESET is pressed

Common Sd

Output closes when any shut-down alarm appears.
The output opens, if

- No sd alarm is active and
- FAULT RESET is pressed

Common Fls

Output closes when any sensor fail alarm appears.
The output opens, if

- No warning alarm is active and
- FAULT RESET is pressed

Sd OilPress

Output closes if the oil pressure shutdown alarm activates.
The output opens, if

- alarm is not active and
- FAULT RESET is pressed

Wrn OilPress

Output closes if the oil pressure warning alarm activates.
The output opens, if

- alarm is not active and
- FAULT RESET is pressed

Sd EngineTemp

Output closes if the water temperature shutdown alarm activates.
The output opens, if

- alarm is not active and
- FAULT RESET is pressed

Wrn EngineTemp

Output closes if the water temperature warning alarm activates.
The output opens, if

- alarm is not active and
- FAULT RESET is pressed

Wrn EngTempLow

Output closes if the water temperature warning alarm activates.
The output opens, if

- alarm is not active and
- FAULT RESET is pressed

Sd FuelLevel

Output closes if the Fuel level shutdown alarm activates.

Wrn FuelLevel

Output closes if the Fuel level warning alarm activates.

OFF mode

The output is closed, if OFF mode is selected.

MAN mode

The output is closed, if MAN mode is selected.

AUT mode

The output is closed, if AUT mode is selected.

ServiceTime

Output closes if the ServiceTime alarm activates.
The output opens, if

- alarm is not active and
- FAULT RESET is pressed

BI1..7 – stat

The outputs give an information about the assigned binary input.
In case the assigned binary input is configured to alarm type, then the output closes when the alarm activates. It opens if

- alarm is not active and
- FAULT RESET is pressed

In case the assigned binary input is configured to any control function, the output propagates the state of the input.

CtrlHeartBeat

Output signalizes watchdog reset. In a healthy state it blinks at 500ms / 500ms rate. When watchdog reset occurs, it stops blinking.

IOM BI1..8 - stat

The outputs give an information about the assigned binary input.
In case the assigned binary input is configured to alarm type, then the output closes when the alarm activates. It opens if

- alarm is not active and
- FAULT RESET is pressed

In case the assigned binary input is configured to any control function, the output propagates the state of the input.

Sd AnInIOM1..4

Output closes if shutdown alarm on the appropriate IOM/PTM analog input activates.
The output opens, if

- alarm is not active and
- FAULT RESET is pressed

ECU CommOK

If the ECU is not communicating and all values from ECU show #### the output is not active. If the ECU communicates the output is active.

ECU CommError

The output is an inversion of binary output *ECU CommOK*, i.e. the output is closed when ECU is not communicating and all values from ECU show #####. Communication error causes stop of the engine.

ECU YellowLamp

The output copies warning information from ECU.

ECU RedLamp

The output copies shutdown information from ECU.

ECU PwrRelay

The output closes at the beginning of prestart and opens if the engine shall be stopped.

Timer1

Output activates when Timer1 is active. Simultaneously, gen-set is started when is in AUT mode.

Timer2

Output activates when Timer2 is active

Glow plugs

The output closes prior to the engine start (*Prestart*) and opens when *Starting RPM* speed is reached. During repeated crank attempts the output is opened.

IL Power

Output activates on controller power up, deactivates when IL Power Off
timer expires.

Timer is running, when engine is not running and controller is in OFF or MAN mode. Timer resets every time when any key is pressed.

Analog inputs

Three analog inputs are jumper configurable for resistive (default), voltage or current sensor.

It is possible to configure on each Analog input:

- Reading from IL-NT Analog inputs or from Engine Control Unit via CAN bus (J1939)
- Sensor characteristics – from the list, or custom sensor curve
- Value dimension (e.g. psi - bars, °F - °C, % - l)
- Number of decimal points (0, 1, 2, …)

Warning and shut-down limits are adjusted in **Engine protect** group.
The analog inputs are configurable. Use LiteEdit software to modify configuration. Default configuration is:

Oil press

Oil pressure analog input. Default VDO sensor in range 0 to 10.0 bars.

Water temp

Water temperature analog input. Default VDO sensor in range 0 to 100 °C.

Fuel level

Fuel level analog input. Default VDO sensor 0-180R = 0-100%

Hint:
For further information about analog inputs' configuration see Analog inputs.

CAN J1939 interface

Following values can be received from Engine Control Unit via CAN bus instead of measuring on IL-NT terminals when J1939 interface is enabled.

Value	Value is received from	
	J1939 enabled	J1939 disabled
RPM	ECU	IL-NT – RPM terminals
Oil pressure	ECU or IL-NT AI1	IL-NT AI1 terminals
Water temperature	ECU or IL-NT AI2	IL-NT AI2 terminals
Fuel level	ECU or IL-NT AI3	IL-NT AI3 terminals
ECU State	ECU	
Fuel rate	ECU	
Manifold temp	ECU	
Boost pressure	ECU	
PercLoadAtCS	ECU	

Use LiteEdit 3.1 to enable/disable J1939 interface and to configure IL-NT analog inputs.

Hint:

RPM reading is automatically switched to pickup or generator voltage measuring (depends on **Basic setting**: *Gear teeth* value) if J1939 fails.

Setpoints

Password

EnterPassword

Password is a four-digit number. Password enables change of relevant protected set points Use ⇑ or ⇓ keys to set and ENTER key to enter the password. There are 3 levels of passwords. Knowledge of higher password lets you to change setpoint protected by lower password.

ChangePassword

Use ⇑ or ⇓ keys to set and ENTER key to change the password.
Hint:
At first the Password has to be entered before the new Password can be changed.

Basic settings

Gen-set name

User defined name, used for InteliLite identification at remote phone or mobile connection.
Gen-set name is max 14 characters long and have to be entered using LiteEdit software.

Nomin power(3ph) [kW]

Nominal power of the generator in three phases connection.
Step: 1 kW
Range: 1 – 3000 kW

Nomin power(1ph) [kW]

Nominal power of the generator in single-phase connection.
Step: 1 kW
Range: 1 – 3000 kW

CT Ratio [/5A]

Gen-set phases current transformers ratio.
Step: 1 A
Range: 1 – 5000 A / 5A

PT ratio [/1]

Gen-set potential transformers ratio.
Step: 0,1 V / V
Range: 0,1 – 500,0 V / V

Nominal freq [Hz]

Nominal generator frequency (usually 50 or 60 Hz)
Step: 1Hz
Range: 45 – 65 Hz

Gear teeth [-]

Number of teeth on the engine gear for the pick-up.
Set to zero, if no pick-up is used. Engine speed is counted from the generator frequency.
Step: 1
Range: 0 – 500

Hint:
Generator frequency can be used only when generator voltage (min 5V) is present before reaching of the firing speed (*Starting RPM*) after start.

Nominal RPM [RPM]

Nominal engine speed.
Step: 1RPM
Range: 100 – 4000 RPM

ControllerMode [OFF, MAN, AUT]

Equivalent to Controller mode changes by MODE→ or ←MODE buttons.
Hint:
Controller Mode change can be separately password protected.

FltResGoToMAN [ENABLED/DISABLED]

DISABLED: Controller stays in AUT mode after Fault reset.
ENABLED: Automatic switch from AUT (or TEST) to MAN mode after Fault reset to avoid automatic engine start. This function is active for Shut down protection only.

STOPinAUT [ENABLED/DISABLED]

DISABLED: START/STOP buttons are not active in AUT mode.
ENABLED: When you press STOP button in AUT mode, the engine goes to cooling and then either after the cooling time or after another STOP button press the engine stops. You can reset this STOP command (= START the engine – in case that all other running conditions are still fulfilled) by pressing START button, by changing the MODE or when you open and close the BI: REMOTE START/STOP.

For further information see Start-stop sequence in MAN mode.

DispBaklightTO [min]

Timeout after which the display backlight is switched off.
Step: 1 min
Range: 0 – 60 min
Default value: 0 … means that the display lights all the time

IL Power Off [min]

Controls binary output IL POWER. Timer is counting down when engine is not operational (since Preheat until Aftercooling is over) Timer restarts every time when any key is pressed. When timer expires, binary output IL POWER opens.
Step: 1 min
Range: 0 – 600 min
Default value: 0 min.
Hint:
When set to “0”, timer sleep function is disabled and output IL POWER remains energized all the time.

Contr. addr (1 .. 32) [-]

Controller identification number. It is possible to set controller address different from the default value (1) so that more IL-NT controllers can be interconnected (via RS485) and accessed e.g. from Modbus terminal.
Hint:
When opening connection to the controller its address has to correspond with the setting in PC tool. From LiteEdit it is only possible to connect to controllers with address 1.

RS232 mode [STANDARD/MODBUS/CumminsMB]

Communication protocol switch.
Standard: LiteEdit communication protocol.
Modbus: Modbus protocol.

CummInsMB: Protocol for communication with Cummins engines via Modbus.

Hint:
For detail description see chapter Modbus protocol.

Engine params

Starting RPM [%]

"Firing" speed when IL-NT controller stops cranking (starter goes OFF).
Step: 1% of nominal RPM
Range: 5 – 50%

Starting POil [Bar/psi]

When reached controller stops cranking (starter goes OFF).
Step: 0,1 bar
Range: 0,0 – 10,0
Hint:
There are three conditions for stop cranking: Starting RPM, StartingPOil and D+ (when enabled). Starter goes off when any of these conditions is valid.

Prestart time [s]

Time of closing of the PRE-START output prior to the engine start.
Set to zero if you want to leave the output PRE-START open.
Step: 1s
Range: 0 – 600 s

MaxCrank time [s]

Maximum time limit of cranking.
Step: 1s
Range: 1 – 60 s

CrnkFail pause [s]

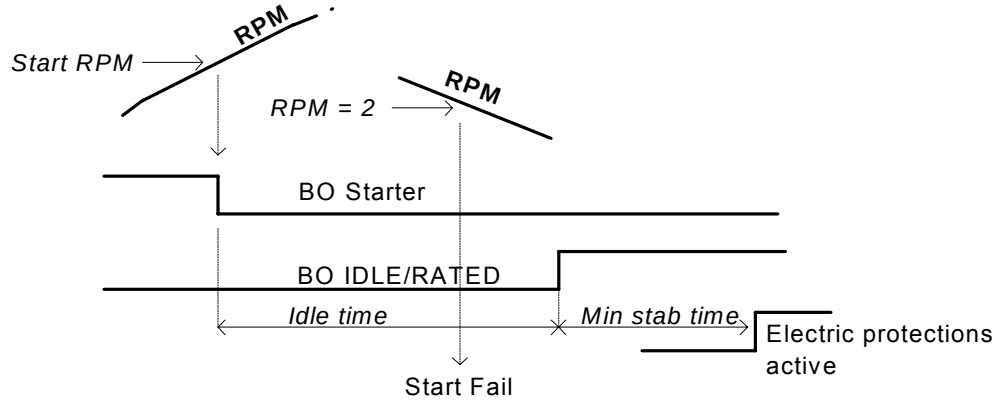
Pause between crank attempts.
Step: 1s
Range: 5 – 60 s

Crank attemps [-]

Max number of crank attempts.
Step: 1
Range: 1 – 10

Idle time [s]

Idle time delay starts when RPM exceeds *Start RPM* . Start fail is detected when during Idle state RPM decreases below 2.
During the *Idle time* timer running the binary output IDLE/NOMINAL is opened, when it elapses the IDLE/NOMINAL output closes. Binary output IDLE/NOMINAL opens during Cooling period again.
Step: 1 s
Range: 0 – 600 s



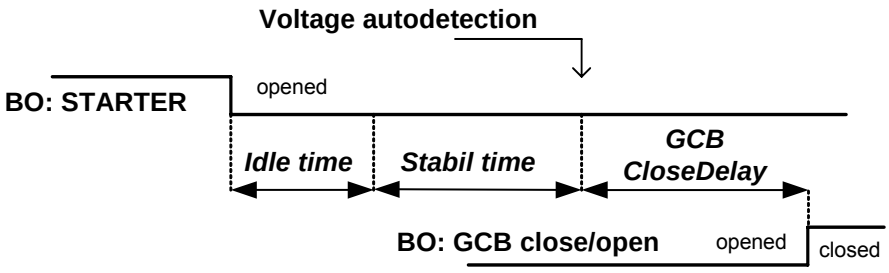
Hint:
If the IDLE function not supported on the governor, set the *Idle time* nevertheless to minimum 5s to avoid *Underspeed* possibly caused by instability of the engine short after start.

GCB CloseDelay [s]

GCB can be closed earliest *GCB CloseDelay* after *Stabil time* when all electric values are in over-under voltage and over-under frequency limits.
Step: 1 s
Range: 0 – 300 s

Stabil time [s]

Generator Nominal voltage is detected during gen-set start after starter is switched off and Idle time elapses. Electric generator protections are active since detection.
Step: 1 s
Range: 0 – 300 s



Cooling speed [NOMINAL / IDLE]

Selects the function of the Binary output IDLE/NOMINAL during engine Cooling state.
NOMINAL : Cooling is executed at Nominal speed and generator protections are active.
IDLE: Cooling is executed at Idle speed and generator protections are switched off.
Hint:
Binary output IDLE/NOMINAL must be configured and connected to speed governor. Engine Idle speed must be adjusted on speed governor.

Cooling time [s]

Runtime of the unloaded gen-set to cool the engine before stop.
Step: 1s
Range: 0 – 3600 s

AfterCool time [s]

Runtime of engine after cooling pump. Binary output *Cooling pump* is closed when the engine starts

and opens *AfterCool time* delayed after gen-set stops.
Step: 1s
Range: 0 – 3600s

Stop time [s]

Under normal conditions the engine must certainly stop within this period. The period starts by issuing stop command.
Step: 1s
Range: 0 – 240 s
Hint:
Stop of engine is detected when all following conditions are met: RPM <2, Oil pressure < *StartingPOil* Generator voltage < 10 VAC and D+ input isn't active.
Stop fail is detected when there is difference between those conditions, e.g. RPM<2 and Generator voltage > 10V.

