

InteliLite^{NT}

InteliLite NT[®] AMF

Modular Gen-set Controller

Compact Controller for Stand-by Operating Gen-sets

(IL-NT AMF20/25 unit)

SW version 2.1, November 2012



Reference Guide



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General Guidelines

What describes this manual?

IMPORTANT SAFETY INSTRUCTIONS

SAVE THESE INSTRUCTION - This manual contains important instructions for IL-NT controllers family that shall be followed during installation and maintenance of the IntelliLite 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 „AMF 20/25“ software which is designed for single set stand-by applications. What is the purpose of the manual?

This manual provides general information how to install and operate IntelliLite-NT AMF20/25 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^{NT} 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

PAGE	(Capital letters in the frame) buttons on the front panel
<i>Break Return</i>	(Italic) set points
Generator protections	(Bold) Set point group
REMOTE START/STOP	(Capital letters) binary inputs and outputs
*Something	(Symbol * before text) valid only for IL AMF 25

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-AMF25 firmware and IL-NT AMF25 HW) otherwise the function will be disabled. If wrong software is downloaded, message **HARDWARE INCOMPATIBLE** appears on controller screen. In this case download correct software and use Boot jumper programming – close Boot jumper and follow instructions in LiteEdit or follow video guide “**Boot Jumper Programming**” at <http://www.comap.cz/support/training/training-videos/>.

WARNING – VERY IMPORTANT !!!

Every time you want disconnect following IntelliLite^{NT} controller terminals:

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

Switch IntelliLite to MAN or OFF Mode or disconnect the Binary outputs Starter and Fuel to avoid unexpected automatic start of gen-set and GCB closing.

!!! 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^{NT} CT terminals!

Adjust set points

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

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

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

General Description

Description of the controller system (with all options)

InteliLite^{NT} AMF20/25 is a comprehensive AMF-controller for single generating sets operating in stand-by mode. IL-NT AMF25 features extended support of electronic engines and extension modules. InteliLite^{NT} controllers are equipped with a powerful graphic display showing icons, symbols and bar-graphs for intuitive operation, which sets, together with high functionality, new standards in Gen-set controls.

InteliLite^{NT} 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.

InteliLite^{NT} provides gas engine support without ventilation.

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

What is in the package?

Accessories	Description	Optional / Obligatory
IL-NT AMF	InteliLite ^{NT} central unit	Obligatory
IL-NT-RS232	RS232 communication card	Optional for AMF20/25
IL-NT-RS232-485	RS232 and RS485 communication card	Optional for AMF20/25
IL-NT-S-USB	Service USB communication card	Optional for AMF20/25
IB-Lite	Ethernet communication card	Optional for AMF20/25
IL-NT-GPRS	GSM/GPRS modem card	Optional for AMF20/25
IL-NT-AOUT8	Gauge driver plug-in card	Optional for AMF20/25
IL-NT-BIO8	Configurable I/O plug-in card	Optional for AMF20/25
IC-NT-CT-BIO7	Configurable I/O plug-in card with earth fault current measurement	Optional for AMF20/25
**IL-NT RD	Remote display software	Optional for AMF20/25
IGL-RA15	Remote annunciator	Optional for AMF25
IG-IOM/PTM	I/O extension module	Optional for AMF25
IG-IB	Internet communication bridge	Optional for AMF20/25
AT-LINK-CONV	Service programming RS232 interface	Optional for AMF20/25
AT-LINK-CABLE	Serial RS232 communication cable 1,8m	Optional for AMF20/25

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

Hint:

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

IL-NT RS232 Communication plug-in card

IL-NT RS232 is optional plug-in card to enable InteliLite^{NT} for RS232 communication. This is required for computer or Modbus connecting. 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

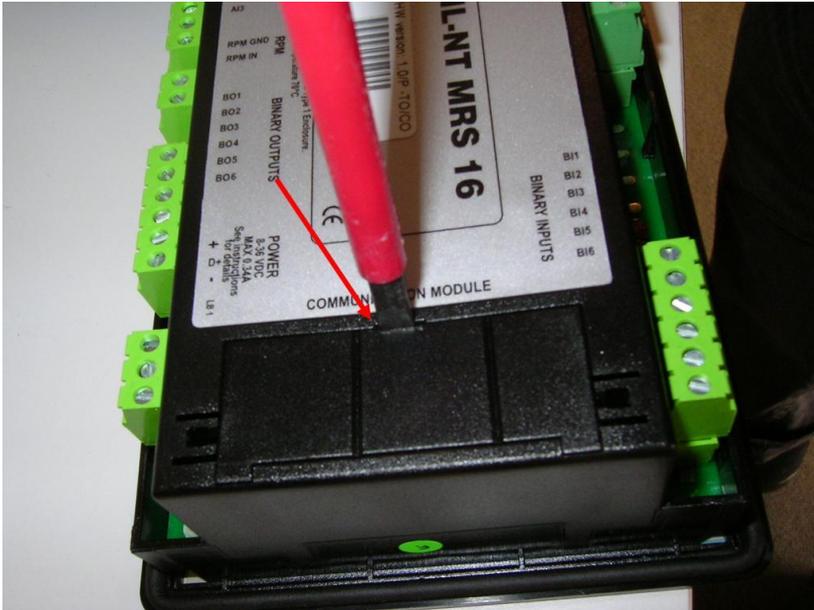
installed permanently. Should you need to remove it, the safest way is to remove whole back cover and than remove module manually.

How to install RS 232 communication module:

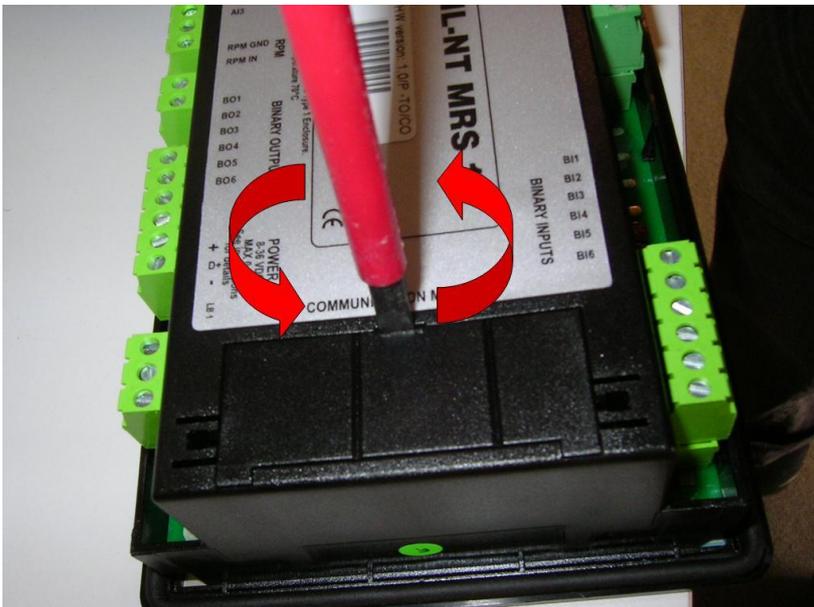
Hint:

The following procedure is analogic also for other communication modules.

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

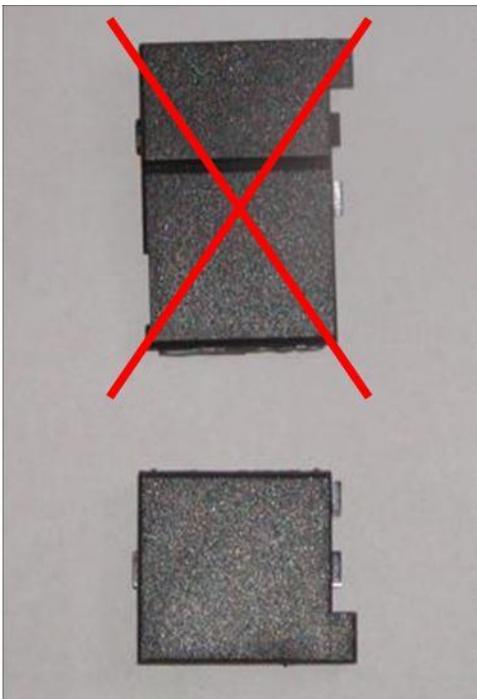
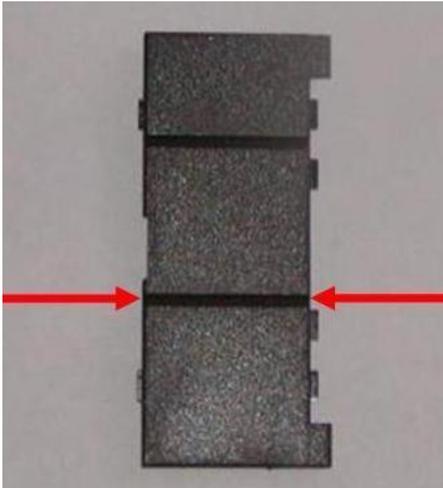


2. Move the screwdriver to set apart the small cover. **Be careful!**



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.

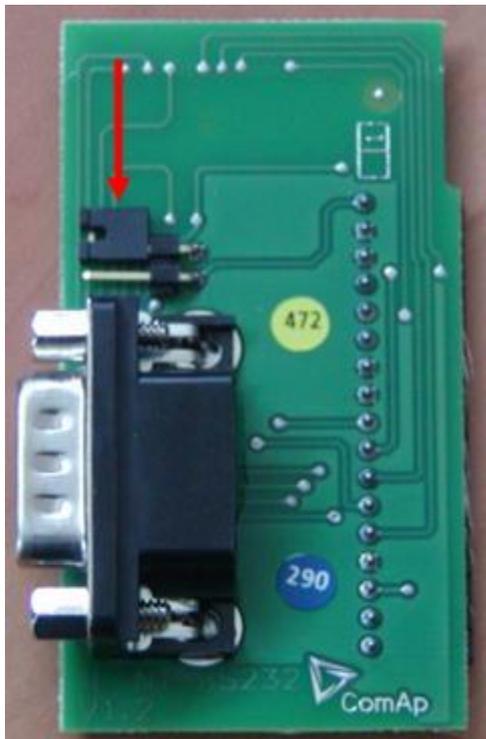


6. Plug RS 232 communication module into the slot of the controller.
7. Put back the small cover.



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.

Hint:

Boot jumper programming – In case of interrupted programming or other software failure is possible to use the boot jumper programming to restore controller to working order. Connect controller to PC, run LiteEdit and wait until connection bar at bottom turns red. Than run programming process via menu Controller -> Programming and cloning – Programming. Select correct firmware and confirm dialog. Than follow instructions in LiteEdit.

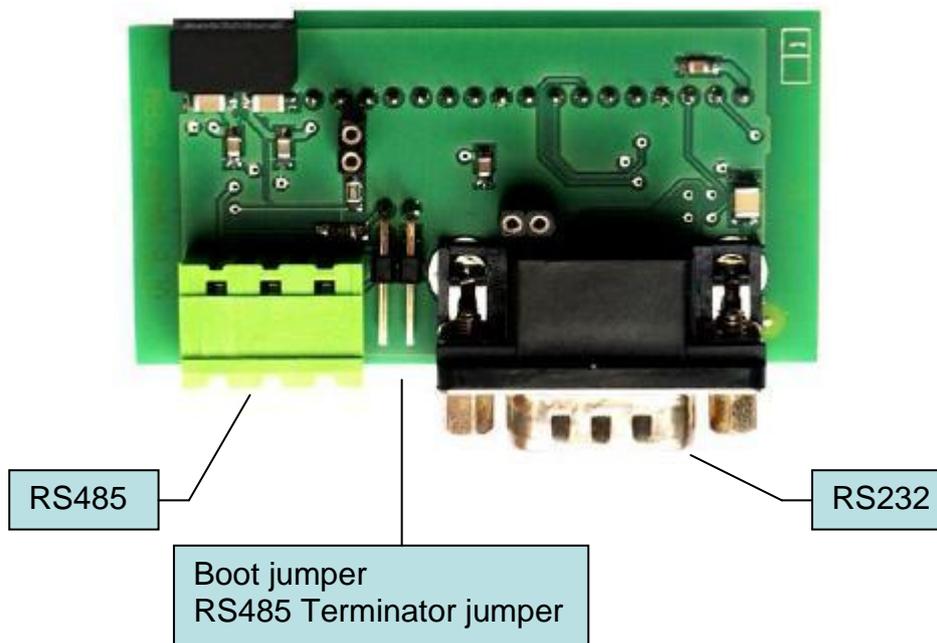
Or follow video guide “**Boot Jumper Programming**“ at <http://www.comap.cz/support/training/training-videos/>.

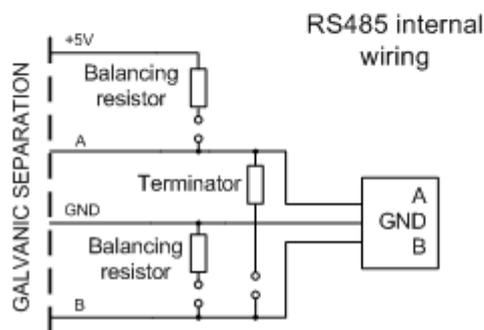
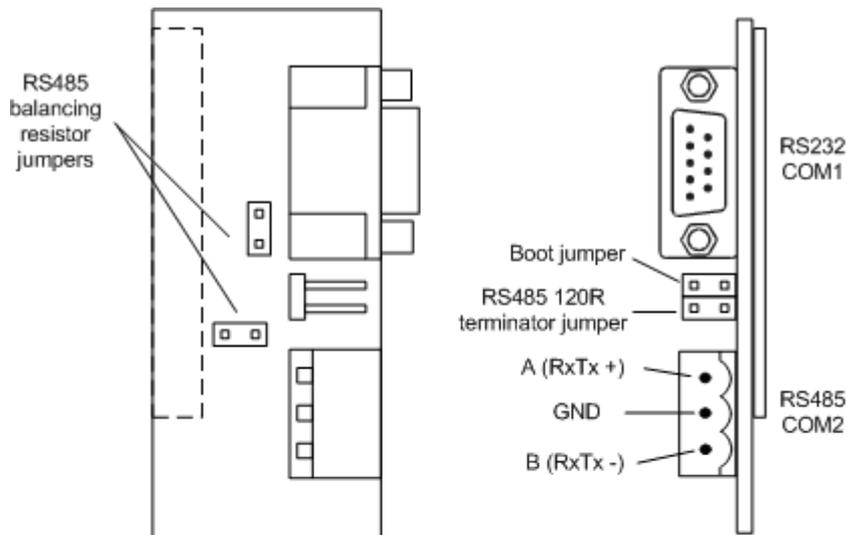
- Please see chapter [IL-NT RS232 interface \(optional card\)](#) for technical details.

