

InteliLite<sup>NT</sup>

# ***InteliLite NT<sup>®</sup> MRSx AMFx***

## ***Modular Gen-set Controller***

Compact Controller for Stand-by Operating Gen-sets

(IL-NT-MRS3,4-AMF8,9)

SW version 2.0, June 2012



## **Reference Guide**



# Table of Contents

Table of Contents .....	2
General Guidelines .....	4
What describes this manual? .....	4
!! Warnings !! .....	4
Symbols.....	4
Text .....	5
Dangerous voltage .....	5
Adjust set points .....	5
General Description .....	6
Description of the controller system (with all options) .....	6
Software and Hardware Compatibility .....	6
What is in the package? .....	6
IL-NT RS232 Communication module .....	7
IL-NT RS232-485 Communication module .....	10
IL-NT S-USB Service USB communication module.....	10
IL-NT AOUT8 Gauge driver module.....	11
IL-NT BIO8 Hybrid binary input/output module .....	12
IL-NT RD Remote display software.....	13
IG-IB Internet bridge.....	14
IL-NT-GPRS GSM and GPRS plug-in modem .....	14
Programming of IL-NT controller .....	14
User Interface .....	15
IL-NT Terminals .....	16
IL-NT Terminals.....	16
Installation.....	19
Mounting.....	19
Recommended Wiring .....	20
AMF – Wiring Diagram .....	20
MRS – Wiring Diagram .....	21
Stand-by Applications .....	22
Contactors (set point MCB Logic = “CLOSE-OFF”).....	22
Getting Started .....	23
How to install .....	23
Current measurement .....	26
Voltage measurement .....	26
Analog inputs.....	29
Binary inputs and outputs.....	36
Inputs and Outputs .....	37
Binary Inputs – List.....	37
Binary Outputs - List.....	38
Analog Inputs .....	40
Analog Outputs .....	41
Setpoints.....	42
Basic Settings.....	42
Engine Protect.....	44
Gener Protect.....	45
^AMF Settings (AMF 8, 9 only) .....	47
SMS/E-Mail .....	47
Fixed application setting.....	48
^Fixed AMF settings.....	51
*ECU-controlled engine support.....	53
Values read from ECU .....	54
Diagnostic messages read from ECU .....	54
Analog inputs.....	55
Connection description.....	55

Sensor Specification .....	58
Default sensor curves .....	58
Function Description .....	59
MAN Mode .....	59
AUT Mode .....	60
Alarm Management .....	62
Sensor Fail (FLS) .....	62
Warning (WRN) .....	62
Breaker open and cooling (BOC) .....	62
Shut down (SD) .....	63
^Mains failure (MF) .....	63
Voltage phase sequence detection .....	63
Gen-set Operation States .....	64
List of possible events .....	66
History file .....	68
Init Screens .....	70
Customer Logo screen .....	70
Firmware Init screen .....	70
Language screen .....	70
User Interface screen .....	70
Remote Control and Data Logging .....	71
Direct connection to the PC .....	71
PC software – LiteEdit .....	71
Modbus protocol .....	71
IL-NT-RD Remote display software .....	75
General description .....	75
Warning ! .....	75
IL-NT-RD Software installation .....	75
IL-NT-RD Wiring .....	76
Function description .....	79
SW compatibility .....	79
Technical Data .....	80
Inputs/Outputs overview .....	80
Generator protections .....	80
Power supply .....	80
Operating conditions .....	81
Dimensions and weight .....	81
Mains and generator .....	81
Binary inputs and outputs .....	82
Analog inputs .....	82
D+ terminal .....	82
*CAN bus interface .....	82
IL-NT RS232 interface (optional card) .....	83
IL-NT RS232-485 interface (optional card) .....	83
IL-NT S-USB interface (optional card) .....	83
IL-NT AOUT8 interface (optional card) .....	83
IL-NT BIO8 interface (optional card) .....	84
IG-IB .....	84

# General Guidelines

## *What describes this manual?*

---

### IMPORTANT SAFETY INSTRUCTIONS

**SAVE THESE INSTRUCTION** - This manual contains important instructions for IGS-NT controllers family that shall be followed during installation and maintenance of the Intelli NT genset controllers.

It is intended for use by Gen-set control panel builders and for everybody who is concerned with installation, operation and maintenance of the gen-set.

This manual describes „MRS3/4 and AMF8/9“ software which is designed for single set and stand-by applications.

What is the purpose of the manual?

This manual provides general information how to install and operate IntelliLite NT MRS3/4 or AMF8/9 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

IntelliLite 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 and MCB CLOSE/OPEN

Because of large variety of IntelliLite<sup>NT</sup> parameters settings, it is not possible to describe any combination. Some of IntelliLite 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.

### IntelliLite controller SW and HW versions compatibility

Be aware that IL-NT SW version 1.2.1 and older is not possible to use with IL-NT HW version 1.3 and newer!!! Software IL-NT 1.3 is compatible with IL-NT hardware version 1.3 and older.

## **Symbols**

---

Symbols used in this manual:



Grounding  
point symbol




AC voltage  
symbol



DC voltage  
symbol

## Text

<b>PAGE</b>	(Capital letters in the frame) buttons on the front panel
<i>Break Return</i>	(Italic) set points
<b>Generator protections</b>	(Bold) Set point group
REMOTE START/STOP	(Capital letters) binary inputs and outputs
*Something	(Symbol * before text) valid only for IL-NT MRS4 and AMF9
^Something	(Symbol ^ before text) valid only for IL-NT AMF8 and AMF9
	(icon) Setpoint is password protected

### 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-AMF9 firmware and IL-NT AMF9 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.

### WARNING – VERY IMPORTANT !!!

Every time you want to disconnect following IntelliLite<sup>NT</sup> controller terminals:

- Mains voltage measuring and / or
- Binary output for MCB control

Switch IntelliLite to MAN or disconnect the Binary outputs Starter and Fuel to avoid unexpected automatic start of genset and GCB closing.

Hint: Applications works without MCB and GCB feedback.

## !!! CAUTION !!!

### ***Dangerous voltage***

In no case touch the terminals for voltage and current measurement!  
Always connect grounding terminals!  
In any case do not disconnect IntelliLite<sup>NT</sup> 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<sup>NT</sup> MRS3/4, AMF8/9 is a comprehensive AMF-controller for single generating sets and sets operating in stand-by mode. IL-NT AMF9 features extended support of electronic engines.

InteliLite<sup>NT</sup> 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<sup>NT</sup> 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.

Gen-set C.B. is controlled by binary output but works without feedback signal. Mains C.B. works similarly.

InteliLite<sup>NT</sup> provides gas engine support without ventilation.

The key feature of InteliLite<sup>NT</sup> is its easy-to-use operation and installation. Predefined configurations for typical applications are available as well as user-defined configurations for special applications.

## ***Software and Hardware Compatibility***

---

It is possible to use HW from higher type of controller for SW of lower type of controller. The table below describes software and hardware compatibility.

Software	Compatible Hardware
IL-NT MRS3	IL-NT MRS10
IL-NT MRS4	IL-NT MRS15
IL-NT AMF8	IL-NT AMF20
all IL-NT AMF/MRS	IL-NT AMF25

## ***What is in the package?***

---

Accessories	Description	Optional / Obligatory
IL-NT AMF/MRS	InteliLite <sup>NT</sup> central unit	Obligatory
IL-NT-RS232	RS232 communication card	Optional
IL-NT-RS232-485	RS232 and RS485 communication card	Optional
IL-NT-S-USB	S-USB service USB card	Optional
IL-NT AOUT8	Gauge driver card	Optional
IL-NT-BIO8	Configurable I/O plug-in card	Optional
IL-NT-GPRS	GSM and GPRS plug-in modem	Optional
**IL-NT RD	Remote display software	Optional
AT -LINK-CONV	Service programming RS232 interface	Optional

\*\*Remote display for IL-NT controllers uses standard IL-NT controller with Remote display software.

Extension modules IGL-RA15 - Remote annunciator and IG-IOM/PTM - I/O extension module are not supported in IL-NT MRS3/4 and IL-NT AMF8/9.

### ***Hint:***

For detailed information about extension modules used with IL-NT controllers, please see the IL-NT-Accessory Modules manual.

## IL-NT RS232 Communication module

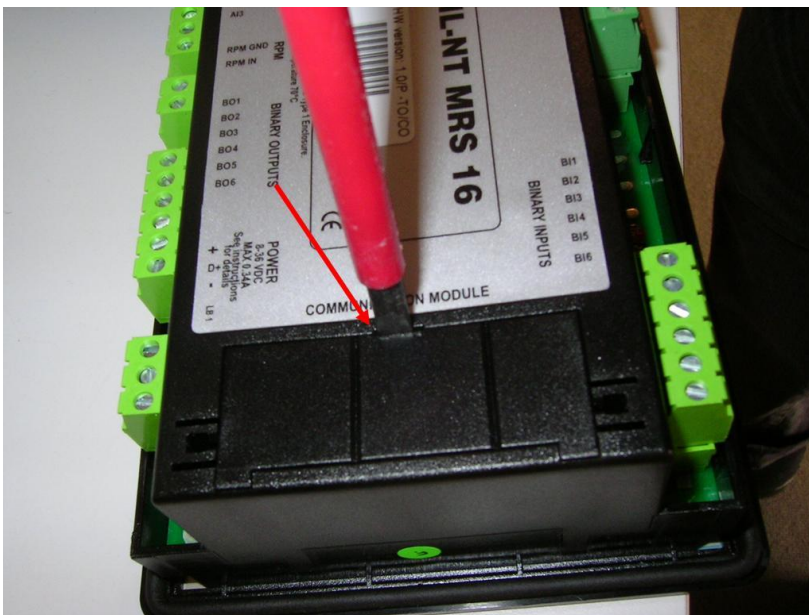
IL-NT RS232 is optional plug-in card to enable IntelliLite<sup>NT</sup> for RS232 communication. This is required for computer or Modbus connection. Card inserts into expansion slot back on the controller. To insert the module, you must open the cover first (use screwdriver to open) and then insert the module into slot. Once you have insert it, the module will snap under plastic teeth. It is supposed to be installed permanently. Should you need to remove it, the safest way is to remove whole back cover and than remove module manually.

How to install RS 232 communication module:

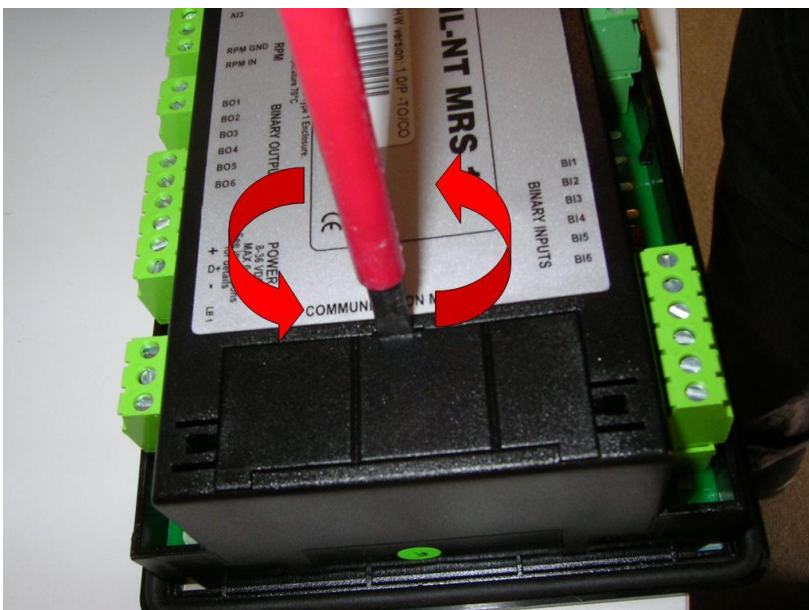
### Hint:

The following procedure is analogic also for other communication modules.

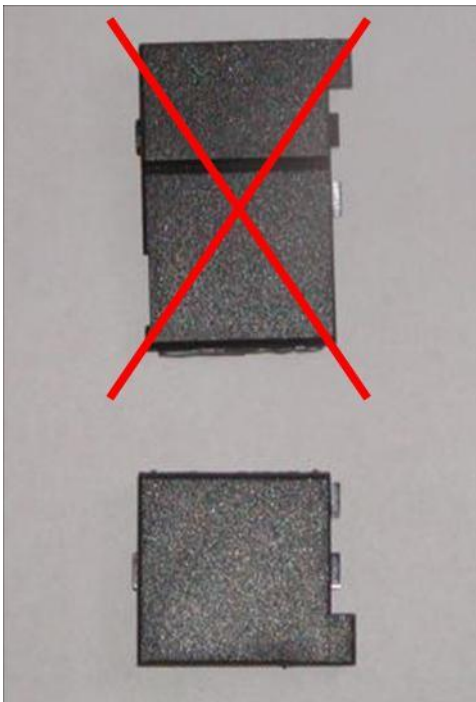
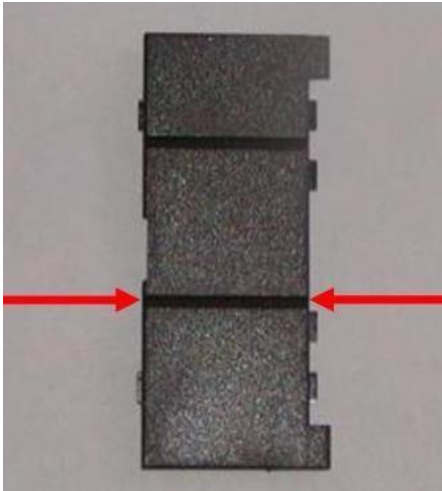
1. Insert a screwdriver into the slot of the cover.



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.



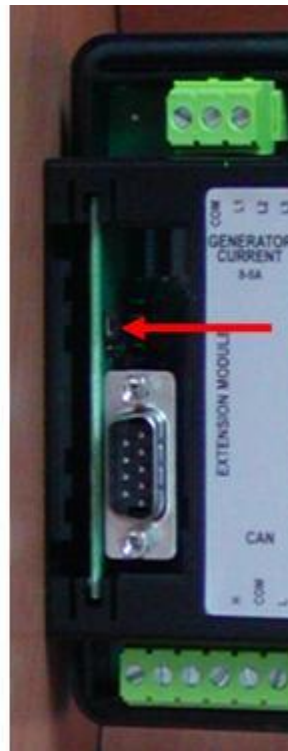
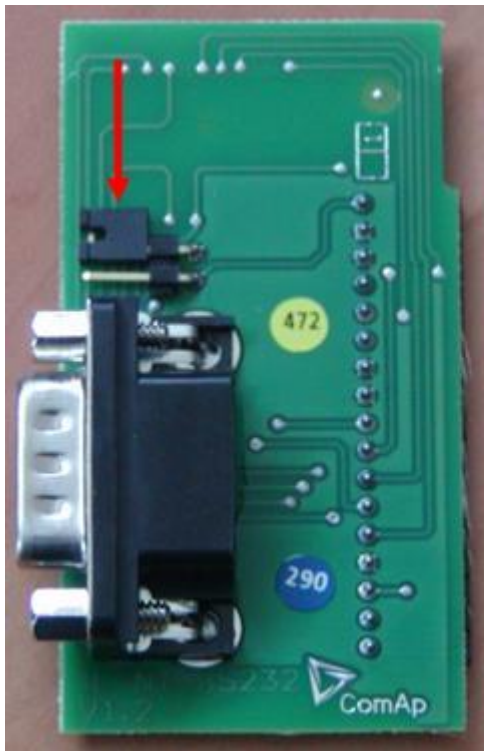


6. Plug RS 232 communication module into the slot of the controller.
7. Put back the small cover.



***Hint:***

When you insert RS 232 communication module, the boot jumper is hidden. For that reason we recommend to use RS 232 communication module with the boot jumper placed on it. See pictures below:

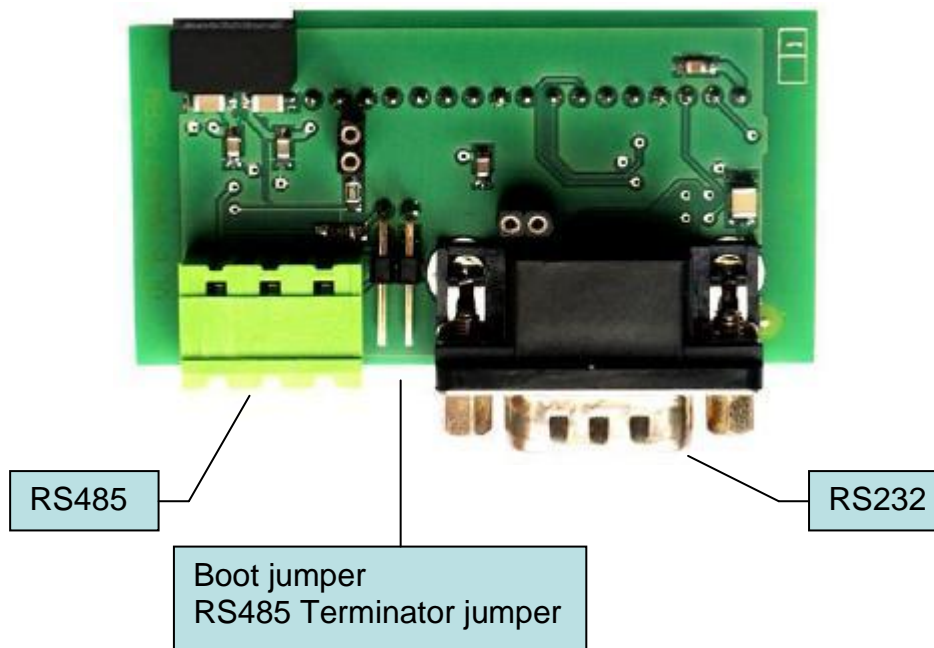


RS 232 communication module with the boot jumper.

## ***IL-NT RS232-485 Communication module***

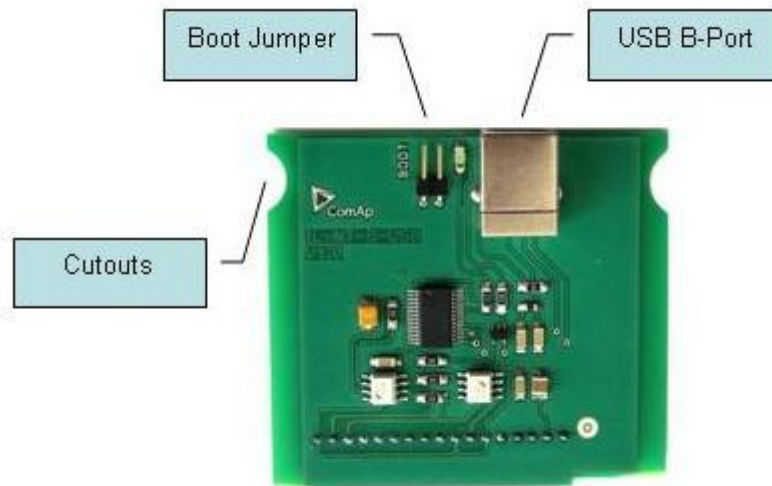
IL-NT RS232-485 is optional plug-in card to enable IntelliLite<sup>NT</sup> the RS232 and RS485 communication. This is required for computer or Modbus connection. Card inserts into expansion slot back on the controller. The IL-NT RS232-485 is a dual port module with RS232 and RS485 interfaces at independent COM channels. The RS232 is connected to COM1 and RS485 to COM2.

To insert the module, please follow the instructions for IL-NT RS232 module, procedure is analogous. You must open the cover first (use screwdriver to open) and then insert the module into slot. Once you have insert it, the module will snap under plastic teeth. It is supposed to be installed permanently. Should you need to remove it, the safest way is to remove whole back cover and than remove module manually.



## ***IL-NT S-USB Service USB communication module***

IL-NT S-USB is optional plug-in card to enable IntelliLite<sup>NT</sup> communication via USB port. This is required for computer or Modbus connecting. Card inserts into expansion slot back on the controller. To insert the module, please follow the instructions for IL-NT RS232 module, procedure is analogous. You must open the cover first (use screwdriver to open) and then insert the module into slot. Once you have inserted it, part of the module will remain over plastic box. It is supposed to be used as a service tool. When you need to remove it, grab module in cutouts and pull it up manually.



***Hint:***

Use the shielded USB A-B cable with this module! Recommended is ComAp cable – Order code: “USB-LINK CABLE 1.8M”.

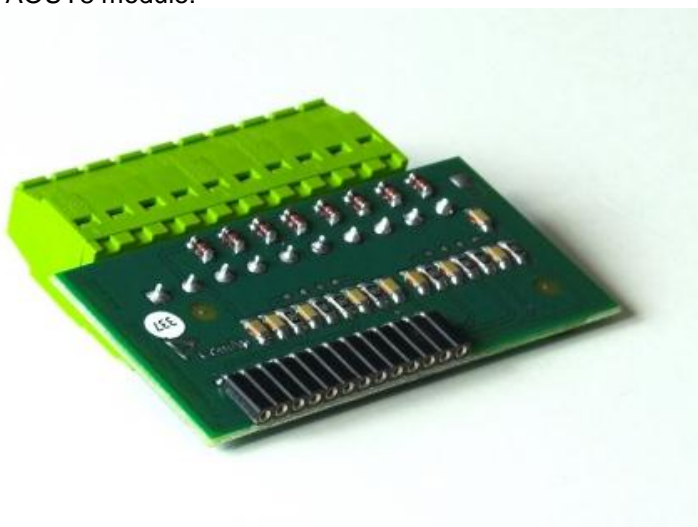
## ***IL-NT AOUT8 Gauge driver module***

IL-NT AOUT8 is optional plug-in card. Through this card controller can drive up to 8 VDO style industrial/automotive gauges. Noncompensated gauges like 0-10V or 0-20mA are not supported. Gauge type and value are configured in LiteEdit software. Any analog value from controller may be shown in that way.

To insert the module, you must open the cover first (use screwdriver to open) and then insert the module into slot. Once you have insert it, the module will snap under plastic teeth. It is supposed to be installed permanently. Should you need to remove it, the safest way is to remove whole back cover and than remove module manually.

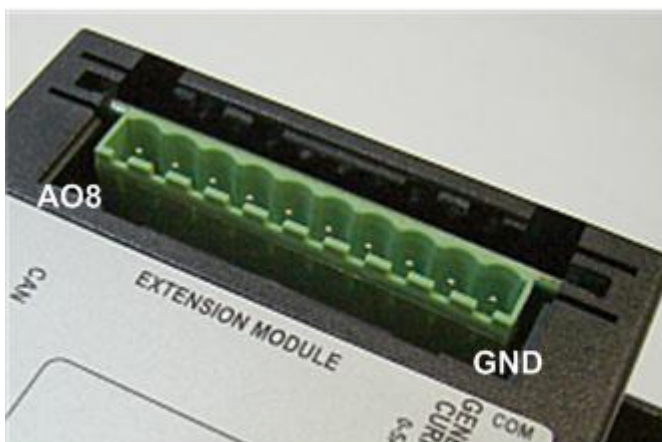
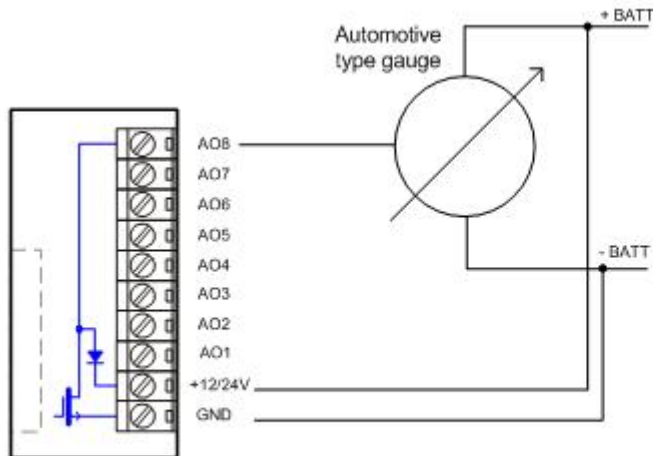
Installing IL-NT AOUT8 module is similar to installing RS 232 module. The difference is that module fits to “extension module” slot and after installing IL-NT AOUT8 you do not put back the small cover.