Fuel solenoid [DIESEL/GAS]

Determines behavior of the Binary output FUEL SOLENOID.
DIESEL: Output closes 1 sec before Binary output STARTER.
The output opens if Emergency stop comes or Cooled gen-set is stopped and in pause between repeated starts.
GAS: Output closes together with Binary output IGNITION if RPM is over the *30 RPM (fix value).*
Output opens after stop command or in pause between repeated start.

D+ function [ENABLED/CHRGFAIL/DISABLED]

ENABLED: The D+ terminal is used for both functions – "running engine" detection and charge fail detection.
CHRGFAIL: The D+ terminal is used for charge fail detection only
DISABLED: The D+ terminal is not used.
Hint:
The magnetization current is provided independently on this setpoint value.
The D+ charge fail protection becomes active after **Engine params**: *Idle time* reaches zero.

ECU FreqSelect [PRIMARY/SECONDARY/DEFAULT]

This setpoint should be used only for Volvo and Scania engines.

Volvo – "Volvo Aux" is selected in ECU configuration:

Primary or secondary engine speed is set by *Frequency select* bits in **VP Status** frame.

Scania – "Scania S6 Singlespeed" is selected in ECU configuration:

Nominal engine speed is chosen by *Nominal speed switch 1* and *2* from **DLN1** frame when the engine is running on nominal speed, i.e. binary output *Idle/Nominal* is active. When the output is not active (engine is running on Idle speed), the setpoint *ECU FreqSelect* is not taken into account.

Frequency change for Volvo Penta engines with EMS2

This description refers to the Volvo Penta Application bulletin 30-0-003.
The procedure for changing engine speed on the D9 and D16 engines is different from the D12 engine.
There is no system reset on the EMS2 unit; therefore the procedure is changed.

Procedure if ECU not energized:

1. Switch the IL-NT controller to MAN mode.
2. Power up the ECU.
3. Change the setpoint *ECU FreqSelect* and confirm it by pressing Enter
4. Press the Stop button on the IL-NT controller.

The whole procedure (step 2 to 4) must not exceed **10 seconds**.

Procedure with ECU powered on:

1. Switch the IL-NT controller to MAN mode.
2. Press the Stop button on the IL-NT controller.
3. Change the setpoint *ECU FreqSelect* and confirm it by pressing Enter
4. Press the Stop button on the IL-NT controller.

The whole procedure (step 2 to 4) must not exceed **10 seconds**.

ECU SpeedAdj [%]

Enables to adjust engine speed in ECU via CAN bus. Nominal speed corresponds to 50%.
This setpoint should be used only for Volvo Penta and Scania engines. It has no effect on other engine brands.
Step: 1%
Range: 0 – 100%

WtBfAcceptRPM [s]

This setpoint says how long to wait to accept RPM. Is counted down since cranking.

Step: 0,1s
Range: 0,1 – 3s

Engine protect

Eng prot del [s]

During the start of the gen-set, some engine protections have to be blocked (e.g. Oil pressure).
The protections are unblocked after the *Protection del* time. The time starts after reaching *Start RPM*.
Step: 1s
Range: 0 – 300 s

Horn timeout [s]

Max time limit of horn sounding. Set to zero if you want to leave the output HORN open. Horn timeout starts again from the beginning if a new alarm appears before previous Horn timeout has elapsed.
Step: 1s
Range: 0 – 600 s

Overspeed [%]

Threshold for over speed protection
Step: 1% of nominal RPM
Range: 100 – 150%

Wrn Oil press [Bar/psi]

Warning threshold level for ANALOG INPUT 1
Step: 0,1 bar
Range: -10 – 1000 bar

Sd Oil press [Bar/psi]

Shutdown threshold level for ANALOG INPUT 1
Step: 0,1 bar
Range: -10 – 1000 bar

Oil press del [s]

Delay for ANALOG INPUT 1
Step: 1s
Range: 0 – 180s

Wrn Water temp [°C/°F]

Warning threshold level for ANALOG INPUT 2
Step: 1°C/1°F
Range: -100 – 10000 °C

Sd Water temp [°C/°F]

Shutdown threshold level for ANALOG INPUT 2
Step: 1°C/1°F
Range: -100 – 10000°C

Water temp del [s]

Delay for ANALOG INPUT 2 alarm.
Step: 1 s
Range: 0 – 180 s

Wrn Wtemp low [°C/°F]

Warning threshold level for ANALOG INPUT 2
Step: 1°C/1°F
Range: -100 – 10000°C

Wtemp low del [s]

Delay for ANALOG INPUT 2 alarm.
Step: 1 s
Range: 0 – 180 s

Wrn FuelLevel [%]

Warning threshold level for ANALOG INPUT 3
Step: 1%
Range: -100 – 10000%

Sd FuelLevel [%]

Shutdown threshold level for ANALOG INPUT 3
Step: 1 %
Range: -100 – 10000 %

Fuel Level del [s]

Delay for ANALOG INPUT 3
Step: 1 s
Range: 0 – 180 s

Batt overvolt [V]

Warning threshold for high battery voltage.
Step: 0,1 V
Range: 8(Batt undervolt)– 40 V

Batt undervolt [V]

Warning threshold for low battery voltage.
Step: 0,1 V
Range: 8V – 40 (Batt overvolt)

Batt volt del [s]

Delay for low battery voltage alarm.
Step: 1 s
Range: 0 – 600 s

BatChrgFailDel [min]

Delay for BI: BattChrgFail
Step: 1min
Range: 0 - 15min

NextServTime [h]

Counts down when engine is running. If reaches zero, an alarm appears.
Step: 1h
Range: 0 – 65535h

Gener protect

Hint:
All electric protections when activated result in shutdown.

Overload [%]

Threshold for generator overload (in % of Nominal power)
Step: 1% of Nominal power
Range: 0 – 200%

Overload Wrn [%]

Threshold for generator overload warning (in % of Nominal power)
Step: 1% of *Nominal power*
Range: 0 – 200%

Overload del [s]

Delay for generator overload alarm.
Step: 0.1 s
Range: 0 – 600.0 s

Ishort [%]

Shutdown occurs when short circuit limit *Ishort* limit is reached.
Step: 1 % of *Nominal current*
Range: 100 - 500 %

Ishort del [s]

Delay for generator shortcurrent alarm.
Step: 0.01 s
Range: 0.00 – 10.00 s

2Inom del [s]

IDMT curve shape selection. *2Inom del* is Reaction time of IDMT protection for 200% overcurrent Igen = 2* *Nominal current*.
Step: 0,1 s
Range: 0,1 - 60,0 s
IDMT is “very inverse” generator over current protection. Reaction time is not constant but depends on generator over current level according following formula.

$$\text{Reaction time} = \frac{\textit{2Inom del} * \textit{Nomin current}}{\text{Igen} - \textit{Nomin current}}$$

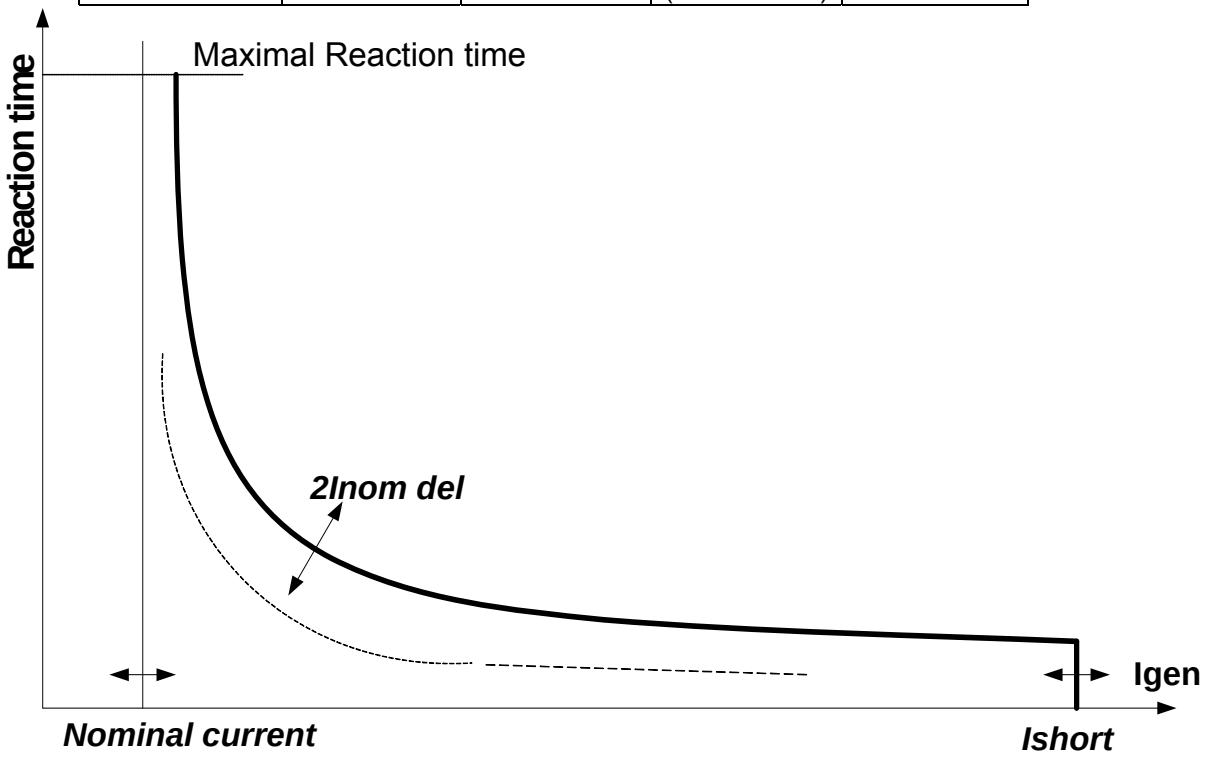
Hint:

Reaction time is limited up to 900 sec = 15 minutes. IDMT protection is not active for Reaction time values longer than 15 minutes.

Igen is maximal value of all measured phases of generator current.

EXAMPLE of Reaction time for different over current levels. Values in column 200% are *2Inom del.*

	Overcurrent			
	200 % = **2Inom del**	≤ 100 %	101 %	110 %
Reaction time	**0,2 s**	No action	20 s	2 s
	2 s	No action	200 s	20 s
	20 s	No action	No action (time > 900 s)	200 s



Curr unbal [%]

Threshold for generator current asymmetric (unbalance).
Step: 1% of Nominal current
Range: 1 – 200% of Nominal current

Curr unbal del [s]

Delay for generator current unbalance
Step: 0.1 s
Range: 0.0 – 600.0 s

Gen >V Sd [%]

Threshold for generator overvoltage. All three phases are checked. Maximum out of three is used.
Step: 1% of Nominal voltage
Range: 0(Gen <V Sd) – 200%

Gen >V Wrn [%]

Warning level for generator overvoltage. All three phases are checked. Maximum out of three is used.
Step: 1% of *Nominal voltage*
Range: Gen <V Wrn – Gen >V

Gen <V Wrn [%]

Warning level for generator under voltage. All three phases are checked. Minimum out of three is used.
Step: 1% of *Nominal voltage*
Range: Gen <V – Gen >V Wrn

Gen <V Sd [%]

Threshold for generator undervoltage. All three phases are checked. Minimum out of three is used.
Step: 1% of Nominal voltage
Range: 0% – 200 (Gen > V Sd) %

Gen V del [s]

Delay for generator undervoltage and overvoltage alarm
Step: 0.1s
Range: 0.0 – 600.0 s

Volt unbal [%]

Threshold for generator voltage unbalance alarm.
Step: 1% of Nominal voltage
Range: 0 – 200% of Nominal voltage

Volt unbal del [s]

Delay for generator voltage unbalance alarm.
Step: 0.1s
Range: 0.0 – 600.0 s

Gen >f [%]

Threshold for generator phase L3 overfrequency.
Step: 0.1% of Nominal frequency
Range: 0 (Gen <f) – 200.0% of Nominal frequency

Gen >f Wrn [%]

Warning level for generator over frequency.
Step: 0.1% of Nominal *frequency*
Range: Gen <f Wrn – Gen >V

Gen <f Wrn [%]

Warning level for generator under frequency.
Step: 0.1% of *Nominal frequency*
Range: Gen <f – Gen >f Wrn

Gen <f [%]

Threshold for generator phase L3 underfrequency.
Step: 0.1% of Nominal frequency
Range: 0.0 – 200 (Gen >f) % of Nominal frequency

Gen f del [s]

Delay for generator underfrequency and overfrequency alarm.
Step: 0.1s
Range: 0.0 – 600.0 s

Date/Time

Time stamp per [min]

Time interval for periodic history records.
Step: 1 min
Range: 0 – 200min

SummerTimeMod [DISABLED/WINTER/SUMMER,WINTER-S,SUMMER-S]

DISABLED: Automatic switching between summer and wintertime is disabled.
WINTER (SUMMER) : Automatic switching between summer and wintertime is enabled and it is set to winter (summer) season.
WINTER-S (SUMMER-S) : Modification for southern hemisphere.

Time [HHMMSS]

Actual real time

Date [DDMMYYYY]

Actual date.

Timer1..2 repeat [NONE/MONDAY/TUESDAY/WEDNESDAY/THURSDAY/WEDNESDAY/FRIDAY/SATURDAY/SUNDAY/MON-FRI/MON-SAT/MON-SUN/SAT-SUN]

Defines TIMER1 activation. Binary output TIMER1 is internally linked with Rem Start/Stop binary input. Refer to binary inputs for details.

NONE: Timer function is disabled
MONDAY, TUESDAY, WEDNESDAY, THURSDAY, WEDNESDAY, FRIDAY, SATURDAY, SUNDAY:
Timer is activated on daily basis.
MON-FRI, MON-SAT, SAT-SUN:
Timer is activated on selected day interval.