IL-NT RS232-485 Communication plug-in card

IL-NT RS232-485 is optional plug-in card to enable IntelliLite^{NT} 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.



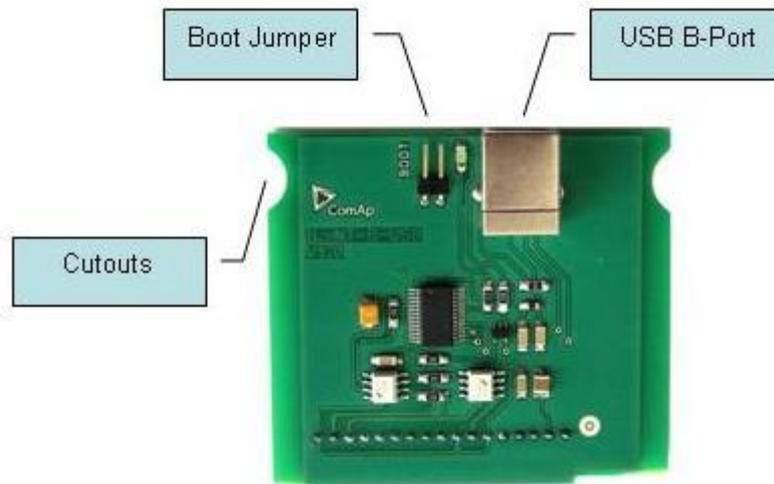


Hint:

- Balancing resistors shall be both closed at only one device in whole RS485 network.
- Boot jumper programming – In case of interrupted programming or other software failure is possible to use the boot jumper programming to restore controller to working order. Connect controller to PC, run LiteEdit and wait until connection bar at bottom turns red. Then run programming process via menu Controller -> Programming and cloning – Programming. Select correct firmware and confirm dialog. Than follow instructions in LiteEdit.
- Or follow video guide “**Boot Jumper Programming**“ at <http://www.comap.cz/support/training/training-videos/>.
- Please see chapter [IL-NT RS232-485 interface \(optional card\)](#) for technical details.

IL-NT S-USB Service USB communication plug-in card

IL-NT S-USB is optional plug-in card to enable IntelliLite^{NT} 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”.
- Please see chapter [IL-NT S-USB interface \(optional card\)](#) for technical details.

Hint:

Boot jumper programming – In case of interrupted programming or other software failure is possible to use the boot jumper programming to restore controller to working order. Connect controller to PC, run LiteEdit and wait until connection bar at bottom turns red. Then run programming process via menu Controller -> Programming and cloning – Programming. Select correct firmware and confirm dialog. Than follow instructions in LiteEdit.

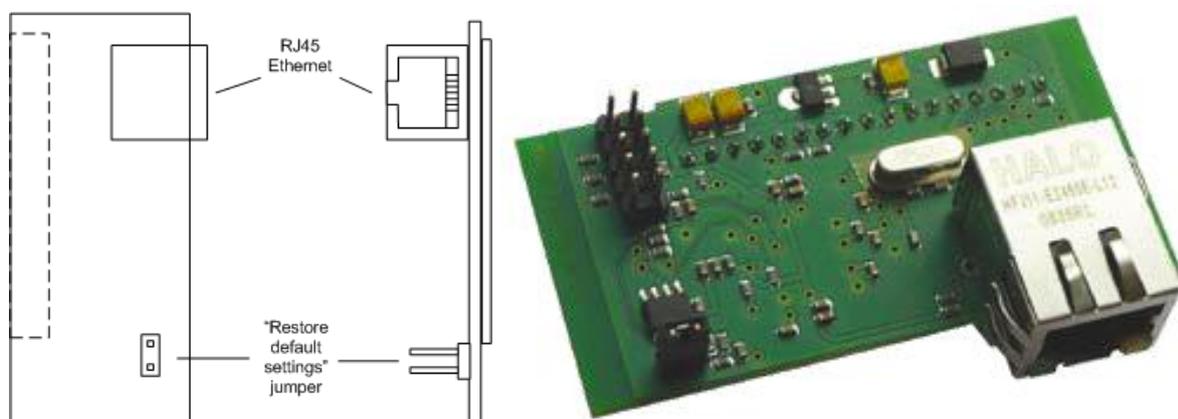
Or follow video guide “**Boot Jumper Programming**“ at <http://www.comap.cz/support/training/training-videos/>.

IB-Lite Ethernet communication plug-in card

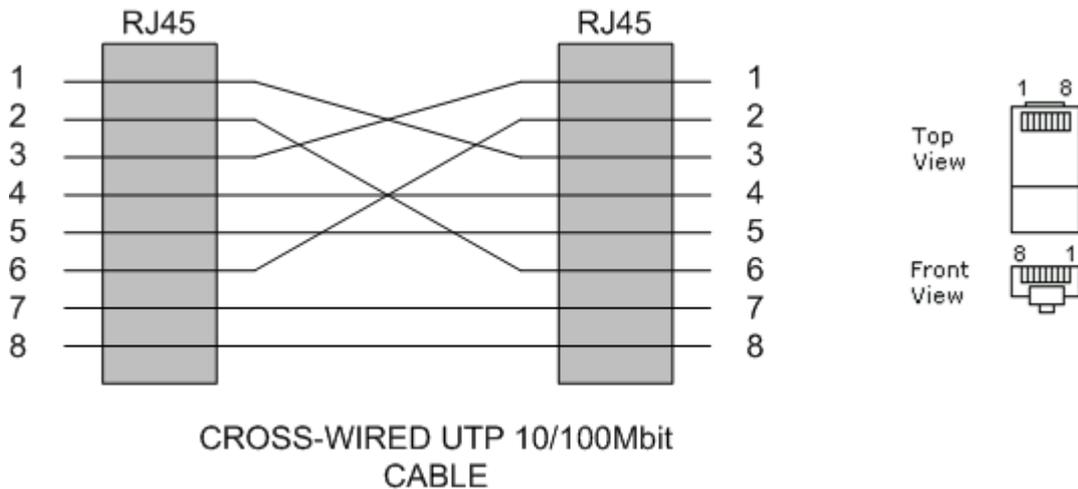
IB-Lite is a plug-in card with Ethernet 10/100 Mbit interface in RJ45 connector. The card is internally connected to both COM1 and COM2 serial channels and provides an interface for connecting a PC with LiteEdit or IntelliMonitor through ethernet/internet network, for sending active e-mails and for integration of the controller into a building management (Modbus TCP protocol).

This card also enables to monitor and control the genset over web browser from any location with internet access using appropriate security measures.

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.



Use Ethernet UTP cable with RJ45 connector for connection of the module into your ethernet network. The module can be also connected directly to a PC using cross-wired UTP cable.



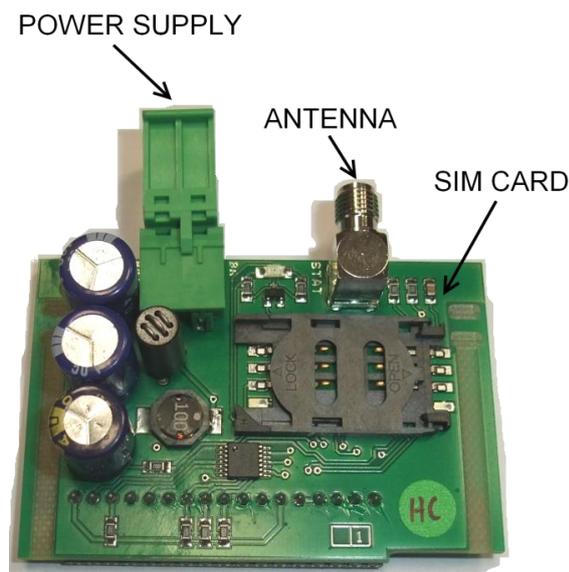
Hint:

- Modbus TCP protocol using IB-Lite communication module requires setting [COM1 Mode](#) = DIRECT and [COM2 Mode](#) = MODBUS.
- Connection to LiteEdit via IP address is not possible if AirGate function is enabled. In this case use Airgate connection. If you require connection using IP address, kindly disable setpoint "Airgate [ENABLE, DISABLE]".
- For details see newest version of IB-Lite Reference Guide.

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

CAUTION!:

Any manipulation with plug-in module shall be done with disconnected power supply to both controller and module. Power supply shall be switched on also is same time to both module and controller. Fail to follow these instructions (power supply active only in controller or only in module) can lead to module or controller failure!



IL-NT-GPRS is a modem plug-in module which support GPRS internet connection and also dial up connection. This module incorporates support of AirGate technology for plug and play connection via GPRS. Module is usually used for connection to remote monitoring and controlling system

WebSupervisor (<http://websupervisor.comap.cz>) or to LiteEdit PC software. Module is capable of sending alarm SMS based on settings in SMS/Email setpoint group.

Hint:

Quick guide how to start using this module is in chapter [Remote Communication - Short guide how to start using IL-NT-GPRS module](#) or on ComAp webpage <http://www.comap.cz/products/detail/IL-NT-GPRS>.

IL-NT AOUT8 Gauge driver module

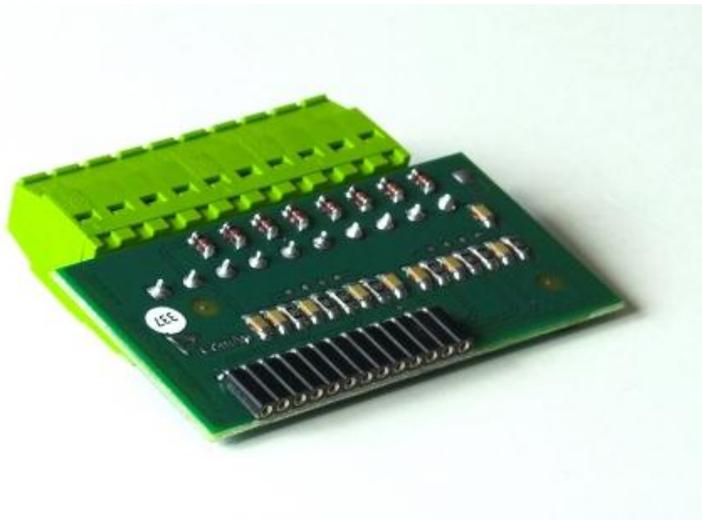
IL-NT AOUT8 is optional plug-in card. Through this card controller can drive up to 8 VDO style industrial/automotive gauges. Noncompensated gauges like 0-10V or 0-20mA are not supported. Gauge type and value are configured in LiteEdit software. Any analog value from controller may be shown in that way.

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.

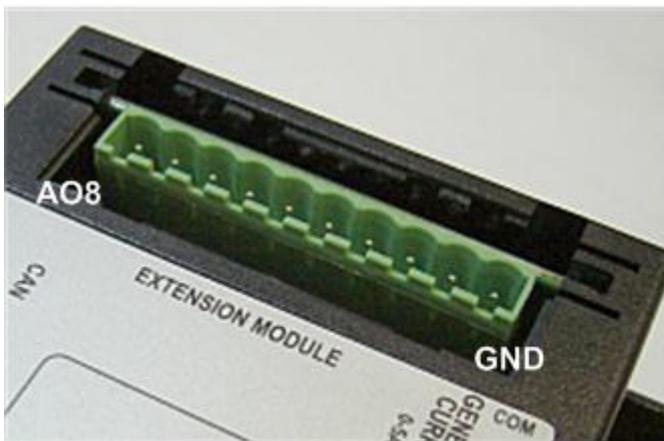
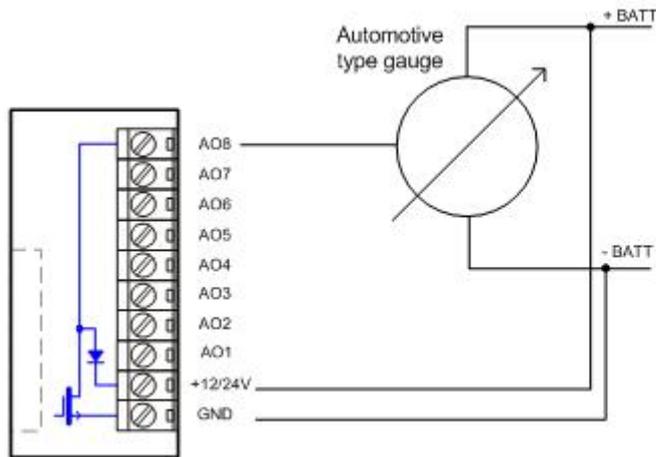
Installing IL-NT AOUT8 module is similar to installing RS 232 module. The difference is that module fits to "extension module" slot and after installing IL-NT AOUT8 you do not put back the small cover.