IL-NT AOUT8 module:



:

## Typical wiring

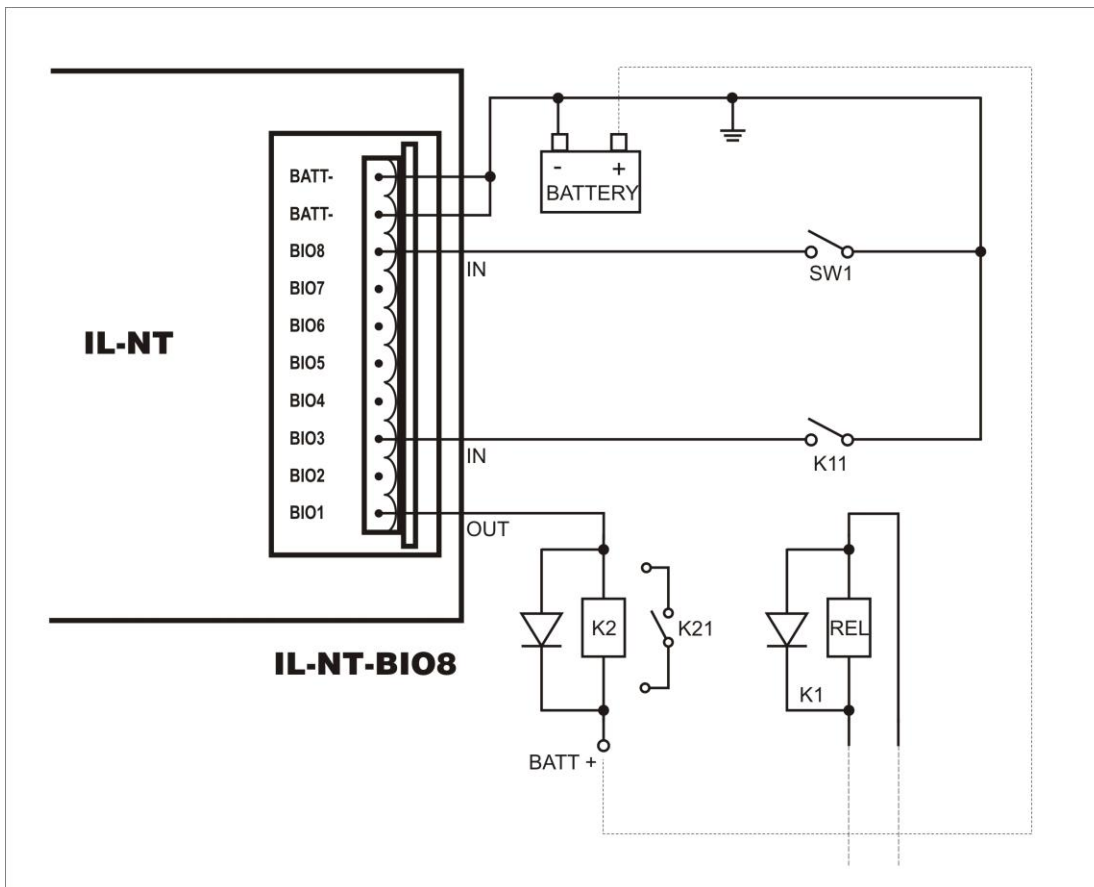
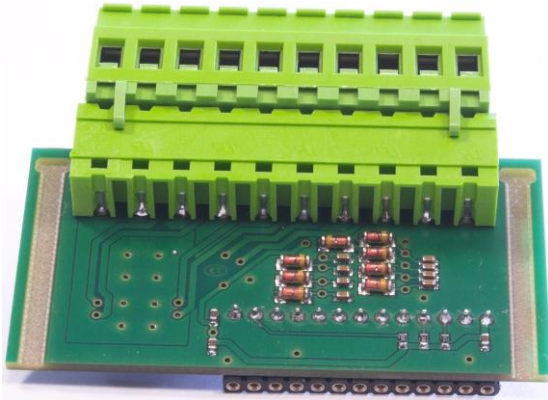


## ***IL-NT BIO8 Hybrid binary input/output module***

IL-NT BIO8 is optional plug-in card. Through this card controller can accommodate up to 8 binary inputs or outputs. In LiteEdit configuration is possible to easily choose if particular I/O will be binary input or output.

To insert the module, you must open the cover first (use screwdriver to open) and then insert the module into slot. Once you have insert it, the module will snap under plastic teeth. It is supposed to be installed permanently. Should you need to remove it, the safest way is to remove whole back cover and than remove module manually.

Installing IL-NT BIO8 module is similar to installing RS 232 module. The difference is that module fits to "extension module" slot and after installing IL-NT BIO8 you do not put back the small cover.



**Hint:**

Please see chapter [IL-NT BIO8 interface \(optional card\)](#) for technical details.

## **IL-NT RD Remote display software**

IL-NT RD is remote display software for a controller. Remote display provides the same control and monitoring functions as controller itself. Remote display for IL-NT controllers uses standard IL-NT controller with Remote display software. No further programming of the display is required – unit is self configurable from the main controller. It is connected with the controller via IL-NT-RS232 communication modules using RS232 line. Longer distances (up to 1200m) are possible using IL-NT-RS232-485 communication module or when RS232/RS485 converters are used.

The IL-NT RD hardware type should fit to the master IL-NT.

**Hint:**

Please see the “IL-NT-RD Remote display software” chapter for more details.

## IG-IB Internet bridge

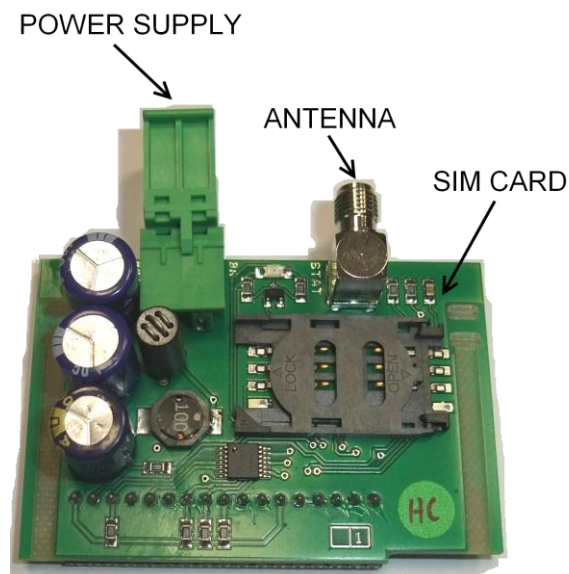
---

IG-IB Internet bridge enables IntelliLite<sup>NT</sup> for Ethernet/Internet communications. It is connected to controller via RS232 line.

See the IntelliCommunication guide for further details.

## IL-NT-GPRS GSM and GPRS plug-in modem

---



IL-NT-GPRS is a modem plug-in module which supports GPRS internet connection and also dial-up connection. This module incorporates support for AirGate technology for plug-and-play connection via GPRS. The module is usually used for connection to remote monitoring and controlling systems, WebSupervisor (<http://websupervisor.comap.cz>) or LiteEdit PC software. The module is capable of sending alarm SMS based on settings in the SMS/Email setpoint group.

**Hint:**

More information is available on the ComAp webpage <http://www.comap.cz/products/detail/IL-NT-GPRS>.

**Hint:**

IL-NT-GPRS module in MRS 3,4, and AMF 8,9 controllers supports only SMS! AirGate is not supported.

## Programming of IL-NT controller

---

Programming is possible only in MAN mode when the engine is not running.

**Hint:**

For more information on programming, see LiteEdit Reference Guide.

# User Interface

Since IL-NT 1.3 SW there is an interchangeable User Interface on controller. It allows two different modes of displaying controller menu.

The first mode called USER is dedicated for users who prefer easy function and need only monitor actual values of engine and generator, see alarms or change language settings.

Second mode is called ENGINEER and it is dedicated for advanced users, who desire to change the settings of controller and monitor all values

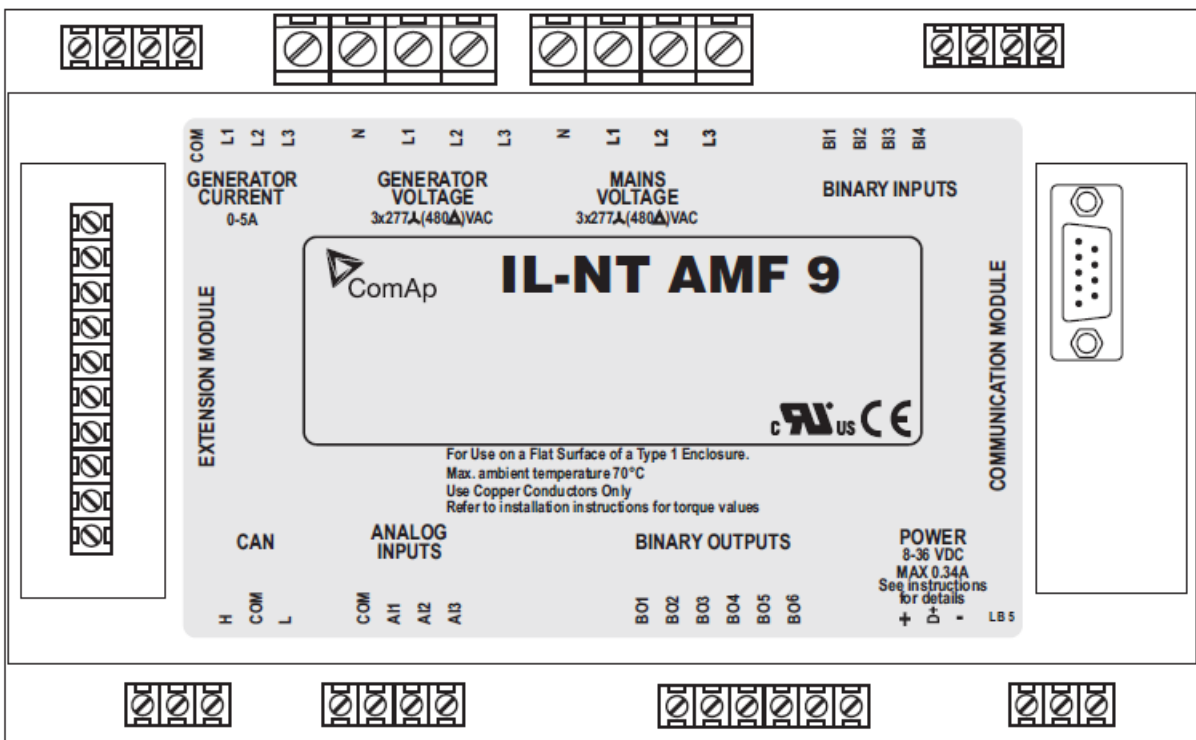
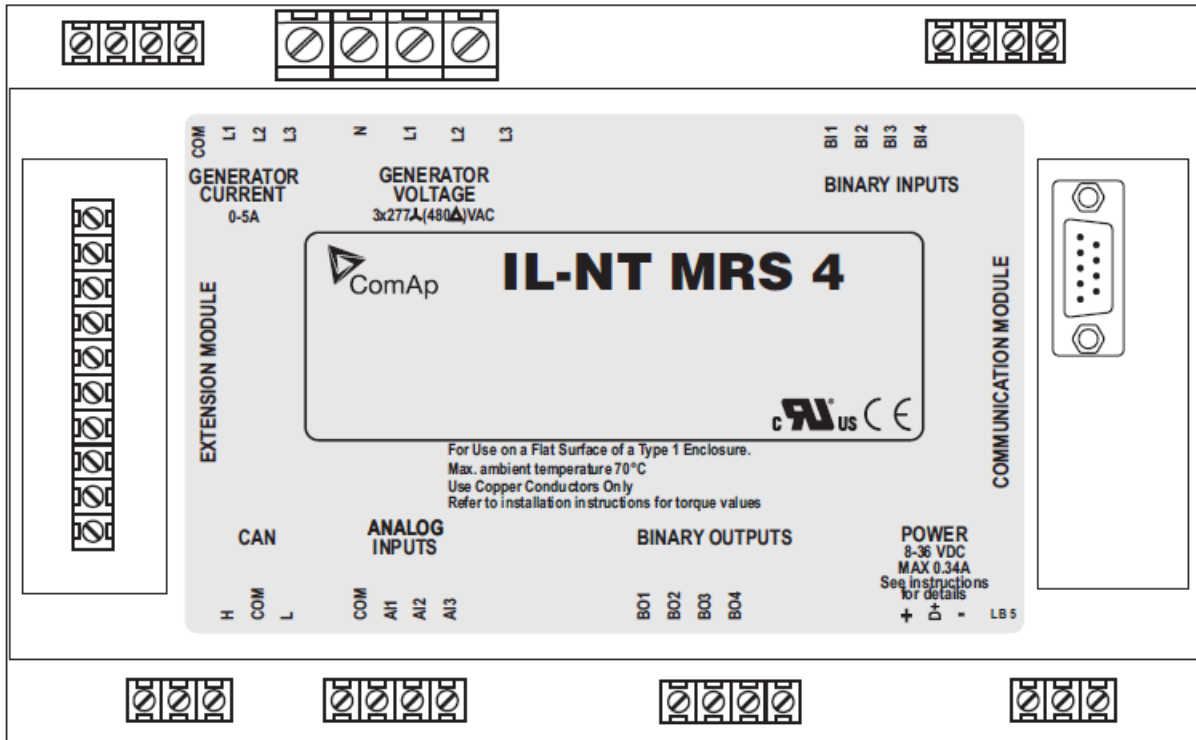
Changing the mode of User Interface is possible from default measuring screen of controller by simultaneous pressing the ENTER and PAGE button and then press again PAGE. On screen will be displayed the choice of two different User Interfaces.

**Please see latest IL-NT Operator Guide for detailed description.**

# IL-NT Terminals

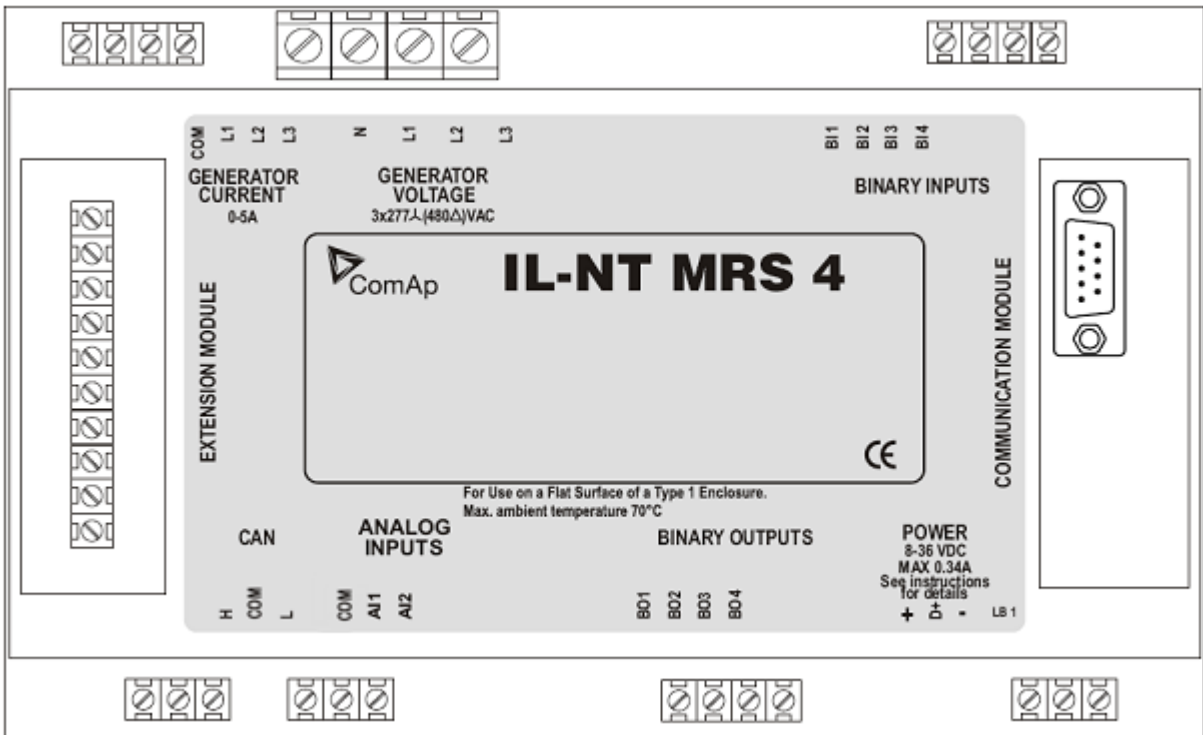
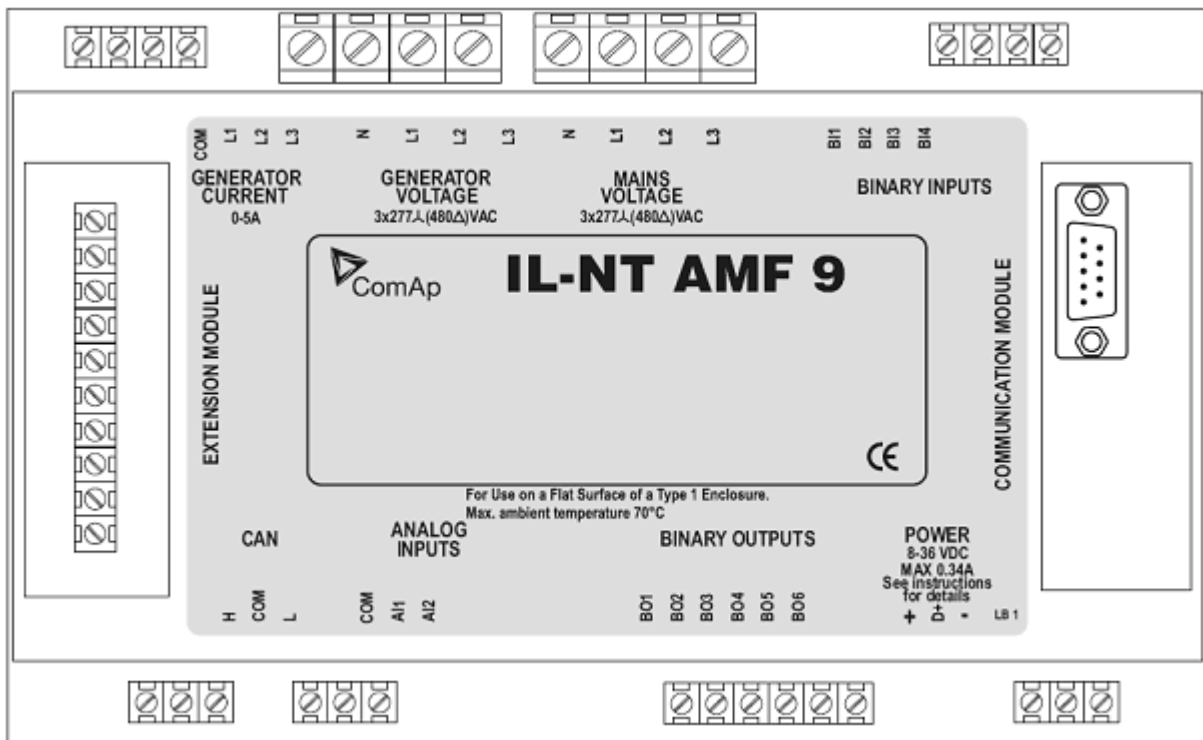
## IL-NT Terminals

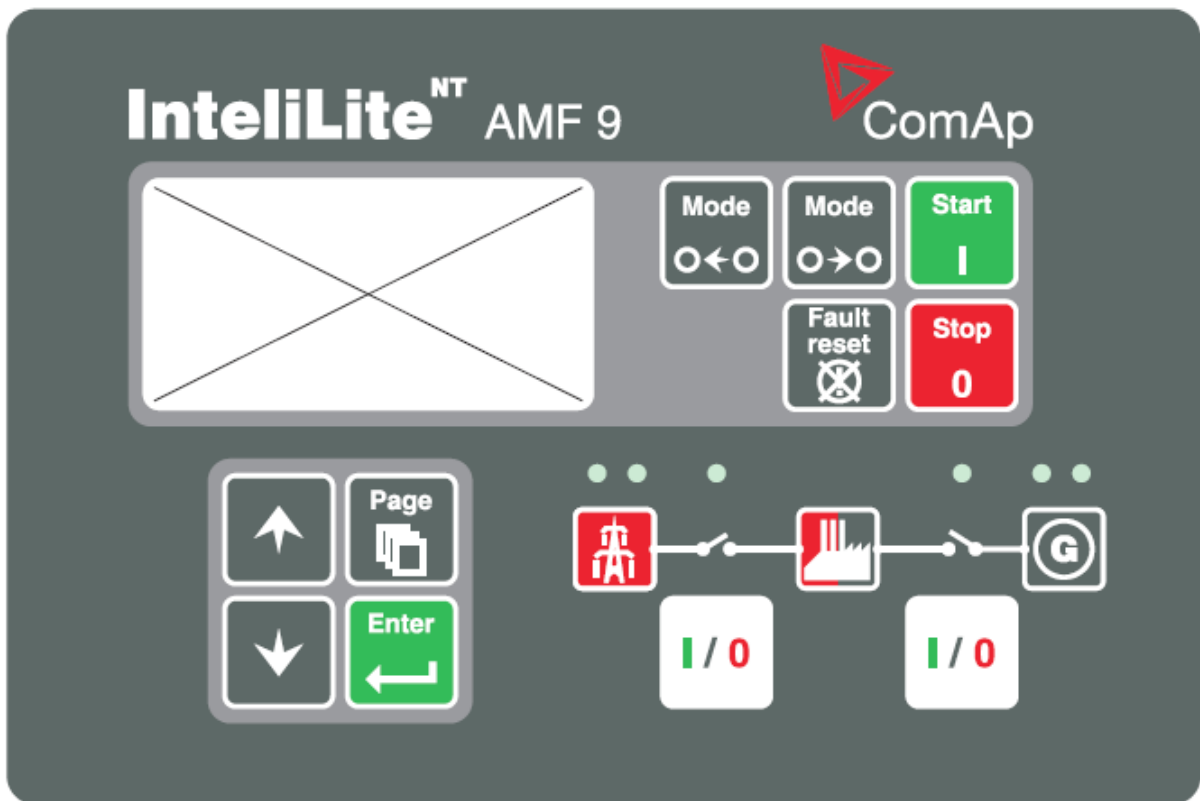
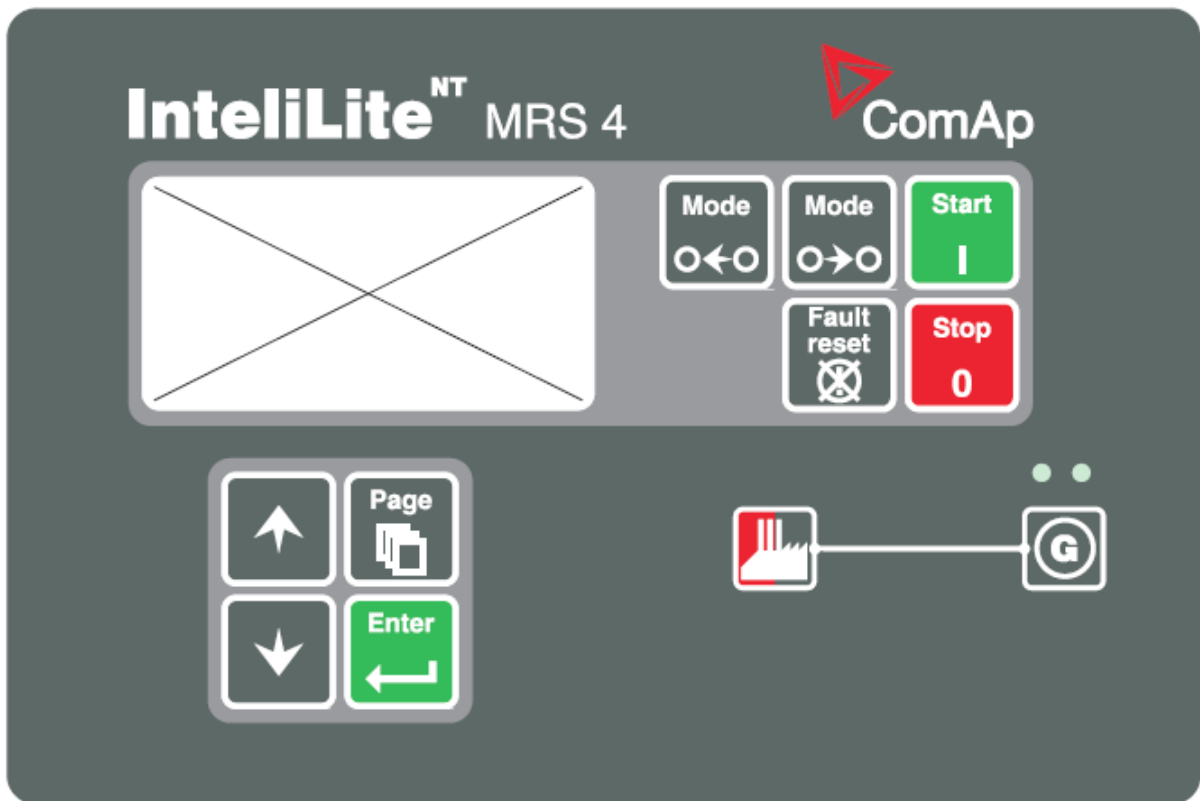
since HW version 1.5