Timer1..2 ON time [HHMMSS]

Day time when Timer output activates.

Timer1..2Duration [min]

Duration of Timer output is active.
Step: 1 min
Range: 1 – 1440 min

Sensor spec

Calibr AI1, AI2, AI3 […]

Calibrating constant to adjust the measured value of IL-NT analog inputs. Physical dimension of calibrating constant is corresponding to Analog input.
Step: 1
Range: -1000 – +1000

Hint:
Calibration constants have to be adjusted when measured value is near the alarm level.
User curves A, B, C can be defined by LiteEdit software.

CalibrAInIOM 1..4 […]

Calibrating constant to adjust the measured value of IOM/PTM analog inputs. Physical dimension of calibrating constant is corresponding to Analog input.

Step: 1
Range: -1000 – +1000

IOM/PTM module

AnlInIOM1..4 lev1 [ ]

The level for IOM ANALOG INPUT 1..4 alarm detection.
Step: 1
Range: -100 - +10000

AnlInIOM1..4 lev2 [ ]

The level for IOM ANALOG INPUT 1..4 alarm detection.
Step: 1
Range: -100 - +10000

AnlInIOM1..4 del [s]

Delay for IOM ANALOG INPUT 1..4 alarm.
Step: 1s
Range: 0 - 180s

Hint:

IG-IOM/IGS-PTM analog inputs protection alarms can be configured following way

Configuration	Protection
Under	Protection is activated only when measured value is under measured level.
Over	Protection is activated only when measured value is over measured level.
Under+fls	Level 2 protection is activated by sensor fail as well.
Over+fls	Level 2 protection is activated by sensor fail as well.

ECU-controlled engine support

There exists only one firmware branch for both standard and electronic controlled (monitored) engines.

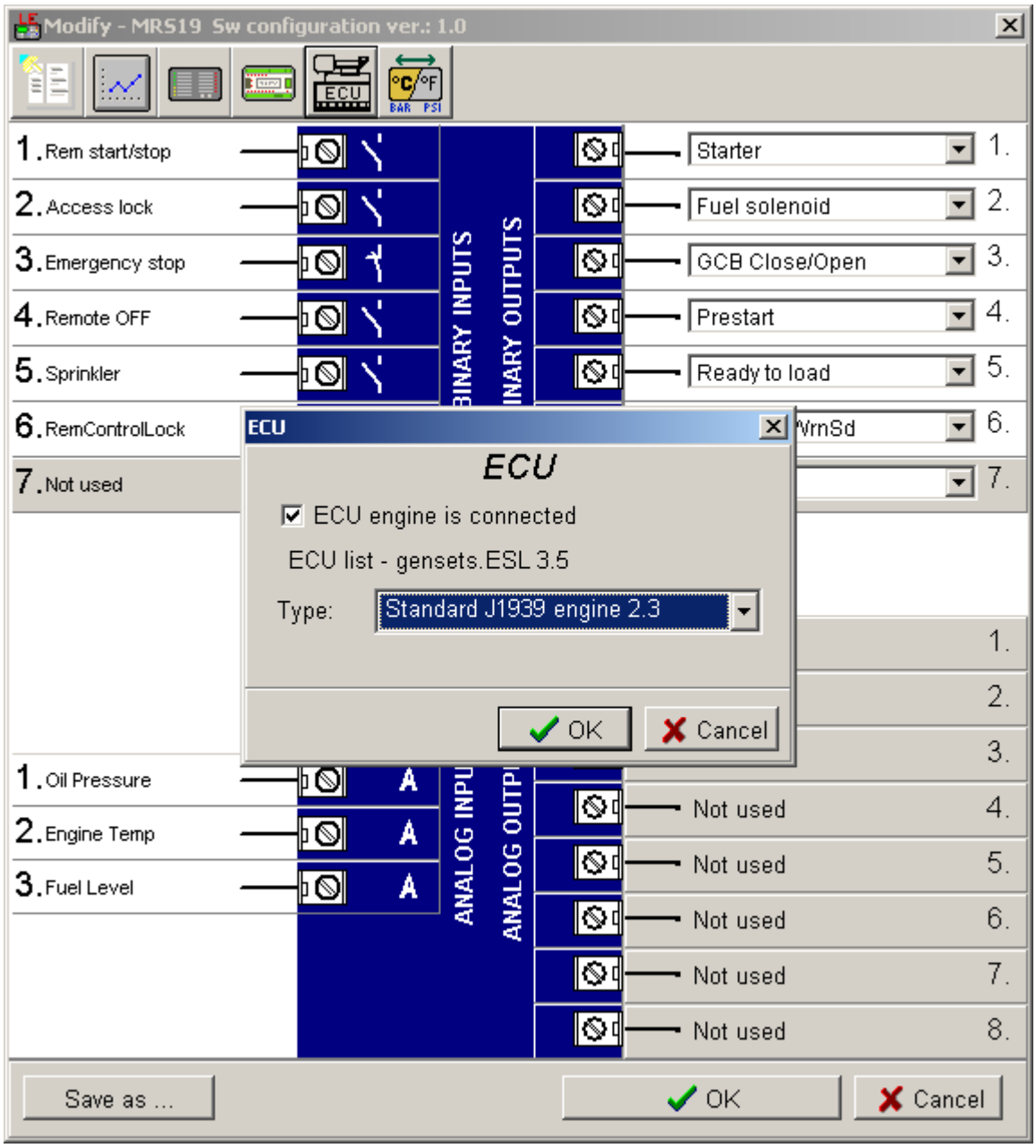
Presence of the ECU on the CAN bus/RS232 is configured via LiteEdit like other peripheries (IG-IOM, IGL-RA15). Pressing the 

button in Configuration window of LiteEdit (version 2.0 and higher), opens ECU dialog window where the appropriate engine/ECU type should be selected. There are three groups of engine/ECU types:

Type selection	Supported engine/ECU
Caterpillar EMCP3	Caterpillar engines equipped with EMCP 3.x
Caterpillar J1939	Caterpillar engines with J1939 CAN data link.
Cummins CM570	Cummins QSM11 engines with CM570 unit
Cummins MODBUS	Cummins engines with Modbus communication support
DDC DDEC IV	Detroit Diesel DDEC IV, V
Deutz EMR2	Deutz EMR2 similar to Volvo EDC4.
Iveco	Iveco engines with J1939 CAN data link.
Jenbacher Diane	Jenbacher engines with Diane control system.
John Deere	John Deere.
MTU ADEC J1939	MTU engines series 2000/4000 with ADEC control unit, SAM module and optional CCB2 card
Perkins ECM	Perkins engine (series 2300 and 2800) with ECM unit.
Scania S6 Singlespeed	Scania engines with S6 unit
Scania S6 Singlespeed newSW	Scania engines with S6 unit with ECU software version 1733219 or higher.
SISU EEM3 gen-set	SISU engines with EEM3 unit. For gen-set applications
Standard J1939 engine	All other engine brands with J1939 support
Volvo Aux	Volvo Penta engines with EMSII, EDCIII units
Waukesha ESM	NOT SUPPORTED IN IL-NT!!!

ECU list – Gensets.esl, version 3.5

Hint:
Import latest ECU list – Gensets.iwe for up to date engine ECU specification.



If the connected engine is Cummins communicating via RS232, it is necessary to set the setpoint **Basic settings**:*RS232 mode* = CUMMINSMB.

Loss of communication causes shutdown of the running engine. On the contrary, the ECU can be switched off at quiescent engine, that means not-communicating ECU is in that moment normal situation. All values from ECU shall show ####, but no alarm is displayed. The output *ECU CommOK* follows the real situation, that means it is not active anytime when the ECU does not communicate.

The output ***ECU PwrRelay*** closes at the beginning of prestart and opens if the engine shall be stopped.

The engine is started via standard contact output or via CAN bus (for Volvo and Scania engines). For other engines J1939 is used for monitoring only.

Values read from ECU

Standard J1939 engines and Scania

When “Standard J1939 engines” and “Scania S6” options are selected, following values are read from standard J1939 frames:

- 5.2.1.9 Engine speed (frame 5.3.7 EEC1)
- 5.2.5.28 Engine oil pressure (frame 5.3.29 Engine Fluid Level/Pressure)
- 5.2.5.5 Engine coolant temperature (frame 5.3.28 Engine Temperature)
- 5.2.5.61 Total engine hours (frame 5.3.19 Engine Hours, Revolutions)
- 5.2.1.7 Percent load at current speed (frame 5.3.6 EEC2)
- 5.2.5.63 Fuel rate (frame 5.3.32 Fuel Economy)
- 5.2.5.36 Boost pressure (frame 5.3.36 Inlet/Exhaust Conditions)
- 5.2.5.4 Intake manifold 1 temperature (frame 5.3.36 Inlet/Exhaust Conditions)

Cummins MODBUS

When “Cummins-Modbus” option is selected, following values are read from Modbus Register Data (for QSX15, QSK45, and QSK60):

- Engine Speed (Register Address:30001)
- Oil Pressure (Register Address:30003)
- Coolant Temperature (Register Address:30002)
- Engine Running Time (Register Address:30008-30009)
- Fuel Consumption Rate (Register Address:30018)
- Intake Manifold Absolute Pressure (Register Address:30530 (QSK45, QSK60 only))
- Intake Manifold Temperature (Register Address:30531 (QSK45, QSK60 only))

Diagnostic messages read from ECU

Diagnostic messages are read and displayed in extra ECU Alarm list. For Standard J1939 SPN (Suspect Parameter Number), FMI (Failure Mode Identifier) and OC (Occurrence Counter) are shown together with verbal description if available.
One SPN (Suspect Parameter Number) / FMI (Failure Mode Identify) couple describes one fail information. If FMI is equal to 0 or 1, WRN is displayed in the ECU Alarm list. For any other FMI values, FLS is displayed.
Detail SPM/FMI code specification see in:

- SAE Truck and Bus Control and Communications Network Standards Manual, SAE HS-1939 Publication
- Or refer to corresponding engine manufacturer’s ECU error codes list.

Following messages are displayed with the description:

- SPN:100 EngOil Press
- SPN:102 Boost Press
- SPN:105 Intake Temp
- SPN:110 EngCool Temp
- SPN:175 EngOil Temp
- SPN:629 Controller#1
- SPN:636 PositionSensor
- SPN:637 TimingSensor
- SPN:651 InjectorCyl#1
- SPN:652 InjectorCyl#2
- SPN:653 InjectorCyl#3
- SPN:654 InjectorCyl#4
- SPN:655 InjectorCyl#5
- SPN:656 InjectorCyl#6
- SPN:677 EngStartRelay
- SPN:1485 ECU MainRelay

Hint:
InteliLite controller doesn’t support J1587 diagnostic line on Volvo engines. This can cause in some cases a J1939 alarm message FC:000608 due to missing J1587 bus. Contact your Volvo distributor to update ECU firmware.

For Scania Fault codes (FC) are displayed. Following messages are available for particular groups of Fault codes:

- FC:1000-1001 Overspeed
- FC:1100-1107 EngSpdSensor1
- FC:1200-1207 EngSpdSensor2
- FC:2000-2002 WtrTempSensor
- FC:2100-2102 ChrgAirTmpSens
- FC:2200-2202 ChrgAirPrsSens
- FC:2400-2403 OilPressSensor
- FC:2600-2601 SensorSupply1
- FC:2700-2701 SensorSupply2
- FC:2800-2802 ExtrAnalogInp
- FC:3200-3205 BatteryVoltage
- FC:4300-4303 HW Watchdog
- FC:6200-6201 FanActuator
- FC:6400-6401 WasteGateAct
- FC:6600-6601 StarterActuatr
- FC:6A00-6A01 ExhaustBrkAct
- FC:B000-B001 OilPressProt
- FC:B100-B101 CoolantLevProt
- FC:B200 OverheatCoolWt
- FC:B300 EmergencyStop
- FC:C000-C006 PDEInjctorCyl1
- FC:C100-C106 PDEInjctorCyl2
- FC:C200-C206 PDEInjctorCyl3
- FC:C300-C306 PDEInjctorCyl4
- FC:C400-C406 PDEInjctorCyl5
- FC:C500-C506 PDEInjctorCyl6
- FC:C600-C606 PDEInjctorCyl7
- FC:C700-C706 PDEInjctorCyl8
- FC:E200 OverheatProt
- FC:E600 CoordEmergStop

Analog inputs (in case of using ECU)