PC Installation Suite consist a set of prepared converting curves for basic usage of PWM outputs with automotove gauges.

IL-NT AOUT8 module:



Typical wiring



Hint:

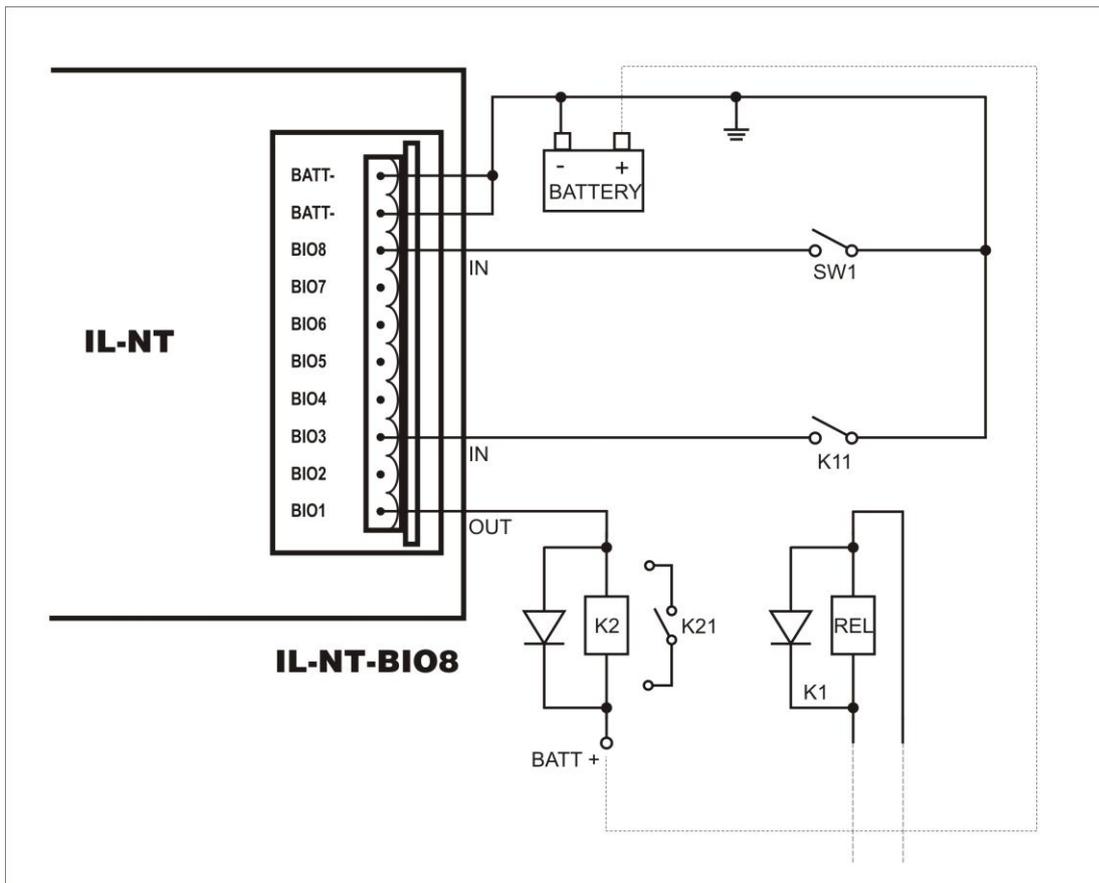
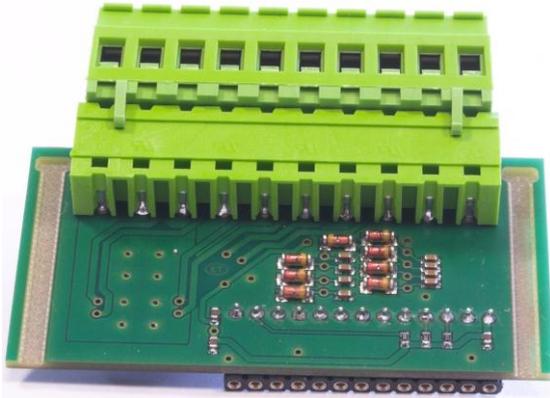
Please see chapter [IL-NT AOUT8 interface \(optional card\)](#) for technical details.

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.

IC-NT CT-BIO7

Hybrid current input and binary input/output module

IC-NT CT-BIO7 is optional plug-in card. Through this card controller can accommodate one AC current (CT) measuring input and up to 7 binary inputs or outputs. In LiteEdit PC configuration tool (version 4.4 and higher) it 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 inserted 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 then remove module manually. Installing IC-NT CT-BIO7 module is similar to installing RS 232 module. The difference is that module fits to "extension module" slot and after installing IC-NT CT-BIO7 you do not put back the small cover.



Hint:

See more details in [Earth Fault measurement](#) or in [IC-NT CT-BIO7 interface](#) chapter.

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.

Remote annunciator IGL - RA15

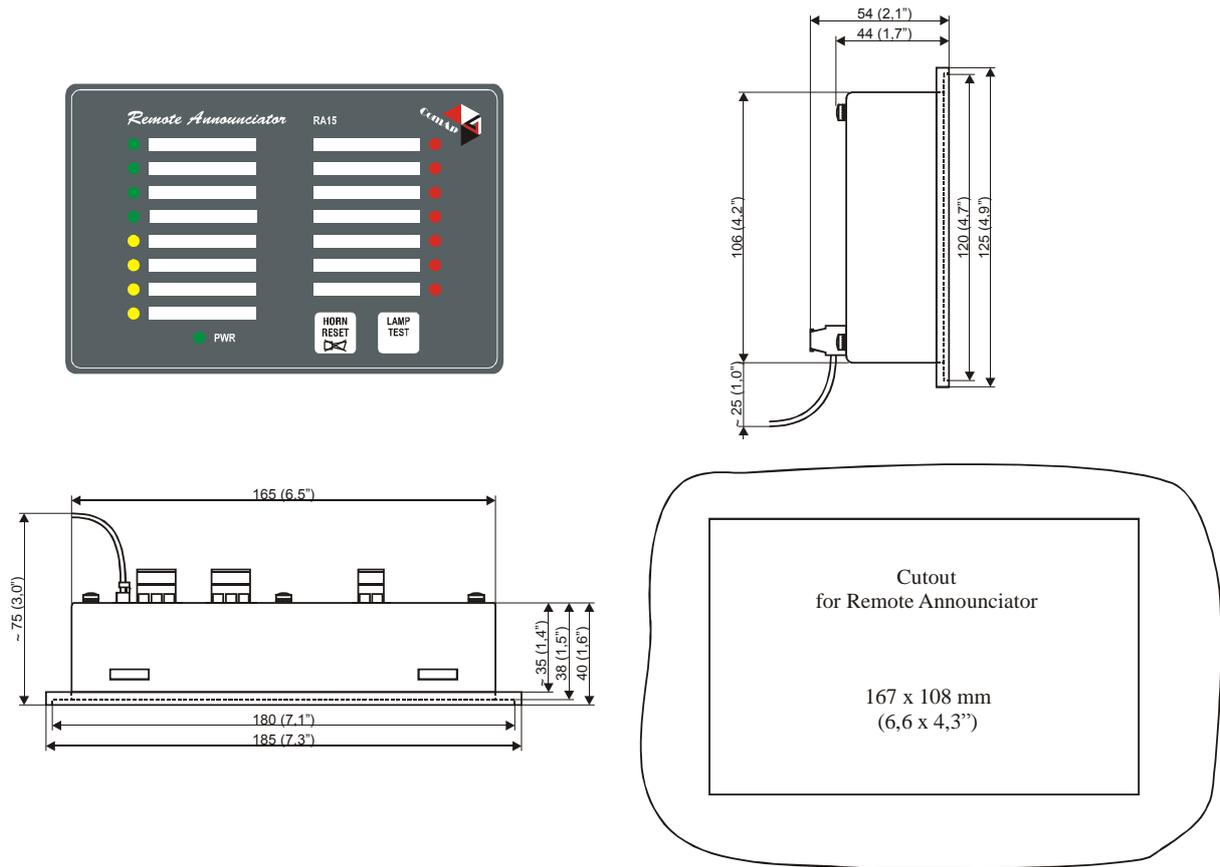
The remote annunciator IGL-RA15 can be connected to the IL-NT unit via CAN bus. Any of the binary outputs can be configured (using LiteEdit software) to each LED diode on the RA15. The module can be also enabled or disabled using LiteEdit software.

If IGL-RA15 remote annunciator is not communicating with a controller via CAN bus, it activates a warning.

Hint:

For connection details please refer to chapter [Extension modules \(CAN bus\) connection](#).

Please see the documentation of RA15 for the technical and function description.



IG IOM/PTM module

IG-IOM and IGS-PTM modules are I/O extension modules equipped with 8 binary inputs, 8 binary outputs, 4 analogue inputs and one analogue output. The module can be used for AMF25, MRS15, 16, 19 only.

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

Hint:

- For connection details please refer to chapter [Extension modules \(CAN bus\) connection](#).
- For a description of setting IGS-PTM module with current/voltage sensors please see the Extension modules manual.
- When module is not configured by LiteEdit SW, controller does not show related values and setpoints
- If IGS-PTM is not communicating to a controller, ShutDown protection on controller is activated.



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

IG-IB Internet bridge

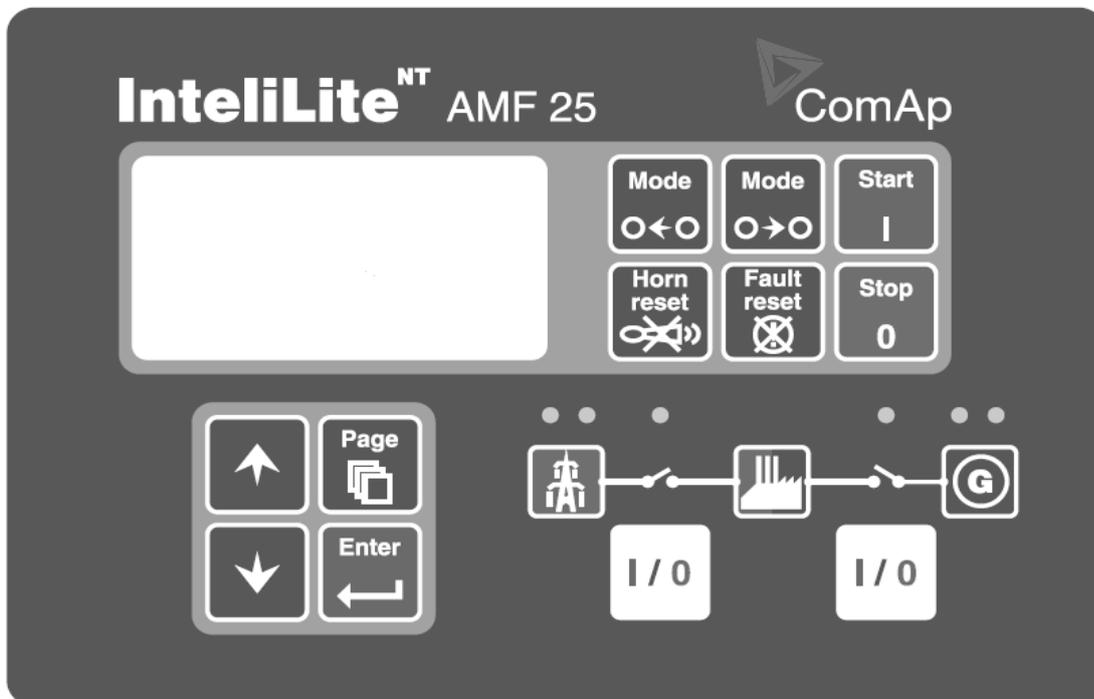
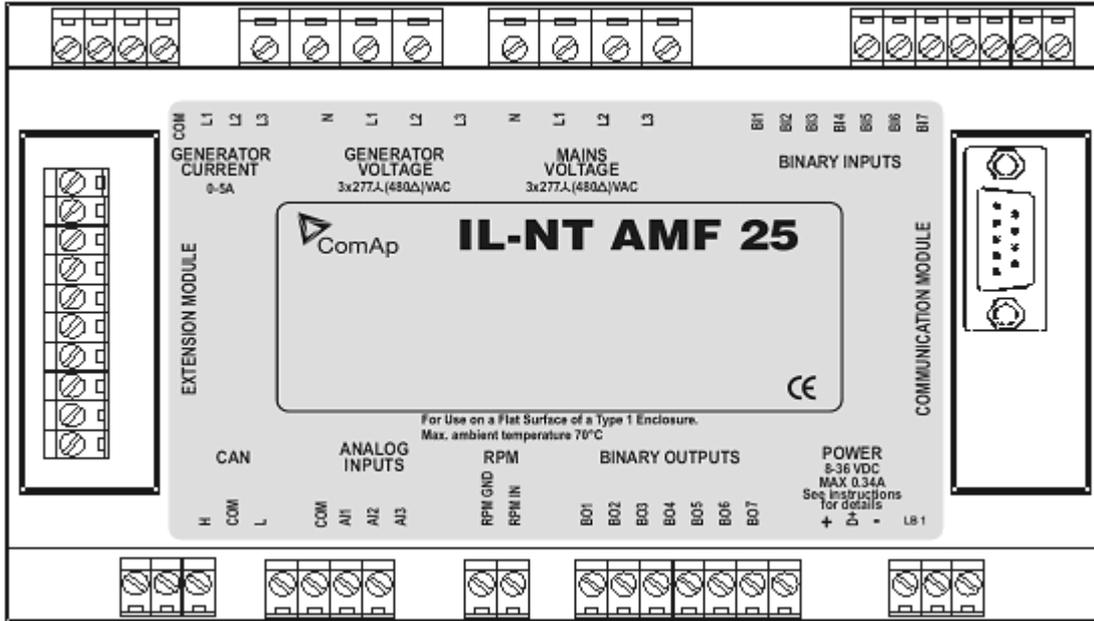
IG-IB Internet bridge enables IntelliLite^{NT} for Ethernet/Internet communications. It is connected to controller via RS232 line.