HW version 1.3

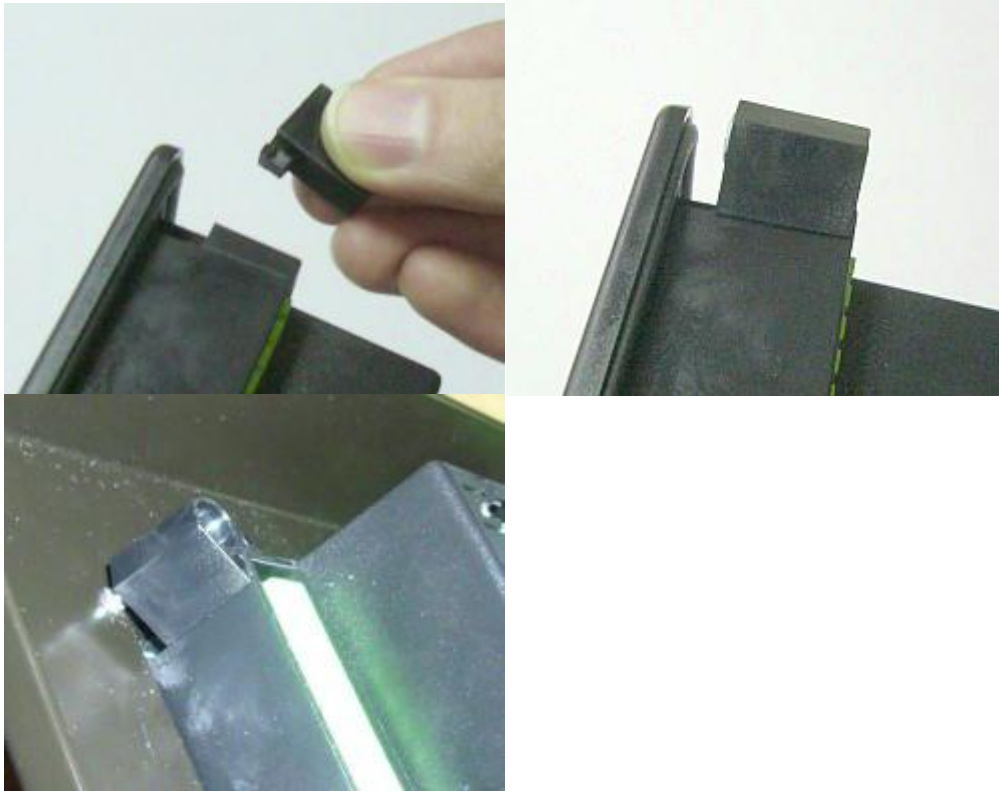




# Installation

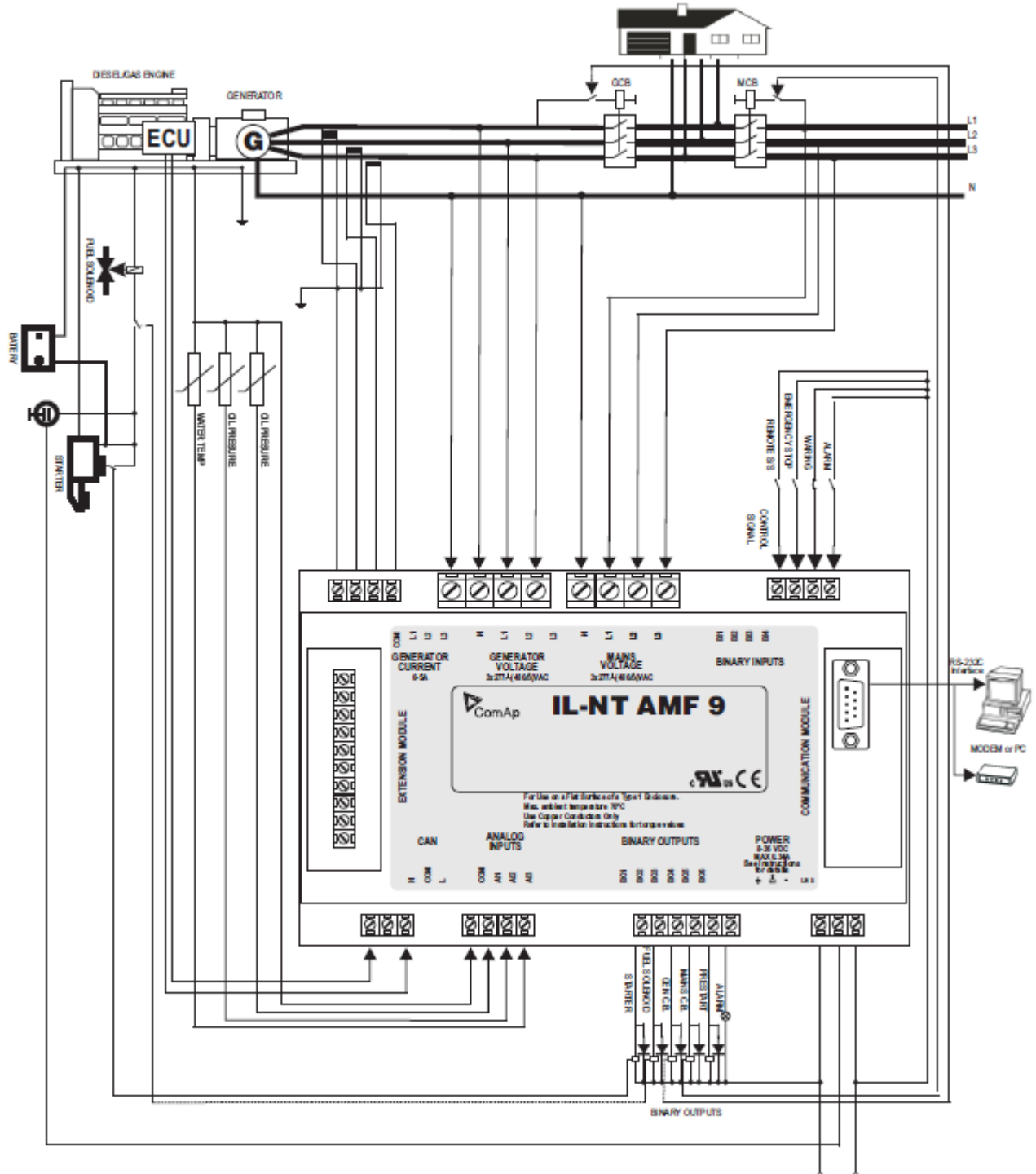
## *Mounting*

The controller is to be mounted onto the switchboard door. Requested cutout size is 175x115mm. Use the screw holders delivered with the controller to fix the controller into the door as described on pictures below.

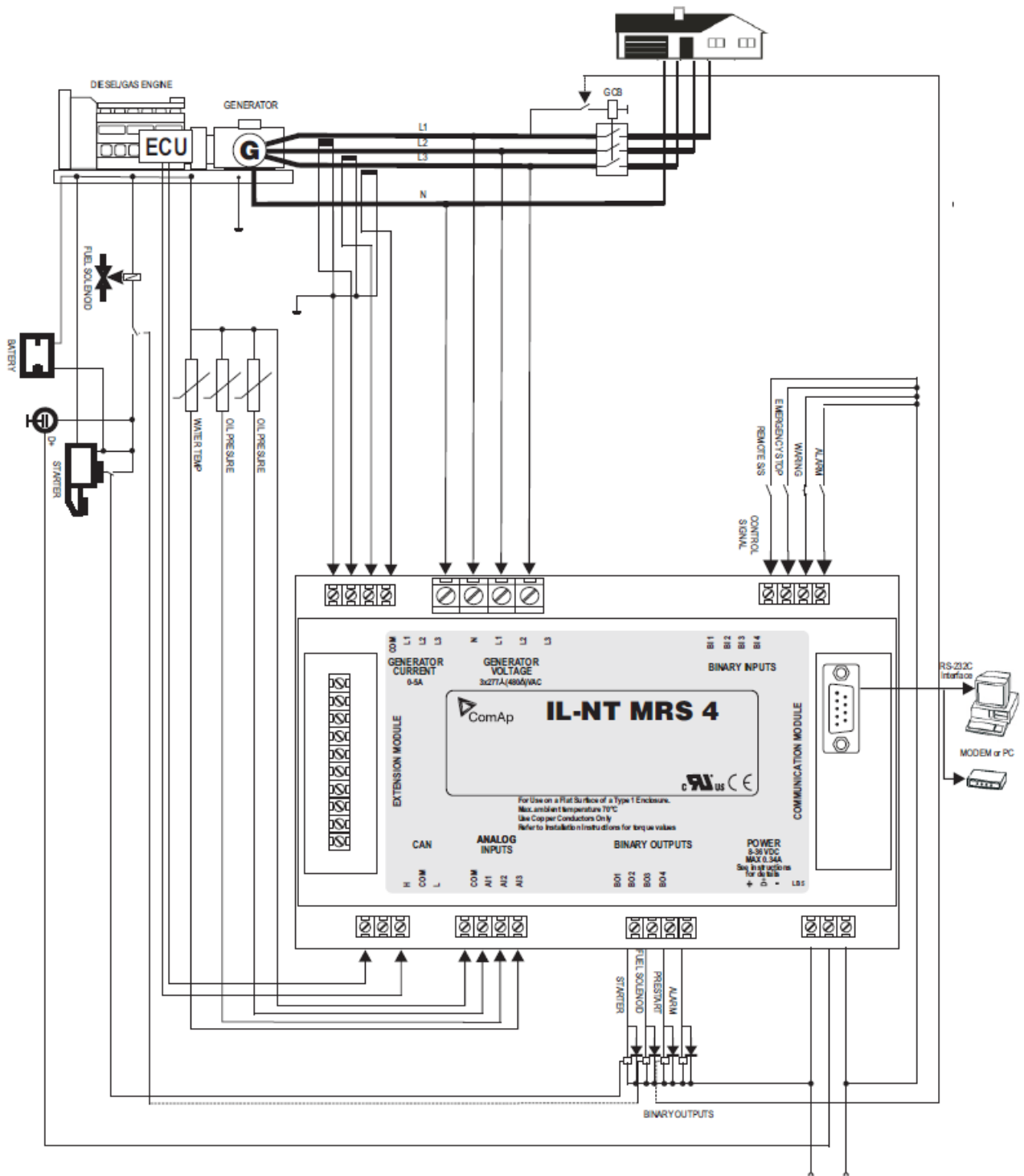


# Recommended Wiring

## AMF – Wiring Diagram



## MRS – Wiring Diagram

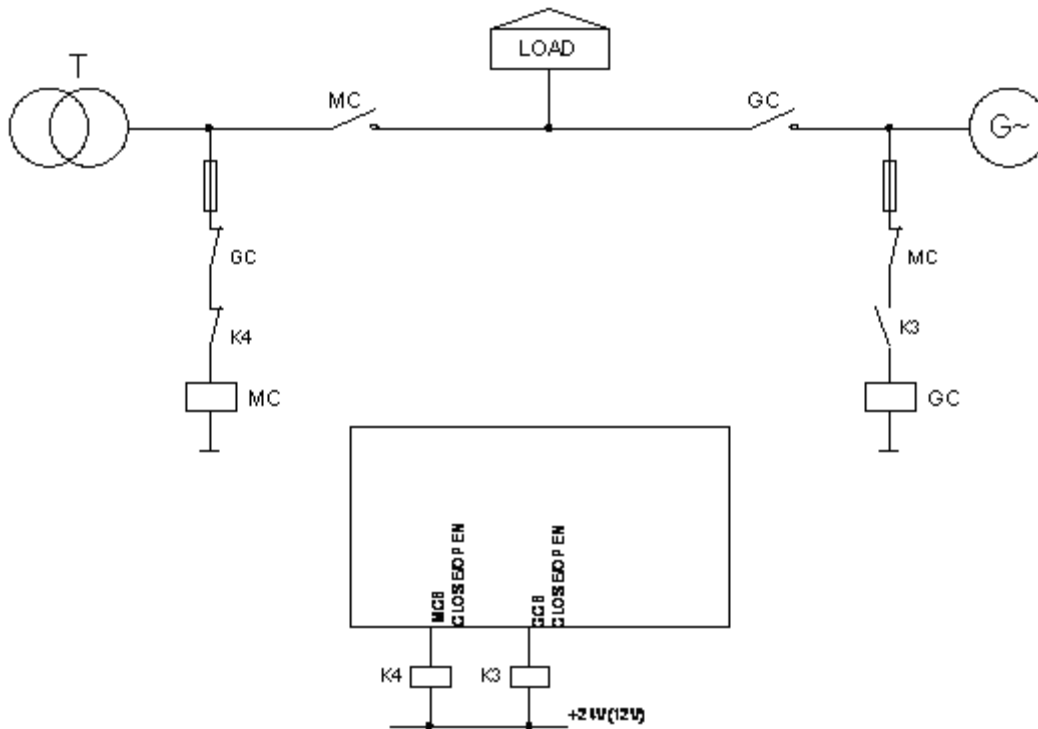


**Hint:**

MCB and GCB is recommended to be mechanically interlocked.  
 It is possible to start Volvo and Scania engines via CAN bus. See [Engines started via CAN bus.](#)  
 If D+ function is not used connect the D+ terminal to battery positive.

# Stand-by Applications

**Contactor (set point MCB Logic = "CLOSE-OFF")**



**Hint:**

MCB logic preset value is CLOSE-OFF: The output is closed when the MCB is requested to be open (inverted, negative logic).

# Getting Started

## *How to install*

---

### General

To ensure proper function:

Use grounding terminals.

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.

### Wiring

Tightening torque, allowable wire size and type, for the Field-Wiring Terminals:

Based on terminal type:

PA256:



Specified tightening torque 0,5Nm (4,4 In-lb)

2EDGK:



Specified tightening torque 0,4Nm (3,5 In-lb)

For field type terminals:

Use only diameter 2,0-0,5mm (12-26AWG) conductor, rated for 75°C minimum.

For Mains(Bus) Voltage and Generator Voltage terminals

Use only diameter 2,0-0,5mm (12-26AWG) conductor, rated for 90°C minimum.

Use copper conductors only.

### Grounding

To ensure proper function:

The shortest possible piece of wire should be used for controller grounding.

Use cable min. 2,5mm<sup>2</sup>

Brass M4x10 screw with star washer securing ring type grounding terminal shall be used.

The negative battery terminal has to be properly grounded.

### Power supply

To ensure proper function:

Use min. power supply cable of 1.5mm<sup>2</sup>

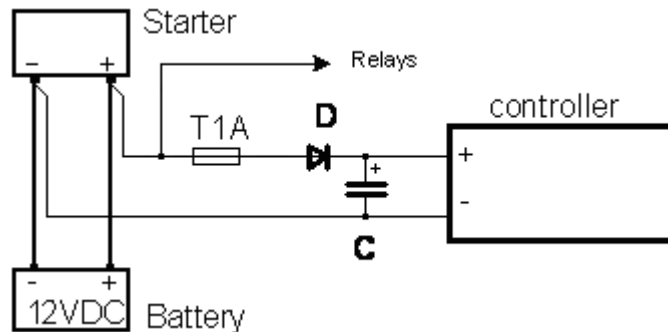
Maximum continuous DC power supply voltage is 36VDC. Maximum allowable power supply voltage is 39VDC. The IntelliLite's power supply terminals are protected against large pulse power disturbances. When there is a potential risk of the controller being subjected to conditions outside its capabilities, an outside protection device should be used.

#### Hint:

The IntelliLite controller should be grounded properly in order to protect against lightning strikes!!

The maximum allowable current through the controller's negative terminal is 4A (this is dependent on binary output load).

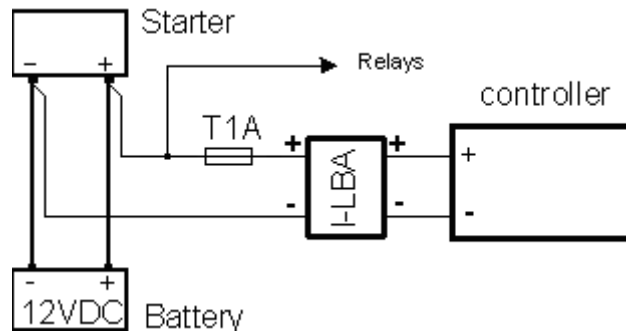
For the connections with 12VDC power supply, the IntelliLite<sup>NT</sup> includes internal capacitors that allow the controller to continue operation during cranking if the battery voltage dip occurs. If the voltage before dip is 10V, after 100ms the voltage recovers to 7 V, the controller continues 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 or I-LBA module:



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 Low Battery Adaptor module:



The I-LBA module ensures min. 350ms voltage dip under following conditions: RS232 and other plug-in module is connected.

Voltage before dip is 12V and after 350ms the voltage recovers to min. allowed voltage 5V.

The I-LBA enables controller operation from 5VDC (for 10 to 30 sec).

The wiring resistance from battery should be up to 0.1 Ohm for I-LBA proper function.

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 .

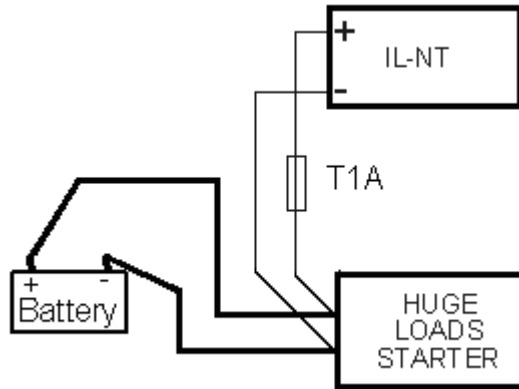
## Power supply fusing

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.

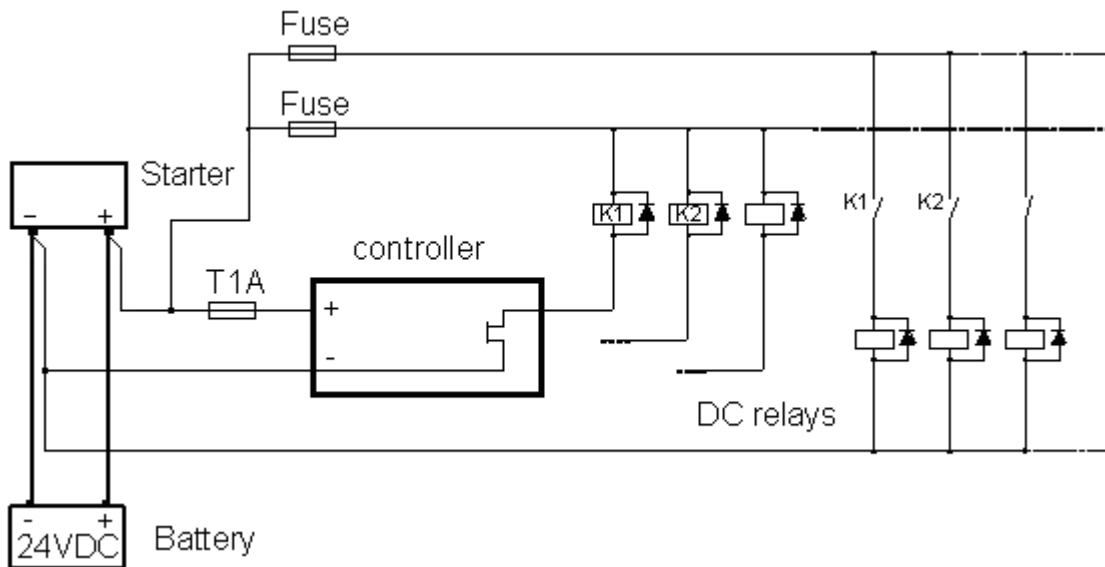
Recommended fuse (not fast) type - T1A. Not fast due to internal capacitors charging during power up.





### 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.



### RPM reading

RPM are readed from frequency of generator voltage. The frequency and consequently the RPM are readed when generator voltage is higher than 10V and RPM are readed only if frequency si higher than 1Hz.

## Current measurement

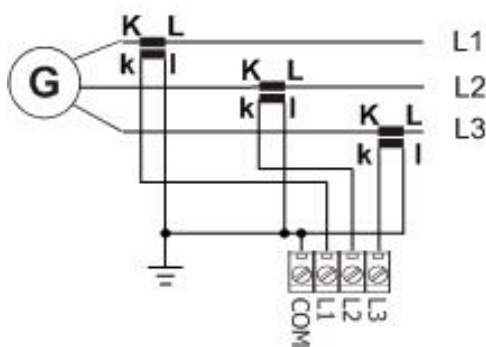
The number of CT's is automatically selected based on selected value of setpoint [ConnectionType \[3Ph4Wire / 3Ph3Wire / Split Ph / Mono Ph\]](#).

### Hint:

- Further informations about measurement limits are at setpoint CT Ratio [/5A] description in chapter Setpoints - Basic Settings.
- **Generator currents and power measurement is suppressed if current level is bellow <1% of CT range.**

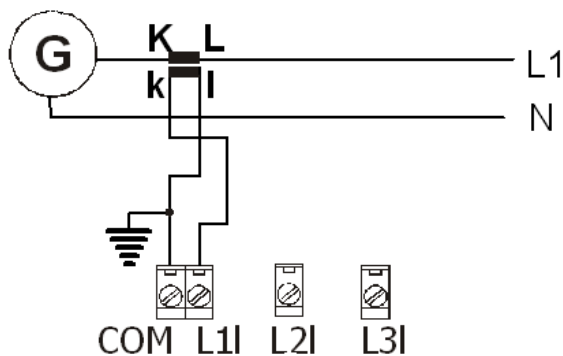
To ensure proper function use cables of 2,5mm<sup>2</sup>, transformers to 5A and connect CT according to following drawings.

### Three phase application:



### Single phase application:

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



It is necessary to ensure that potential difference between generator current COM terminal and battery “-” terminal is maximally  $\pm 2V$ . Therefore is strongly recommended to interconnect these two terminals together.

## Voltage measurement

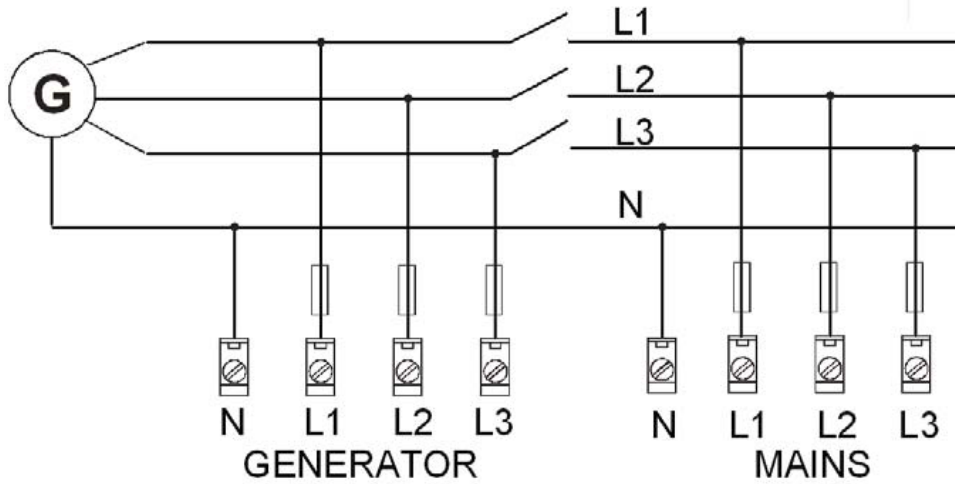
There are 4 voltage measurement **ConnectionType** ([setpoint ConnectionType \[3Ph4Wire / 3Ph3Wire / Split Ph / Mono Ph\]](#)) options, every type matches to corresponding generator connection type.