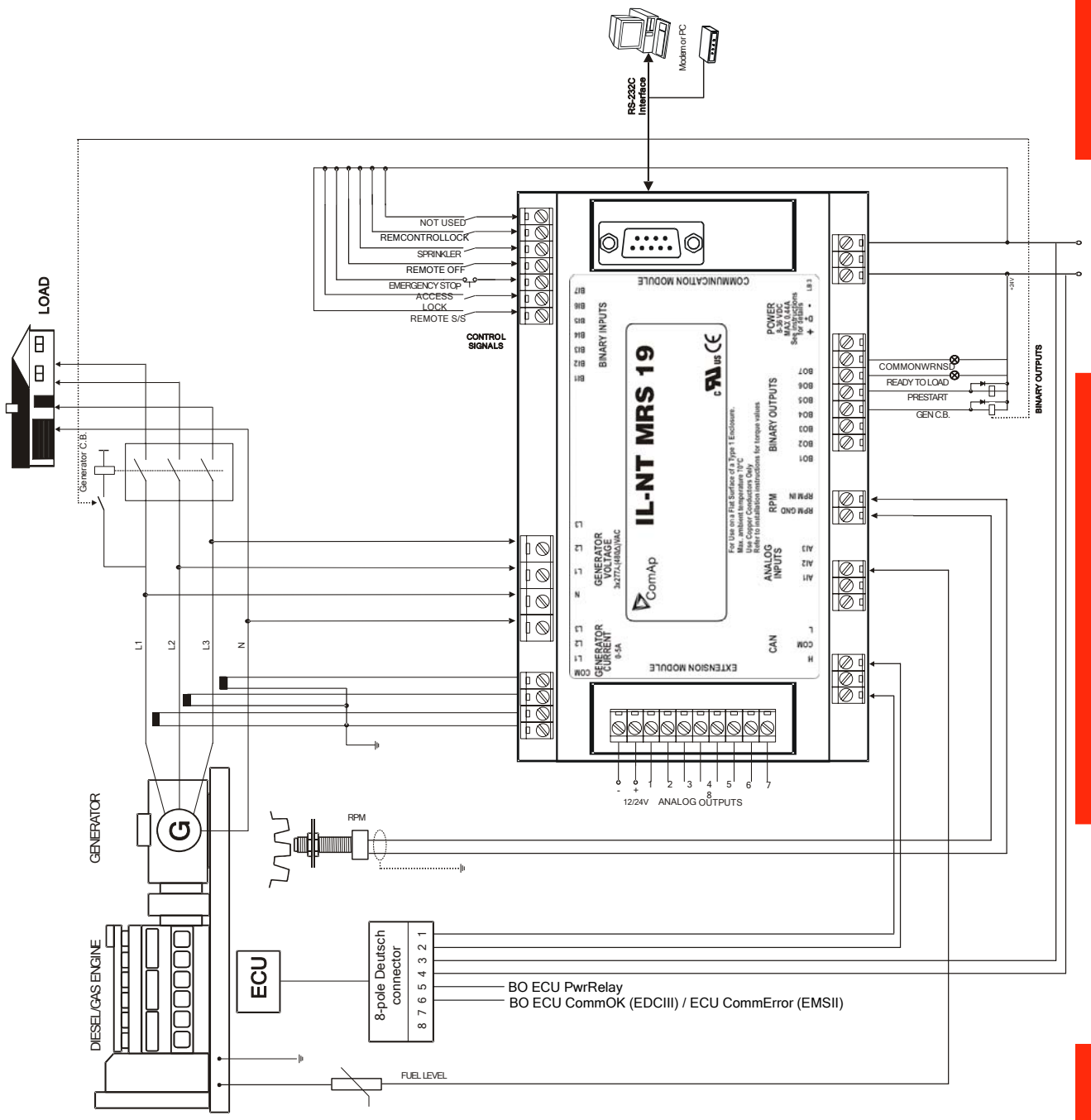
Reading of mentioned values from ECU enables to use analog inputs of the unit for other purposes, e.g. measuring, displaying and alarm activation related to various quantities. The configuration thus allows to use three analog inputs on the central unit and four analog inputs on IG-IOM/IGS-PTM module if connected.
If the engine without ECU is controlled by InteliLite, the first analog input is permanently configured to Oil pressure, other analog inputs remain freely configurable.

Connection description

The following diagrams show how to connect the engine control unit to the IL-NT controller:

Engines with J1939 support started via CAN bus

VOLVO PENTA engines (EMS II, EDC III units)



Hardware connection between IL-NT and Volvo EDCIII

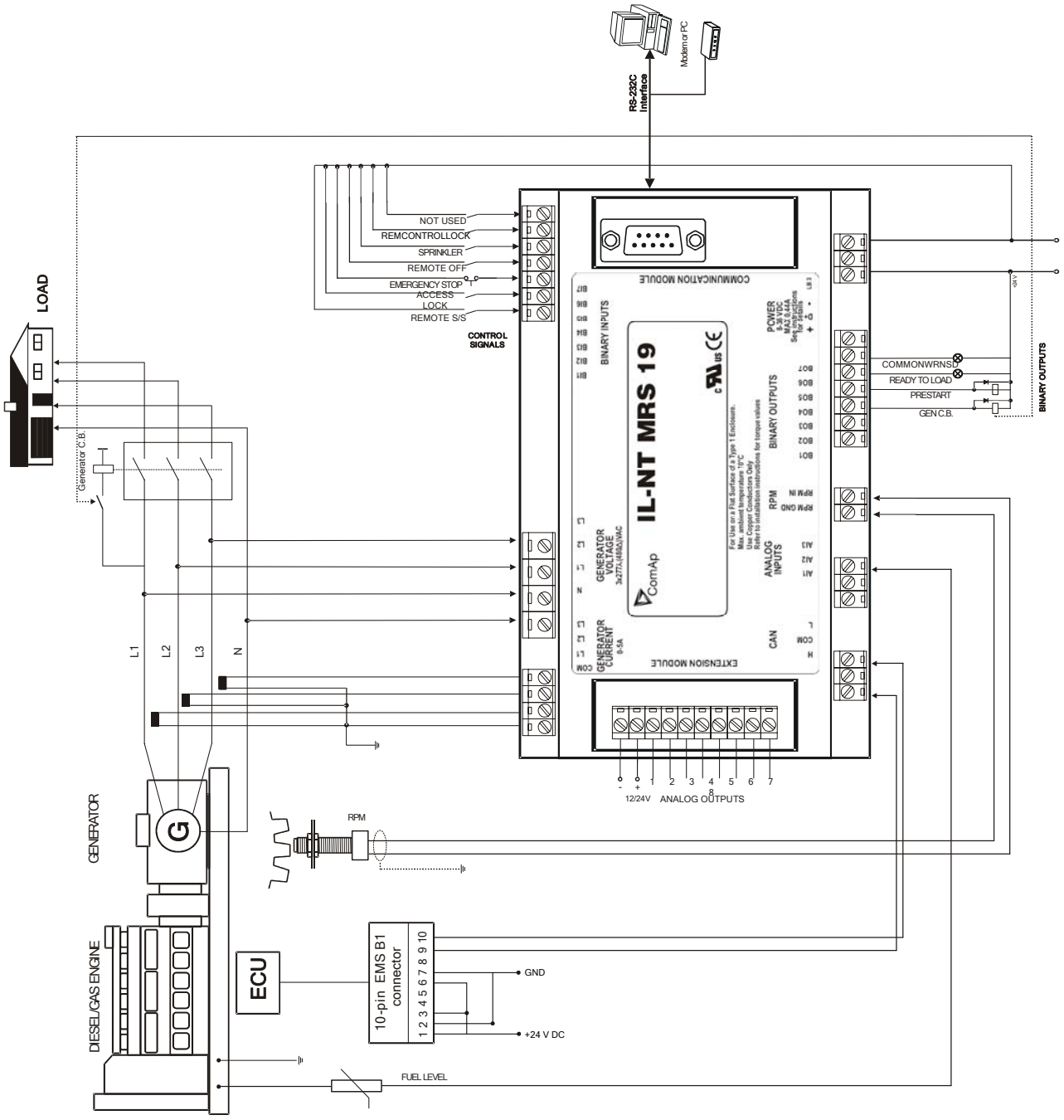
EDCIII 8 pole connector	IL-NT	Function
Pin 1	CAN H	CAN H
Pin 2	CAN L	CAN L
Pin 3	- POWER on IL-NT	Battery minus
Pin 4	+POWER on IL-NT	Battery plus
Pin 5		Activation of EDCIII Power Supply
Pin 6		Stop Switch (in case of lost communication)

Pin 7	Not used	Diagnostic line
Pin 8	Not used	Diagnostic line

Hint:

Before EDC interface connection refer to EDC manual. Used connector is DEUTSCH VIP8.
Loss of communication causes shutdown of the running engine.
The ECU can be switched off at stopped engine without Shut down activation.

SCANIA S6



Engines not started via CAN bus

PERKINS 2800 series

IL-NT binary output description	Perkins Customer interface connector
Start output	connects directly to engine starter solenoid
Fuel output	1,10,15,33,34 powers up ECU and enables the injectors

IL-NT CAN description	Perkins Customer interface connector
CAN bus common	Screen for the J1939 cable.
CAN bus H	31
CAN bus L	32

JOHN DEERE

IL-NT binary output description	John Deere 21 pin Deutsch connector
Start output	D
Fuel output	G (switched ECU power),J (ignition)

IL-NT CAN description	John Deere 21 pin Deutsch connector
CAN bus common	Screen for the J1939 cable.
CAN bus H	V
CAN bus L	U

CUMMINS ISB/ISBE

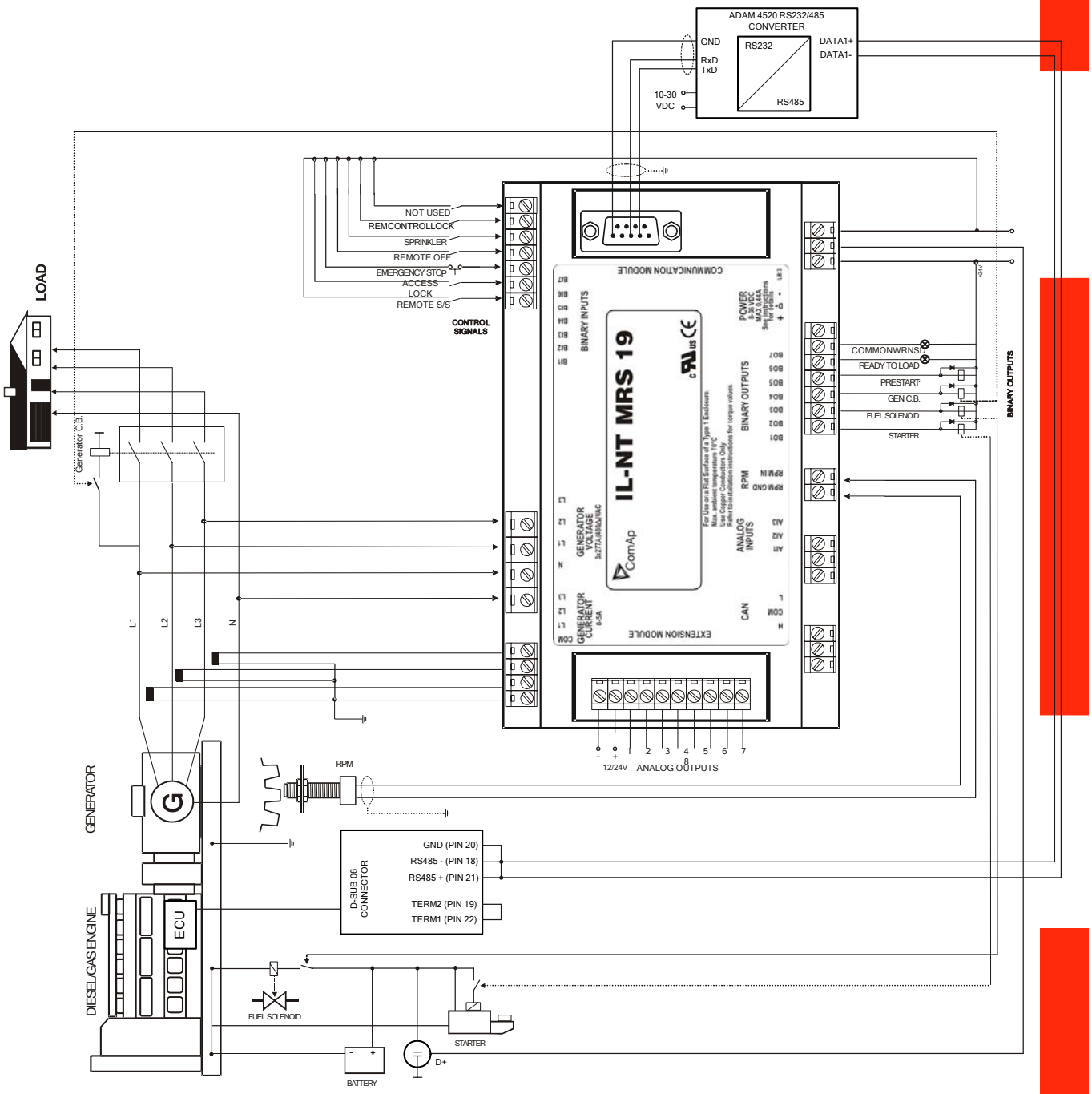
IL-NT binary output description	Cummins ISB OEM Harness connector B
Start output	connects directly to engine starter solenoid
Fuel output	39

IL-NT CAN description	Cummins ISB 9 pin Deutsch connector
CAN bus common	SAE J1939 shield - screen for J1939 cable.
CAN bus H	SAE J1939 signal
CAN bus L	SAE J1939 return

Cummins engines with MODBUS communication

IL-NT: **Basic settings**: *RS232 mode* = CUMMINS MB
Software configuration: ECU → ECU engine is connected → Type: Cummins MODBUS

RS232/RS485 converter (see following diagram) set up:
Data format settings (SW1) 11 bits (1 start bit, 8 data bits, 2 stop bits)
Baud rate settings (SW2) 9600 bps
(more info available on http://www.advantech.com/products/Model_Detail.asp?model_id=1-D6FLH)



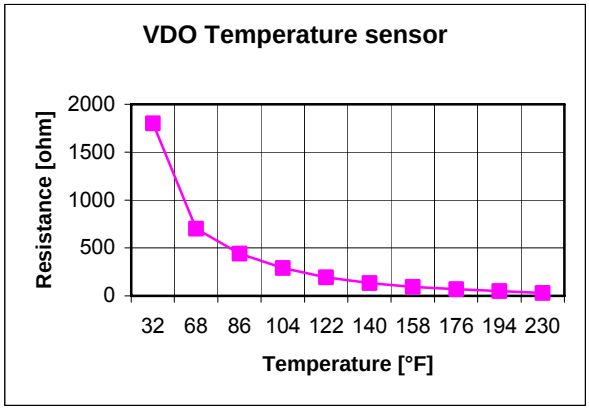
Sensor specification

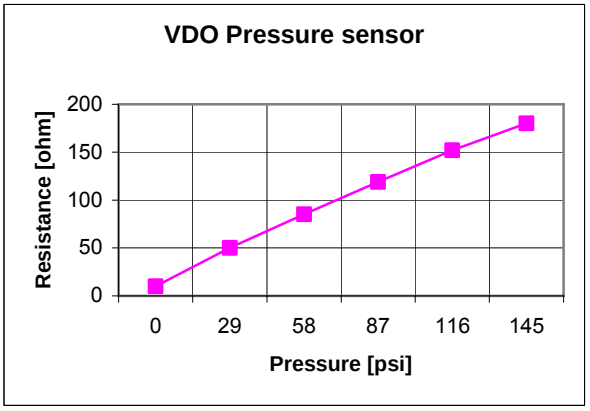
Background of the sensor calibration

To correct measuring error of each analog input (pressure, temperature, level) calibrating constants within 10 % of measure range should be set. Three (seven) calibrating constants are set in physical units - bar, °C, %. From these constants are counted equivalent calibrating resistances which are internally (in software) add to sensor resistance.
At the moment of calibration (ENTER pressing) is calculated (and in memory saved) calibrating resistance (Ω). This value is added to measured sensor resistance before calculation of the AI1 (AI2 or AI3) value.
Example: IL-NT display Temperature 70 °C and real value is 73 °C.
After setting *Calibr AI1* to +3 °C (and pressing ENTER) InteliLite calculates corresponding resistance (e.g.5Ω) and saves this value into the memory. The resistance is then added to all calculations (e.g. instead of 70°C -> 73°C, or e.g. instead of 5°C -> 6°C).
Hint:
The calibration must be done at the operational point of the analog input (e.g. 80°C, 4.0Bar etc.)