See IntelliCommunication Guide for further details.



IL-NT Terminals

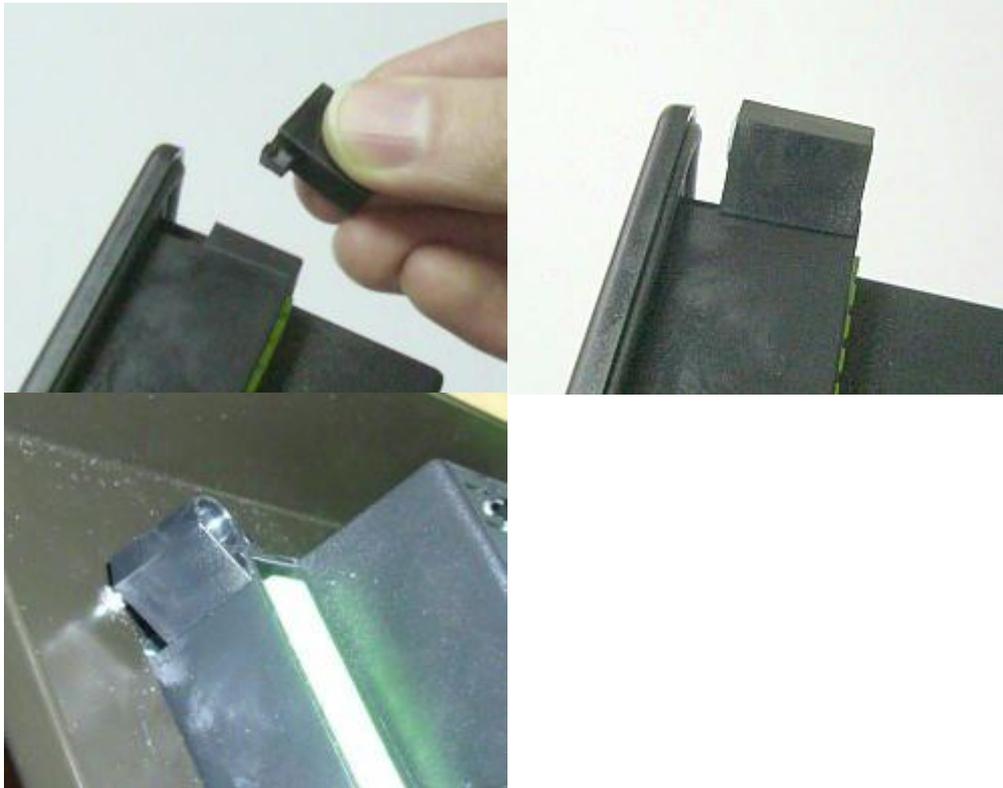
IL-NT terminals and front face



Installation

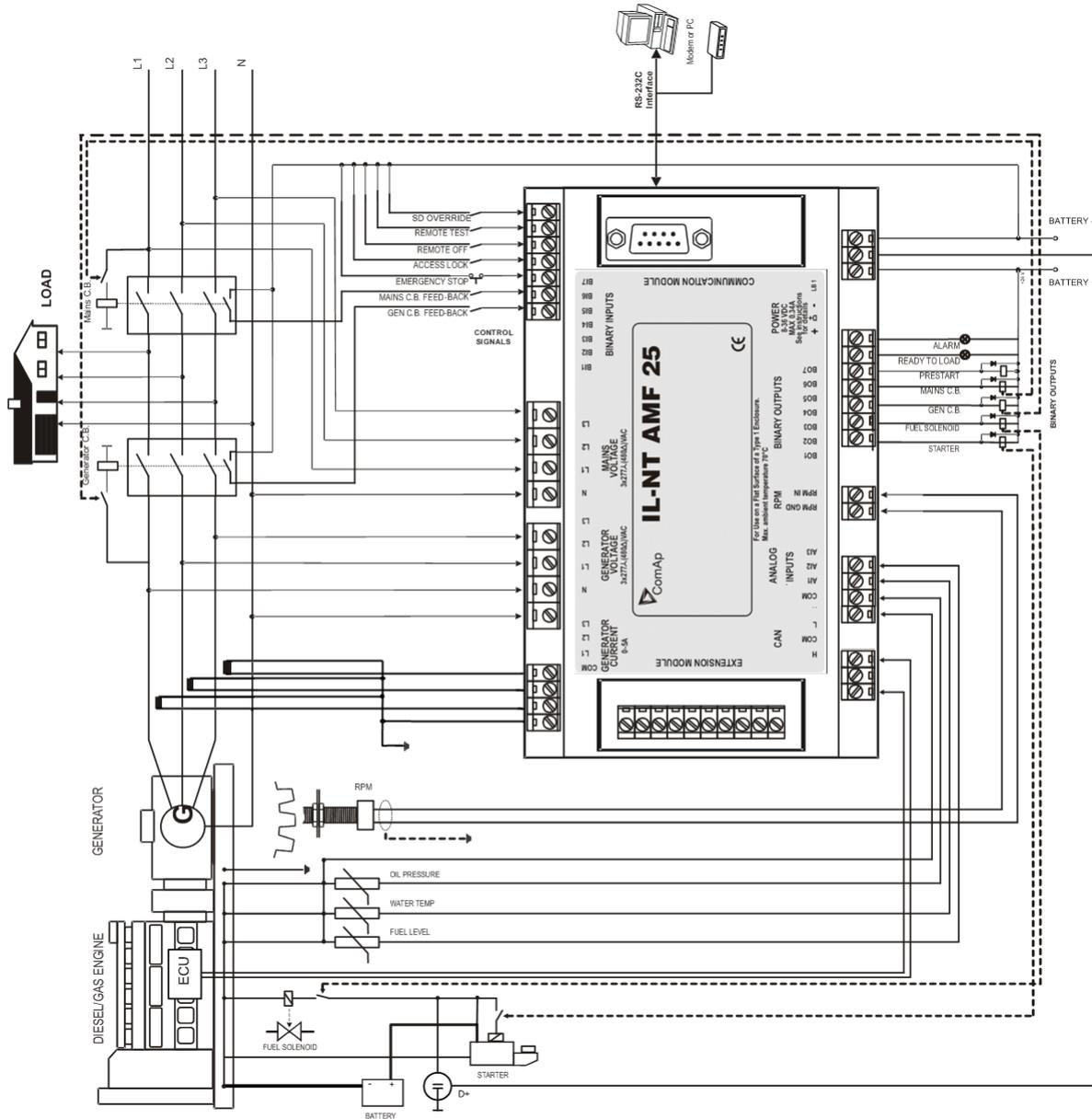
Mounting

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

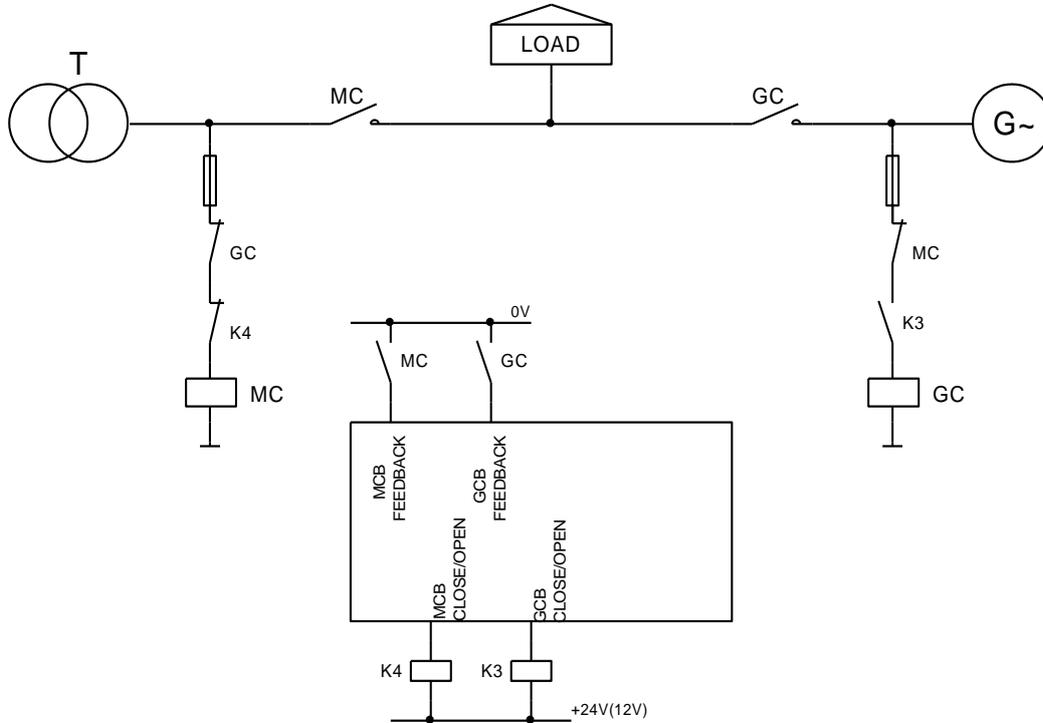


Hint

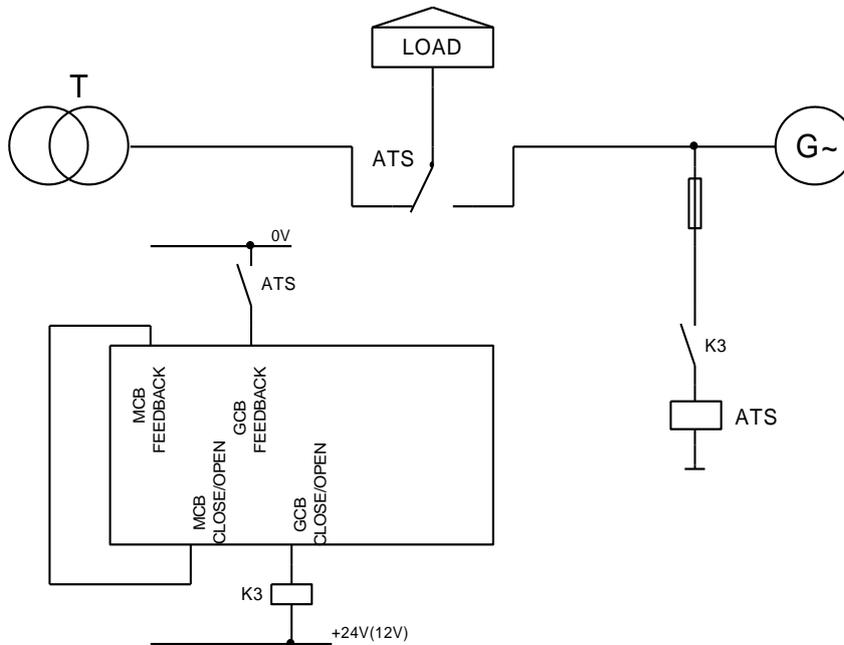
MCB and GCB is recommended to be mechanically interlocked.
It is possible to start Volvo and Scania engines via CAN bus. See [Engines started via CAN bus.](#)

Stand-by Applications

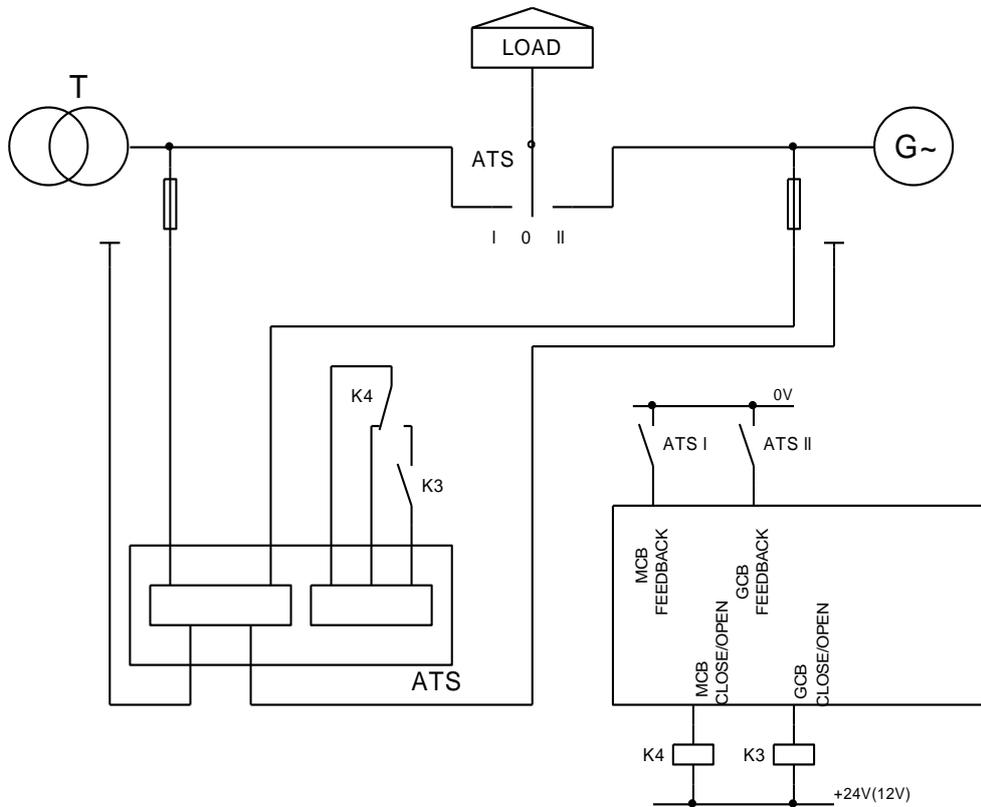
Contactor (set point MCB Logic = "CLOSE-OFF")



ATS with two stable positions (set point MCB Logic = "CLOSE-ON")



ATS with three stable positions (set point MCB Logic = "CLOSE-OFF")



Dual Mutual Standby (Dual AMF) application

Dual AMF is system of two mutual stand-by gen-sets, which switches in supplying the load. Usual work operation is that after mains fails, first genset starts, takes the load and works for dedicated time interval, e.g. 6 hours. Then it hand over the load to other gen-set, which runs for another 6 hours. This operation system continues as long as Mains is failed. Transfer of load from one gen-set to other one is with blackout.