The generator protections are evaluated from different voltages based on **ConnectionType** setting:

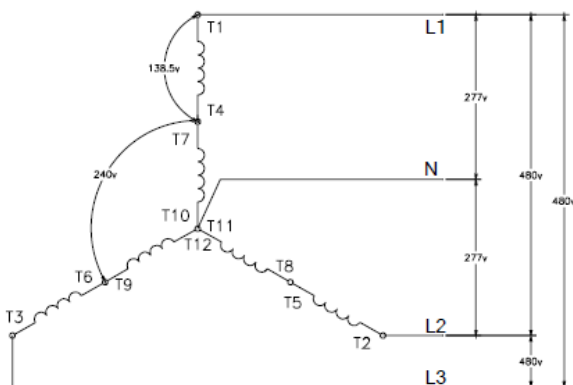
- 3W 4Ph – Ph-Ph voltage

- 3W 3Ph – Ph-Ph voltage
- Split Ph – Ph-N voltage
- Mono Ph – Ph-N voltage

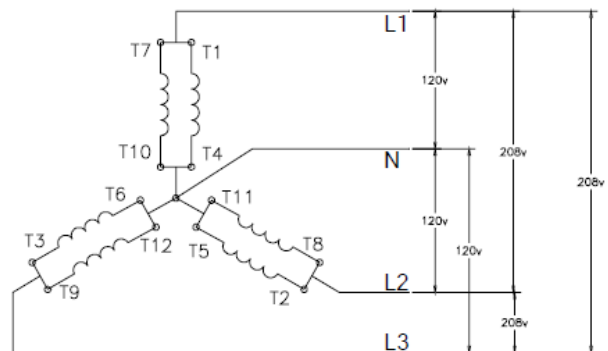
**ConnectionType: 3 Phase 4 Wires**



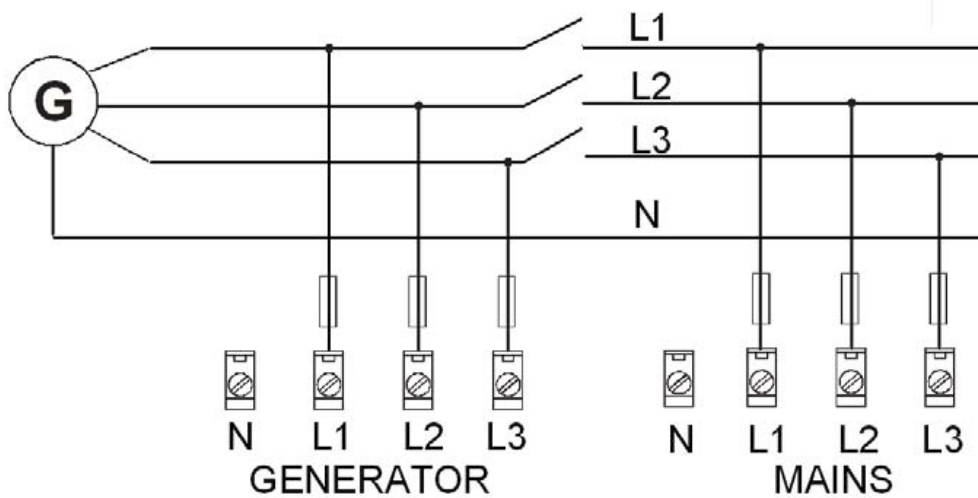
**3 Phase 4 Wires - STAR Connection**



**Three phase “wye” measurement – 3PY**

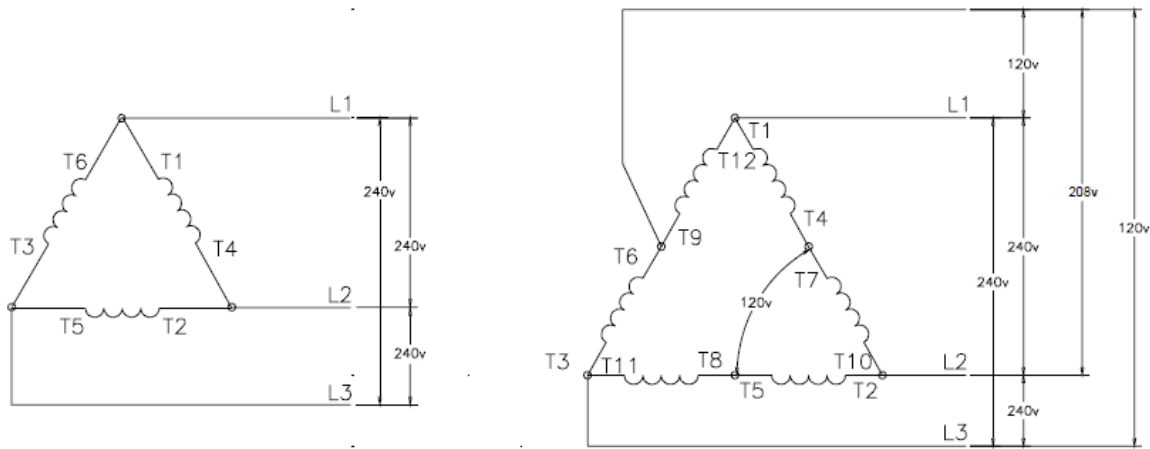


**ConnectionType: 3 Phase 3 Wires**



### Three phase “delta” measurement – 3PD 3 Phase 3 Wires

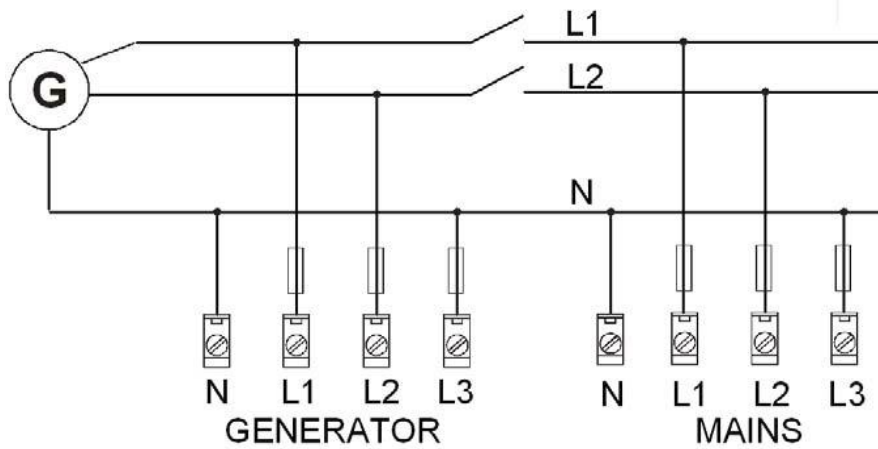
- DELTA Connection
- HI-LEG (WILD-LEG, RED-LEG) DELTA Connection



**Hint:**

Only L1, L2 and L3 wires should be connected. In case of HI-LEG (WILD-LEG, RED-LEG) DELTA connection the N (neutral) wire (in the diagram connected between T6 and T9) has to be disconnected. No separation transformers for three wires voltage connection (without N) are needed.

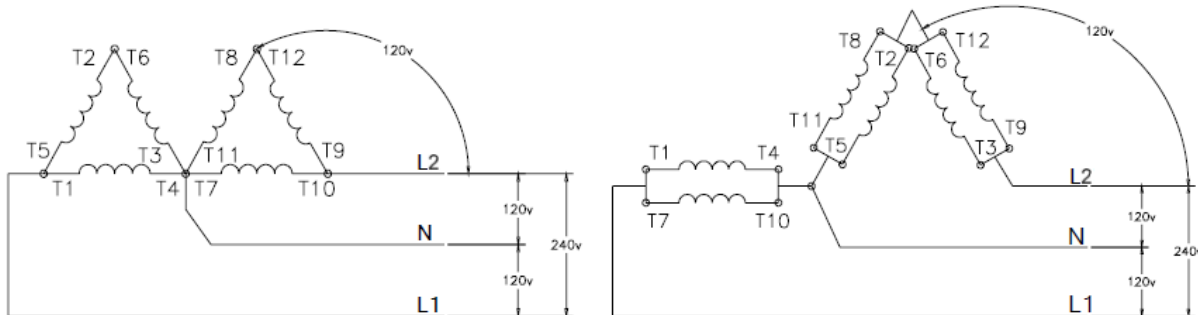
### ConnectionType: Split Phase



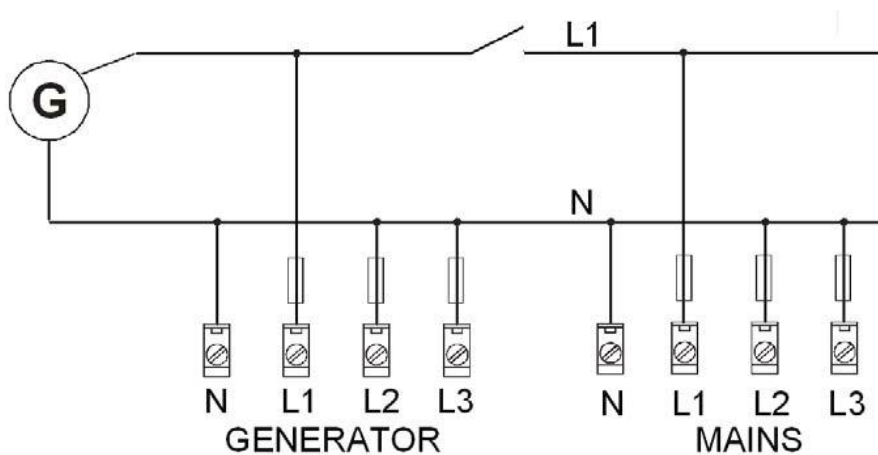
### Single-phase measurement – 1PH

#### Split Phase

- DOUBLE DELTA Connection
- ZIG ZAG (DOG LEG) Connection



## ConnectionType: Mono Phase

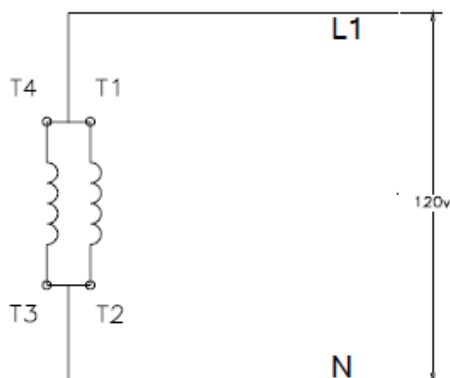


### Single-phase measurement – 1PH

#### Hint:

There has been a change in wiring of monophase at voltage terminals between firmwares IL-NT1.4 and IL-NT1.5! Picture above shows connection for IL-NT 1.5. Wiring for older firmwares is described in older IL-NT manuals, line L1 was connected to all three terminals L1,L2 and L3.

### Mono Phase – MONOPHASE Connection



#### Hint:

Switchboard lighting strike protection according standard regulation is expected **for all 4 connection types!!!**

#### Hint:

Phase sequence check is not possible to evaluate under voltage 50V what causes that if measured voltage 50V is within the allowed range, controller will not allow to close the GCB, even if relevant LED diod on front panel of IL-NT lits.

## Analog inputs

Three analog inputs are available from the IL-NT HW 1.5 and two AI in older HW versions.

### Configuration

Each analog input can be configured by LiteEdit software following way (First analog input is dedicated to engine Oil pressure).

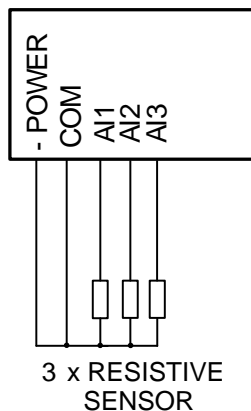
Analog input item	LiteEdit		Possibility
Type	Type	Not used Alarm  Monitoring	Analog input isn't used Analog is measured and used for protection Analog is only measured and not used for protection
Analog input name	Name		Up to 14 ASCII characters
Config of input	Config	Analog  Binary (not supp. by PTM) Tri-state (not supp. by PTM)  ECU	Analog measuring in specified range. Binary: open/close - threshold 750 Ω. Three-state: open/close - threshold 750 Ω, Failure <10 Ω or > 2400 Ω Value is read from ECU
Physical dimension	Dim	bar,%,°C, ...	Up to 4 ASCII characters (Valid only for analog inputs)
Polarity	Contact type	NC  NO	Valid only for binary and three-state inputs 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	Predefined user curves	User changeable and configurable
Resolution	Resolution	0 – 0,00001	Sensor resolution (Valid only for analog inputs)

Each Analog input has separate set points for two level alarm setting. Analog input alarm levels and delay adjust in **Extension I/O** and **Engine Protect** group.

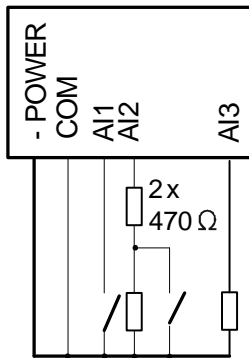
*Hint:*

Description of Sensor fail evaluation can be found in chapter [Alarm Management](#), article [Sensor Fail \(FLS\)](#).

### Connection of IL-NT analog inputs



Standard connection of three resistive sensors to analog inputs.



Mixed connection of IntelliLite analog inputs:

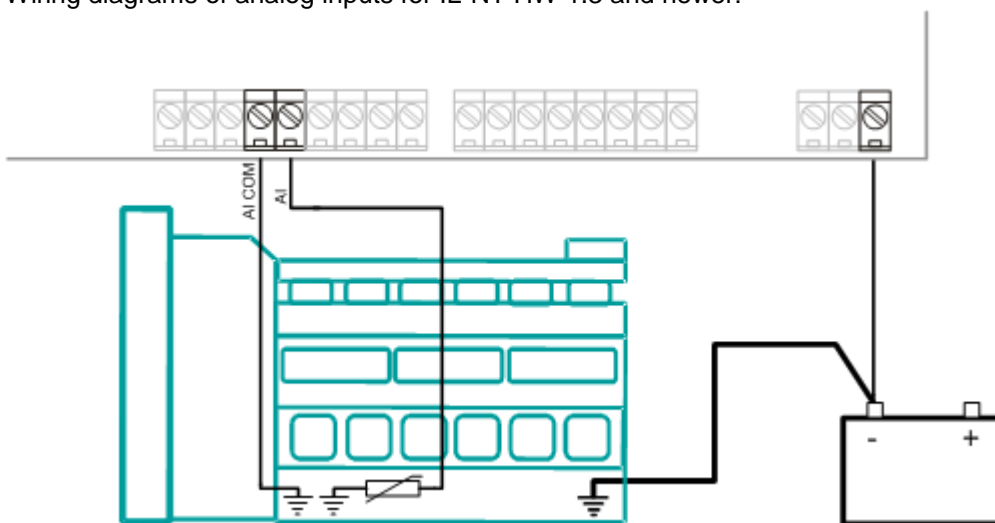
- AI1 – binary input
- AI2 – three state input
- AI3 – analog resistive input

*Hint:*

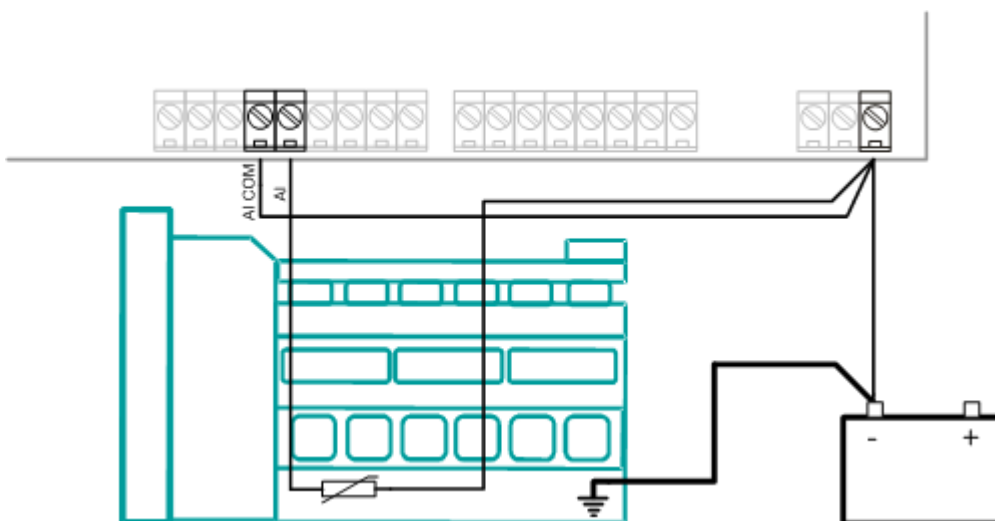
Description of analog inputs with COM terminal and 4 pins relates to units with HW version 1.3. Older HW versions do not have “COM” terminal and use only 3 pins AI1, AI2 and AI3.

## Wiring

Wiring diagrams of analog inputs for IL-NT HW 1.3 and newer:



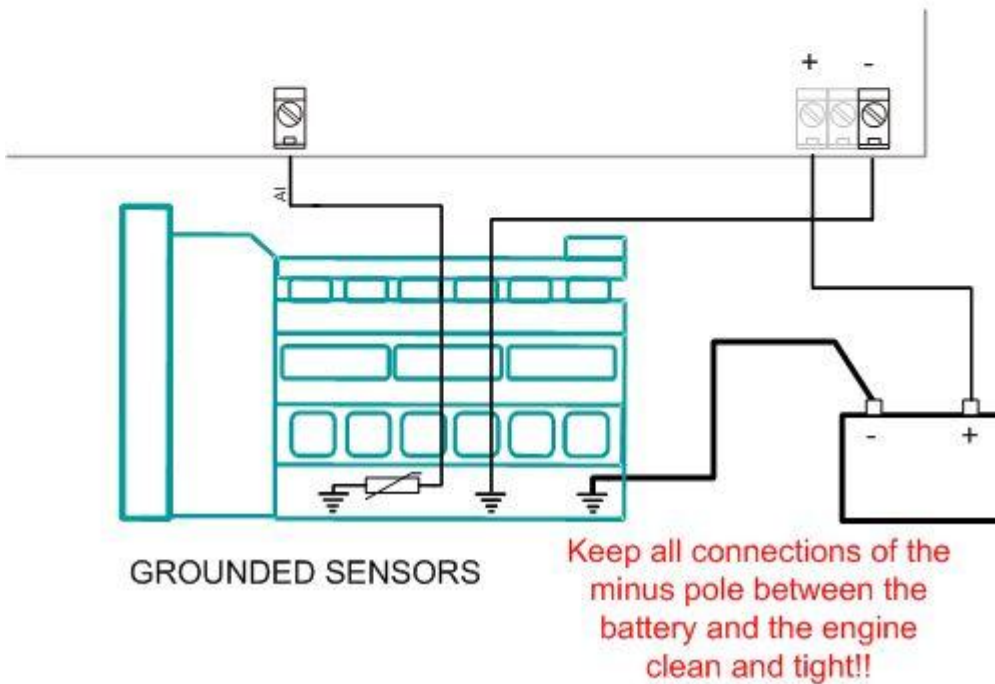
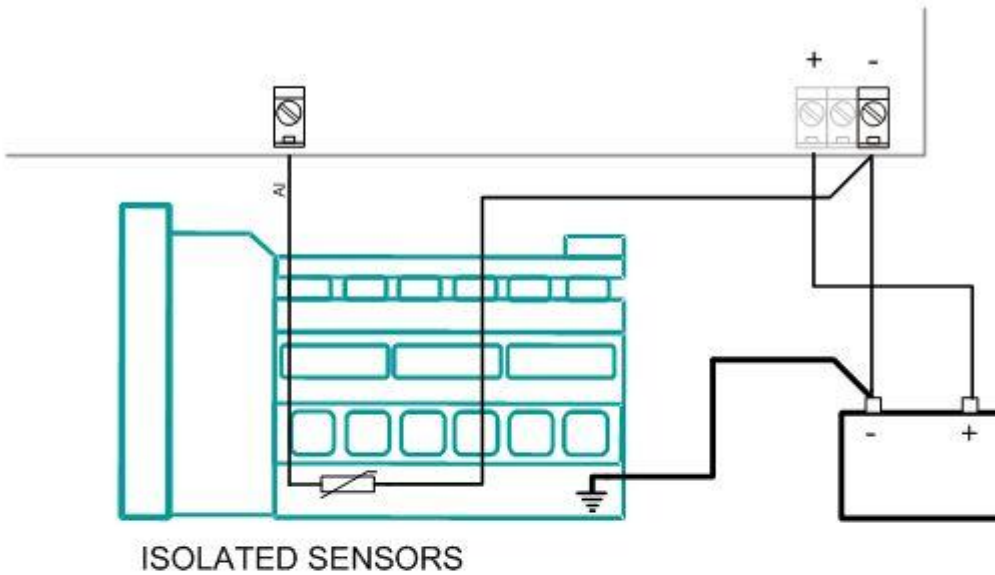
**WIRING OF ANALOG INPUTS-GROUNDED SENSORS**



**WIRING OF ANALOG INPUTS-ISOLATED SENSORS**

Wiring diagrams of analog inputs for IL-NT HW 1.1 and older:

WIRING OF ANALOG INPUTS FOR CONTROLLERS WHERE COM TERMINAL IS NOT PROVIDED



Analog inputs are designed for resistive sensors with resistance in range of  $0\Omega$  to  $2,4k\Omega$ . To ensure a proper function use shielded cables, especially for length over  $>3m$ .

COM terminal is dedicated to measure ground voltage potential difference between engine and controller.

### As binary input

Open, close state are detected, threshold level is  $750\Omega$ .



## As three state input

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

### Hint:

Protections on binary and three state inputs are following:

<i>IL-NT:</i>	AI1	Shutdown	<i>IG-IOM:</i>	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 Engine Temp input for measuring in  $^{\circ}\text{C}$ , VDO 40-120 $^{\circ}\text{C}$  sensor, range -16 to 120  $^{\circ}\text{C}$ . Alarm protection level set to 90  $^{\circ}\text{C}$ , shut down level 110  $^{\circ}\text{C}$ .

Start LiteEdit and select – Controller - Configuration – Modify – Engine Temp.

Set configuration for Engine temp analog input:

**Type:** Selection between Not used and Alarm

“Not used” – analog input isn’t used

”Alarm” – analog input is used

Set to: Alarm

**Name:** Name of the analog input. Maximally 14 letters.

Set to: Engine Temp

**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 of Analog inputs. 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 of Analog inputs.

Set to: Analog

**Alarm Properties:** Selection between different direction of protection – Under Limit, Over Limit or combination with Fail sensor.

“Engine running only” – check this setting if you wish to active protection on analog input only while engine is running, not, when it stops.

Set to: Over Limit

**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 IntelliLite screen is displayed „####“ value, no alarm is detected.

Default user curves predefined on AI1 – AI3:

„VDO 10 Bar“ – VDO pressure sensor

„VDO 40-120  $^{\circ}\text{C}$ “ – VDO temperature sensor

„VDO level %“ – VDO level sensor

Set to: VDO 40-120  $^{\circ}\text{C}$

When you choose the predefined or user curve the Sensor Name, Dim and Resolution are setted automatically according to curve, user modification is possible.

**Sensor Name:** Name of used sensor, up to 14 letters can be used.

**Dim:** Name of measured unit (Bar, °C, %, ...), up to 4 letters can be used.

**Resolution:** setting of resolution of measured value.

„0“ - e.g. 360 kPa, 100%, 50 °C

„1“ - e.g. 360.0 kPa

„2“ - e.g. 360.00 kPa

„3“ - e.g. 360.000 kPa

Set to: 1

When Analog input configuration is finished set the setpoints *AI1 Wrn*, *AI1 Sd*, *AI1 Del* in **Engine Protect** group.

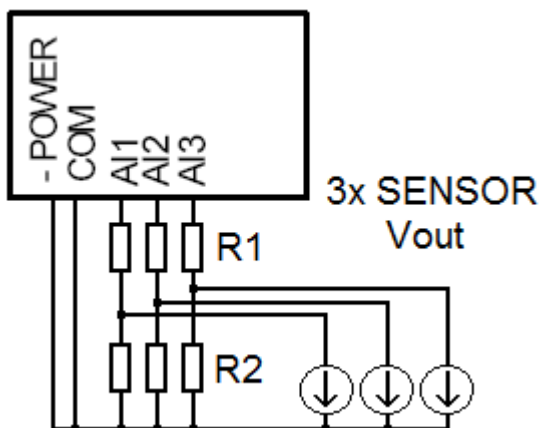
Each Analog input has separate triplet of setpoints: *Wrn level*, *Sd level*, *AI del*. Names of these setpoints are fix defined

Number of decimal points of *Wrn level* and *Sd level* is the same as the configured number of decimal powers of measured value.

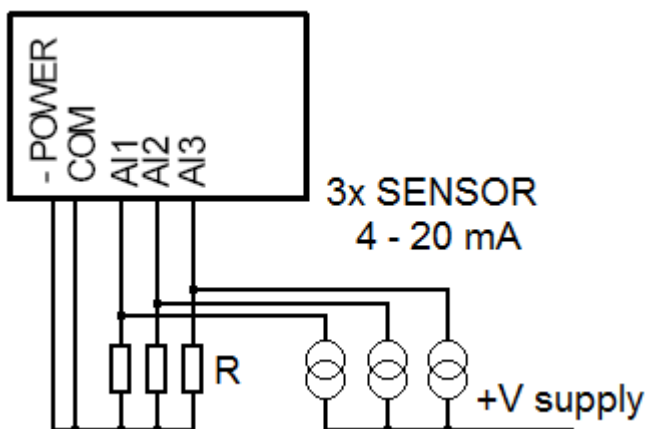
### Analog input extension measurement (0 - 70V, 4 - 20mA)

On each analog input there is a possibility to connect voltage or current output sensor instead of resistive. Recommended connections for these measurements are shown bellow.

#### Voltage output sensor - connection



#### Current output sensor - connection



### Table with recommended values

Analog input	R1	R2	Curve
0 - 10V	150Ω [1%,0,5W]	100Ω [1%,0,5W]	AI 0-10V.CRV
0 - 30V	680Ω [5%,2W]	100Ω [1%,0,5W]	AI 0-30V.CRV
0 - 65V	1500Ω [5%,3W]	100Ω [1%,0,5W]	AI 0-65V.CRV
4 – 20mA	R = 160Ω [1%,0,5W]		AI 4-20mA.CRV

#### Hint:

Please note that external resistors disconnection, connection incorrect resistors or input voltage value during operation may cause an analog input destruction.