Default sensor settings

Analog input 1: 6 points VDO characteristic, pressure measuring in bar
Analog input 2: 10 points VDO characteristic, temperature measuring in °C
Analog input 3: 2 points VDO fuel level sensor, 0% = 10Ω, 100% = 180Ω





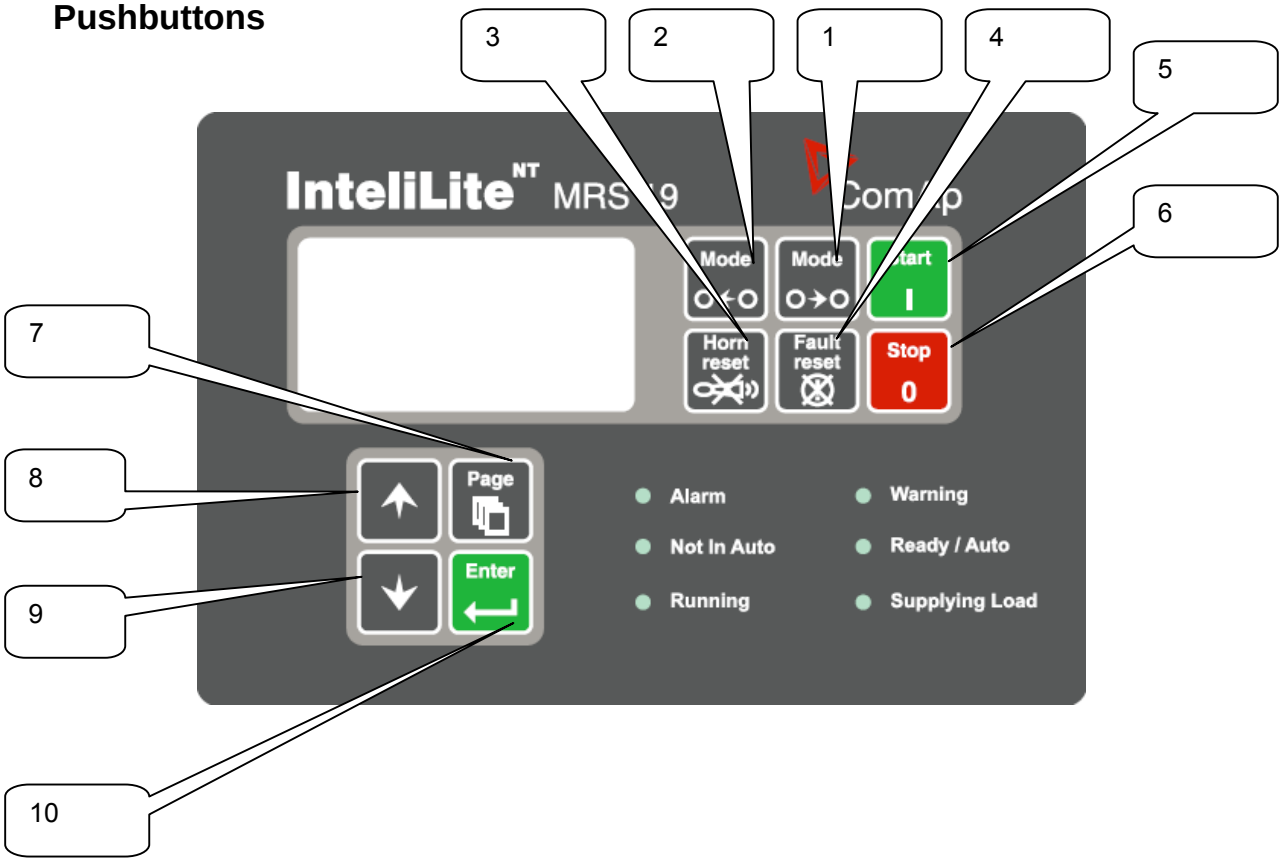
Temperature °C/°F	Pt 1000 Ohm	Ni 1000 Ohm
-20/-4	922	893
-10/14	961	946
0/32	1000	1000
30/86	1117	1171
60/140	1232	1353
80/176	1309	1483
90/194	1347	1549
100/212	1385	1618
110/230	1423	1688
120/248	1461	1760

Hint:
When measured value is 6% out of range the Sensor fail FLS is detected.

Operator interface

Pushbuttons and LEDs, MRS19

Pushbuttons



1. MODE→ - Cyclic forward selection the gen-set operation mode (OFF -> MAN -> AUT)
2. ←MODE - Cyclic backward selection the gen-set operation mode (AUT -> MAN ->OFF)
3. HORN RESET - Deactivates the HORN
4. FAULT RESET - Acknowledges faults and alarms
5. START - Start of the gen-set
6. STOP - Stop of the gen-set
7. PAGE - Cyclic selection of the display mode(MEASUREMENT->ADJUSTEMENT)
8. ↑ - Select the set point, select the screen or increase set point value
9. ↓ - Select the set point, select the screen or decrease set point value
10. ENTER - Confirm set point value

LEDs

ALARM	Indicates active or inactive, but still not reset shutdown alarm
NOT IN AUTO	Indication the controller in not in AUTO mode
RUNNING	Indicates running engine
WARNING	Indicates active or inactive, but still not reset warning alarm
READY/AUTO	Indicates the controller is in AUTO mode and is ready to operation. The LED goes off after the engine is started.
SUPPLYING LOAD	Indicates the gen-set is running, giving proper voltage and frequency and the outputs *Read to Load, GCB close/open* are closed.

How to select the gen-set mode?

Use MODE→ or ←MODE to select requested gen-set operation mode
(OFF – MAN – AUT)

Display menus

There are 2 display menus available: MEASUREMENT and ADJUSTMENT
Each menu consists of several screens. Press repeatedly PAGE button to select requested menu.

How to view measured data?

1. Use repeatedly PAGE button to select the MEASUREMENT menu.
2. Use ⇑ and ⇓ to select the screen with requested data.

How to view and edit set points?

1. Use repeatedly PAGE button to select the ADJUSTMENT menu.
2. Use ⇑ or ⇓ to select requested set points group.
3. Press ENTER to confirm.
4. Use ⇑ or ⇓ to select requested set point.
5. Set points marked **"*"** are password protected.
6. Press ENTER to edit.
7. Use ⇑ or ⇓ to modify the set point. When ⇑ or ⇓ is pressed for 2 sec, auto repeat function is activated.
8. Press ENTER to confirm or PAGE to leave without change.
9. Press PAGE to leave selected set points group.

How to change the display contrast?

Press ENTER and ⇑ or ⇓ at the same time to adjust the best display contrast
Hint:
Only in MEASUREMENT menu.

How to check the serial number and software revision?

Press ENTER and then PAGE. On the display you can see InteliLite INFO screen for 10 seconds.
InteliLite INFO screen contains :

1) *Controller name* (see **Basic setting** group)
2) InteliLite serial number (8 character number)
3) SW version: the first is the firmware version number, the second is configuration table number.
4) Application: MRS16
5) Branch: Standard

Hint:
Only in MEASUREMENT menu.

How to change language?

Press ENTER and then PAGE to get to Serial number and software revision screen. Then press PAGE to enter Language selection screen. Use ⇑ or ⇓ to select desired langue and press ENTER to confirm selection.

How to find active alarms ?

Active alarm list is the last screen in the MEASUREMENT menu.
Select MEASUREMENT menu. Press ⇑ You will see the list of all active alarms with the number of alarms at the top-right corner. Three state alarms are introduced:

	Description
* Wrn Water temp	Active not accepted alarm
Wrn water temp	Active accepted alarm
* Wrn Water temp	Inactive not accepted alarm
	Inactive accepted alarm

Press FAULT RESET accepts all alarms. Non-active alarms immediately disappear from the list. Active alarm list appears on the screen when a new alarm comes up and Main MEASUREMENT screen is active.

Hint:

Alarm list does not activate when you are reviewing the values or setpoints.

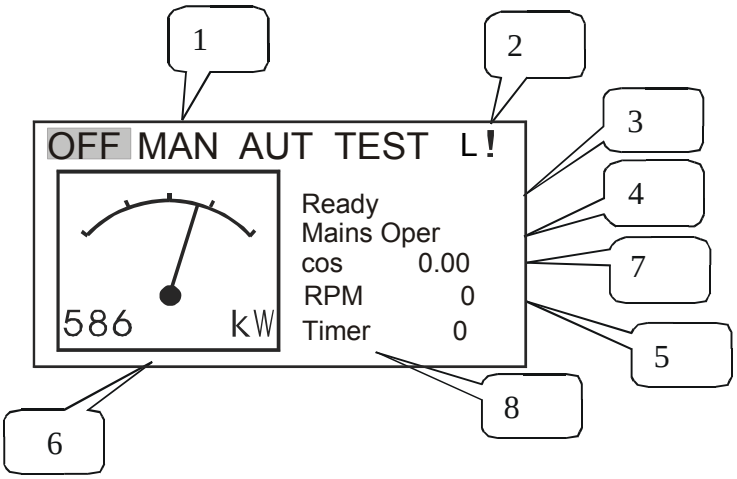
Second alarm list for ECU alarms is also available. It is displayed one screen above the standard alarm list on the controller display or under the standard alarm list in Control window of LiteEdit. If an alarm appears in this alarm list, it is signalized in the standard alarm list and by exclamation mark on the main measure screen.

Control from the front panel:

↑↓	One screen up/down
Enter	Cursor move within the ECU alarm list
Enter + Fault reset	ECU fault code reset

MEASUREMENT screens description

Main measure screen



1. Operation mode of the gen-set
2. Indication of active access lock, Remote OFF or Remote TEST – "**L**" and alarm – "**!**"
3. Status of the gen-set
4. Actual electric condition
5. RPM of the gen-set
6. Active power
7. Power factor
8. Timer - event's counting time (e.g. prestart, cooling, etc.)

Generator screen

Gen freq
Gen V1-2, V2-3, V3-1 ph-ph
Gen V1, V2, V3 ph-N (triple bargraph)
Gen I1, I2, I3 (triple bargraph)

IL-NT Analog inputs screen

Oil pressure	(single bargraph)
Water temperature	(single bargraph)
Fuel level	(single bargraph)
Battery voltage	(single bargraph)

IL-NT binary inputs

BI1 to BI6

IL-NT binary outputs

BO1 to BO6

ECU state

ECU YellowLamp
ECU RedLamp
WaitToStart

Hint:

This screen is shown/hidden depending on whether the ECU is configured or not.

ECU Values

Oil press
Water temp
PercLoadAtCS
Boost pressure
ManifoldTemp
Fuel rate

Hint:

This screen is shown/hidden depending on whether the ECU is configured or not.

Gen-set power screen

Active power	(total and per phase)
Power factor	(total and per phase)
React power	(total and per phase)
Appar power	(total and per phase)

Statistic

Run hours
Number of starts

Kilowatt-hours	kWh	(total)
Reactive power hours	kVAh	(total only)

NextServTime

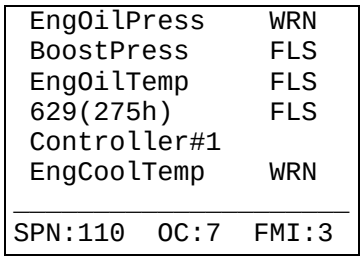
Hint:

Running time is measured in complete minutes, displayed in complete hours. Values are stored in nonvolatile memory.

ECU AlarmList

Diagnostic messages are read from ECU and displayed in this second alarm list. For Standard J1939 engines SPN (Suspect Parameter Number), FMI (Failure Mode Identifier) and OC (Occurrence Counter) are shown together with verbal description if available.

Following image shows displaying of ECU alarms in the second alarm list. The additional information for the row selected by cursor is on the last row (SPN, OC and FMI codes).
If the verbal description of alarm is not available, the SPN (decimal and hexadecimal) is displayed.



Hint:
For FMI = 0 and 1, WRN is displayed. For other FMI codes, FLS is displayed.