System works for two gensets with IL-NT-AMF25 controllers. One controller is Master and second is Slave. Other models of IL-NT are not supported.

System needs one binary input and one binary output in each controller.

System works only in AUT mode

For correct operation both controllers have to have set identical times/delays for mains protections, mains return delays and other delays in setpoint group AMF Settings.

Mechanical interlock between GCB of one gen-set, GCB of second gen-set and MCB breaker is required due to safety reasons.

Detailed description:

There is a basic communication interface between Master and Slave controller realized by interconnection of two wires ([DualAMFCtrlIn](#), [DualAMFCtrlOut](#)) on both.

Binary input DualAMFCtrlIn and binary output DualAMFCtrlOut adjust their function automatically based on fact if there are used in Master or in Slave controller.

Master controller has information about Slave controller and when Slave failure or cannot work the Master will substitute it.

AMF start of Slave controller can be blocked by Master but when Master controller has failure or cannot work the Slave will substitute it.

When there is incorrect wiring or only one controller is configured as Master or Slave than the controller will display "*DAMF Disconnect*" in alarm list.

In case of incorrect configuration (two Masters, two Slaves, both controllers are not in AUT mode) the controller will display "*DAMF ConfigError*" in alarm list.

When there is any problem with Slave controller Master will display "*DAMFSlaveDown*" in alarm list.

Every time when any Alarm related to DAMF function is occurring both of the controllers are switched to normal AMF operation. That meaning that at least one of the controllers will be able to supplying the load until failure on both of them.

To decide which genset should start in case of mains fail, there is rule that if mains fails in time period 00:00AM – 11:59AM, than Master will start and take the load. If mains will fail in period 12:00PM – 23:59PM, than Slave will start and take the load.

Master controller will prevent unnecessary blackout in case, when it is over 12:00 AM (Slave starting period), and Master is already supplying load, but not in AUT mode with DualAMF function enabled, and mode is changed to AUT. Or if Master is already supplying load in AUT, and it is switched to DualAMF operation after 12AM (in Slave's starting period).

Setpoint "MCB Opens On" has to be setted to MAINSFAIL. Otherwise system would not correctly work if Slave would start to stand-by as first. Master would not know when to open MCB breaker.

In case one gen-set should run in stand-by, but it fails, the other gen-set runs instead. After failed gen-set recovers there is 60s delay for load transfer back to this gen-set.

Setpoints related to Dual AMF function are located in "AMF Settings" group.

Setpoint "DualAMFRole" with settings [MASTER, SLAVE] is determining if controller behaves as Master or Slave in Dual AMF system. One controller has to be setted to MASTER and second as SLAVE, for correct function of system.

Binary input "DualAMFRole" can help in switching roles of both gen-sets. Both gen-sets can be easily transformed from Slave to Master and vice versa. Log1 = MASTER, Log 0 = SLAVE. Binary input has higher priority over manual setting of setpoint. If binary input is configured, manual change of setpoint is disabled.

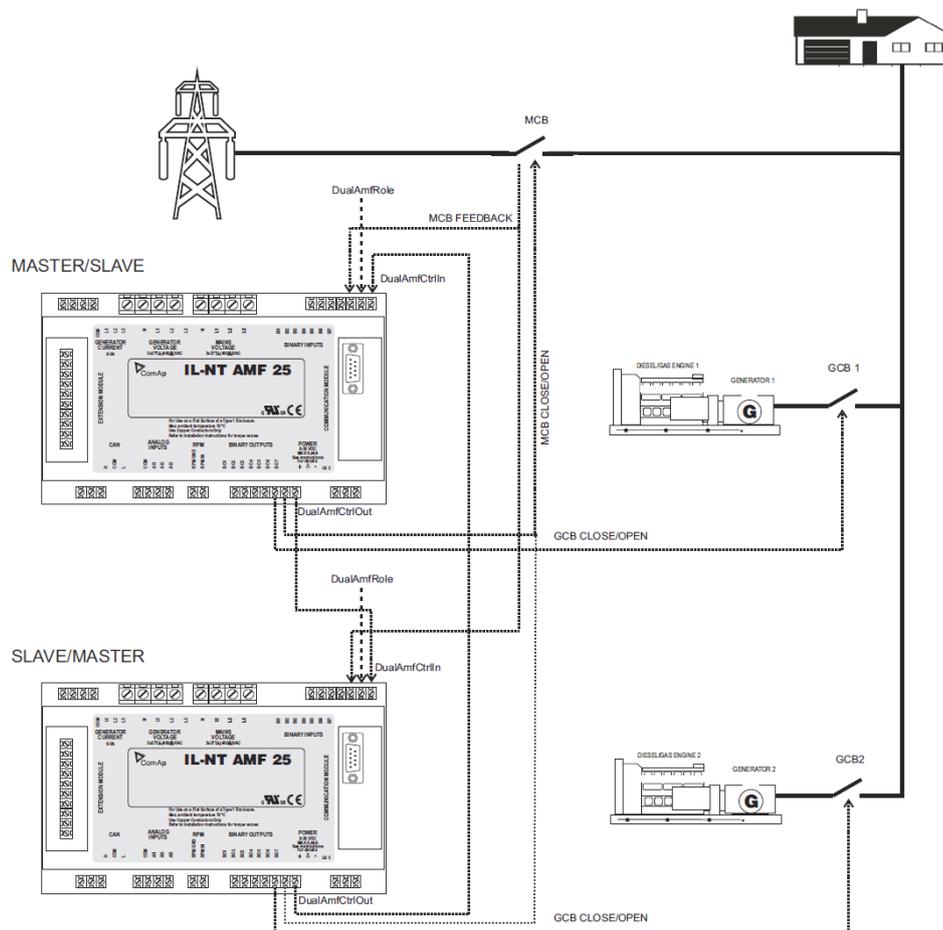
Setpoint „DualAMFTime“ control time period of gen-sets switching in supplying the load. Settings are [1..24], step = 1 hour. Default setting is 6 hours. This timer is reset when load is transferred back to healthy mains

Example of setting the Dual AMF function:

- 1- Prepare two IL-NT-AMF25 controllers. Copy the identical configurations to both of them.
- 2- Use wiring with mechanical/electrical interlock between all breakers (GCB1, GCB2 and MCB)
- 3- Configure one binary input on each controller as DualAMFCtrlIn.
- 4- Configure one binary output on each controller as DualAMFCtrlOut.
- 5- Interconnect DualAMFCtrlOut from one controller with DualAMFCtrlIn on second controller. Interconnect DualAMFCtrlOut from second controller with DualAMFCtrlIn on first controller. So you have two wires interconnecting both controllers.

- 6- Set setpoint "MCB Opens On" to MAINSFAIL on both controllers.
- 7- Set „DualAMFTime“ to time period in which you wish to switch gensets in supplying the load. For example 6 hours. Make this setting on Master controller. Only Master controller controls this timer.
- 8- Set "Operation Mode" to MASTER on first controller and to SLAVE on second controller.
- 9- Change the mode of both controllers to AUT.
- 10- System is now ready for DualAMF function.

Wiring of system with selectable MASTER and SLAVE role settings:



Hint:

GCB and MCB breakers feedbacks are recommended, but not required.

Getting Started

How to install

During the configuration of controller or setpoints changes is required a password to the controller. The default password from ComAp is “0”.

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.

Hint:

Beware of heavy harnesses hanging down from controller terminals. Harnesses must be tightened to panel doors or other suitable place as close to controller as possible.

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

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

Use cable min. 2,5mm²

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

The negative “-“ battery terminal has to be properly grounded.

Switchboard and engine has to be grounded in common spot. Use as short as possible cable to the grounding point.

Power supply

To ensure proper function:

Use min. power supply cable of 1.5mm²

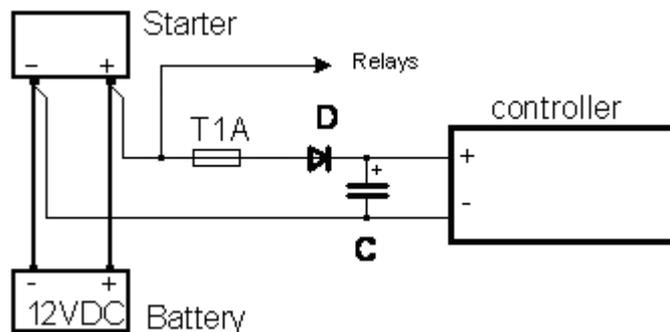
Maximum continuous DC power supply voltage is 36VDC. Maximum allowable power supply voltage is 39VDC. The IntelliLite's power supply terminals are protected against large pulse power disturbances. When there is a potential risk of the controller being subjected to conditions outside its capabilities,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

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.

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



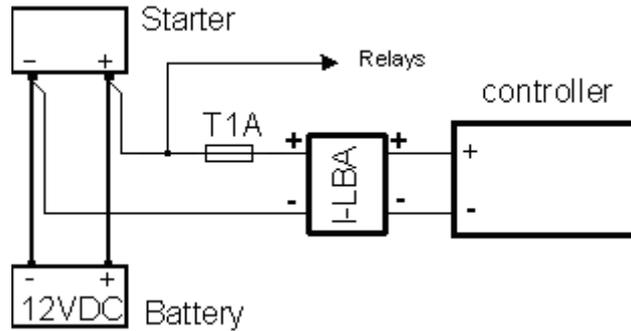
The capacitor size depends on required time. It shall be approximately thousands of microFarads. The capacitor size should be 5 000 microFarad to withstand 150ms voltage dip under following conditions:

Voltage before dip is 12V, after 150ms the voltage recovers to min. allowed voltage, i.e. 8V

Hint:

Before the battery is discharged the message "Low BackupBatt" appears.

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.

Hint:

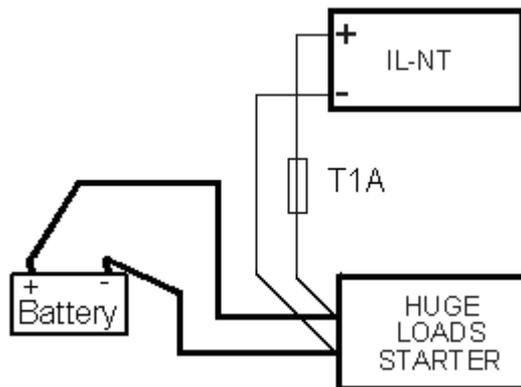
I-LBA may not eliminate voltage drop when used with low temperature (-40°C) version of controller and display heating element is on (below 5°C). Current drain of heating element exhausts LBA capacitors very fast .

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.

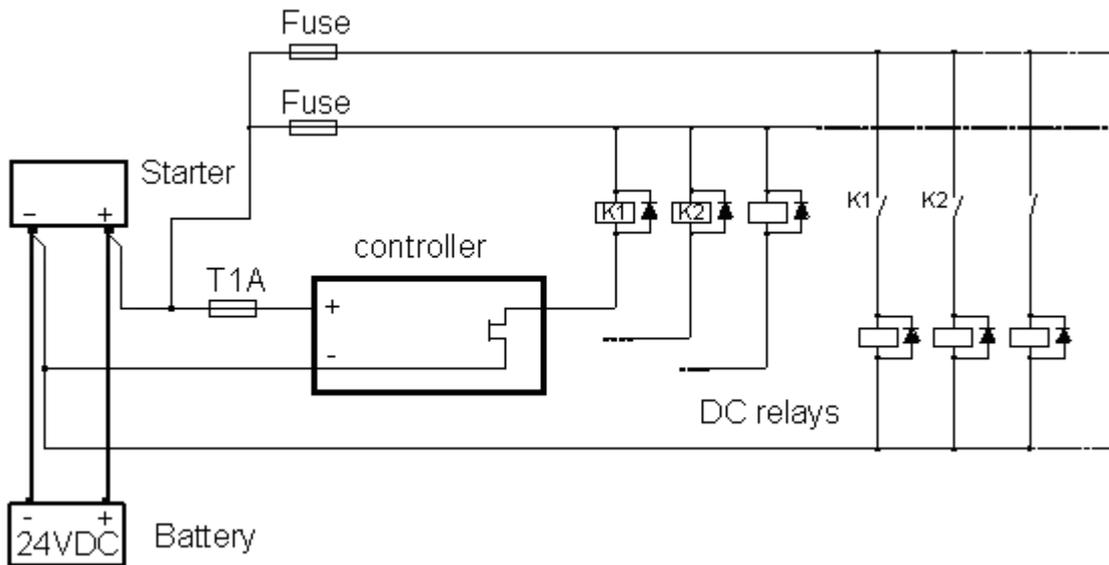
Recommended fuse (not fast) type - T1A. Not fast due to internal capacitors charging during power up.