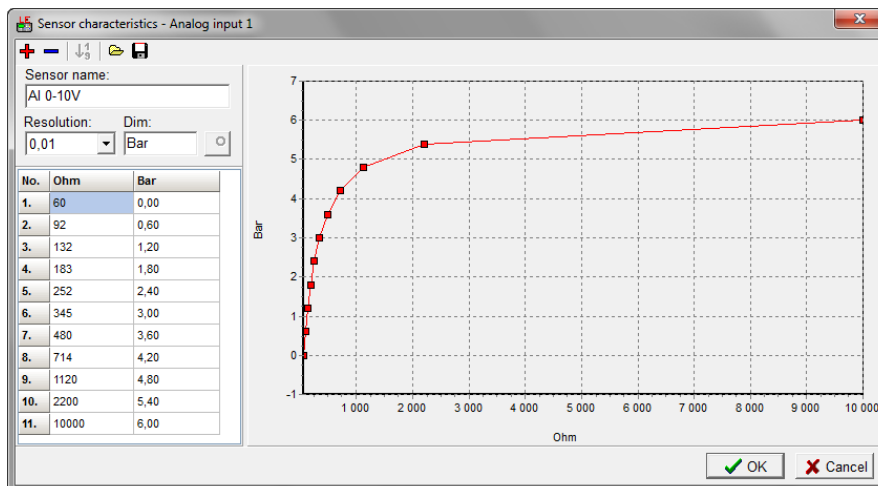
### Practical example: VDO pressure sensor 0 – 6bar with linear voltage output 0 – 10V

#### Conversion table

<b>Vout [V]</b>	0	1	2	3	4	5	6	7	8	9	10
<b>P [bar]</b>	0	0,6	1,2	1,8	2,4	3	3,6	4,2	4,8	5,4	6

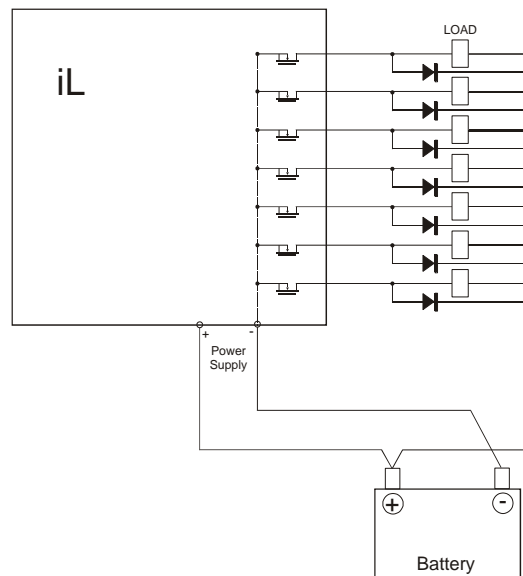
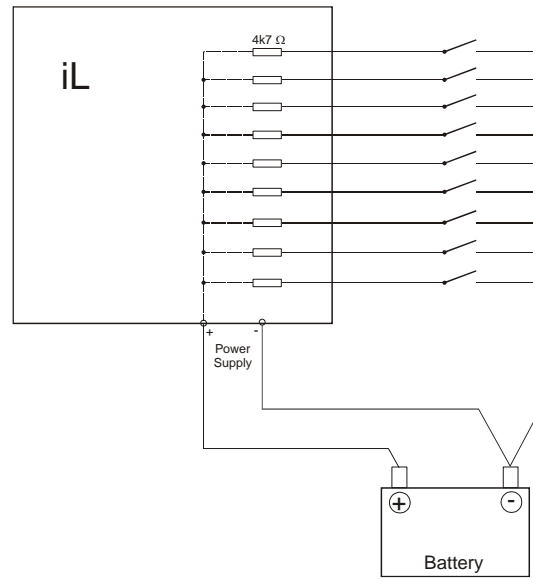
Modify one of analog input in LiteEdit configuration and load curve AI 0-10V.CRV  
Then you can change resolution and measured value name witch is default displayed at V (volts).

For example if you have connected pressure sensor and his output voltage is 5V for pressure 3bar you can change value 'V' in column "Dim." to 'Bar' and by sensor specification adjust all corresponding values in this column. In this case you can change the value at row 6. from 5 to 3.



When you finish with adjusting the values click OK and Write to controller.

## Binary inputs and outputs



# Inputs and Outputs

For Inputs/Outputs overview table see chapter Technical Data.

**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.

**Hint:**

^ AMF version only.

## 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	
	BOC	
	Shut down	
Alarm active	All the time	Valid if checkbox "Engine running only" is not checked
	Engine running only	Valid if checkbox "Engine running only" is checked

### Rem Start/Stop

External request for engine run. AUT mode only.

**Hint:**

If the binary input Rem Start/Stop is active and mains failure occurs, the MCB breaker opens, and after FwRet Brk delay the GCB breaker is closed. Once the mains is OK, the RetTransf delay elapses and the GCB breaker is opened. Then after FwRet Brk delay is MCB breaker closed. Gen-set remains running as long as Rem Start/Stop is active.

### 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.

## 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, AUTO 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.

## ^MainsFailBlock

If the input is closed, the automatic start of the gen-set at Mains failure is blocked. In case of running gen-set in AUT mode, timer ReturnDel is started and when it elapse GCB is opened, gen-set goes to cooling procedure and stops. When GCB is opened after TransferDel the MCB is closed.

Hint:

This input simulates healthy Mains.

## ^AMF StartBlock

This binary input can allow or block the AMF start. When the AMF start is blocked and Mains Fail will come in AUT mode than the MCB breaker will stay closed.

## ^AMF Function

This BI can switch controller function between AMF and MRS.

Hint:

Binary input “AMF function” has higher priority than the setpoint [Operation Mode](#) in AMF Settings.

## 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. This output is deactivate 10s after the still engine conditions are evaluated.

Hint:

For more detail see chapter "[Stop engine](#)" conditions in chapter [Gen-set Operation States](#)

*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).

## Prestart

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

## Idle/Nominal

The output *Idle/Nominal* closes after the timer *Idle Time* elapses. The *Idle Time* counter starts to countdown when *Starting RPM* reached. The *Underspeed* protection is not evaluated during fixed 5 seconds period after reaching *Starting RPM*. A *Start Fail* protection occurs if the RPM drop below 2RPM during idle.

*Hint:*

Connect binary output "Idle/Nominal" to speed governor to switch the speed: opened = IDLE, closed=NOMINAL.

## Alarm

The output closes if :

- any alarm 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.

## GCB Close/Open

The output controls the generator circuit breaker.

*Hint:*

Supposed time to close (reaction time) of GCB is 0,1 sec.

## ^MCB Close/Open

The output controls the mains circuit breaker.

*Hint:*

IL-NT controller works without breaker feedbacks.

## Ready

The output is closed if following conditions are fulfilled:

- Gen-set is not running and
- No Shut down is active
- Controller is not in OFF Mode

## ^Ready to AMF

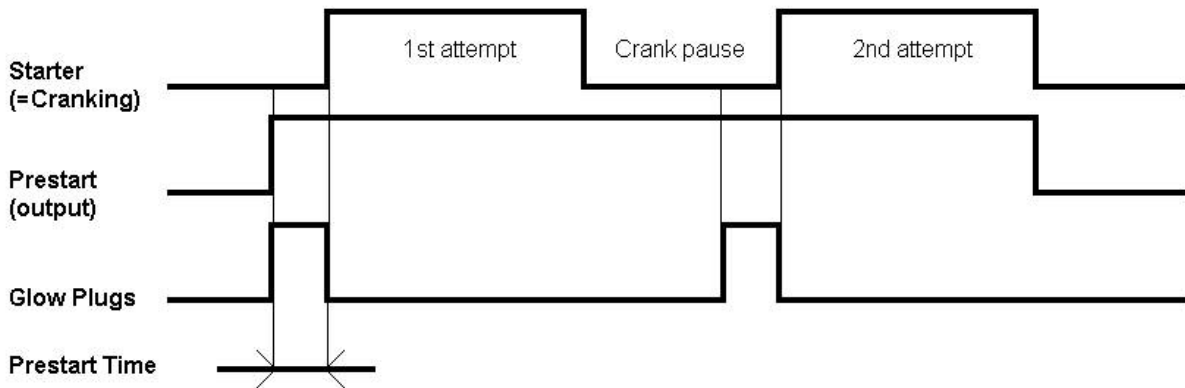
The output is active, if the controller is able to start the engine (the output Ready to run is active) or engine is already running and simultaneously the controller is in AUTO Mode.

## 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.

## Glow Plugs

The output closes prior to the engine start (by Prestart Time) and opens at the beginning of cranking time. In case of repeated crank attempts the output closes always prior to the other engine start attempts (by Prestart Time) and is opened during crank attempts.



## Not in AUT

The output is closed, if MAN Mode is selected.

## ^AL Mains Fail

Output closes if the mains over/under voltage alarm, voltage asymmetry alarm or mains over/under frequency alarm activates.

The output opens, if

- alarm is not active and
- **FAULT RESET** is pressed

## AL BatteryFail

Output closes when IL-NT performs reset during start procedure (probably due to weak battery) or when battery under voltage warning appears.

The output opens, if

- alarm is not active and
- **FAULT RESET** is pressed

## \*ECU PowerRelay

The output closes at the beginning of prestart and opens if the engine shall be stopped. The communication failure with ECU is not evaluated while the output is not active even if it is not configured. It means that if communication with ECU fails during engine stop for example (*ECU PowerRelay* output would be closed if configured) the controller doesn't issue any related alarms.

## Analog Inputs

---

It is possible to configure on each Analog input:

- Reading from IL 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)
- Sensor resolution

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 Pressure

Oil pressure analog input. Default range 0 to 10.0 bars.



## Engine Temp

Water temperature analog input. Default range 40 to 120 °C.

## Fuel Level

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

*Hint:*

Third analog input is available from HW version 1.5.

*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
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	
Percent Load	ECU	

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

*Hint:*

RPM reading is automatically switched to generator voltage measuring if J1939 fails.

## Analog Outputs

Optional plug in card IL-NT AOUT8 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.

# Setpoints

## EnterPassword

Password is a four-digit number. Password enables change of relevant protected setpoints. Use  $\uparrow$  or  $\downarrow$  keys to set and **ENTER** key to enter the password.

*Hint:*

There is only 1 level of a password.

## ChangePassword

Use  $\uparrow$  or  $\downarrow$  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.

**During the configuration of controller or setpoints changes is required a password to the controller. The default password from manufacturer is "0". Maximum value of password is "9999".**

**Controller has following functions:**

- Automatic checking of password during change to be maximally 9999, if it is bigger value it will be automatically changed to 0. LiteEdit (LE) will prevent to write bigger value than 9999.
- Cyclic rotation of value of password in case of using arrows on controller

## Basic Settings

---

### Gen-set Name

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

### CT Ratio [5A]

Gen-set phases current transformers ratio.

Step: 1 A  
Range: 1 – 5000 A / 5A

*Hint:*

For CT Ratio  $\leq 250$  the values of power and current are displayed in a controller with one tenth. For CT Ratio  $> 250$  the values of power and current are displayed in a controller with integers. If you change CT Ratio in LiteEdit or directly in the controller, decimal numbers will not be changed immediately. The change will be executed only by reconfiguring in LiteEdit. The statistics of power will be recounted at this time with regards to decimal numbers of power.

**WARNING!** When you change the firmware, statistics can be invalid!

*Hint:*

When decimals in the controller are used maximal current value on single phase is 3200 kVA. When decimals are not used the maximum current value is 32000 kVA.

### Nominal Freq [Hz]

Nominal generator frequency (usually 50 or 60 Hz)

Step: 1Hz  
Range: 45 – 65 Hz

## Nominal Current [A]

It is current limit for generator \*IDMT over current and short current protection and means maximal continuous generator current. See **Gener Protect**: \*Amps IDMT Del, Short Crct Sd setpoints. *Nominal Current* can be different from generator rated current value.

Step: 1 A  
Range: 1 - 10000 A

## 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.

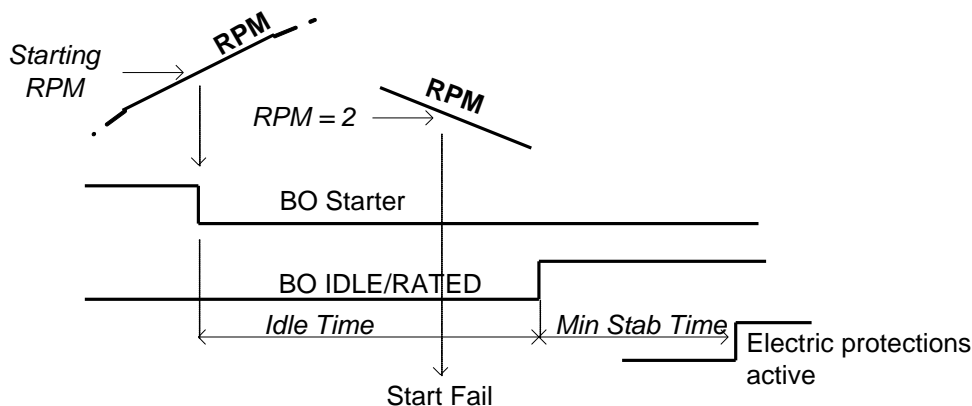
Step: 1s  
Range: 1 – 60 s

## Idle Time [s]

Idle time delay starts when RPM exceeds *Starting 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



## Cooling Time [s]

Runtime of the unloaded gen-set to cool the engine before stop.

Step: 1s  
Range: 0 – 3600 s

## Cooling Speed [IDLE/NOMINAL]

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:*

When ECU is connected the predefined value 900 RPM for IDLE speed is requested.

*Hint:*

Binary output IDLE/NOMINAL must be configured and connected to speed governor. Engine Idle speed must be adjusted on speed governor

## WrnMaintenance [h]

Counts down when engine running. If reaches zero, an alarm appears. When the value 10000 is set, than the Maintenance function is disabled and counter does not count. Counter value disappear in controllers statistics. Maximum value for running countdown is 9999.

Step: 1h  
Range: 0 – 10000 h

## Test Period [d]

After the given value of Test Period setpoint expires, the engine is started and is running as long as the value of Test Duration setpoint. Test Period starts counting always when the engine is stopped.

Range: 0 – 240 days  
^ Available only in AMF8, 9.

## Test Duration [min]

Time interval, when engine is running after expiring the Test Period setpoint.

Range: 0 – 240 minutes  
^ Available only in AMF8, 9.

### Hint:

This function does not work till both setpoints (**Test Period** and **Test Duration**) are set to non-zero values.

## ConnectionType [3Ph4Wire / 3Ph3Wire / Split Ph / Mono Ph]

Generator winding connection.

3Ph4Wire: STAR Connection, 3 phases and neutral - 4 wires,  
Three phase “wye” measurement – 3PY, 3x CT's  
3Ph3Wire: DELTA Connection, 3 Phase without neutral - 3 Wires,  
Three phase “delta” measurement – 3PD, 3x CT's  
Split Phase: DOUBLE DELTA Connection, Split Phase,  
Single-phase measurement – 1PH, 1xCT  
Mono Phase: MONOPHASE,  
Single-phase measurement – 1PH, 1x CT

### Hint:

For more details about connection types see [Voltage measurement and generator connection types](#) chapter.

For details about influence of Connection type setting on voltage values in history check [History file](#) chapter.

## COM1 Mode [DIRECT/MODEM]

Communication protocol switch for the COM1 channel.

DIRECT: LiteEdit communication protocol via direct cable.  
MODEM: LiteEdit communication protocol via modem.

### Hint:

For details on communication speed and other technical parameters please see chapter [Technical Data](#).

## Engine Protect

---

### AI1 Wrn [ Bar]

Warning threshold level for ANALOG INPUT 1

Step: 0,1 bar  
Range: -10 – 1000

**AI1 Sd [ Bar]**

Shutdown threshold level for ANALOG INPUT 1

Step: 0,1 bar  
Range: -10 – 1000

**AI1 Del [s]**

Delay for ANALOG INPUT 1

Step: 1 s  
Range: 0 – 900 s

***Hint:***

First analog input is dedicated to Oil Pressure measurement. It is not supposed to be used for measurement of other values.

**AI2 Wrn [ ]**

Warning threshold level for ANALOG INPUT 2

Step: 1 °C  
Range: -100 – 10000

**AI2 Sd [ ]**

Shutdown threshold level for ANALOG INPUT 2

Step: 1 °C  
Range: -100 – 10000

**AI2 Del [s]**

Delay for ANALOG INPUT 2 alarm.

Step: 1 s  
Range: 0 – 900 s

**AI3 Wrn [ ]**

Warning threshold level for ANALOG INPUT 3

Step: 1 %  
Range: -100 – 10000

**AI3 Sd [ ]**

Shutdown threshold level for ANALOG INPUT 3

Step: 1 %  
Range: -100 – 10000

**AI3 Del [s]**

Delay for ANALOG INPUT 3

Step: 1 s  
Range: 0 – 900 s

**Batt Undervolt [V]**

Warning threshold for low battery voltage.

Step: 0,1 V  
Range: 8V – 40 (Battery >Volts)

**Gener Protect*****Hint:***

All electric protections when activated result in shutdown or BOC.

The generator protections are evaluated from different voltages based on ConnectionType setting:

- 3W 4Ph – Ph-Ph voltage

- 3W 3Ph – Ph-Ph voltage
- Split Ph – Ph-N voltage
- Mono Ph – Ph-N voltage

### **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 BOC) – 200%

### **Gen <V BOC** [%]

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)%

#### *Hint:*

Over- and undervoltage protection is evaluated according to [Basic Settings: Connection Type](#) setting. 3Ph4Wire and 3Ph3Wire connections are evaluated according to Ph-Ph nominal voltage (NomVolts Ph-Ph) and Split Phase and Mono Phase connections are evaluated according to Ph-N nominal voltage (NomVolts Ph-N).

### **Gen V Del** [s]

Delay for generator undervoltage and overvoltage alarm

Step: 0.1s  
Range: 0.0 – 600.0 s

### **Gen >Freq BOC** [%]

Threshold for generator phase L1 overfrequency.

Step: 0.1% of Nominal frequency  
Range: 0 (Gen <Freq BOC) – 200.0% of Nominal frequency

### **Gen <Freq BOC** [%]

Threshold for generator phase L1 underfrequency.

Step: 0.1% of Nominal frequency  
Range: 0.0 – 200 (Gen >Freq BOC ) % of Nominal frequency

### **Gen Freq Del** [s]

Delay for generator underfrequency and overfrequency alarm.

Step: 0.1s  
Range: 0.0 – 600.0 s

### **Short Crct BOC** [ % ]

BOC (Breaker Open and genset Cooldown) occurs when generator current reaches *Short Crct BOC* limit.

Step: 1 % of *Nominal current*  
Range: 100 - 500 %

### **Short Crct Del** [s]

Delay for generator shortcurrent alarm.

Step: 0.04s  
Range: 0.00 – 10.00 s

## **^AMF Settings (AMF 8, 9 only)**

---

### **^EmergStart Del [s]**

Delay after the mains failure to the start of the gen-set

Step: 1s  
Range: 0 – 6000 s

### **^MainsReturnDel [s]**

Delay after the mains return to the GCB opening.

Step: 1s  
Range: 1 – 3600 s

### **^Mains > V [V]**

Threshold for mains overvoltage. All three phases are checked. Maximum out of three is used.

Step: 1V  
Range: 240 – 600V

### **^Mains < V [V]**

Threshold for mains undervoltage. All three phases are checked. Minimum voltage out of three phases is used.

Step: 1V  
Range: 50 – 440V

### **^Mains > Freq [%]**

Threshold for mains overfrequency. All three phases are checked. Maximum out of three is used.

Step: 0.1% of Nominal frequency  
Range: 50 (Mains <f) – 150.0%

### **^Mains < Freq [%]**

Threshold for mains underfrequency. All three phases are checked. Maximum out of three is used.

Step: 0.1% of nominal frequency  
Range: 50% – 150.0(Mains >)%f

### **^Operation Mode [AMF/MRS]**

Based on this setpoint is defined basic controller function.

AMF: Normal AMF operation

MRS: When MRS mode is selected the controller will not perform AMF functions anymore. MCB button will be inactive and also mains measurement and protections will be disabled. The controller will keep TEST mode and the genset in AUT mode will be able to start by *Rem Start/Stop* binary input.

## **SMS/E-Mail**

---

### **Remote alarm messaging**

If a GSM modem and/or Internet bridge is connected to the controller, the controller can send SMS messages in the moment when a new alarm appears in the Alarm list. The message will contain a copy of the Alarm list.

To enable this function, you should select with setpoints Yel Alarm Msg and Red Alarm Msg, which levels of alarms shall be announced (red/yellow/both) and also enter valid GSM phone number to the setpoints Tel Number.

**NOTE:**

An internet module must be available for sending of SMS.

*Hint:*

There are 5 attempts for any active call (SMS/E-Mail). Timeout for connection is 90 sec and after 120 sec controller starts the next attempt. During the time the IL-NT is trying to send an active call type, incoming calls are blocked.

**Yel Alarm Msg [ON/OFF]**

Set this setpoint to ON if you want to get messages when a **yellow** (warning) alarm occurs.

*Hint:*

The target address (GSM phone number) must be set correctly to the setpoint(s) Tel Number.

**Red Alarm Msg [ON/OFF]**

Set this setpoint to ON if you want to get messages when a **red** (shutdown or BOC) alarm occurs.

*Hint:*

The target address (GSM phone number) must be set correctly to the setpoint(s) Tel Number.

**Event Msg [ON/OFF]**

Set this setpoint to ON if you want to get messages when a new event occur .

*Hint:*

The target address (GSM phone number) must be set correctly to the setpoint(s) Tel Number.

**Tel Number**

Enter either a valid GSM phone number to this setpoint, where the alarm messages shall be sent. Type of active call is considered from the value of this parameter.

*Hint:*

For GSM numbers use either national format (i.e. like number you will dial if you want to make a local call) or full international format with "+" character followed by international prefix in the begin.

**Phone numbers and emails can be modified from controller display or from PC.**

Following buttons are used for phone number modification

- **ENTER** for    - opening the modification
- confirmation of particular number change and jump to the next position
- confirmation of the last number and closing of the modification
- **MODE** for    - while adjusting character press Mode button to jump between character groups to fasten the process.
- **↑** and **↓** for    - particular number/character change

***Fixed application setting***

---

*Hint:*

This application parameters are fixed and internal. This chapter describes standard controller behavior.

**Nominal Power [kVA]**

Nominal power of the generator

**Nominal Power = Nomin Current \* Nomin Voltage**

Range:            1 – 5000 kVA

Example:



CT Ratio = 1250A then Nomin Current = 1250A  
 Nomin Voltage = 264V  
 Nominal Power = 1250 \* 264 = 330kVA

**PT Ratio** [1]

Gen-set potential transformers ratio.

Preset value is 1. (PT Ratio = 1/1)

**Vm PT Ratio** [1]

Mains potential transformers ratio.

Preset value is 1. (Vm PT Ratio = 1/1)

*Hint:*

This setpoints is used for AMF controllers' version only!

**Nomin Voltage** [V]

Nominal generator and mains voltage (phase to neutral or phase to phase depend on connection type)

Preset value is 264V. (Nom Voltage = 264)

**Gear Teeth** [-]

Number of teeth on the engine gear for the pick-up. These controllers don't support magnetic pick-up. Zero value means that the RPM are derived from frequency.

Preset value is 0. (Gear Teeth = 0)

**Nominal RPM** [RPM]

Nominal engine speed.

**Nominal RPM = 30 \* Nominal Freq**

Range: 1350 – 1950 RPM

Example:

Nominal Freq = 50

Nominal RPM = 30 \* 50 = 1500

**Overspeed** [%]

Threshold for over speed protection

Preset value is 115%

*Hint:*

The Overspeed protection value is increasing from 115 % to 125% of nominal RPM for the duration of 5sec (ProtectHoldOff delay). ProtectHoldOff delay takes place during the start of the gen-set when some engine protections have to be blocked. This delay starts after reaching 25% of nominal RPM.

**Reset To MAN** [ENABLED]

ENABLED: Automatic switch from AUT to MAN Mode after Fault Reset to avoid automatic engine start. This function is active for Shut down protection only.

Preset value is ENABLED.

**ControllerAddr** [-]

Controller identification number. This controller address is used for remote communication.

Preset controller address is 1.

*Hint:*

When opening connection to the controller it's address has to correspond with the setting in PC tool. From LiteEdit it is only possible to connect to controllers with address 1.

**Starting RPM** [ % ]

“Firing” speed when IL controller stops cranking (starter goes OFF).

Preset RPM are 25% from Nominal RPM.

**CrnkFail Pause** [ s ]

Pause between Crank Attempts.

Cranking fail pause is preset to 8s.

**Crank Attempts** [ - ]

Max number of Crank Attempts.

Preset value is 3.

**Min Stab Time** [ s ]

Minimum time after reaching of defined level of RPM to the closing GCB.

Min Stab Time is preset to 3s.

**Max Stab Time** [ s ]

Maximum time after start to get proper voltage level of the generator.

Preset time is 10s

*Hint:*

When generator voltage within *Max Stab Time* does not reach defined limits, an alarm occurs and the gen-set will shut down

**Stop Time** [ s ]

Under normal conditions the engine must certainly stop 10s before this period will exceed. The period starts by issuing stop command.

Step: 1s

Range: 0 – 600 s

*Hint:*

For more details see chapter [„Stop engine“ conditions](#) in chapter [Gen-set Operation states](#)

**Fuel Solenoid** [ DIESEL ]

Determines behavior of the Binary output FUEL SOLENOID.

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.

**D+ Function**

The D+ terminal is not used.

**ECU FreqSelect**

Preset frequency is DEFAULT. Some Volvo and Scania engines may not be supported.

*Hint:*

This setpoints affect only AMF9 and MRS4 controllers.

## **ECU SpeedAdj** [%]

Enables to adjust engine speed in ECU via CAN bus. Nominal speed corresponds to 50%.

Preset value is 50%.

### *Hint:*

This setpoints affect only AMF9 and MRS4 controllers.

## **ProtectHoldOff** [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 *ProtectHoldOff* time. The time starts after reaching *Starting RPM*.