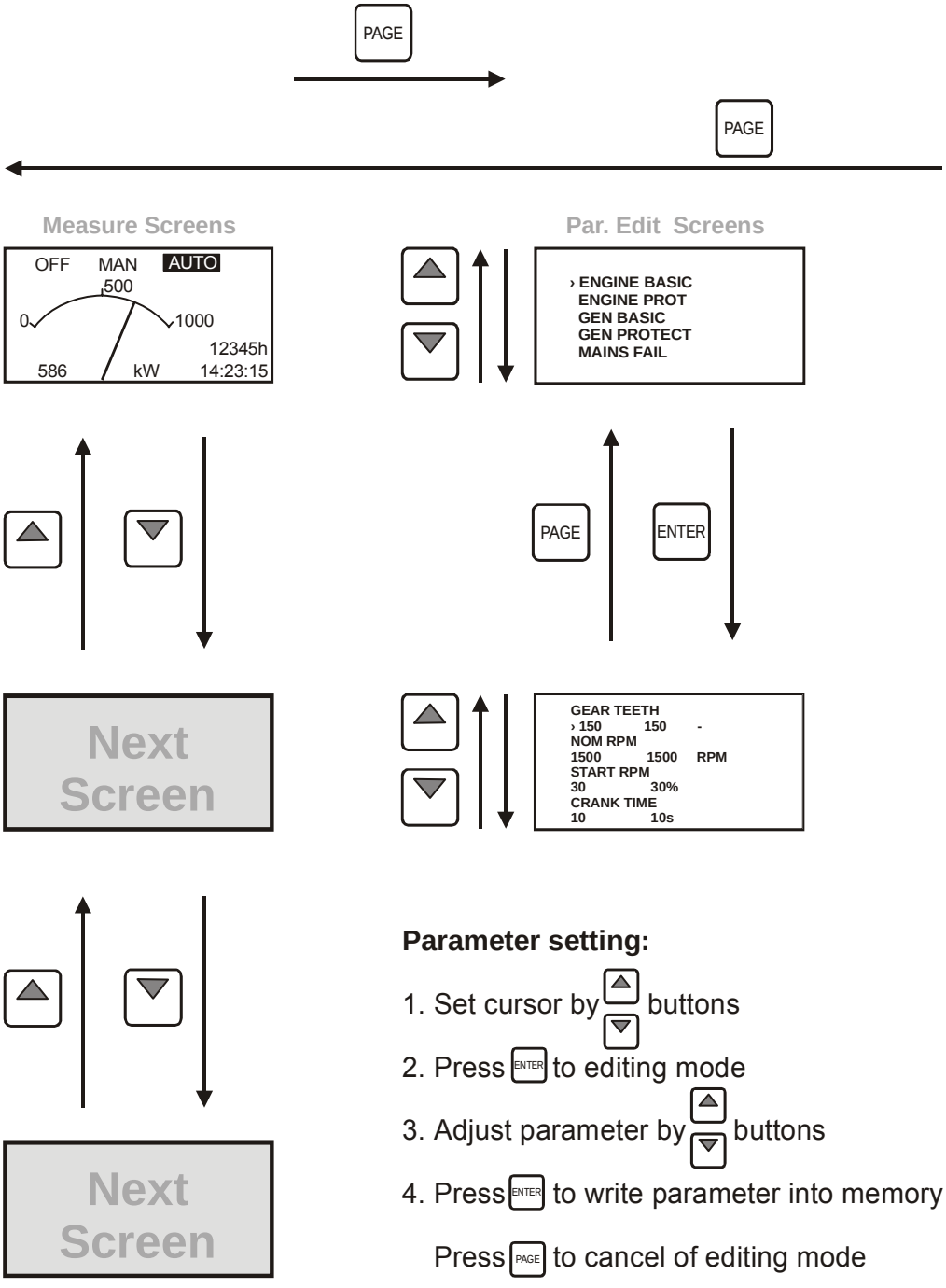
Alarm list

Alarm list Includes

- Active unacknowledged alarms
- Active acknowledged alarms
- Inactive unacknowledged alarms

See more in the chapter *How to find active alarms?*

Chart guide to menus and pushbutton's operation



Parameter setting:

1. Set cursor by buttons
2. Press ENTER to editing mode
3. Adjust parameter by buttons
4. Press ENTER to write parameter into memory

   Press PAGE to cancel of editing mode

Function description

OFF mode

No start of the gen-set is possible. Outputs STARTER, GCB CLOSE/OPEN and FUEL SOLENOID are not energized.
No reaction if buttons START,STOP are pressed.

MAN mode

START - starts the gen-set.

The controller closes GCB after engine is running and generator parameters are within limits (also *GCB CloseDelay* has to elapse before GCB closes in case that *GCB CloseDelay* > 0).

STOP stops the gen-set.

Hint:
The engine can run without load unlimited time.
The controller does not automatically stop the running gen-set in MAN mode.
The controller does not start the gen-set when binary input REM START/STOP is closed.

Start-stop sequence (simplified)

MODE = MAN (Engine start/stop request is given by pressing buttons START and STOP)
MODE = AUT (Engine start/stop request is given by binary input REM START/STOP and in case that **Basic setting:** *STOPinAUT* = ENABLED also by pressing buttons START and STOP)

Hint:
The START button is NOT active in AUT mode till the time when the engine is stopped in AUT mode by pressing STOP button. See more in **Basic setting**.

State	Condition of the transition	Action	Next state
Ready	Start request	PRESTART on *Prestart time* counter started	*Prestart*
	RPM > 2 or Oil pressure detected or Gen voltage > 10V or D+ is active		*Stop (Stop fail)*
	OFF mode selected or Shut down alarm active		*Not Ready*
Not Ready	RPM < 2, Oil pressure not detected, Vgen < 10V, D+ not Active, no shutdown alarm active, other than OFF mode selected		*Ready*
Prestart [3]	Prestart time *elapsed*	STARTER *on* FUEL SOLENOID *on*[4] *MaxCrank time* counter started	*Cranking*
Cranking [3]	*RPM*> Start RPM	STARTER *off* PRESTART *off*	*Starting*
	D+ input activated for 1s or oil pressure detected or Gen voltage > 25% Vgnom	STARTER *off* PRESTART *off*	*Cranking*

State	Condition of the transition	Action	Next state
	MaxCrank time *elapsed, 1st attempt*	STARTER *off* FUEL SOLENOID *off* STOP SOLENOID *on* *CrankFail pause* timer started	*Crank pause*
	MaxCrank time *elapsed, last attempt*	STARTER *off* PRESTART *off*	*Shutdown (Start fail)*
Crank pause [3]	CrankFail pause *elapsed*	STARTER *on* FUEL SOLENOID *on*[4] STOP SOLENOID *off* *MaxCrank time* counter started	*Cranking*
Starting [3]	*80%* Nominal speed *reached*	READY TO LOAD *on* [1] *Min, MaxStabTime* counter started	*Running*
	RPM = 0 or any other shutdown condition	FUEL SOLENOID *off* STOP SOLENOID *on*	*Shutdown*
	60 sec. *Elapsed*	FUEL SOLENOID *off* STOP SOLENOID *on*	*Shutdown (Start fail)*
Running	Stop request	READY TO LOAD off *Cooling time* timer started	*Cooling*
	RPM = 0 or any other shutdown condition	READY TO LOAD *off* [2] *FUEL SOLENOID off*	*Shutdown*
	GCB CLOSE/OPEN *closed*		*Loaded*
Loaded	GCB CLOSE/OPEN *opened*		*Running*
	RPM = 0 or any other shutdown condition	FUEL SOLENOID off STOP SOLENOID on READY TO LOAD off	*Shutdown*
Cooling	Cooling time *elapsed*	FUEL SOLENOID off STOP SOLENOID on	*Stop*
	RPM = 0 or any other shutdown condition	FUEL SOLENOID off STOP SOLENOID on	*Shutdown*
	Start request	READY TO LOAD on [1]	*Running*
Stop	*RPM = 0,* Oil pressure not detected, Vgen < 10V, D+ not active		*Ready*
	60 sec. *Elapsed*		*Stop (Stop fail)*

[1] if all generator parameters OK and MinStab Time elapsed, indicates that GCB is possible to close. In AUT mode closes in this moment GCB automatically.

[2] If GCB output used GCB opens automatically

[3] The start-up sequence can be interrupted in any time by comming stop request

[4] Fuel solenoid is switched on with time advance of 1s fixed before starter motor is switched on.

Hint:
Threshold level for D+ input is 80% supply voltage, activation delay is 1s (to override short firings during cranking – for example in cold conditions).

AUT mode

The controller does not respond to buttons START, STOP
Engine start/stop request is given by binary input REM START/STOP.
Except **Basic setting:** *STOPinAUT* = ENABLED. See more in Basic setting or Start-stop sequence in MAN mode.

Alarm management

Following alarms are available:

- Sensor fail
- Warning
- Shut down

Sensor fail (FLS)

Sensor fail is detected when measured value is 6% out of selected sensor characteristic. Sensor fail is indicated by ##### symbol instead measured value.

Warning (WRN)

When warning comes up, only alarm outputs and common warning output are closed.

Possible warnings:

See List of possible events

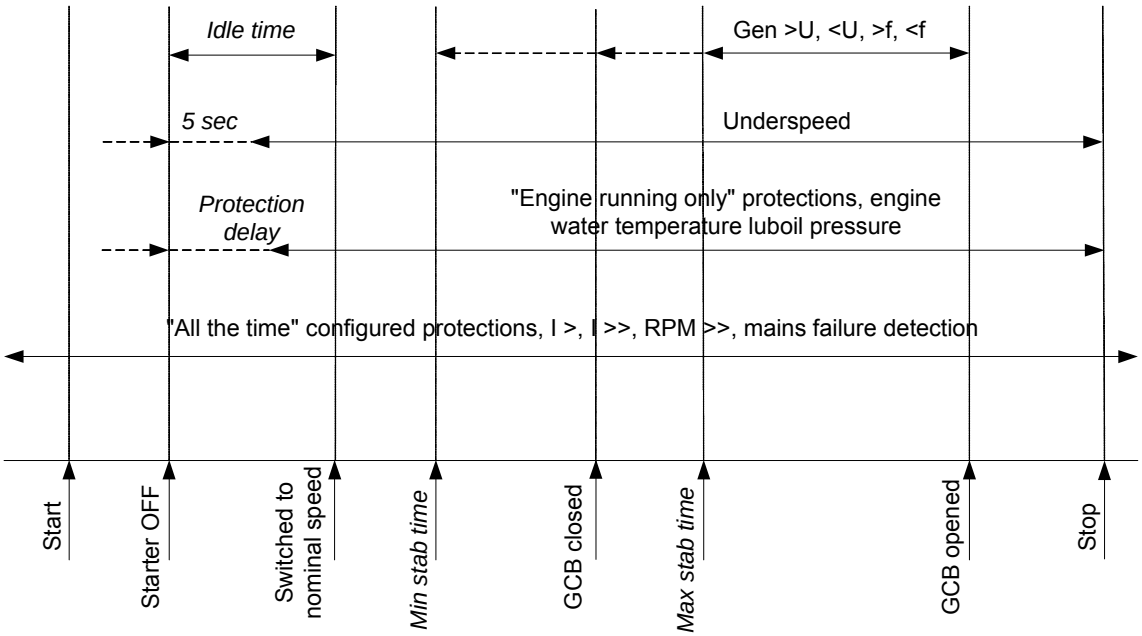
Shut down (SD)

When the shut-down alarm comes up, InteliLite opens outputs GCB CLOSE/OPEN, FUEL SOLENOID, STARTER and PRESTART to stop the engine immediately. Alarm outputs and common shutdown output are closed. Active or not reset protection disables start.

Possible shut-down alarms:

See List of possible events

Alarm time chart



Voltage phase sequence detection

InteliLite controller detects phase sequence on generator voltage terminals. This protection is important after controller installation to avoid wrong voltage phases phase connection. Following alarms can be detected:

Wrong phase sequence

There is fix defined phase sequence in InteliLite controller L1, L2, L3. When the phases are connected in different order (e.g. L1,L3,L2 or L2,L1,L3) following alarms are detected:

G ph opposed = wrong generator phase sequence

Inverted phase polarity

inverted phase polarity can be detected due to wrong connection of separation transformers between controller and generator / mains / bus voltage. Phase sequence is OK but some phase(s) is connected in opposite way (180° shift).

Following alarms can be detected:

GEN L1 neg = generator phase L1 is inverted
GEN L2 neg = generator phase L2 is inverted
GEN L3 neg = generator phase L3 is inverted

Wrong phase sequence and inverted polarity

It is combination of both previous alarms

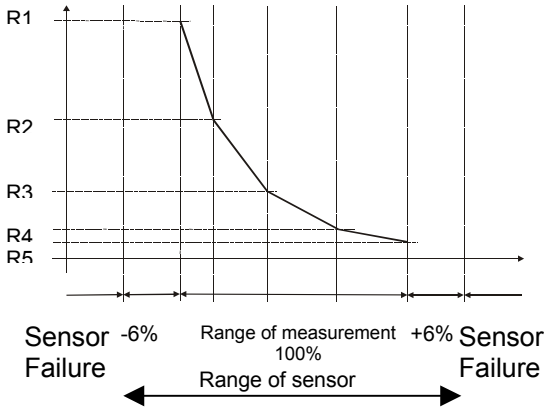
G ph+L1 neg = wrong generator phase sequence and phase L1 is inverted
G ph+L2 neg = wrong generator phase sequence and phase L2 is inverted
G ph+L3 neg = wrong generator phase sequence and phase L3 is inverted

Hint:

Phase sequence detection is active when voltage in all three phases is >50VAC and all phases angles are in the range 120° ± 20.
Phase sequence alarm detection is 1 sec delayed to avoid transient effects.

Sensor fail detection

Sensor fail FIs is detected when measured value is 6 percent out of range. Controller screen displays in this case string #### instead measured value.