Binary output protections

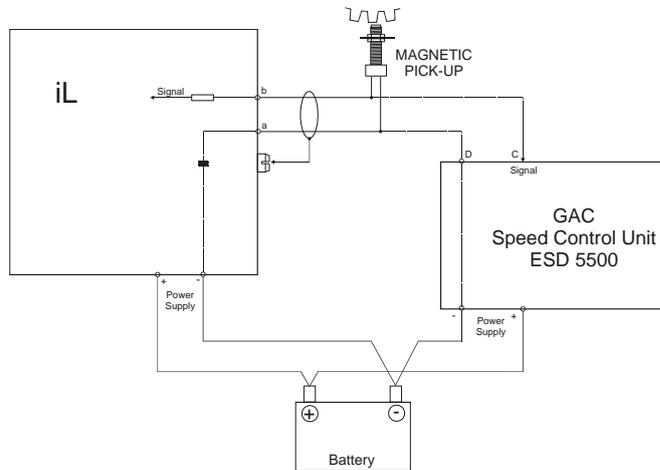
Hint

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



Magnetic pick-up

To ensure proper function:
Use a shielded cable



Be aware of interference signal from Speed governor when one speed pick-up is used.

If engine will not start:

- Check ground connection from pick-up to controllers, eventually disconnect ground connection to one of them
- Galvanically separate IntelliLite RPM input using ComAp separation transformer RPM-ISO (1:1)
- Use separate pick-up for Speed governor and IntelliLite^{NT}

Hint:

In some cases the controller will measure a RPM value even though the gen-set is not running: RPM is measured from the generator voltage (Gear Teeth = 0)

IL-NT is measuring some voltage value on input terminals due to open fusing.

If RPM > 0 the controller will be put into a Not ready state and the engine will not be allowed to start.

Current measurement

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.**

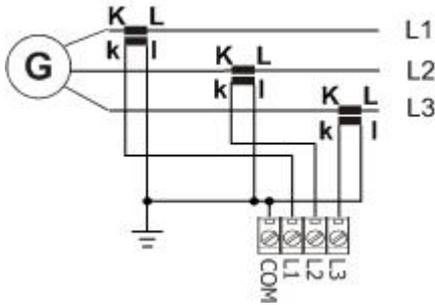
To ensure proper function:

Use cables of 2,5mm²

Use transformers to 5A

Connect CT according to following drawings:

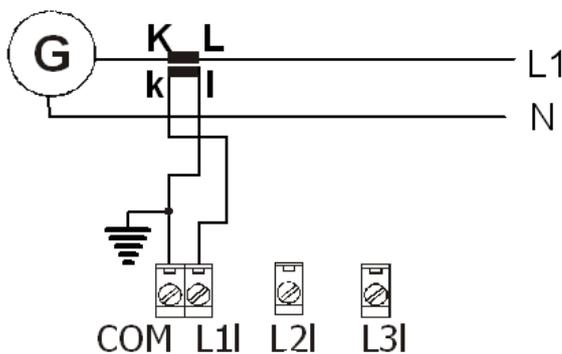
Three phase application:



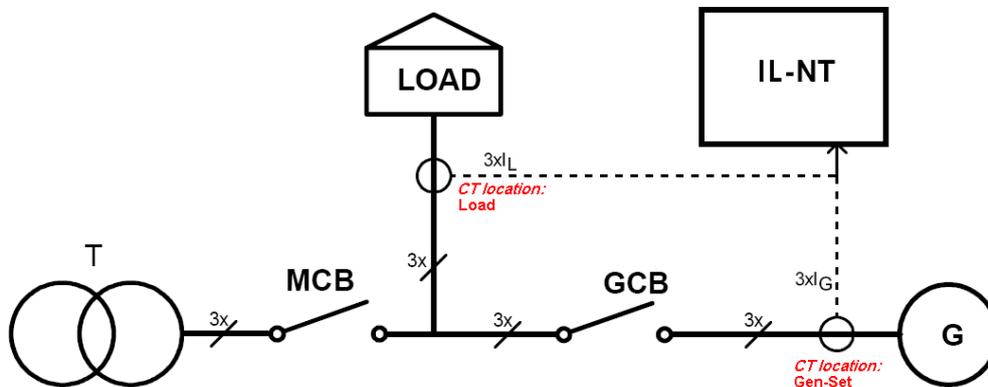
It is necessary to ensure that potential difference between generator current COM terminal and battery “-” terminal is maximally $\pm 2V$. Therefore is strongly recommended to interconnect these two terminals together.

Single phase application:

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



CT location



There are two options of CT location.

- Load
- Gen-Set

New setpoint [CT Location](#) for AMF20 and AMF25 controllers is placed in group Basic Setting. According to the connection it is possible to set CT location: Load or Gen-Set. When CT Location is set to Load and MCB is closed the controller will display on Mains screen current value. The statistics now contain Mains kWh, Mains kVAh, Genset kWh, Genset kVAh.

Hint:

The protections related to the current measurement are active only when the Genset is running.

Earth Fault measurement (module)

The Earth Fault protection is done by extension module IC-NT CT-BIO7.

Technical characteristics

- Input current range up to 5 A ([IC-NT CT-BIO7](#))
- Measurement range from 0,03 to 5A
- Operating frequency 50 or 60 Hz
- Tripping current software programmable from 0,03 to 5 A or DISABLED
- Tripping delay software programmable from 0,03 to 5 seconds
- Included seven binary inputs or seven binary outputs (IL-NT-CT-BIO7)

Hint:

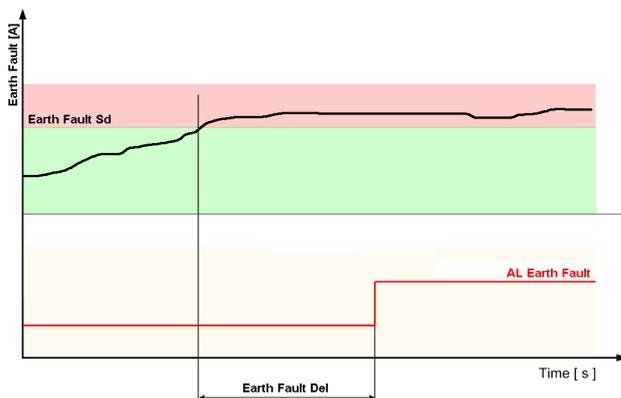
For more technical details see [IC-NT CT-BIO7 interface](#).

Hint:

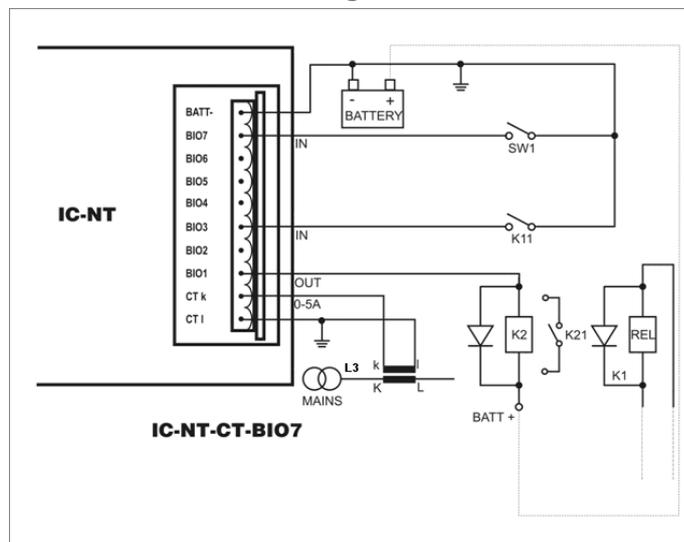
For more information about the application settings see [EarthFaultProt](#) setpoint group

Operating principle

When the measured current exceeds the set value, this indicates that part of the current is dispersed to earth and after the set [Earth Fault Del](#) then [Earth Fault Sd](#) protection and [AL EarthFault](#) output are activated. Earth Fault protection is not active when gen-set does not run and also when [EF Protection](#): DISABLED.



IC-NT CT-BIO7 wiring



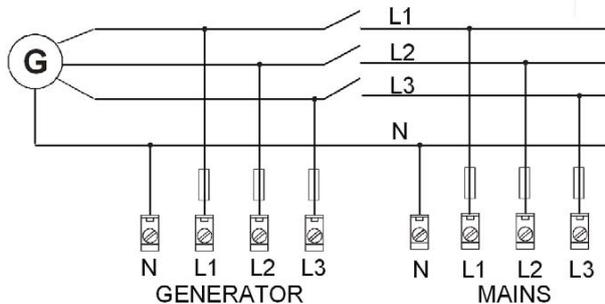
Voltage measurement and generator connection types

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

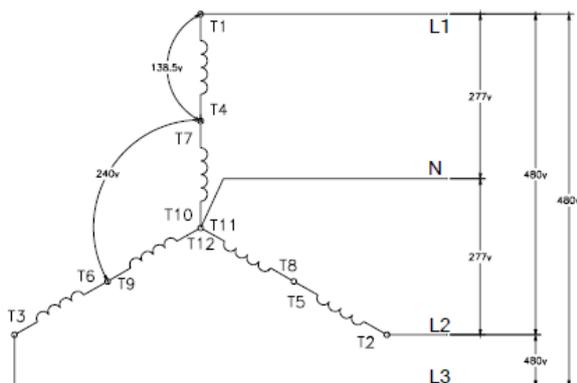
The generator protections are evaluated from different voltages based on **ConnectionType** setting:

- 3W 4Ph – Ph-Ph voltage
- 3W 3Ph – Ph-Ph voltage
- Split Ph – Ph-N voltage
- Mono Ph – Ph-N voltage

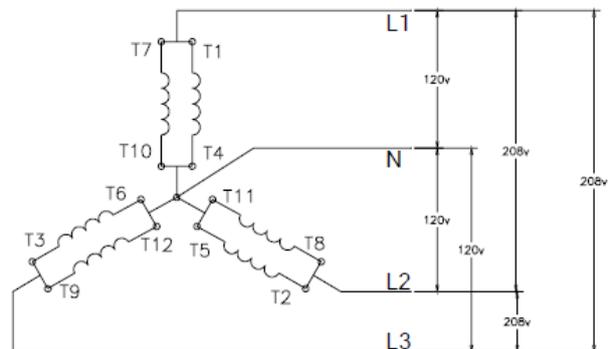
ConnectionType: 3 Phase 4 Wires



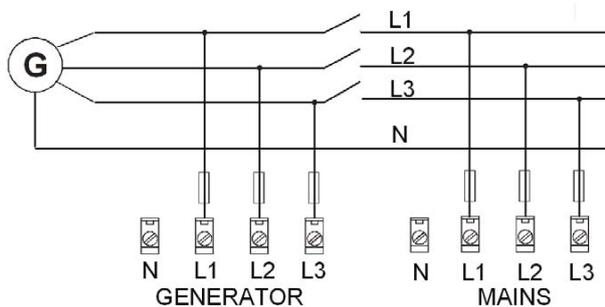
3 Phase 4 Wires - STAR Connection



Three phase “wye” measurement – 3PY

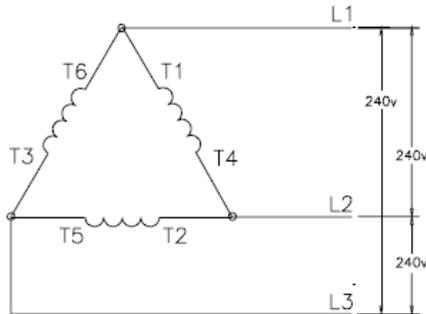


ConnectionType: 3 Phase 3 Wires

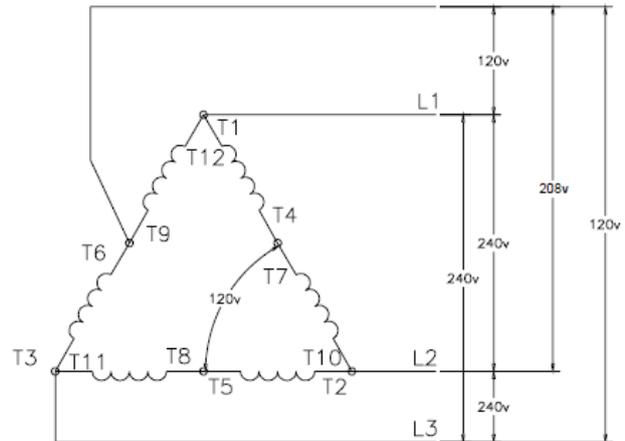


3 Phase 3 Wires

– DELTA Connection



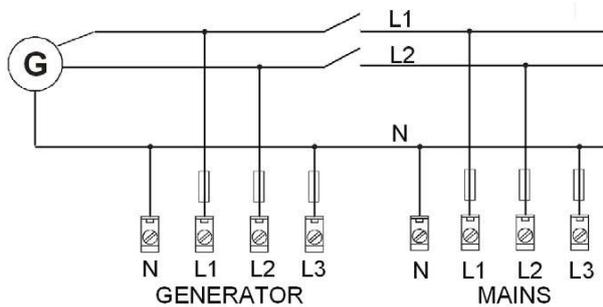
– HI-LEG (WILD-LEG, RED-LEG) DELTA Connection



Hint:

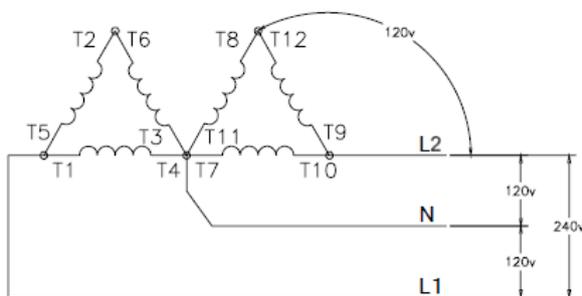
Only L1, L2 and L3 wires should be connected. In case of HI-LEG (WILD-LEG, RED-LEG) DELTA connection the N (neutral) wire (in the diagram connected between T6 and T9) has to be disconnected. No separation transformers for three wires voltage connection (without N) are needed.