Preset value is 5s.

## **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.

Preset timeout is 10s

## **Batt Volt Del** [s]

Delay for low battery voltage alarm.

Preset delay is 30s.

## ***^Fixed AMF settings***

---

### **^RetFromIsland** [AUTO]

AUTO: No automatic switching to MAN Mode after closing GCB.

Preset value is AUTO.

### **^Transfer Del** [s]

Delay after GCB opening to MCB closing during the return procedure.  
Delay after MCB opening to GCB closing if the setpoint *MCB Opens On* set to GENRUN

Preset delay is 1s.

### **^MCB Close Del** [s]

Delay after mains returns to MCB closing, if gen-set is not running (e.g. is in start-up procedure)

Preset delay is 1s.

### **^Mains V Del** [s]

Delay for mains undervoltage and overvoltage

Preset delay is 2s.

### **^Mains Freq Del** [s]

Delay for mains underfrequency and overfrequency

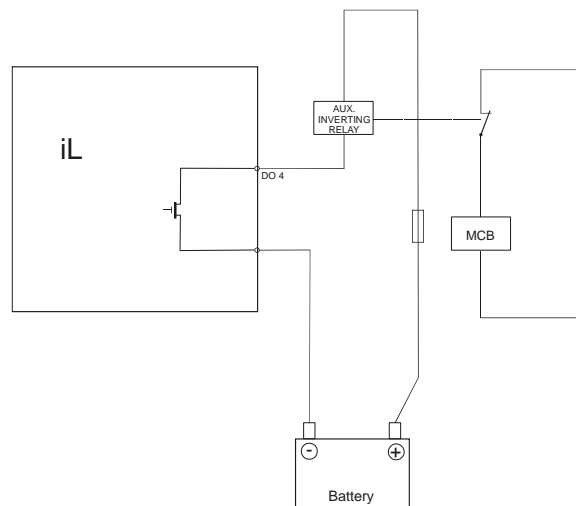
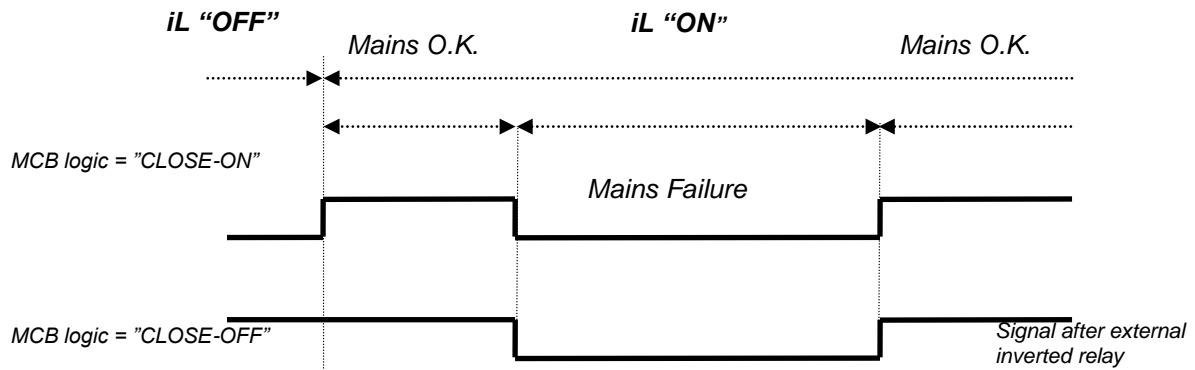
Preset delay is 0,5s.

## ^MCB Logic [CLOSE-OFF]

The setpoint influences the behavior of the output MCB CLOSE/OPEN

CLOSE-OFF: When the output MCB CLOSE/OPEN is closed – MCB should be opened.

MCB Logic is preset to CLOSE-OFF.



*Hint:*

In the case **MCB Logic = "CLOSE-OFF"** it is necessary to change externally the polarity of the output signal.

## ^MCB Opens On [GENRUN]

### GENRUN

The command to open the MCB is not given till the Gen-set starts (with respecting the setpoint *EmergStart Del*), reaches *Running* state, reaches proper voltage and frequency and *Min Stab Time* elapses. After that, the MCB is opened, *Transfer Del* timer is started and the GCB is closed after the timer elapses.


MCB Opens On is preset to GENRUN.

# \*ECU-controlled engine support

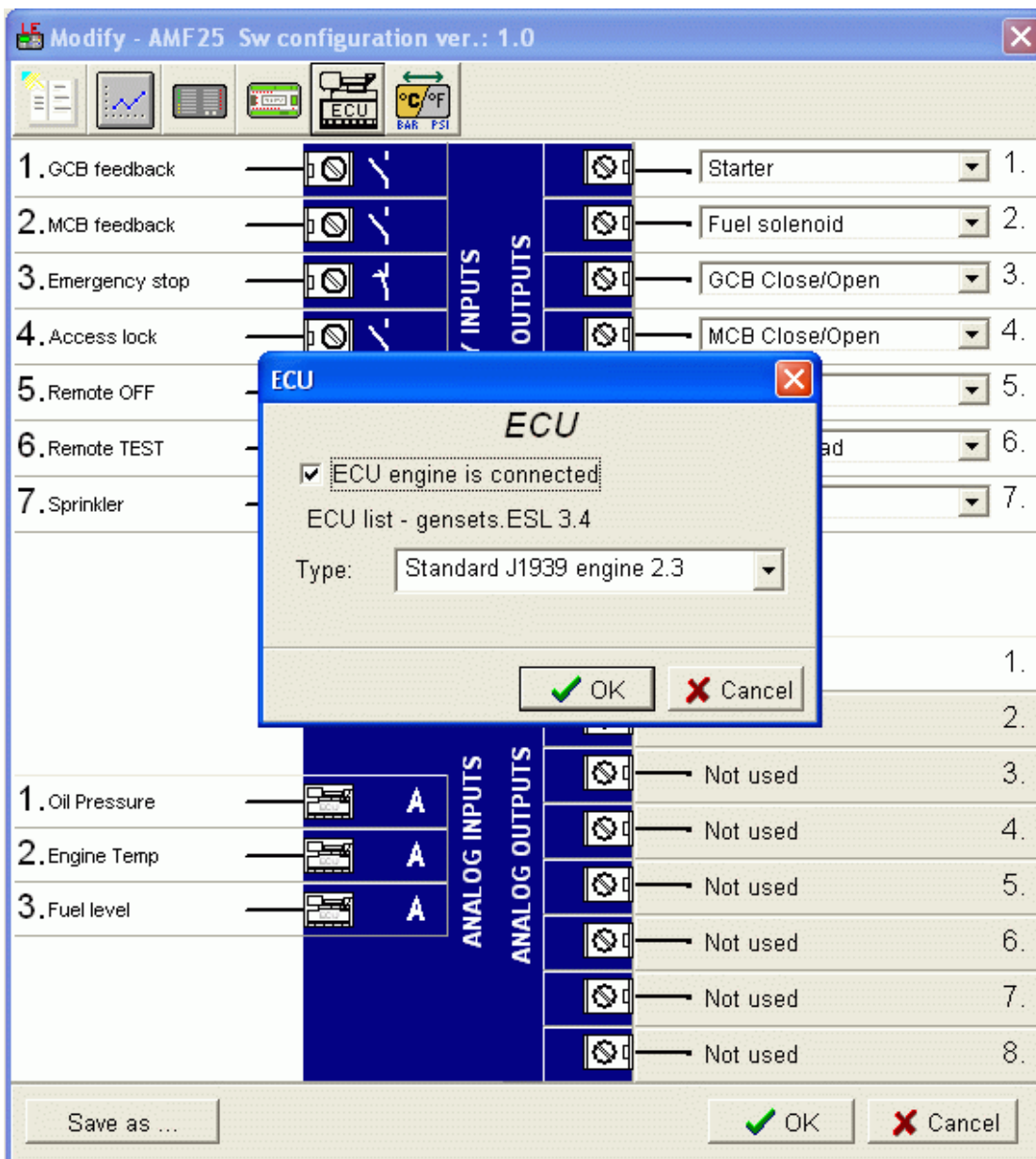
There exists only one firmware branch for both standard and electronic controlled (monitored) engines.

Presence of the ECU on the CAN bus/RS232 is configured via LiteEdit like other peripherals (IG-IOM,



IGL-RA15). Pressing the  button in Configuration window of LiteEdit opens ECU dialog window where the appropriate engine/ECU type should be selected. The actual list of ECU types is available on ComAp website in "ECU list - x.y.iwe" package. Download this package and import it into LiteEdit in the same way as standard firmware IWE package.

More information about ECU list packages, configuration and wiring recommendations can be found in *Comap Electroni Engines Support manual*.



Loss of communication causes a warning alarm. 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 PowerRelay* closes at the beginning of prestart and opens if the engine shall be stopped. It can be used to switch the ECU on and off. If the putput is configured but not active the ECU communication alarm is blocked.

The engine is started via standard contact output or via CAN bus depending on ECU capabilities.

## Values read from ECU

There is fixed set of values read from J1939 ECU by IL-NT controller:

- Engine speed (frame EEC1)
- Engine oil pressure (frame Engine Fluid Level/Pressure)
- Engine coolant temperature (frame Engine Temperature)
- Total engine hours (frame Engine Hours, Revolutions)
- Fuel rate (frame Fuel Economy)
- Boost pressure (frame Inlet/Exhaust Conditions)
- Intake manifold 1 temperature (frame Inlet/Exhaust Conditions)
- Engine oil temperature 1 (frame Engine Temperature 1)

When "ECU LINK"-Modbus option is used, following values are read from Modbus Register Data (for QSX15, QSK45, 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))

### Hint:

Values read from ECU are not written to history besides the fault codes.

## 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 text 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 SPN/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.

Complete list of text diagnostic messages for each ECU can be found in *Comap Electronic Engines Support* manual.

### 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 engines the fault codes are displayed in hexadecimal format.

## Analog inputs

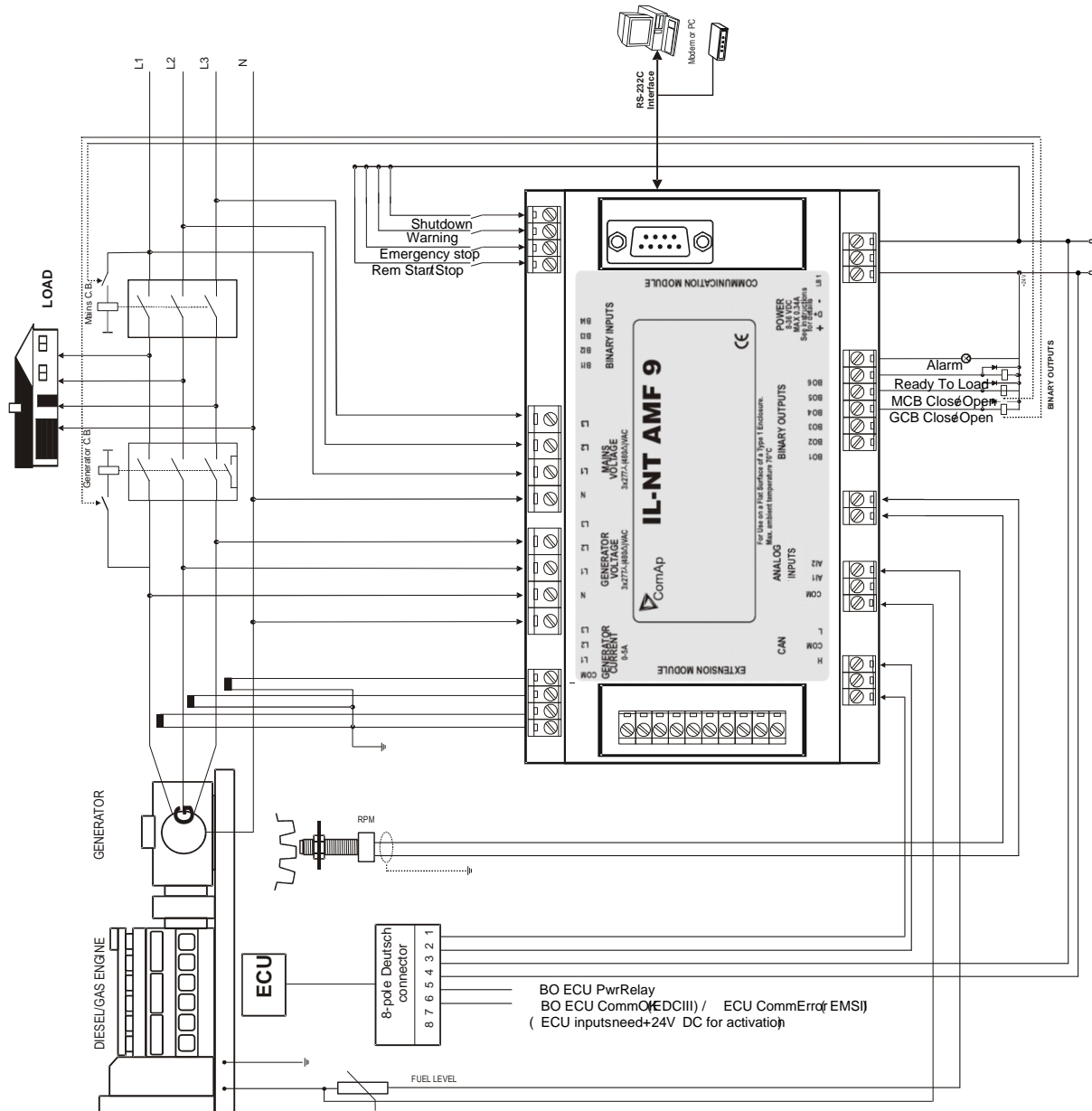
Reading of mentioned values from ECU enables to use analog inputs of the unit for other purposes, e.g. measuring, displaying and alarm activation related to various quantities. The configuration thus allows to use three analog inputs on the central unit.

## Connection description

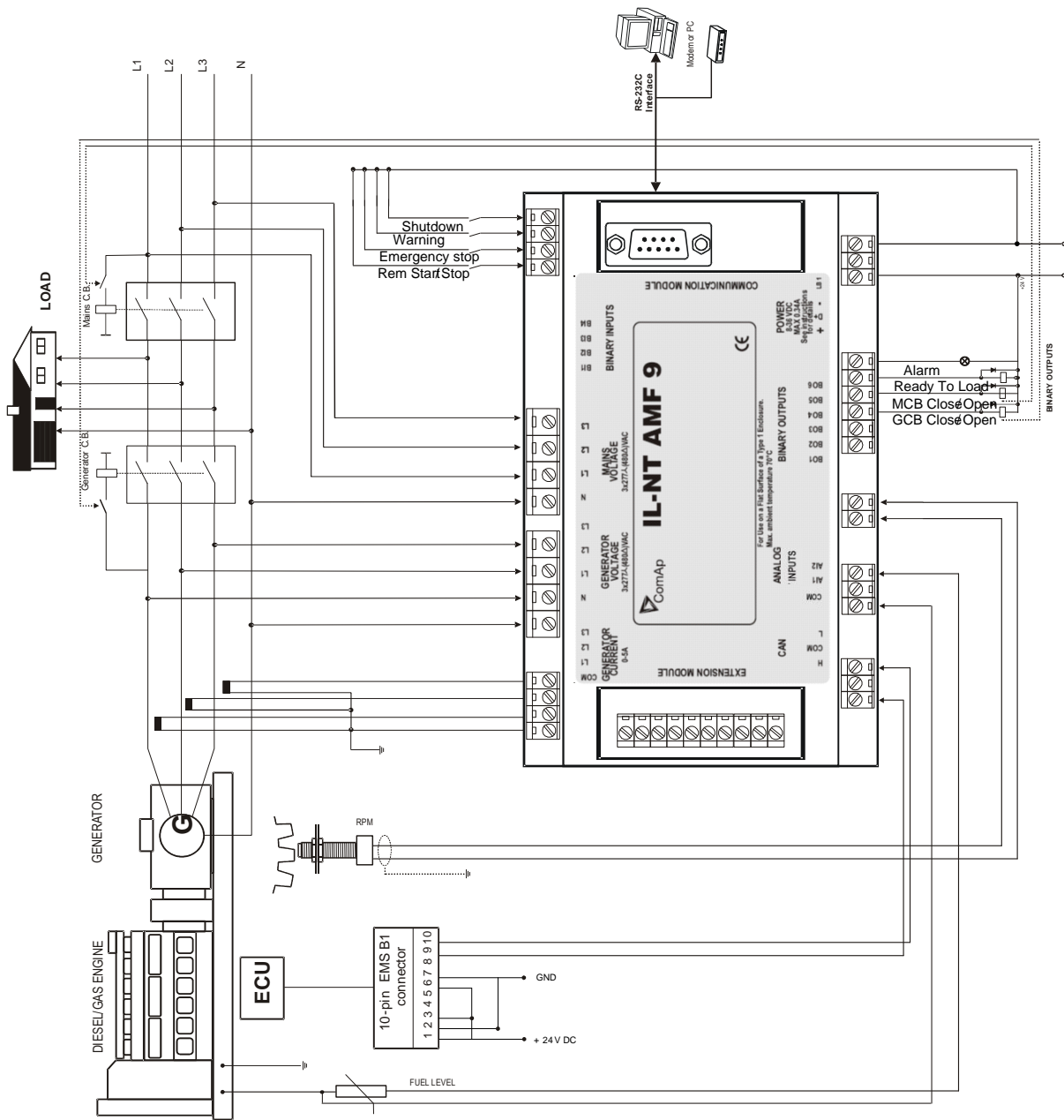
The following diagrams show how to connect the engine control unit to the IntelliLite controller:

### Engines with J1939 support started via CAN bus

#### VOLVO PENTA engines (EMS II, EDC III units)



SCANIA S6





## Cummins engines with MODBUS communication

InteliLite set up:

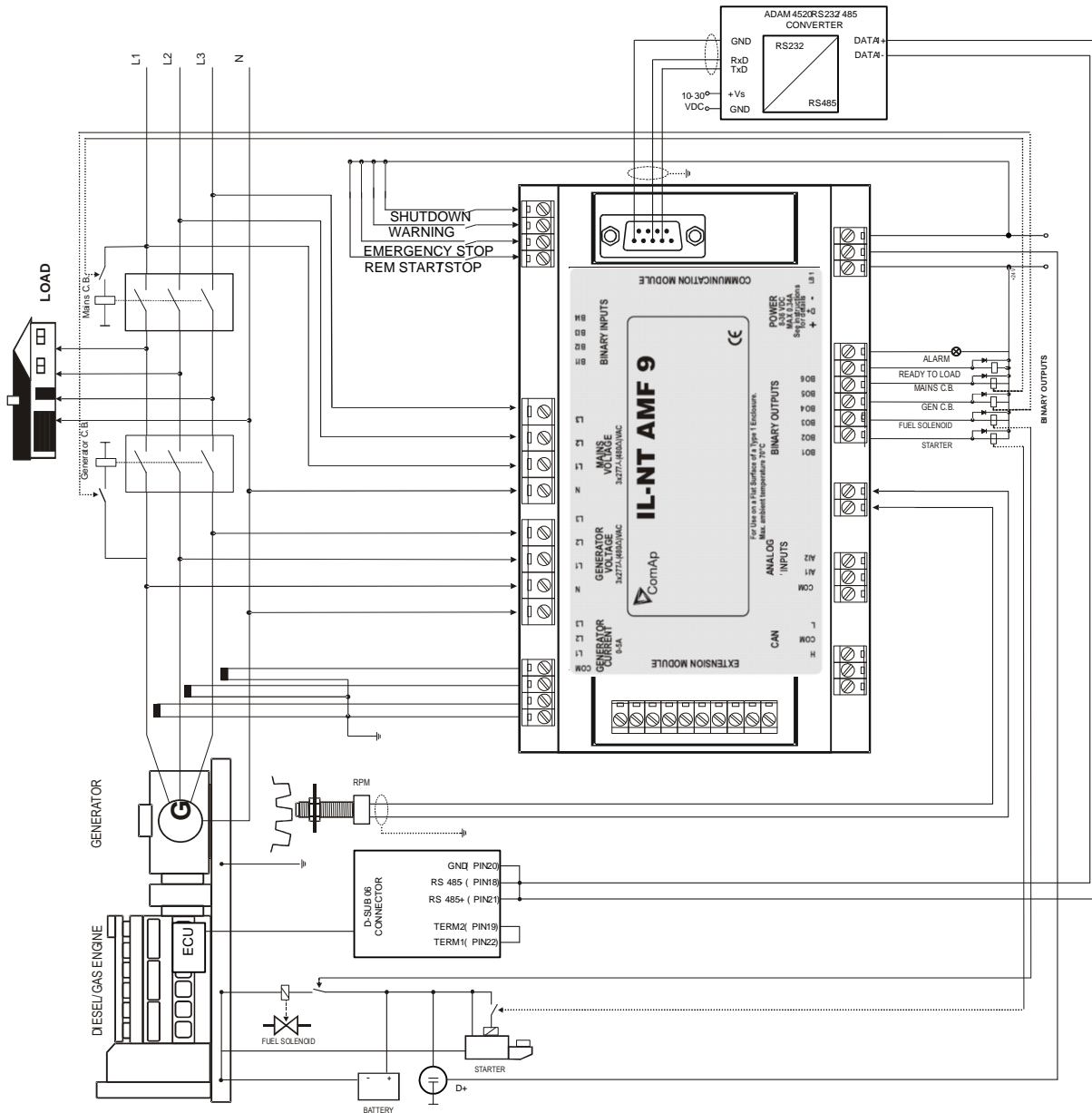
Software configuration: ECU → ECU engine is connected → Type: Cummins MODBUS

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](http://www.advantech.com/products/Model_Detail.asp?model_id=1-D6FLH))



# Sensor Specification

## Default sensor curves

---

There are 20 default resistive curves available. The following table provides information on minimum/maximum values of respective sensors. Actual values especially of temperature curves may differ. Meaning is to prolong curve to the lower temperature values, so the cold engine will not raise alarm fail sensor.

Curve	Min Value	Max Value	Unit
Datcon 5 Bar	0	5	Bar
Datcon 7 Bar	0	7	Bar
Datcon 10 Bar	0	10	Bar
Datcon 80 Psi	0	80	Psi
Datcon 100 Psi	0	100	Psi
Datcon 150 Psi	0	150	Psi
Datcon Low °C	25	150	°C
Datcon High °C	25	160	°C
Datcon Low °F	80	300	°F
Datcon High °F	80	320	°F
Datcon Fuel %	0	100	%
VDO 5 Bar	0	5	Bar
VDO 10 Bar	0	10	Bar
VDO 72 Psi	0	72	Psi
VDO 145 Psi	0	145	Psi
VDO 40-120 °C	40	120	°C
VDO 50-150 °C	50	150	°C
VDO 100-250 °F	100	250	°F
VDO 120-300°F	120	300	°F
VDO Fuel %	0	100	%

**Hint:**

You can find detail information on sensors in LiteEdit Reference Guide and details about sensor fails in this manual in chapter Alarm Management - [Sensor Fail \(FLS\)](#).

# Function Description

## MAN Mode

**START** - starts the gen-set.

### GCB ON/OFF

- The controller closes GCB to dead bus.
- The controller opens GCB when closed.
- If the generator voltage is out of the limits, the controller does not respond to the **GCB ON/OFF**

### MCB ON/OFF

- The controller closes MCB to dead bus.
- The controller opens MCB when closed.

**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 power cut comes.

**!! The controller provides interlock between GCB and MCB, it means it is never possible to close both CB together**

## 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 evaluated form Mains failure/return)

State	Condition of the transition	Action	Next state
Ready	Start request	PRESTART on <i>Prestart Time</i> counter started	<i>Prestart</i>
	RPM > 2 or Oil pressure > Starting OilP detected or Gen voltage > 10V		<i>Stop (Stop fail)</i>
	OFF Mode selected or Shut down alarm active		<i>Not Ready</i>
Not Ready	RPM < 2, Oil pressure not detected, Vgen < 10V, D+ not Active no shutdown alarm active, other than OFF Mode selected		<i>Ready</i>
Prestart <sup>3</sup>	<i>Prestart time elapsed</i>	STARTER on FUEL SOLENOID on <sup>4</sup> <i>MaxCrank Time</i> counter started	<i>Cranking</i>
Cranking <sup>3</sup>	RPM > Starting RPM	STARTER off PRESTART off	<i>Starting</i>
	D+ input activated or oil pressure detected or Gen voltage > 25% Vgnom or D+ active for 1s	STARTER off PRESTART off	<i>Cranking</i>
	<i>MaxCrank Time elapsed, 1st attempt</i>	STARTER off FUEL SOLENOID off STOP SOLENOID on <i>CrankFail Pause</i> timer started	<i>Crank pause</i>

State	Condition of the transition	Action	Next state
	MaxCrank Time <i>elapsed, last attempt</i>	STARTER off PRESTART off	Shutdown (Start fail)
Crank pause <sup>3</sup>	CrankFail Pause <i>elapsed</i>	STARTER on FUEL SOLENOID on <sup>4</sup> STOP SOLENOID off MaxCrank Time counter started	Cranking
Starting <sup>3</sup>	80% Nominal RPM <i>reached</i>	READY TO LOAD on <sup>1</sup> Min, Max Stab Time counter started	Running
	RPM = 0 or any other shutdown condition	FUEL SOLENOID off STOP SOLENOID on	Shutdown
	60 sec. <i>Elapsed</i>	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 <sup>2</sup> FUEL SOLENOID off	Shutdown
	GCB CLOSE/OPEN <i>closed</i>		Loaded
Loaded	GCB CLOSE/OPEN <i>opened</i>		Running
	RPM = 0 or any other shutdown condition	FUEL SOLENOID off STOP SOLENOID on READY TO LOAD off	Shutdown
Cooling	Cooling Time <i>elapsed</i>	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 <sup>1</sup>	Running
Stop	RPM = 0, Oil pressure not detected, Vgen < 10V, D+ not active		Ready
	If at least one of engine running indication is detected when Setpoint Stop Time elapsed. See more details in chapter Gen-Set Operation state – <a href="#">Stop engine conditions</a>		Stop (Stop fail)

<sup>1</sup> If all generator parameters OK and Min Stab Time elapsed, indicates that GCB is possible to close. In AUTO Mode closes in this moment GCB automatically.