Gen-set operation states

Engine state machine

Init	Autotest during controller power on
Not ready	Genset is not ready to start
Prestart	Prestart sequence in process, Prestart output is closed
Cranking	Engine is cranking
Pause	Pause between start attempts
Starting	Starting speed is reached and the *Idle timer* is running
Running	Genset is running at nominal speed
Loaded	Genset is running at nominal speed and GCB OPEN/CLOSE is closed
Stop	Stop
Shutdown	Shut-down alarm activated
Ready	Genset is ready to run
Cooling	Genset is cooling before stop
EmergMan	Emergency Manual gen-set operation
AFterCool	Engine aftercooling, CoolingPump output is closed

Electric state machine

MinStabTO	Minimal Stabilization Timeout
MaxStabTO	Maximal Stabilization Timeout
FwRet Brk	Forward return break delay. Delay between GCB opening and MCB closing

List of possible alarms

Events specification	Protection type	Information on binary output available (See list of Binary outputs)	Description
Oil Press Wrn	WRN	YES	Oil pressure is smaller than *Wrn Oil press* setpoint.
Oil Press Sd	SD	NO	Oil pressure is smaller than *Sd Oil press* setpoint.
Engine Temp Wrn	WRN	YES	Water temperature is greater than *Wrn Water temp* setpoint.
Engine Temp Sd	SD	NO	Water temperature is greater than *Sd Water temp* setpoint.
Fuel Level Wrn	WRN	YES	Fuel level is smaller than *Wrn Fuel Level* setpoint.
Fuel Level Sd	SD	NO	Fuel level is smaller than *Sd Fuel Level* setpoint.
Ubat	WRN	YES	Battery voltage is out of limits given by *Batt overvolt* and *Batt undervolt* setpoints.
AnInIOM Wrn	WRN	YES	Warning alarm configurable on the input of IG-IOM/IGS-PTM.
AnInIOM Sd	SD	YES	Shutdown alarm configurable on the input of IG-IOM/IGS-PTM.
Binary input	Configurable	YES	Configurable Warning/Shutdown alarms on the inputs of IL-NT.
Battery flat	SD	YES	If the controller switches off during starting sequence due to bad battery

Events specification	Protection type	Information on binary output available (See list of Binary outputs)	Description
			condition it doesn't try to start again and activates this protection.
Start failed	SD	YES	Gen-set start failed.
ParamFail	NONE	NO	Wrong checksum of parameters. Happens typically after downloading new firmware or changing of the parameter. The controller stays in INIT mode. Check all parameters, write at least one new parameter.
Vgen <, >	SD	YES	The generator voltage is out of limits given by *Gen <V* and *Gen >V* setpoints.
Vgen unbl	SD	NO	The generator voltage is unbalanced more than the value of *Volt unbal* setpoint.
Fgen <,>	SD	YES	The generator frequency is out of limits given by *Gen >f* and *Gen <f* setpoints.
Igen unbl	SD	NO	The generator current is unbalanced.
Overload	SD	YES	The load is greater than the value given by *Overload* setpoint.
Overspeed	SD	YES	The protection comes active if the speed is greater than *Overspeed* setpoint.
Underspeed	SD	YES	During starting of the engine when the RPM reaches the value of *Starting RPM* setpoint the starter is switched off and the speed of the engine can drop under *Start RPM* again. Then the Underspeed protection becomes active. Protection evaluation starts 5 seconds after reaching *StartingRPM*.
EmergencyStop	SD	NO	If the input *Emergency stop* is opened shutdown is immediately activated.
GCB fail	SD	NO	Failure of generator circuit breaker.
PickupFault	SD	NO	Failure of magnetic pick-up sensor for speed measurement.
Stop fail	SD	YES	Gen-set stop failed.
WrnServiceTime	WRN	NO	The period for servicing is set by the *NextServTime* setpoint. The protection comes active if the running hours of the engine reach this value.
ChrgAlternFail	WRN	YES	Failure of alternator for charging the battery.
SprinklActive	WRN	NO	The protection is active if the output *Sprinkler* is closed.
Wrn RA15 fail	WRN	NO	Warning alarm in case of lost connection to IGL-RA15 module.
Sd IOM fail	SD	NO	Shutdown alarm in case of lost connection to IG-IOM/IGS-PTM module.
Wrn ECU Alarm	WRN	NO	ECU alarm list is not empty
Low BackupBatt	WRN	NO	RTC backup battery is flat

History file

InteliLite NT stores a record of each important event into the history file. The history file seats 117 records. When the history file is full, the oldest records are removed.

Hint:
To force history download in LiteEdit (direct, modem or Internet) open History window and select History | Read history command.

Record structure

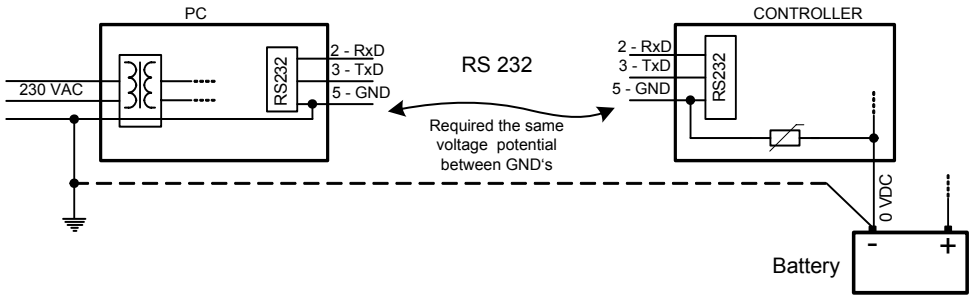
Abbreviation	Historical value
Num	Number of historical event
Reason	Event specification
Date	Date of historical event in format DD/MM/YY
Time	Time of historical event in format HH:MM:SS
RPM	Engine speed
Pwr	Generator active power
PF	Generator PF
LChr	Character of the load
Gfrq	Generator frequency
Vg1	Generator voltage L1
Vg2	Generator voltage L2
Vg3	Generator voltage L3
Ig1	Generator current L1
Ig2	Generator current L2
Ig3	Generator current L3
UBat	Battery voltage
OilP	IL-NT Analog input 1 value (default Oil pressure)
EngT	IL-NT Analog input 2 value (default Water temperature)
FLvl	IL-NT Analog input 3 value (default Fuel level)
AIM1	IG-IOM, IGS-PTM Analog input 1 value (when configured IG-IOM, IGS-PTM)
AIM2	IG-IOM, IGS-PTM Analog input 2 value (when configured IG-IOM, IGS-PTM)
AIM3	IG-IOM, IGS-PTM Analog input 3 value (when configured IG-IOM, IGS-PTM)
AIM4	IG-IOM, IGS-PTM Analog input 4 value (when configured IG-IOM, IGS-PTM)
BIN	Binary inputs IL-NT
BIM	IG-IOM, IGS-PTM Binary inputs (when configured IG-IOM, IGS-PTM)
BOUT	Binary inputs IL-NT
BOM	IG-IOM, IGS-PTM Binary outputs (when configured IG-IOM, IGS-PTM)
FC	ECU alarm FailureCode
FMI	ECUalarm Failure Mode Identifier

Remote control and data logging

Direct connection to the PC

InteliLite can be connected directly with PC via optional IL-NT RS232 interface.
Use the standard serial cable to connect PC with InteliLite.

Hint:
Make sure the grounding system on controller and PC – COM port (negative of the PC DC supply) are identical – before the first direct connection. There must not be any voltage between these two points otherwise the internal reversible fuse in controller burns out. The simple solution is to assure, that the PC supply 240/20V is ground free (GND terminal is not connected).



PC software - LiteEdit

On the PC (for direct or modem connection) has to be installed the ComAp's software package LiteEdit. (based on Windows 95 or newer platform)
LiteEdit enables:

- read the quantities
- adjust all set points
- control the engine
- configure the controller
- select software configuration
- modify alarm inputs and outputs
- modify password, commands protections
- direct, modem or Internet communication

Modbus protocol

The selection of the function of IL-NT serial port is done via the setpoint *RS232 mode* in *Basic settings*

- 9600 bps, 8 data bits, 1 stop bit, no parity
- Transfer mode RTU
- Function 3 (Read Multiply Registers)
- Function 6 (Write Single Register)
- Function 16 (Write Multiply Registers)
- The response to an incoming message is sent with minimum 4.096 ms delay after message reception

The complete description of Modbus communication protocol can be found in *Modbus Protocol Reference Guide PI-MBUS-300* and *Open Modbus Specification Release 1.0*. Both documents are available from web site at http://www.modicon.com/openmbus/ .

Communication object vs. Register

All the data intended for communication has its representation as communication objects in the controller. The communication object is represented by the n-byte array in the controller memory and identified by the unique 16-bit communication object number. The register, according to Modbus communication protocol, represents a two-byte data and in communication functions is referenced by 16-bit register address. Further in the description of communication functions **the communication object number will always be used as a register address** and length of the communication object will be expressed by number of registers. **Just one communication object can be read or written by one communication function.**

Hint:

To obtain communication object numbers it is possible to download the actual controller description on-line from controller or from (ail) archive and use “export data” function from LiteEdit software.

Communication object list (exported from default IL-NT-MRS19 archive)

Setpoints (MRS19):

Name	Firmware ver.	Application	Date	App. ver.	Ser. num.	Filename
IL-NT	IL-NT-VA-1.0 R:03.10.2007	MRS19	27.10.2007	1,0	12345678	IL-NT-MRS19-VA-1.0.AIL

Group	Name	Value	Dimension	Password	Com. obj.	Low limit	High limit	Data type
Basic settings	Gen-set name	IL-NT		0	8637			Short string
Basic settings	Nom power(3ph)	200	kW	0	8276	1	32000	Unsigned 16
Basic settings	Nom power(1ph)	200	kW	0	9977	1	32000	Unsigned 16
Basic settings	CT ratio	2000	/5A	0	8274	1	5000	Unsigned 16
Basic settings	PT ratio	1,0	/1	0	9579	0,1	500,0	Unsigned 16
Basic settings	Nominal freq	60	Hz	0	8278	45	65	Unsigned 16
Basic settings	Gear teeth	120		0	8252	0	500	Unsigned 16
Basic settings	Nominal RPM	1800	RPM	0	8253	100	4000	Unsigned 16
Basic settings	ControllerMode	OFF		0	8315			String list
Basic settings	FltResGoToMAN	DISABLED		0	9983			String list
Basic settings	STOPinAUT	DISABLED		0	11375			String list
Basic settings	DispBaklightTO	15	min	0	10121	0	241	Unsigned 8
Basic settings	IL Power Off	0	min	0	8548	0	600	Unsigned 16
Basic settings	Contr. addr	1		3	24537	1	32	Unsigned 8
Basic settings	RS232 mode	STANDARD		3	24522			String list
Engine params	Starting RPM	25	%	0	8254	5	50	Unsigned 8
Engine params	Starting POil	65	psi	0	9681	0	100	Integer 16
Engine params	Prestart time	2	s	0	8394	0	600	Unsigned 16
Engine params	MaxCrank time	5	s	0	8256	1	60	Unsigned 8
Engine params	CrnkFail pause	8	s	0	8257	5	60	Unsigned 8
Engine params	Crank attempts	3		0	8255	1	10	Unsigned 8
Engine params	Idle time	12	s	0	9097	0	600	Unsigned 16
Engine params	GCB CloseDelay	2	s	0	8259	0	300	Unsigned 16
Engine params	Stabil time	10	s	0	8313	0	300	Unsigned 16
Engine params	Cooling speed	NOMINAL		0	10046			String list

Engine params	Cooling time	30	s	0	8258	0	3600	Unsigned 16
Engine params	AfterCool time	180	s	0	8662	0	3600	Unsigned 16
Engine params	Stop time	60	s	0	9815	0	240	Unsigned 16
Engine params	Fuel solenoid	DIESEL		0	9100			String list
Engine params	D+ function	DISABLED		0	9683			String list
Engine params	ECU FreqSelect	DEFAULT		0	10266			String list
Engine params	ECU SpeedAdj	50	%	0	9948	0	100	Unsigned 16
Engine params	WtBfAcceptRPM	0,5	s	0	8722	0,1	3,0	Unsigned 16

Values (MRS19):

Name	Firmware ver.	Application	Date	App. ver.	Ser. num.
IL-NT	IL-NT-VA-1.0 R:03.10.2007	MRS19	27.10.2007	1.0	12345678

Group	Name	Value	Dimension	Com. obj.	Data type
Engine params	ECU State	[010]		10034	Binary 8
Engine params	Fuel rate	0,00	gph	9860	Unsigned 16
Engine params	Water temp	22	°F	9855	Integer 16
Engine params	ManifoldTemp	20	°F	9878	Integer 16
Engine params	Oil Pressure	0	psi	10354	Integer 16
Engine params	Boost pressure	0	psi	9877	Unsigned 8
Engine params	PercLoadAtCS	0	%	9925	Unsigned 8
Engine values	RPM	1800	RPM	8209	Unsigned 16
Statistics	kWhours	0	kWh	8205	Integer 32
Statistics	kVArhrs	0	kVAh	8539	Integer 32
Statistics	Run hrs	0	h	8206	Integer 32
Statistics	Num starts	0		8207	Unsigned 16
Statistics	NextServTime	#####	h	9648	Unsigned 16
Statistics	E-Stop	0		11195	Unsigned 32
Statistics	ShutDown	0		11196	Unsigned 32
Analog CU	Ubat	24,3	V	8213	Integer 16
Analog CU	CPU temp	37,1	°C	10124	Integer 16
Analog CU	D+	5,7	V	10603	Integer 16
Analog CU	Oil Pressure	106	psi	8227	Integer 16
Analog CU	Engine Temp	50	°F	8228	Integer 16
Analog CU	Fuel Level	99	%	8229	Integer 16
Generator	Act power	150	kW	8202	Integer 16
Generator	Act pwr L1	50	kW	8524	Integer 16
Generator	Act pwr L2	50	kW	8525	Integer 16