ConnectionType: Split Phase

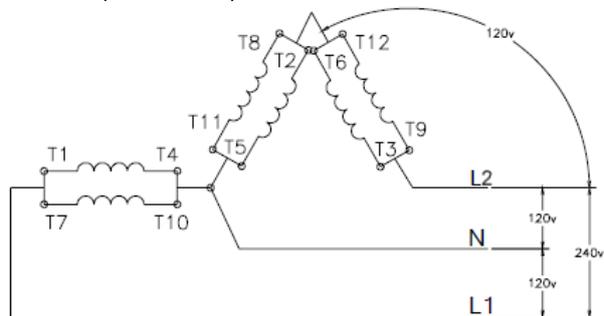


Split Phase

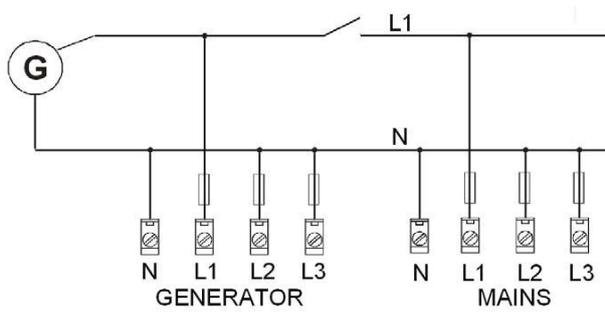
– DOUBLE DELTA Connection



– ZIG ZAG (DOG LEG) Connection



ConnectionType: Mono Phase

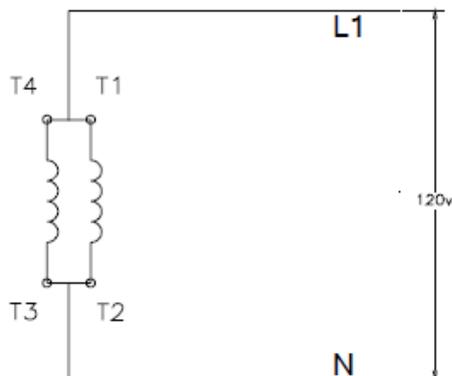


Single-phase measurement – 1PH

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 on the IL-NT. First analog input is fixed to be used for engine Oil Pressure.

Configuration

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

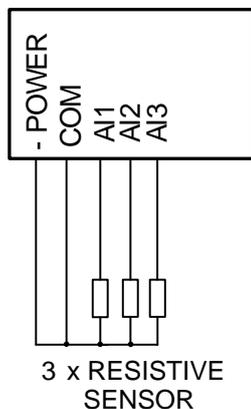
Analog input item	LiteEdit		Possibility
Type	Type	Not used Alarm Monitoring	Analog input isn't used Analog is measured and used for protection Analog is only measured and not used for protection
Analog input name	Name		Up to 14 ASCII characters
Config of input	Config	Analog Binary (not supp. by PTM) 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.

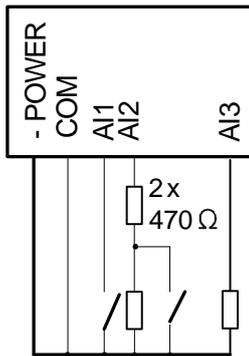
Hint:

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:

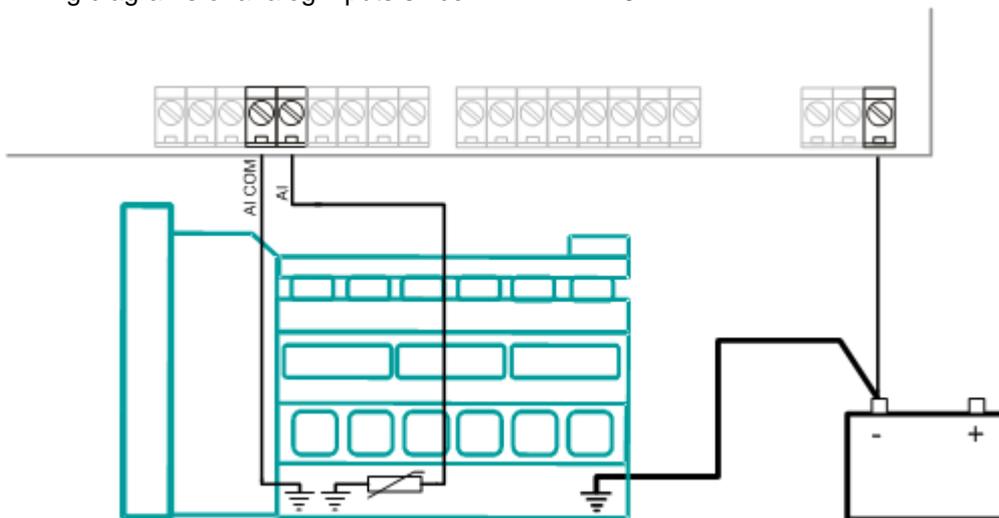
- AI1 – binary input
- AI2 – three state input
- AI3 – analog resistive input

Hint:

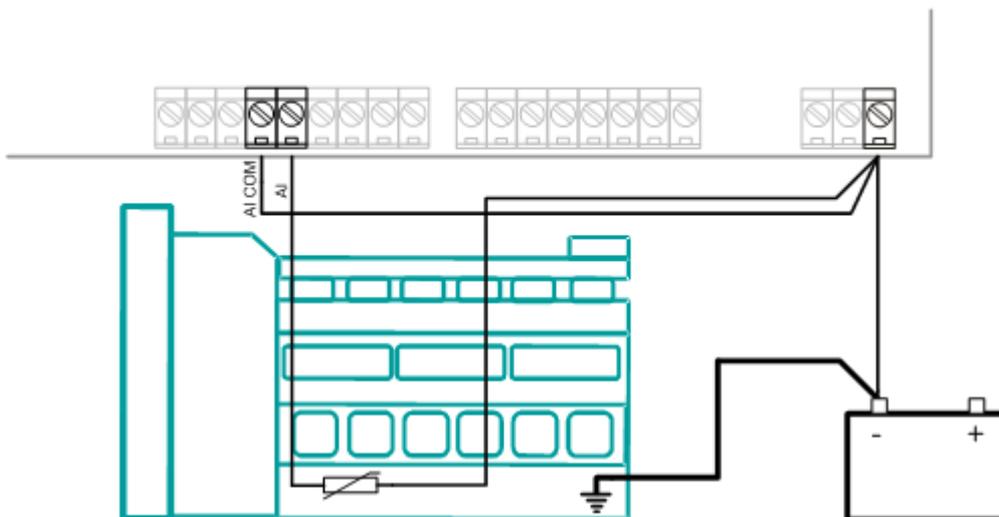
Description of analog inputs with COM terminal and 4 pins relates to units with HW version 1.3. Older HW versions do not have “COM” terminal and use only 3 pins AI1, AI2 and AI3.

Wiring

Wiring diagrams of analog inputs since IL-NT HW 1.3:



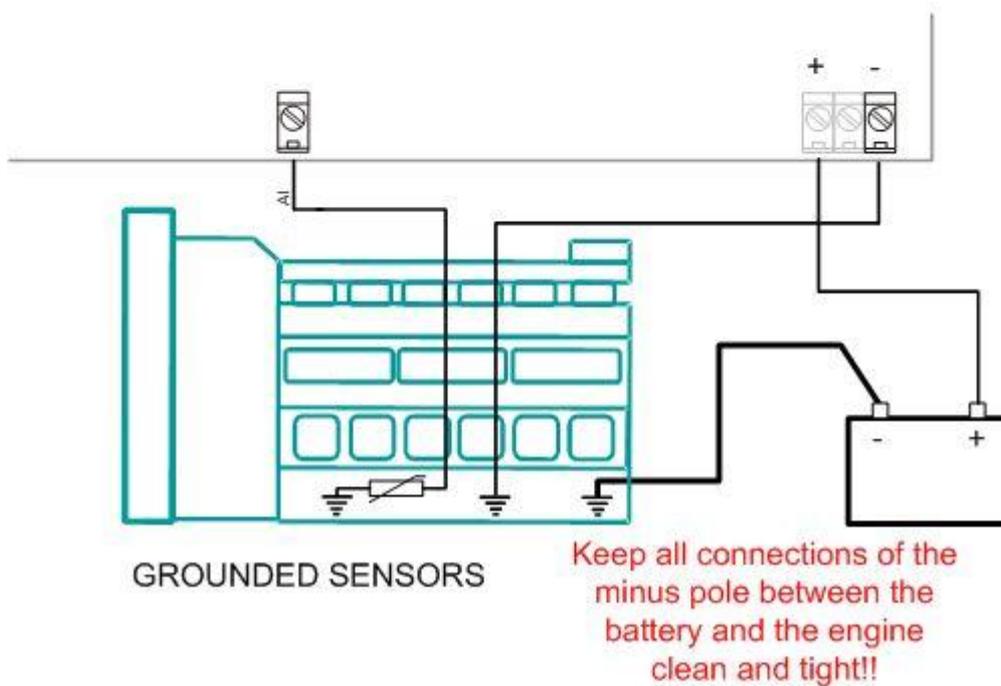
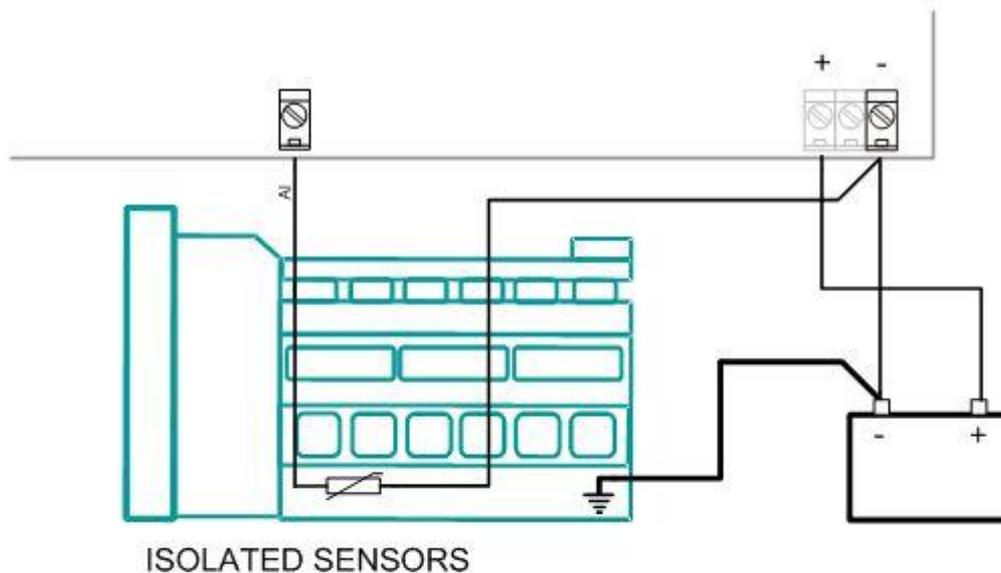
WIRING OF ANALOG INPUTS-GROUNDED SENSORS



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 0Ω 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 750Ω .

As three state input

Open, close and failure state are detected. Threshold level is 750 Ω , 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.

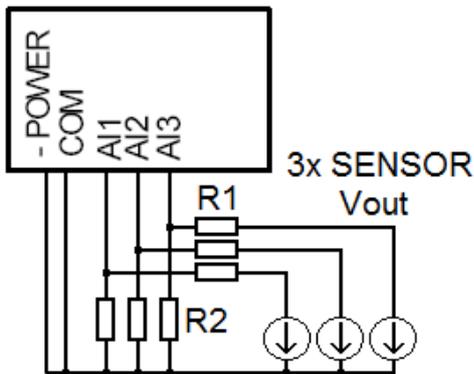
Each Analog input has separate triplet of setpoints: *Wrn level*, *Sd level*, *AI del*. Names of these setpoints are fix defined

Number of decimal points of *Wrn level* and *Sd level* is the same as the configured number of decimal points 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 one. Recommended wiring connection for these measurements are bellow.

Voltage output sensor - connection



Current output sensor - connection

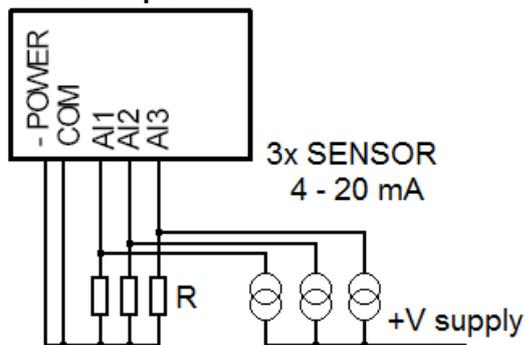


Table with recommended values

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.