<sup>2</sup> If GCB output used GCB opens automatically

<sup>3</sup> The start-up sequence can be interrupted in any time by comming stop request

<sup>4</sup> 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**, **MCB ON/OFF**, **GCB ON/OFF**. Engine start/stop request is evaluated form Mains failure/return.

## AMF sequence (simplified)

State	Condition of the transition	Action	Next state
Mains Oper / Mains operation	Mains failed <sup>1</sup> or MCB feedback dropout <i>MCB Opens On</i> = MAINSFAIL	MCB CLOSE/OPEN off <i>EmergStart Del</i> timer started	Mains failure
	Mains failed <sup>1</sup> or MCB feedback dropout <i>MCB Opens On</i> = GENRUN	<i>EmergStart Del</i> timer started	Mains failure
Mains Flt / Mains failure	Mains voltage and frequency OK <i>MCB Opens On</i> = MAINSFAIL	After elapsing <i>MCB Close Del</i> MCB CLOSE/OPEN on	Mains operation
	Mains voltage and frequency OK <i>MCB Opens On</i> = GENRUN	None	Mains operation
	<i>EmergStart Del</i> elapsed <i>MCB Opens On</i> = MAINSFAIL	Engine start sequence performed, then GCB CLOSE/OPEN on <sup>2</sup>	Island operation
	<i>EmergStart Del</i> elapsed <i>MCB Opens On</i> = GENRUN	Engine start sequence performed, then MCB CLOSE/OPEN off, time delay <i>Transfer Del</i> performed and GCB CLOSE/OPEN on <sup>2</sup>	Island operation
IslOper / Island operation	Mains voltage and frequency OK	<i>MainsReturnDel</i> timer started	Mains return
MainsRet / Mains return	Mains failed		Island operation
	<i>MainsReturnDel</i> elapsed	GCB CLOSE/OPEN off, then after <i>Transfer Del</i> MCB CLOSE/OPEN on and then engine stop sequence performed <sup>3</sup>	Mains operation

<sup>1</sup> **Mains failed** means mains over/under -voltage, over/under -frequency, voltage assymetry (preset delay must elapse)

<sup>2</sup> If during start-up sequence mains returns, then MCB is reclosed with delay *MCB Close Del* (if opened, depending on *MCB Opens On* setpoint) and start-up sequence is interrupted.

<sup>3</sup> If mains fails during stop procedure (cooling) again, stop sequence is interrupted, MCB opened and GCB reclosed with delay *Transfer Del*.

See also chapter **Circuit breakers timing**.

### Hint:

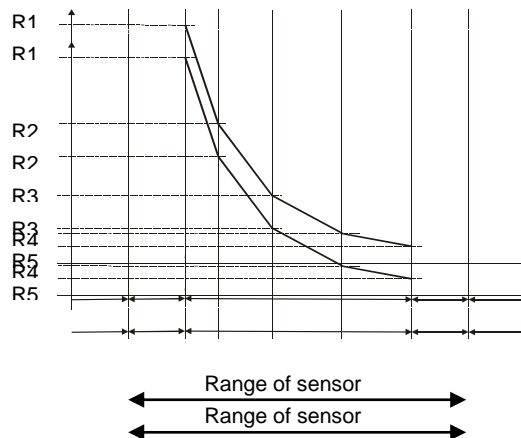
When the AMF function will start the engine than the engine will be running at least for the time which is defined in [MainsReturnDel](#) setpoint, even if the mains would return in the meantime.

# Alarm Management

Following alarms are available:

- Sensor Fail
- Warning
- Breakers open and cooling (BOC)
- Shut down
- Mains failure

## Sensor Fail (FLS)



Sensor Fail of analog inputs is detected in three ways. First when measured resistance value is lower than half of the lowest point of sensor characteristics. Second when measured resistance value is higher than 112,5% of highest point of sensor characteristics. Or when data from ECU are missing. Sensor Fail is indicated by ##### symbol instead measured value.

Sensor Fail is only evaluated for values of sensor curve within range 1..14999Ohm.

When the sensor characteristic curve consists values "0" or "15000", the sensor fault for shortcircuit/sensor fail is not evaluated.

Maximum allowable resistance value for sensor characteristics is 15000 Ohms.

## Warning (WRN)

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

### Possible warnings:

See [List of possible events](#)

## Breaker open and cooling (BOC)

When the BOC alarm comes up, IL-NT opens first output GCB CLOSE/ to unload the gen-set and then after cooling time it also stops the gen-set. Alarm outputs and common shutdown output are activated. Active or not acknowledged protection disables gen-set start.

### Possible BOC alarms:

See [List of possible events](#)

## Shut down (SD)

When the shut-down alarm comes up, IntelliLite 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](#)

## ^Mains failure (MF)

Mains failure detection depends on **Auto mains failure** setpoints (levels and delays) adjusting. When the mains failure comes up, mains circuit breaker is opened.

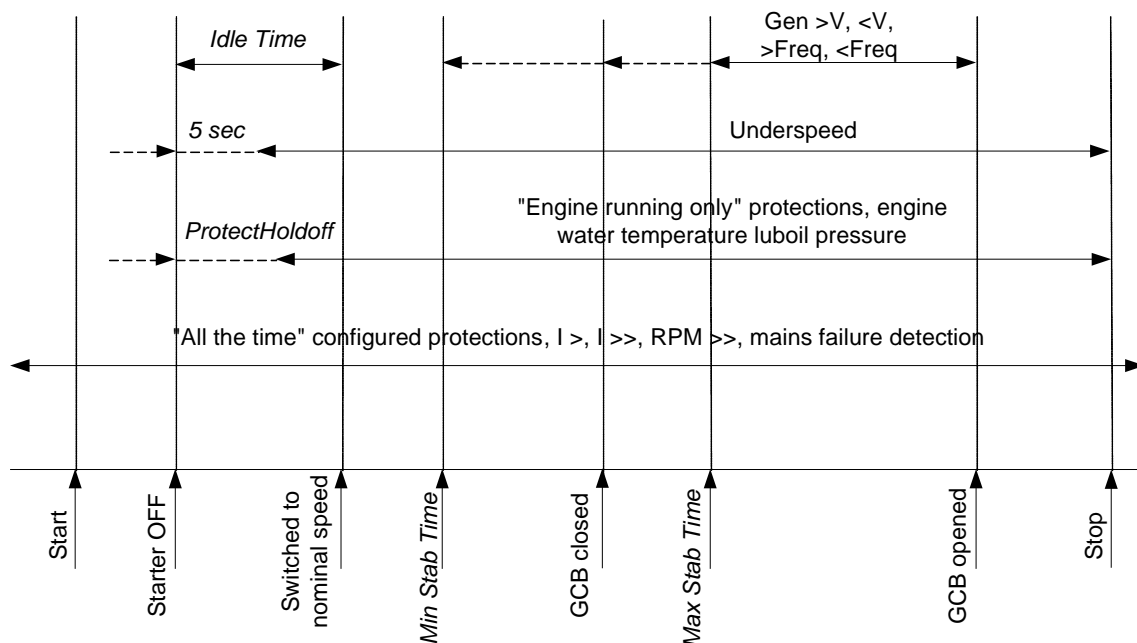
### Possible mains failure reasons:

See [List of possible events](#)

#### Hint:

Mains failure is not written to alarm list!

### Alarm time chart



## Voltage phase sequence detection

IntelliLite controller detects phase sequence on both generator and mains/bus voltage terminals. This protections are 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 IntelliLite 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:

- Gen CCW Rot = wrong generator phase sequence
- Mains CCW Rot = wrong mains phase sequence

# Gen-set Operation States

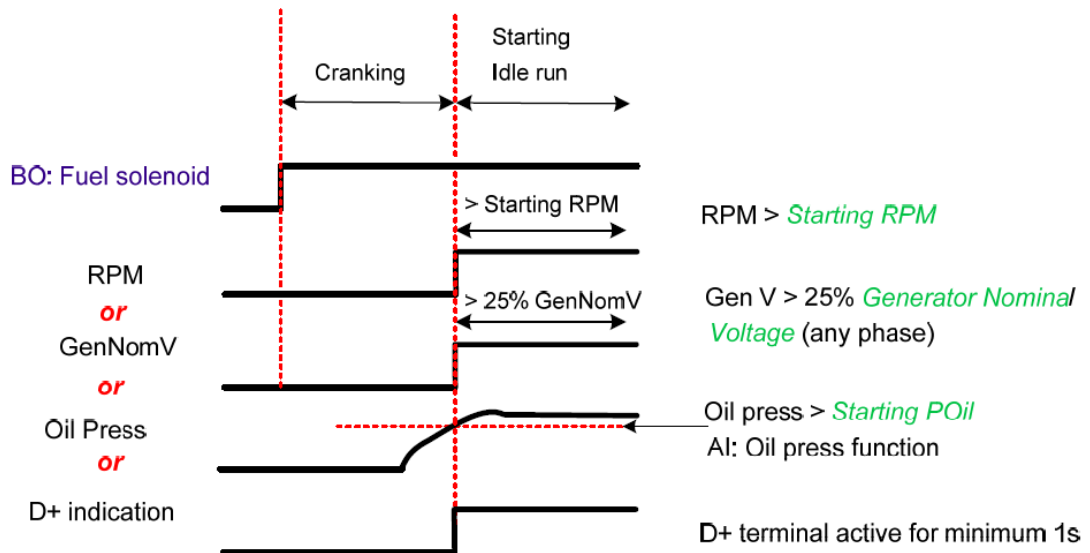
## Engine state machine

Init	Autotest during controller power on.
Not ready	Gen-set is not ready to start. For example when shutdown alarm is active or unit is in OFF mode.
Prestart	Prestart sequence in process, Prestart output is closed. Usually used for preheating or processes executed prior gen-set start.
Cranking	Engine is cranking. Starter output is closed
Pause	Pause between start attempts.
Starting	Starting speed is reached and the <i>Idle timer</i> is running.
Running	Gen-set is running at nominal speed.
Loaded	Gen-set is running at nominal speed and GCB OPEN/CLOSE is closed.
Stop	Stop. Automatic or manual stop command was issued, engine is stopping.
Shutdowns	Shut-down alarm activated.
Ready	Gen-set is ready to run.
Cooling	Gen-set is cooling before stop.
EmergMan	Emergency Manual gen-set operation. Used for bypass the controller and engine manual start.

## “Engine started” conditions

- Engine speed (RPM) > *Starting RPM* or
- AI: Oil press > *Starting POil* or
- D+ terminal active (reached 80% of supply voltage) for minimum 1s or
- Generator voltage > 25% of NomVolts Ph-N or NomVolts Ph-Ph (any phase)

Any of these condition will disconnect starter of the engine, however for transition to next state RPM needs to be higher than *Starting RPM*.



## “Engine running” conditions

- RPM > 2 *RPM* or
- Analog input Oil pressure > **Engine params:** *Starting POil* or
- Vgen > 10 V (any phase).



## “Still engine” conditions

- Engine speed (RPM)  $\leq 1$  RPM
- AI: Oil press  $<$  Starting POil
- Generator voltage  $<$  10V (all phases)

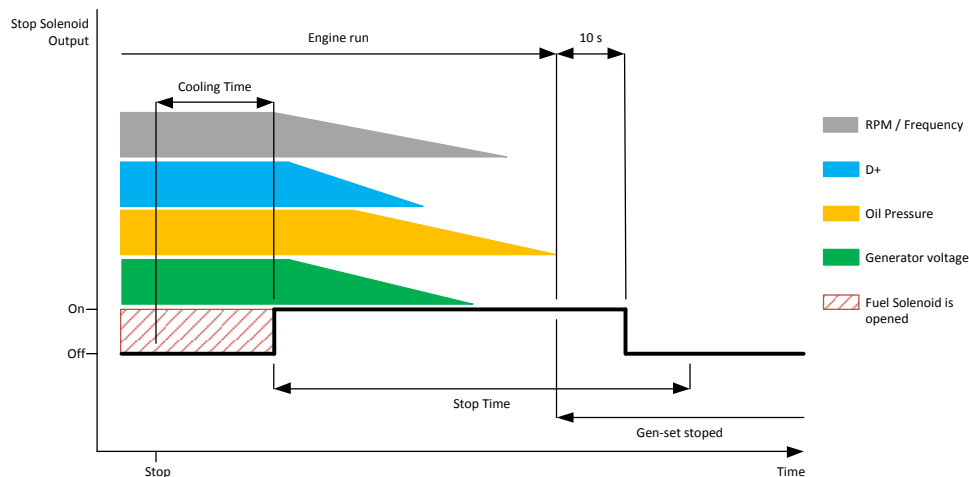
When the engine was running before and all above conditions are fulfilled, additional 2s delay is necessary to confirm “still engine”.

When any engine running conditions are appeared on still engine than the Wrn Stop Fail is activated with following delay:

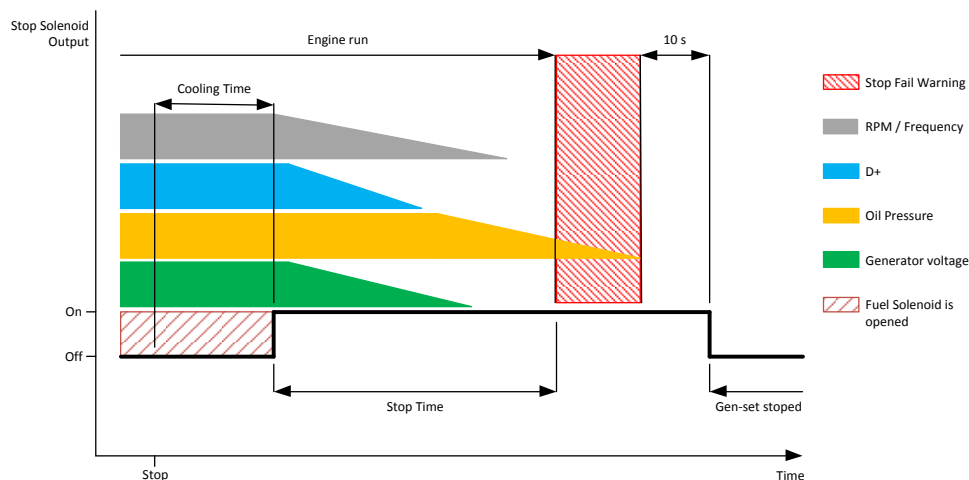
- for generator voltage  $<$  50% of nominal voltage, Wrn Stop Fail has delay 1s
- for generator voltage  $>$  50% of nominal voltage, Wrn Stop Fail has delay 200ms
- for oil pressure  $>$  starting oil pressure, Wrn Stop Fail has delay 1s
- for detected RPM, there is no delay.

## “Stop engine” conditions

If no engine running conditions are validated than the controller will wait extra 10s before leaving the Machine state Stop and than it will release the Binary output [Stop solenoid](#).



When the total time of stopping will exceed setpoint [Stop time](#) (in Engine Params) than the Stop fail warning and related binary outputs are activated. The controller will continuously try to stop the engine.



## Electric state machine

MainsOper	^Mains is present and all its values are within limits. (MCB is closed, GCB is opened)
MainsFlt	^Mains cut off – immediate state
MainsFlt	^Mains cut off – takes EmergStart del
IslOper	^Island operation (MCB is opened, GCB is closed)
MainsRet	^Mains recover
Brks Off	GCB, MCB opened
MinStabTO	Minimal Stabilization Timeout for electric protections
MaxStabTO	Maximal Stabilization Timeout for electric protections
Trans Del	Forward return break delay. Delay between GCB opening and MCB closing

## List of possible events

Events specification	Protection type	Information on binary output available (See list of <a href="#">Binary outputs</a> )	Description
A11 Wrn	WRN	YES	Value measured on analog input 1 is lower than <i>A11 Wrn</i> setpoint.
A11 Sd	SD	YES	Value measured on analog input 1 is lower than <i>A11 Sd</i> setpoint.
A12 Wrn	WRN	YES	Value measured on analog input 2 is greater than <i>A12 Wrn</i> setpoint.
A12 Sd	SD	YES	Value measured on analog input 2 is greater than <i>A12 Sd</i> setpoint.
A13 Wrn	WRN	YES	Value measured on analog input 3 is greater than <i>A13 Wrn</i> setpoint.
A13 Sd	SD	YES	Value measured on analog input 3 is greater than <i>A13 Sd</i> setpoint.
Wrn Batt Volt	WRN	YES	Battery voltage is out of limits given by <i>Batt Undervolt/Batt OverVolt</i> setpoints.
Binary input	Configurable	YES	Configurable Warning/BOC/Shutdown alarms on the inputs of IL-NT.
Sd BatteryFlat	SD	YES	If the controller switches off during starting sequence due to bad battery condition it doesn't try to start again and activates this protection.
Sd Start Fail	SD	YES	Gen-set start failed. All crank attempts were tried without success.
ParamFail	NONE	NO	Wrong checksum of parameters. Happends 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.
Sd Gen Lx >V BOC Gen Lx <V (where x=1,2,3)	SD BOC	YES	The generator voltage is out of limits given by <i>Gen &lt;V BOC</i> and <i>Gen &gt;V Sd</i> setpoints.
BOC Gen V Unbal	BOC	YES	The generator voltage is unbalanced more than the value of <i>Volt Unbal BOC</i> setpoint.
BOC Gen >, <Freq	BOC	YES	The generator frequency is out of limits given by <i>Gen &gt;Freq BOC</i> and <i>Gen &lt;Freq BOC</i> setpoints.
BOC Amps Unbal	BOC	NO	The generator current is unbalanced.
BOC Amps IDMT	BOC	NO	Generator current exceeds the limit for IDMT protection given by <i>Nominal</i>

Events specification	Protection type	Information on binary output available (See list of <a href="#">Binary outputs</a> )	Description
			<i>current and Amps IDMT Del</i> setpoints.
BOC Overload	BOC	YES	The load is greater than the value given by <i>Overload</i> setpoint.
Sd Earth Fault	SD	YES	This alarm is activated when Earth Fault value exceeds <i>Earth Fault Sd</i> limit for at least <i>Earth Fault Del</i> period.
Sd Overspeed	SD	YES	The protection comes active if the speed is greater than <i>Overspeed</i> setpoint.
Sd Underspeed	SD	YES	During starting of the engine when the RPM reach the value of <i>Starting RPM</i> setpoint the starter is switched off and the speed of the engine can drop under <i>Starting RPM</i> again. Then the Underspeed protection becomes active. Protection evaluation starts 5 seconds after reaching <i>StartingRPM</i> .
EmergencyStop	SD	NO	If the input <i>Emergency Stop</i> is opened shutdown is immediately activated.
GCB Fail	SD	NO	Failure of generator circuit breaker.
MCB Fail	MF	NO	Failure of mains circuit breaker.
Sd RPMMeasFail	SD	NO	Failure of magnetic pick-up sensor for speed measurement. This alarm appears, if starter was disengaged for other reason than overcrossing starting speed (like oil pressure or D+) and at the end of timer Max Crank Time there are no RPMs > Starting speed detected.
Wrn Stop Fail	WRN	YES	Gen-set stop failed. See description at <a href="#">Gen-set Operation States</a> chapter.
WrnMaintenance	WRN	NO	The period for servicing is set by the <i>WrnMaintenance</i> setpoint. The protection comes active if the running hours of the engine reach this value.
ChargeAlt Fail	WRN	YES	Failure of alternator for charging the battery.
Sd Override	WRN	NO	The protection is active if the output <i>Sd Override</i> is closed.
Wrn ECU Alarm	WRN	NO	ECU alarm list is not empty
Low BackupBatt	WRN	NO	RTC backup battery is flat
Mains CCW Rot	WRN	NO	Mains voltage phases are not wired correctly. MCB closing is prohibited by controller.
Gen CCW Rot	WRN	NO	Genset voltage phases are not wired correctly. MCB closing is prohibited by controller.

## History file

InteliLite NT stores a record of each important event into the history file. The history file seats 100+ records based on running hours for IL-NT-MRS3,4 and AMF8,9 controllers. When the history file is full, the oldest records are removed.

Number of history records varies with number of configured modules.

For different [ConnectionType](#) [[3Ph4Wire](#) / [3Ph3Wire](#) / [Split Ph](#) / [Mono Ph](#)] different voltages are shown in history file. In fact always Ph-Ph voltage is shown, but due to different connections the result is following:

1. For 3Ph4Wire:
  - a. Vg1 = Gen. Ph-Ph voltage L1-L2
  - b. Vg2 = Gen. Ph-Ph voltage L2-L3
  - c. Vg3 = Gen. Ph-Ph voltage L3-L1
2. For 3Ph3Wire:
  - a. Vg1 = Gen. Ph-Ph voltage L1-L2
  - b. Vg2 = Gen. Ph-Ph voltage L2-L3
  - c. Vg3 = Gen. Ph-Ph voltage L3-L1
3. For Split Ph:
  - a. Vg1 = Gen. Ph-Ph voltage L1-L2
  - b. Vg2 = Gen. Ph-N voltage L2
  - c. Vg3 = Gen. Ph-N voltage L1
4. For Mono Ph:
  - a. Vg1 = Gen. Ph-N voltage L1
  - b. Vg2 = 0
  - c. Vg3 = 0

The mains voltages are displayed in history analogously.

### Hint:

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

### Hint:

The first history record after the controller is switched on, programmed or watchdog reset occurs contains diagnostic values instead of operational. Some fields in these records seem to have nonsense values. Do not take these values into account.

## Record structure

Abbreviation	Historical value
Num	Number of historical event
Reason	Event specification
Time	Time of historical event (Running hours)
Mode	Controller's mode
RPM	Engine speed
Pwr	Generator active power
PF	Generator PF
LChr	Character of the load
Gfrq	Generator frequency
Vg1	Generator voltage L1-L2 or *see description above
Vg2	Generator voltage L2-L3 or *see description above
Vg3	Generator voltage L3-L1 or *see description above
Ig1	Generator current L1
Ig2	Generator current L2
Ig3	Generator current L3
Mfrq	Mains frequency
Vm1	Mains voltage L1-L2 or *see description above
Vm2	Mains voltage L2-L3 or *see description above

Vm3	Mains voltage L3-L2 or *see description above
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)
BIN	Binary inputs IL-NT
BOUT	Binary outputs IL-NT
BIOE*	Binary inputs/outputs plug-in module (when IL-NT-BIO8 module is configured)
FC*	ECU alarm FailureCode (when ECU is configured)
FMI*	ECUalarm Failure Mode Identifier (when ECU is configured)

# Init Screens

Each IntelliLite NT controller holds informations about serial number, uploaded firmware version and others. These informations are displayed on so called “Init Screens”. It is possible to call this screens from any measurement screen by pressing **ENTER** and **PAGE** buttons concurrently and then only **PAGE** button separately.

Init screens consists of:

## ***Customer Logo screen***

---

This is a first screen which is dedicated for informations provided by customers such as contact numbers, service technician contact and customer message for end users of gen-set. Configuration of this screen is only done by LiteEdit PC software.

## ***Firmware Init screen***

---

This screen consists informations about type of controller, controller manufacturer ComAp, uploaded firmware branch, used application and version of firmware. There is also information about currently configured electronic engine, respectively used ESF file.

Details on recognition of configured electronic engine are in chapter [Identifying configured ECU](#).

## ***Language screen***

---

IL-NT controller offers configurable language support. On this screen si possible to switch between languages configured in controller.

Other way to change language is by binary input [Lang Selection](#).

## ***User Interface screen***

---

IntelliLite NT controller since IL-NT 1.3 SW enables to choose the user interface as customer prefers. There are two choices available: USER or ENGINEER interface.

USER interface is ment for customers, who prefer simple and easy menu and don't wish to list in complex menu or change the settings of controller. In USER interface controller displayes measuring, alarm and init screens.

ENGINEER interface is dedicated for engineers and allow changing the settings of controller, reviewing the history, measurement, alarms and grant the full access to all controllers screens with are available. This mode is default.

This screen also consists information about controller's Serial number and Password decode number which can be useful in case of lost password to controller. For this situations please contact your distributor for help and these two numbers will be needed to recover the password.

Last value displayed on screen is DiagData, which is internal ComAp information is case of FW or unit problems, which helps ComAp to analyze the root cause and find a proper solution.