Generator	Act pwr L3	50	kW	8526	Integer 16
Generator	React pwr	15	kVAr	8203	Integer 16
Generator	React pwr L1	5	kVAr	8527	Integer 16
Generator	React pwr L2	5	kVAr	8528	Integer 16
Generator	React pwr L3	5	kVAr	8529	Integer 16
Generator	Appar pwr	153	kVA	8565	Integer 16
Generator	Appar pwr L1	51	kVA	8530	Integer 16
Generator	Appar pwr L2	51	kVA	8531	Integer 16
Generator	Appar pwr L3	51	kVA	8532	Integer 16
Generator	Pwr factor	1,00		8204	Integer 8
Generator	Load char	R		8395	Char
Generator	Pwr factor L1	1,00		8533	Integer 8
Generator	Load char L1	R		8626	Char
Generator	Pwr factor L2	1,00		8534	Integer 8
Generator	Load char L2	R		8627	Char
Generator	Pwr factor L3	1,00		8535	Integer 8
Generator	Load char L3	R		8628	Char
Generator	Gen freq	60,0	Hz	8210	Unsigned 16
Generator	Gen V L1-N	230	V	8192	Unsigned 16
Generator	Gen V L2-N	230	V	8193	Unsigned 16
Generator	Gen V L3-N	230	V	8194	Unsigned 16
Generator	Gen V L1-L2	398	V	9628	Unsigned 16
Generator	Gen V L2-L3	398	V	9629	Unsigned 16
Generator	Gen V L3-L1	398	V	9630	Unsigned 16
Generator	Gen curr L1	41	A	8198	Unsigned 16
Generator	Gen curr L2	41	A	8199	Unsigned 16
Generator	Gen curr L3	41	A	8200	Unsigned 16
Generator	Nominal power	200	kW	9018	Integer 16
Generator	NomVolt	231	V	9917	Unsigned 16
Generator	NomAmps	1000	A	9978	Unsigned 16
Generator	Phase mode	#####		9976	Unsigned 16

Binary I/O	BIN	[1111001]	8235	Binary 16
Binary I/O	BInpIOM	[01000110]	8602	Binary 16
Binary I/O	BOUT	[1111000]	8239	Binary 16
Binary I/O	BOutRA15	[100010010000000]	9849	Binary 16
Binary I/O	BOutIOM	[11011001]	8604	Binary 16

Date/Time	Time	#####	24554	Time
Date/Time	Date	#####	24553	Date

IL info	Engine state	#####	8330	Unsigned 16
IL info	Breaker state	#####	8455	Unsigned 16
IL info	Timer text	#####	8954	Unsigned 16

IL info	Timer val	0	s	8955	Unsigned 16
IL info	SW version	0,0		8393	Unsigned 8
IL info	Application	10		8480	Unsigned 8
IL info	SW branch	4		8707	Unsigned 8
IL info	PasswordDecode	#####		9090	Unsigned 32

IOM/PTM module	AnInIOM 1	10	U4	8978	Integer 16
IOM/PTM module	AnInIOM 2	20	U5	8759	Integer 16
IOM/PTM module	AnInIOM 3	30	U6	8760	Integer 16
IOM/PTM module	AnInIOM 4	40	U7	8761	Integer 16

Remote communication

Note:
Refer to InteliCommunication guide for all additional information.

Internet connection

IL-NT controllers can be monitored from LiteEdit 3.0 over the Internet using Internet Bridge (IG-IB) connected to the controller RS232 port.

Recommended ISDN modem

- Askey TAS-200E
- ASUScom TA-220ST
- Develo Microlink ISDN i

Recommended GSM modem

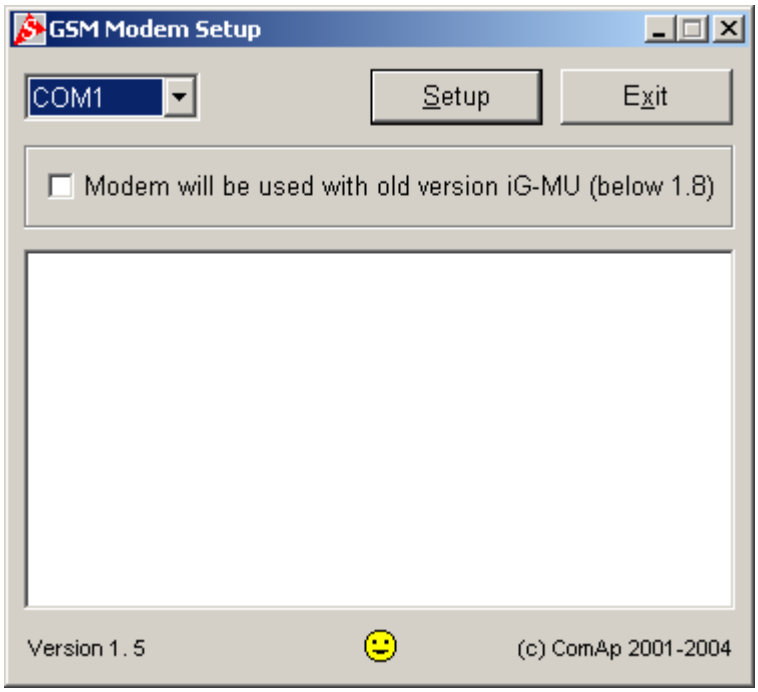
- Siemens M20, TC35, TC35i, ES75, MC39
- Wavecom M1200/WMOD2
- Wavecom - Maestro 20, dual 900/1800MHz.
- Wavecom – Fastrack M1306B, dual 900/1800 MHz (Fastrack M1206B is NOT recommended)
- FALCOM A2D, dual 900/1800MHz.

GSM Modem setup

Run following program for proper GSM setup, before you start to work with GSM modem. Program writes all the necessary AT commands to configure the GSM modem properly for use with IL-NT.

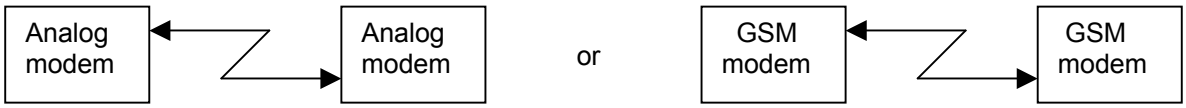
This program runs independently on LiteEdit:

- Start MS Windows -> Start -> Program files -> LiteEdit -> Gm_setup.exe.
- Select COM port
- Select IGS-NT or IG-MU unit
- Press Setup button
- Follow commands in GSM Modem Setup window



Typical real baud rate for GSM data communication is 80 to 90 Bps.

Hint:
It is strongly recommended to use the same type of modem on the both sides (IL-NT and PC) of connection.



Mobile SIM card setting

- Adjust SIM card in GSM modem following way:
- enable data connection (when required)
- no PIN code

Technical data

Power supply

Voltage supply	8-36V DC
Consumption	40-430mA depend on supply voltage and temperature
Consumption depends on supply voltage	0,104A at 8VDC 0,080A at 12VDC 0,051A at 24VDC 0,044A at 30VDC 0,040A at 36VDC
Allowed supply voltage drop-out:	100ms from min. 10V return to min. 8V
Battery voltage measurement tolerance	2 % at 24V

Hint:
For the supply voltage less than 7V the backlight of the display is switched off.
Short-term voltage drops (e.g. during the engine cranking) do not affect the operation at all.

Operating conditions

Operating temperature	-40...+70°C
Storage temperature	-30...+80°C
Protection front panel	IP65
Humidity	95% without condensation
Standard conformity	
Low Voltage Directive	EN 61010-1:95 +A1:97
Electromagnetic Compatibility	EN 50081-1:94, EN 50081-2:96 EN 50082-1:99, EN 50082-2:97
Vibration	5 - 25 Hz, ±1,6mm 25 - 100 Hz, a = 4 g
Shocks	a = 200 m/s^2

Low Temperature modification (default for MRS19)

LCD display normally limits IL-NT controllers (MRS10, MRS11, MRS15 and MRS16) operating temperature range to –20 °C - + 70 °C even if the other electronic components work in wider temperature range.

Internal preheating foil is mounted in IL-NT MRS19 (by default) or in other MRS controllers (as an option) as LT version to extend display operational temperature range.
Preheating starts at temperature below 5 °C and preheating power depends on temperature and power supply voltage.

Technical data

	IL-NT Standard	IL-NT MRS19 or IL-NT-xxxxx LT
Operating temperature	-20 °C...+70°C	-40 °C...+70°C
Storage temperature	-30 °C...+80°C	-30 °C...+80°C

Preheating foil increases controller current consumption

Controller consumption at	No preheating	Preheating at ambient temperature		
		0 °C	-20 °C	-40 °C
12VDC	80 mA	+75 mA	+210 mA	+325 mA
24VDC	51 mA	+31 mA	+100 mA	+175 mA

InteliLite LT works immediately after switch on at -30 °C and display becomes visible after a few minutes.

Dimensions and weight

Dimensions	180x120x55mm
Weight	450g

Generator

Nominal frequency	50-60Hz
Frequency measurement tolerance	0,2Hz

Current inputs

Nominal input current (from CT)	5 A
Load (CT output impedance)	< 0,1 Ω
CT input burden	< 0,2 VA per phase (In=5A)
Max. measured current from CT	10 A
Current measurement tolerance	2% from the Nominal current
Max. peak current from CT	150 A / 1s
Max. continuous current	12 A

Voltage inputs

Measuring voltage range	0 – 277 VAC phase to neutral 0 – 480 VAC phase to phase
Maximal measured voltage	340 VAC phase to neutral 600 VAC phase to phase
Input resistance	0.6 MΩ phase to phase 0.3 MΩ phase to neutral
Voltage measurement tolerance	2 % from the Nominal voltage
Overvoltage class	III / 2 (EN61010)

Binary inputs and outputs

Binary inputs

Number of inputs	7
Input resistance	4,2 kΩ
Input range	0-36 VDC
Switching voltage level for close contact indication	0-2 V
Max voltage level for open contact indication	8-36 V

Binary open collector outputs

Number of outputs	7
Maximum current	0,5 A
Maximum switching voltage	36 VDC

Analog inputs

Not electrically separated	
Number of inputs	3
Resolution	10 bits
Jumper selectable range	V, Ohm(default), mA
Maximal resistance range	2500 Ω
Maximal voltage range	2.5 V
Current range	0 – 20 mA
Input impedance	180 Ω for mA measuring
Input impedance	> 100 kΩ for V measuring
Resistance measurement tolerance	± 2 % ± 2 Ω out of measured value
Voltage measurement tolerance	± 1 % ± 1mV out of measured value

Current measurement tolerance	± 2.5 % ± 0,5mA out of measured value

Speed pick-up input

Type of sensor	magnetic pick-up (connection by shielded cable is recommended)
Minimum input voltage	2 Vpk-pk (from 4 Hz to 4 kHz)
Maximum input voltage	50 Veff
Minimum measured frequency	4 Hz
Maximum measured frequency	10 kHz (min. input voltage 6Vpk-pk)
Frequency measurement tolerance	0,2 %

D+ function

Max. D+ output current	300 mA
Guaranteed level for signal Charging OK	80% of supply voltage

CAN bus interface

Galvanically separated	
Maximal CAN bus length	200m
Speed	250kBd
Nominal impedance	120Ω
Cable type	twisted pair (shielded)

Following dynamic cable parameters are important especially for maximal 200 meters CAN bus length and 32 IS-COM units connected:

Nominal Velocity of Propagation	min. 75% (max. 4,4 ns/m)
Wire crosscut	min.0,25 mm^2
Maximal attenuation (at 1 MHz)	2 dB / 100m

Recommended Industrial Automation & Process Control Cables:
BELDEN (see http://www.belden.com):

- 3082A DeviceBus for Allen-Bradley DeviceNet
- 3083A DeviceBus for Allen-Bradley DeviceNet
- 3086A DeviceBus for Honeywell SDS
- 3087A DeviceBus for Honeywell SDS
- 3084A DeviceBus for Allen-Bradley DeviceNet
- 3085A DeviceBus for Allen-Bradley DeviceNet
- 3105A Paired EIA Industrial RS485 cable

LAPP CABLE (see http://www.lappcable.com)

- Unitronic BUS DeviceNet Trunk Cable
- Unitronic BUS DeviceNet Drop Cable
- Unitronic BUS CAN
- Unitronic-FD BUS P CAN UL/CSA

IL-NT RS232 interface

Maximal distance	10m
Speed	19.2kBd (STD) 9.6kBd (MODBUS)

Recommend external converter:
ADVANTECH – ADAM 4520: RS232 to RS422/485 converter, DIN rail, automatic RS485 bus supervision, no external data flow control signals, galvanic isolated.

Recommended internal converter:

ADVANTECH – PCL-745B or PCL745S : Dual port RS422/485 Interface card, automatic RS485 bus supervision, no external data flow control signals, galvanic isolated

IL-NT AOUT8 interface (optional card)

Plugs into IL-NT controller EXTENSION MODULE port.

Number of PWM outputs	8
PWM frequency	250Hz
Maximum current	0.5 A
Maximum switching voltage	36 VDC
Output resistance	1Ω
Resolution	10 bits

IGS-PTM

Voltage supply	8-36V DC
Consumption	0,1A depend on supply voltage
Mechanical dimensions:	40 x 95 x 45 mm , DIN rail (35 mm) mounted
Interface to controller	CAN
Binary inputs and outputs	see IG-IOM
Analog output	see IG-IOM

Analog inputs

Not electrically separated	
Number of inputs	4
Resolution	10 bits
Maximal resistance range	0 – 250 Ω
Maximal voltage range	0 – 100 mV
Maximal current range	0 – 20 mA
Resistance measurement tolerance	1 % ± 2 Ω out of measured value
Voltage measurement tolerance	1,5 % ± 1mV out of measured value
Current measurement tolerance	2,5 % ±0,5mA out of measured value

IGL-RA15

Power supply

Voltage supply	8-36V DC
Consumption	0,35-0,1A (+1A max horn output) Depend on supply voltage

Operating conditions

Operating temperature	-20..+70°C
Storage temperature	-40..+80°C
Protection front panel	IP65

Dimensions and weight

Dimensions	180x120x55mm
Weight	950g

Horn output

Maximum current	1 A
Maximum switching voltage	36 VDC

IG-IB

Voltage supply	8-36V DC
Consumption	0,1A depend on supply voltage
Mechanical dimensions:	95 x 96 x 43 mm , DIN rail (35 mm) mounted
Interface to controller	RS232
Interface to modem	RS232
Interface to Ethernet	RJ45 (10baseT)
Operating temperature	-30..+70°C
Storage temperature	-30..+70°C