**Please see latest IL-NT Operator Guide for detailed description.**

# 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:

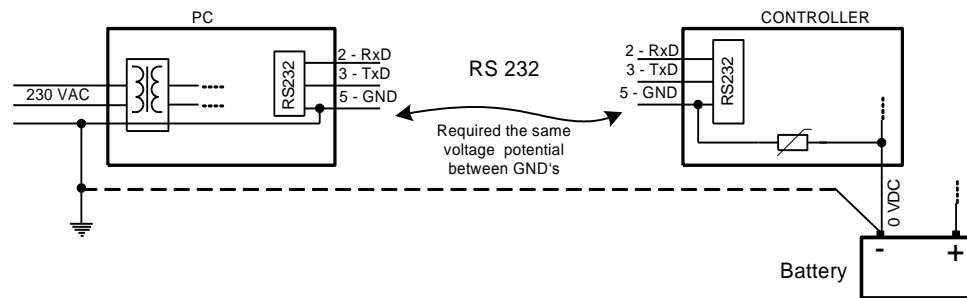
The communication setting for both communication ports on IL-NT controller is presetted subsequently:

For MRS3 and AMF8: COM1 Mode is DIRECT – direct/internet communication  
COM2 Mode is DIRECT – direct/internet communication

For MRS4 and AMF9: COM1 Mode is DIRECT – direct/internet communication  
COM2 Mode is ECU LINK – protocol for communication with Cummins engines via Modbus

### 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 serial port is done via the setpoint *COMx Mode* in *Basic settings*

- 57600 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-AMF9 archive)

##### Setpoints of AMF9:

Name	Firmware ver.	Application	Date	App. ver.	Ser. num.	Filename
IL-NT	IL-NT-2.0 R:18.05.2012	AMF9	18.6.2012	2.0	12345678	IL-NT-AMF9-2.0.AIL

Group	Name	Value	Dimension	Com. obj.	Low limit	High limit	Data type
Basic Settings	Gen-set Name	IL-NT		8637			Short string
Basic Settings	CT Ratio	300	/5A	8274	1	5000	Unsigned 16
Basic Settings	Nominal Freq	50	Hz	8278	45	65	Unsigned 16
Basic Settings	Nomin Current	200	A	8275	1	5000	Unsigned 16
Basic Settings	Prestart Time	2	s	8394	0	600	Unsigned 16
Basic Settings	MaxCrank Time	5	s	8256	1	255	Unsigned 8
Basic Settings	Idle Time	12	s	9097	0	600	Unsigned 16
Basic Settings	Cooling Time	30	s	8258	0	3600	Unsigned 16
Basic Settings	Cooling Speed	NOMINAL		10046			String list
Basic Settings	WrnMaintenance	9999	h	9648	0	10000	Unsigned 16
Basic Settings	Test Period	0	d	10044	0	240	Unsigned 16
Basic Settings	Test Duration	0	min	10201	0	240	Unsigned 16
Basic Settings	ConnectionType	3Ph4Wire		11628			String list
Basic Settings	COM1 Mode	DIRECT		24522			String list
Engine Protect	AI1 Wrn	2	Bar	8369	-10	1000	Integer 16
Engine Protect	AI1 Sd	1	Bar	8370	-10	1000	Integer 16
Engine Protect	AI1 Del	3	s	8365	0	900	Unsigned 16
Engine Protect	AI2 Wrn	80	°C	8375	-100	10000	Integer 16



Engine Protect	AI2 Sd	90	°C	8376	-100	10000	Integer 16
Engine Protect	AI2 Del	5	s	8371	0	900	Unsigned 16
Engine Protect	AI3 Wrn	20	%	8381	-100	10000	Integer 16
Engine Protect	AI3 Sd	10	%	8382	-100	10000	Integer 16
Engine Protect	AI3 Del	10	s	8377	0	900	Unsigned 16
Engine Protect	Batt Undervolt	11,5	V	8387	8	40	Integer 16
Gener Protect	Gen >V Sd	440	V	8291	160	600	Unsigned 16
Gener Protect	Gen <V BOC	280	V	8293	0	450	Unsigned 16
Gener Protect	Gen V Del	3	s	8292	0	600	Unsigned 16
Gener Protect	Gen >Freq BOC	110	%	8296	85	115	Unsigned 16
Gener Protect	Gen <Freq BOC	85	%	8298	0	110	Unsigned 16
Gener Protect	Gen Freq Del	3	s	8297	0	600	Unsigned 16
Gener Protect	Short Crct BOC	150	%	8282	100	500	Unsigned 16
Gener Protect	Short Crct Del	0,04	s	9991	0	60	Unsigned 16
AMF Settings	EmergStart Del	5	s	8301	0	6000	Unsigned 16
AMF Settings	MainsReturnDel	20	s	8302	1	3600	Unsigned 16
AMF Settings	Mains >V	440	V	8305	240	600	Unsigned 16
AMF Settings	Mains <V	240	V	8307	50	440	Unsigned 16
AMF Settings	Mains >Freq	102	%	8310	98	150	Unsigned 16
AMF Settings	Mains <Freq	98	%	8312	50	102	Unsigned 16
AMF Settings	Operation Mode	AMF		12157			String list
SMS/E-Mail	Yel Alarm Msg	OFF		8482			String list
SMS/E-Mail	Red Alarm Msg	OFF		8484			String list
SMS/E-Mail	Event Msg	OFF		10926			String list
SMS/E-Mail	Tel Number			9597			Long string

#### Values of AMF9:

Name	Firmware ver.	Application	Date	App. ver.	Ser. num.	Filename
IL-NT	IL-NT-2.0 R:18.05.2012	AMF9	18.6.2012	2,0	12345678	IL-NT-AMF9-2.0.AIL

Group	Name	Value	Dimension	Com. obj.	Data type
Engine	RPM	0	RPM	8209	Unsigned 16
Generator	Gen Output	0	kVA	8565	Integer 16
Generator	Gen kVA L1	0	kVA	8530	Integer 16
Generator	Gen kVA L2	0	kVA	8531	Integer 16
Generator	Gen kVA L3	0	kVA	8532	Integer 16
Generator	Gen Freq	0	Hz	8210	Unsigned 16
Generator	Gen V L1-N	0	V	8192	Unsigned 16
Generator	Gen V L2-N	0	V	8193	Unsigned 16
Generator	Gen V L3-N	0	V	8194	Unsigned 16
Generator	Gen V L1-L2	0	V	9628	Unsigned 16
Generator	Gen V L2-L3	0	V	9629	Unsigned 16

Generator	Gen V L3-L1	0	V	9630	Unsigned 16
Generator	Gen A L1	0	A	8198	Unsigned 16
Generator	Gen A L2	0	A	8199	Unsigned 16
Generator	Gen A L3	0	A	8200	Unsigned 16
Mains	Mains V L1-N	0	V	8195	Unsigned 16
Mains	Mains V L2-N	0	V	8196	Unsigned 16
Mains	Mains V L3-N	0	V	8197	Unsigned 16
Mains	Mains V L1-L2	0	V	9631	Unsigned 16
Mains	Mains V L2-L3	0	V	9632	Unsigned 16
Mains	Mains V L3-L1	0	V	9633	Unsigned 16
Mains	Mains Freq	0	Hz	8211	Unsigned 16
Controller I/O	Battery Volts	0	V	8213	Integer 16
Controller I/O	D+	0	V	10603	Integer 16
Controller I/O	Oil Pressure	0	Bar	8227	Integer 16
Controller I/O	Engine Temp	0	°C	8228	Integer 16
Controller I/O	Fuel Level	0	%	8229	Integer 16
Controller I/O	Bin Inputs	[0000]		8235	Binary 16
Controller I/O	Bin Outputs	[000000]		8239	Binary 16
Controller I/O	GSM SignalLvl	0	%	11895	Unsigned 16
Controller I/O	GSM ErrorRate	0		12199	Unsigned 8
Controller I/O	GSM Diag Code:	0		11270	Unsigned 8
Controller I/O	Modem Status:	No Connection		12485	Short string
Statistics	Run Hours	0	h	8206	Integer 32
Statistics	Num Starts	0		8207	Unsigned 16
Statistics	Maintenance	9999	h	9648	Unsigned 16
Statistics	Num E-Stops	0		11195	Unsigned 32
Statistics	Shutdowns	0		11196	Unsigned 32
IL Info	Engine State	#####		8330	Unsigned 16
IL Info	Breaker State	#####		8455	Unsigned 16
IL Info	Timer Text	#####		8954	Unsigned 16
IL Info	Timer Value	0	s	8955	Unsigned 16
IL Info	FW Version	2		8393	Unsigned 8
IL Info	Application	17		8480	Unsigned 8
IL Info	FW Branch	1		8707	Unsigned 8
IL Info	PasswordDecode	#####		9090	Unsigned 32
IL Info	DiagData	#####		10050	Unsigned 32

# IL-NT-RD Remote display software

This chapter describes Remote display software IL-NT-RD, which is designed as an remote signalling and control software for IntelliLite-NT and IntelliDrive Lite controllers. **It is the optional software which is possible to upload into controller instead of standard controller's firmware.**

## ***General description***

---

Remote display software works as “remote display and control” for the master IntelliLite-NT or IntelliDrive Lite controller. Genset/Engines can be controlled from remote display as well as from master controller. All remote display screens (Measure, Setpoints and History) displays the same data like master controller. Front panel buttons on both controllers work the same way. All remote display LED's shows the same state as corresponding LED's on master controller.

## ***Warning !***

---

**It is highly recommended to use the same type and model of controller for master and remote display. Only in such case is assured the proper function of all buttons, LED diods and display. Another combinations of HW types and models from Master controller and remote display are not supported nor tested!**

## ***IL-NT-RD Software installation***

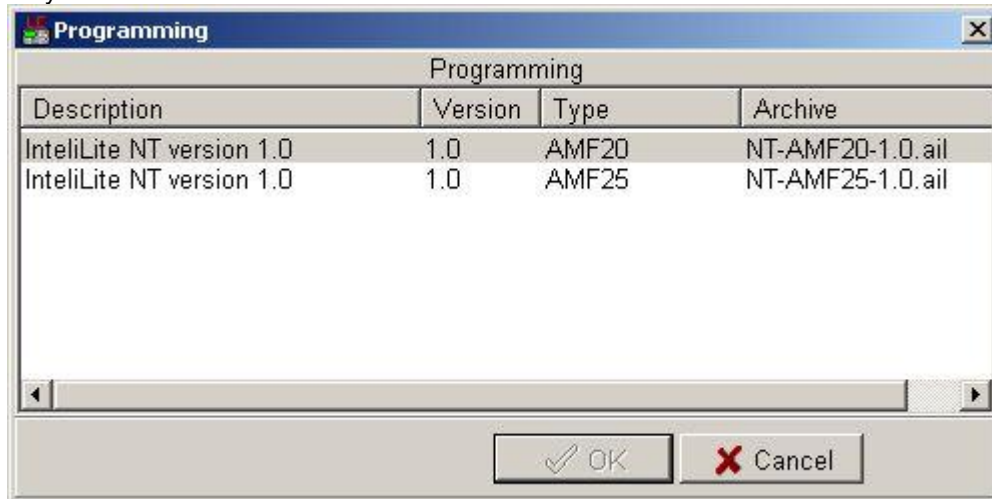
---

The IL-NT-RD remote display firmware is installed in the same way as any other IL-NT firmware using LiteEdit software. Please see LiteEdit Reference guide for details about upgrading firmware. IL-NT-RD consists only firmware, not an archive.

However when there is IL-NT-RD firmware installed in the controller the procedure to install back the original standard firmware is following:

- Open any type of online connection.
- DDE server will try to open the connection, but it will fail and write red error message in the status bar.
- In this moment go to **CONTROLLER -> PROGRAMMING AND CLONING -> PROGRAMMING** and select **proper!** firmware you want program to the controller. Choosing the wrong type of firmware

may result in non-functional controller.



- Press "OK" button to programm the firmware to the controller.
- It may be required to switch off power supply of controller, close the boot jumper and switch on controller again. Follow the information windows accordingly.
- After programming is finished (it may be required to power off controller, open the boot jumper and power it on again) open configuration window and perform the configuration process manually. There is no compatibility of the configuration between different firmware versions.
- In some cases the "wrong setpoints" message can occur in the DDE server status line and the controller is blocked showing "Init" state. Use **CONTROLLER -> RESET FROM INIT STATE** menu item to put the controller to normal operation. Be sure you have checked all setpoints before.

#### **CAUTION!**

Check the statistic value "Engine hours" after firmware upgrade. Readjust the value if necessary.

## ***IL-NT-RD Wiring***

IL-NT-RD can be connected to InteliLite-NT or InteliDrive Lite controller via RS232 or RS485 communication line. It is possible to connect only up to two remote displays to one master controller, if they are using different communication COMs. It is not supported to connect two or more remote displays to one communication line, eg. RS485. It is possible to monitor only one master controller from one remote display at the time.

### **Connection process**

Remote display after power on automatically starts to search for any master controller connected. It starts to search on COM1 from master controllers address 1 to 32 and later on COM2 from address 1 to 32. Remote display tries two communication speeds 38400 bps and 56000bps.

During this process is displayed text "Detecting..." on screen and progress bar below counts from 0 to 100%. This process takes approx. 10-15 seconds. Than is 5 seconds pause and process continues again until compatible master controller is found.

Not supported types of controllers, not supported application, or controllers that are not properly communicating are skipped during the search.

### **Controller type selection**

IL-NT-RD automatically detects controller type.

### **Troubles with connection**

There are few reasons why remote display can not connect with master controller:

1. Not supported type of controller connected (Eg. IGS-NT, ID-DCU, IC-NT, IGS-CU, etc.)

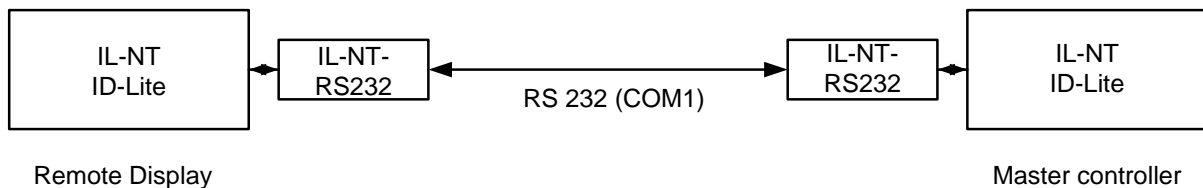
2. Not supported firmware in master controller
3. Configuration table error in master controller
4. Wrong settings of setpoint COMx Mode in master controller
5. Wrong connection, wiring, communication fail

## Direct RS232 connection

HW module:  
IL-NT-RS232

Master controller settings:  
ControllerAddr = 1..32  
COM1 Mode = DIRECT

Up to 2 meters:  
It is recommended to use our standard AT-LINK cable.



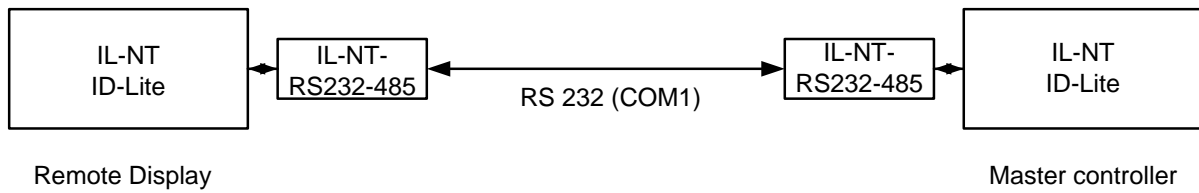
Up to 10 meters:  
It is recommended to use standard Null-modem cable for local connection between controller and remote display, although the three wires (TxD, RxD, GND) RS 232 connection is enough for direct communication:

IL-NT/ID-Lite connector D-SUB9 female	IL-NT-RD connector D-SUB9 female
RxD 2	3 TxD
TxD 3	2 RxD
GND 5	5 GND

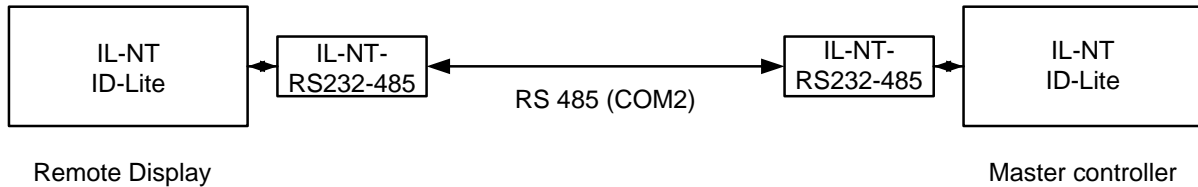
## Remote RS485 and/or direct RS232 connection

HW module:  
IL-NT-RS232-485

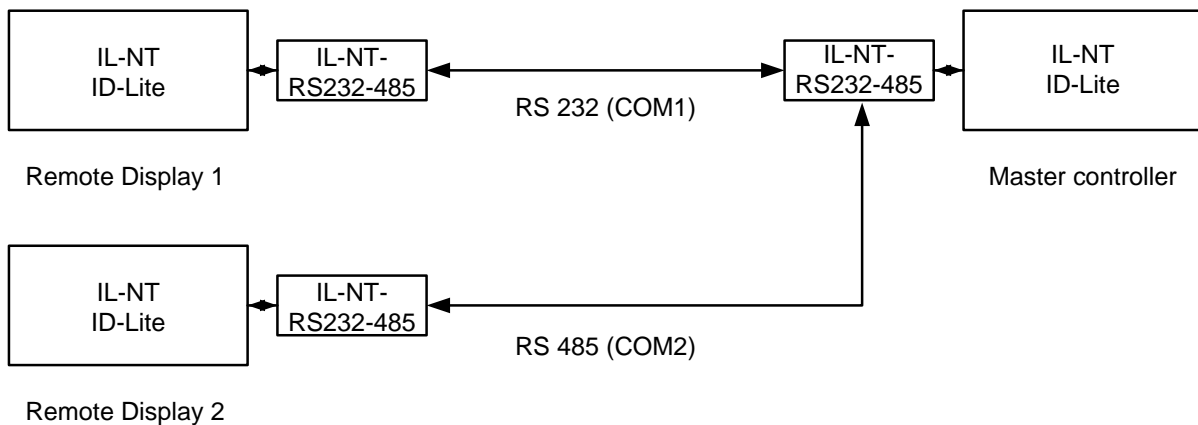
Up to 1000 meters (only with RS485):



OR



OR



#### Case 1) RS232

Master controller settings:  
ControllerAddr = 1..32  
COM1 Mode = DIRECT

#### Case 2) RS485

Master controller settings:  
ControllerAddr = 1..32  
COM2 Mode = DIRECT

#### Case 3) RS232 +RS485

Master controller settings:  
ControllerAddr = 1..32  
COM1 Mode = DIRECT  
COM2 Mode = DIRECT

It is possible to make a RS232 direct connection with IL-NT-RS232 module on one side and IL-NT-RS232-485 module on the other side.

### Alternative connection using external RS232-RS422/485 converter:

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, baud rate 38400 or 56000 bps.

Any connected RS 232 to RS 422/485 converter has to be set to passive DSR signal (when DSR connected) after switch on.

## ***Function description***

---

Remote display IL-NT-RD works as remote display and control of the master IntelliLite-NT or IntelliDrive Lite controller. It is supposed and highly recommended that both, remote display and master are using the same HW type and model of controller. Another types and models of master and remote display are not supported nor tested. All remote display's LEDs shows the same state as corresponding LEDs on master controller. Front panel buttons on both controllers work in the same way. Genset/Engine can be controlled from remote display as well as from master controller. User can switch screens, set password, change setpoints and view history records.

All IL-NT-RD screens Init, Measure, Setpoints and History display the same data like in the master controller.

Master device is always able to work without connected Remote display.

Interruption of the serial line between master device and Remote display has no effect to the master controller.

If the serial line between master device and remote display is interrupted, or communication cannot be established, remote display shows it's Init screen and message "Trying" and all LED's are off.

Once remote display finds compatible master it shows "Preparing" and downloads configuration table from master controller.

After the configuration from master is downloaded remote display jump to master controllers Init screen and all LEDs and blinking.

It is possible to switch to remote displays Init screen to check it's version and serial number of used controller and communication status by pressing PAGE button for 3 seconds.

## ***SW compatibility***

---

IL-NT-RD sw. version 1.0 is compatible with masters SW:

- All IntelliLite-NT standard software from ver. 1.1
- All ID-Lite standard software from ver. 1.0
- Chosen IL-NT and ID-Lite customer branches

Some of the future IL-NT, ID-Lite versions may require upgrade of the IL-NT-RD software.

# Technical Data

## Inputs/Outputs overview

Model	BIN	BOUT	AI	AOUT	COM1	COM2	CAN	RPM	Gen. Voltage	Mains Voltage	Gen. Current
IL-NT MRS3	4+8*	4+8*	3	8*	Y*	Y*	N	N	Y	N	Y
IL-NT MRS4	4+8*	4+8*	3	8*	Y*	Y*	Y	N	Y	N	Y
IL-NT AMF8	4+8*	6+8*	3	8*	Y*	Y*	N	N	Y	Y	Y
IL-NT AMF9	4+8*	6+8*	3	8*	Y*	Y*	Y	N	Y	Y	Y

**Note:**

\* With optional plug-in module

Y -Available

N -Not available

## Generator protections

ComAp gen-set controllers provide following range of generator protections. For each protection adjustable limit and time delay are available.

Comparison table with ANSI codes:

ANSI code	Protection	IL-NT MRS3	IL-NT MRS4	IL-NT AMF8	IL-NT AMF9
59	Overvoltage	•	•	•	•
27	Undervoltage	•	•	•	•
47	Voltage Assymetry	-	-	-	-
81H	Overfrequency	•	•	•	•
81L	Underfrequency	•	•	•	•
50+51	Overcurrent	***	***	***	***
46	Current Unbalance	-	-	-	-
32	Overload	-	-	-	-
51N+64	Earth Fault	-	-	-	-
32R	Reverse Power	-	-	-	-
25	Synchronism Check	-	-	-	-
47	Phase Rotation	**	**	**	**
37	Undercurrent	-	-	-	-
55	Power Factor	-	-	-	-
71	Gas (Fuel) Level	•	•	•	•

**Note:**

- Not available

• Available

\*\* Fixed setting

\*\*\* Shortcurrent only

## 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 IL-NT	-20..+70°C
Operating temperature IL-NT LT <sup>#</sup>	-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 <sup>2</sup>

## **Dimensions and weight**

Dimensions	180x120x55mm
Weight	450g

## **Mains and 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 (I <sub>n</sub> =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	4
Input resistance	4,2 k $\Omega$
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	4 (MRS3,4) or 6 (AMF8,9)
Maximum current	0,5 A
Maximum switching voltage	36 VDC

## ***Analog inputs***

---

Not electrically separated	
Number of inputs	3
Resolution	10 bits
Maximal resistance range	2500 $\Omega$
Resistance measurement tolerance	$\pm 2 \% \pm 2 \Omega$ out of measured value

## ***D+ terminal***

---

CHARGE ALT D+ Function:

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

*Hint:*

"CHARGE ALT D+ Function" works automatically, depending on voltage measured on CHARGE ALT D+ terminal on controller start. If not used connect this terminal to battery positive.

## ***\*CAN bus interface***

---

Galvanically separated	
Maximal CAN bus length	200m
Speed	250kBd
Nominal impedance	120 $\Omega$
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 <sup>2</sup>
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 (optional card)***

---

Plugs into IL-NT controller COMMUNICATIN MODULE port.

Maximal distance	10m
Maximum Speed	Up to 57.6 kBd (DIRECT)

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

### *Hint:*

For details on all IL-NT extension and communication modules see IL-NT, IC-NT-Accessory Modules manual.

## ***IL-NT RS232-485 interface (optional card)***

---

Plugs into IL-NT controller COMMUNICATIN MODULE port.

Maximal distance	10m (RS232), 1200m (RS485)
Maximum Speed	Up to 57.6 kBd (DIRECT)

## ***IL-NT S-USB interface (optional card)***

---

Plugs into IL-NT controller COMMUNICATIN MODULE port.

Maximal distance	5m
Maximum Speed	Up to 57.6 kBd (DIRECT)

Use only shielded A-B USB cables up to 5m length.

Recommend USB cable:

USB-LINK CABLE 1.8M– ComAp A-B USB cable.

## ***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

### ***IL-NT BIO8 interface (optional card)***

---

Plugs into IL-NT controller EXTENSION MODULE port.

8 dedicated pins of the plug-in card's terminal can be configured as binary inputs or outputs.

#### **Binary inputs**

Number of inputs	8
Input resistance	4,7kΩ
Input range	0-36 VDC
Voltage level for close contact indication (Logical 1)	<0,8 VDC
Voltage level for open contact indication (Logical 0)	>2 VDC
Max voltage level for open contact indication	8-36 VDC

#### **Binary open collector outputs**

Number of outputs	8
Maximum current per pin	0,5 A
Maximum switching common current	2 A
Maximum switching voltage	36V

#### *Hint:*

Binary inputs are not galvanically isolated.

Please see detail about wiring and description at chapter [IL-NT BIO8 Hybrid binary input/output module](#).

### ***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