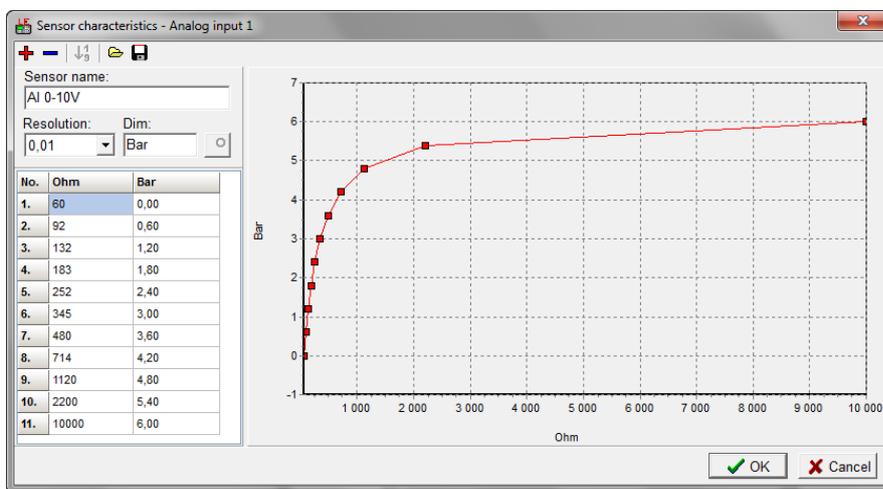
Practical example: VDO pressure sensor 0 – 6bar with linear voltage output 0 – 10V

Conversion table

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

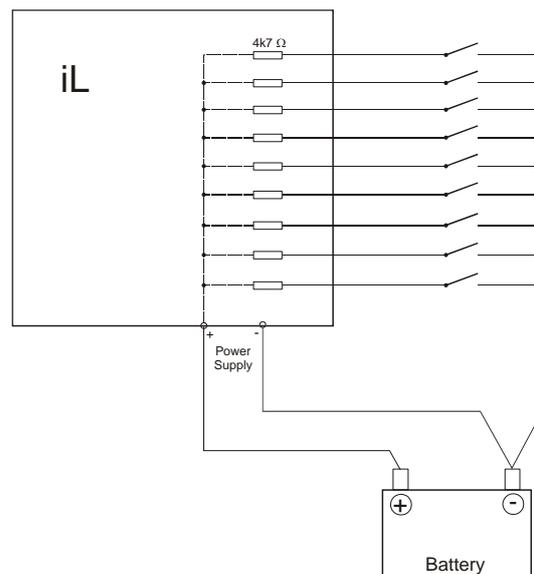
Modify one of analog input in LiteEdit configuration and load curve AI 0-10V.CRV
 Than you can change resolution and measured value name witch is default displayed at V (volts).

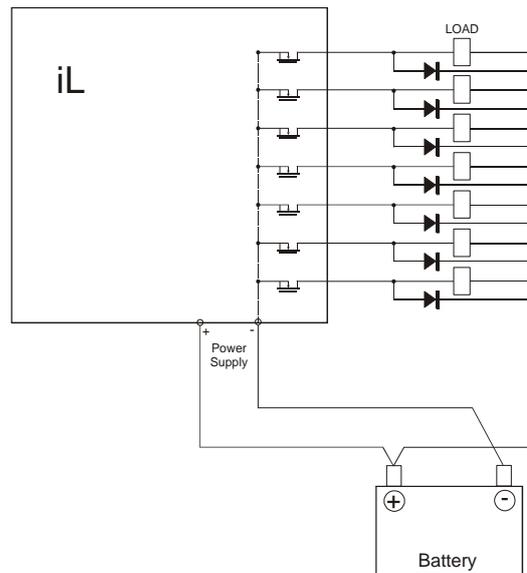
For example if you have connected pressure sensor and his output voltage is 5V for pressure 3bar you can change value 'V' in column "Dim.:" to 'Bar' and by sensor specification adjust all corresponding values in this column. In this case you can change the value at row 6. from 5 to 3.



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

Binary inputs and outputs





Recommended CAN/RS485 connection

CAN bus connection

The bus has to be terminated by 120 Ohm resistors at both ends.

External units can be connected on the CAN bus line in any order, but keeping line arrangement (no tails, no star) is necessary.

Standard maximum bus length is 200m

Shielded cable has to be used, shielding has to be connected to PE on one side (controller side).

A) For shorter distances (all network components within one room) – **picture 1**

Interconnect H and L; shielding connect to PE on controller side

B) For longer distances (connection between rooms within one building) – **picture 2**

Interconnect H, L, COM; shielding connect to PE in one point

C) In case of surge hazard (connection out of building in case of storm etc.) – **picture 3**

We recommend to use following protections:

- Phoenix Contact (<http://www.phoenixcontact.com>):

PT 5-HF-12DC-ST with PT2x2-BE (base element)

- Saltek (<http://www.saltek.cz>):

DM-012/2 R DJ

Recommended data cables: BELDEN (<http://www.belden.com>)

A) For shorter distances: 3105A Paired - EIA Industrial RS-485 PLTC/CM (1x2 conductors)

B) For longer distances: 3106A Paired - EIA Industrial RS-485 PLTC/CM (1x2+1 conductors)

C) In case of surge hazard: 3106A Paired - EIA Industrial RS-485 PLTC/CM (1x2+1 conductors)

RS485 connection

The line has to be terminated by 120 Ohm resistors at both ends.

External units can be connected on the RS485 line in any order, but keeping line arrangement (no tails, no star) is necessary.

Standard maximum link length is 1000m.

Shielded cable has to be used, shielding has to be connected to PE on one side (controller side).

A) For shorter distances (all network components within one room) – **picture 1**

interconnect A and B; shielding connect to PE on controller side

B) For longer distances (connection between rooms within one building) – **picture 2**

interconnect A, B, COM; shielding connect to PE in one point

C) In case of surge hazard (connection out of building in case of storm etc.) – **picture 3**

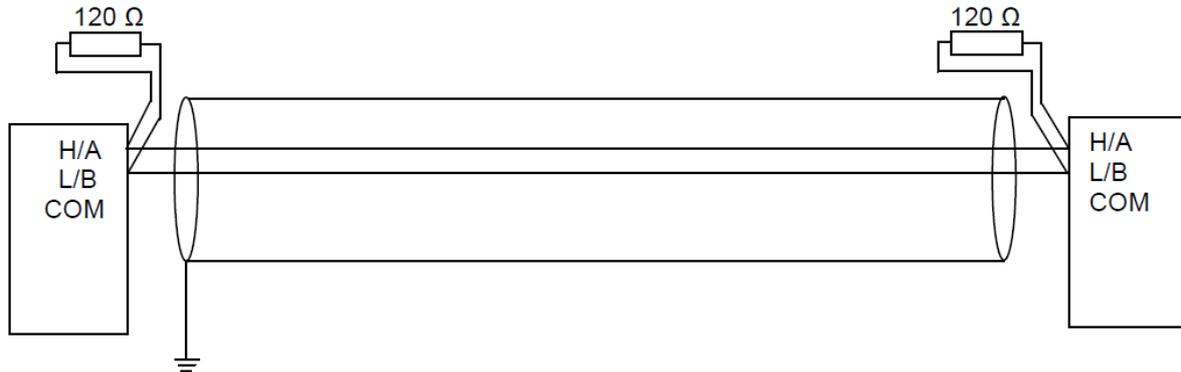
We recommend to use following protections:

- Phoenix Contact (<http://www.phoenixcontact.com>):
PT 5-HF-5DC-ST with PT2x2-BE (base element)
(or MT-RS485-TTL)
- Saltek (<http://www.saltek.cz>):
DM-006/2 R DJ

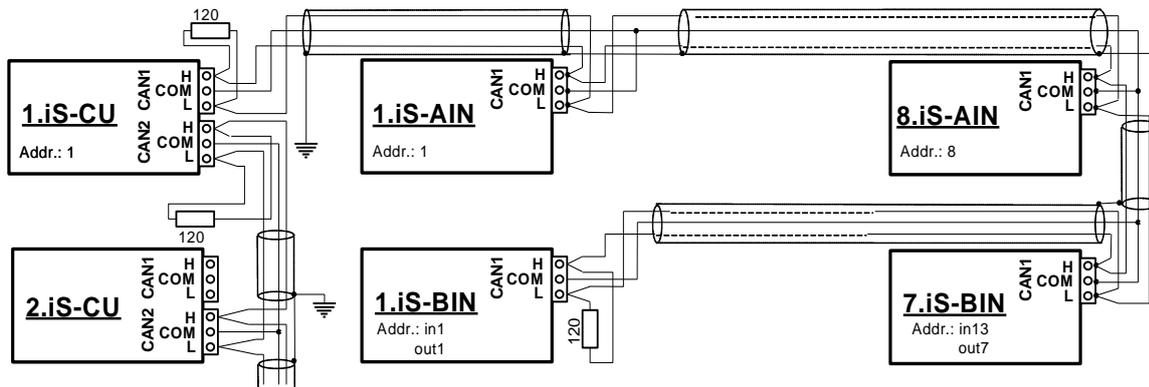
Recommended data cables: BELDEN (<http://www.belden.com>)

- A) For shorter distances: 3105A Paired - EIA Industrial RS-485 PLTC/CM (1x2 conductors)
- B) For longer distances: 3106A Paired - EIA Industrial RS-485 PLTC/CM (1x2+1 conductors)
- C) In case of surge hazard: 3106A Paired - EIA Industrial RS-485 PLTC/CM (1x2+1 conductors)

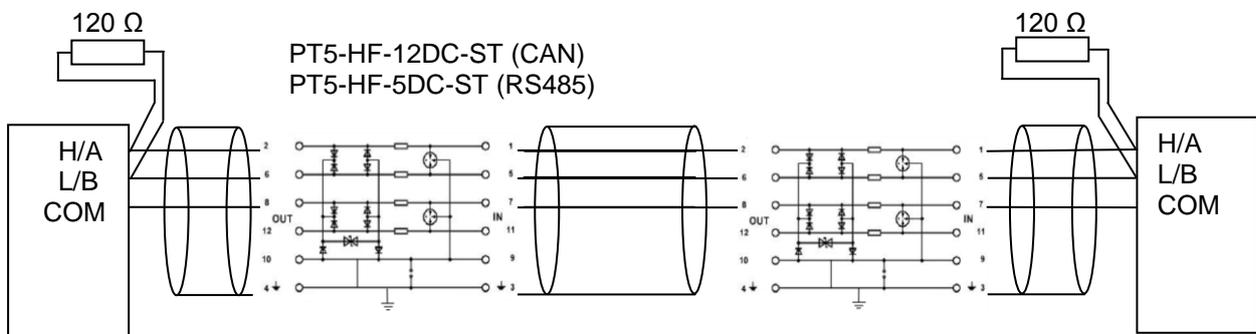
Picture 1 - shorter distances (all network components within one room)



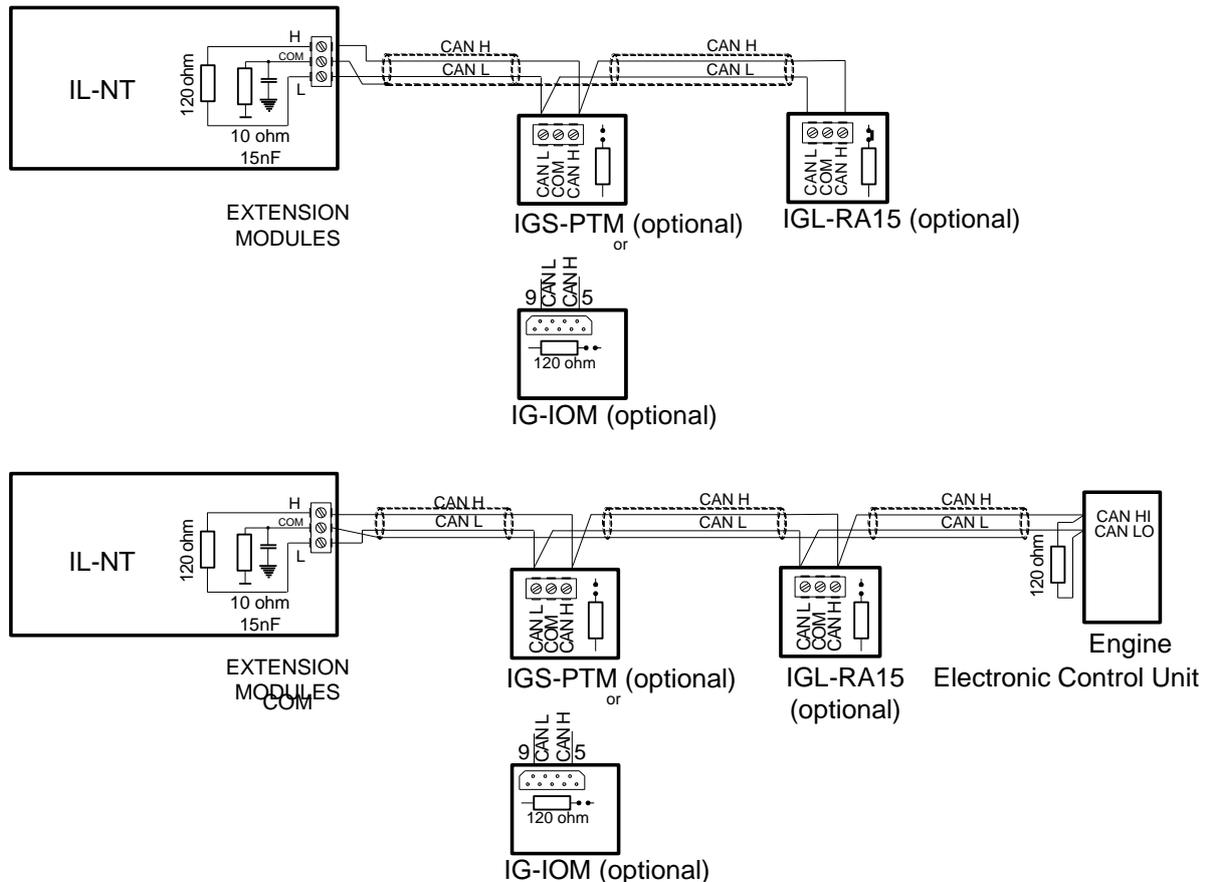
Picture 2 - longer distances (connection between rooms within one building)



Picture 3 - surge hazard (connection out of building in case of storm etc.)



Extension modules (CAN bus) connection



Connection rules

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

For CAN data cables details see chapter [Technical data – Communication interface](#). CAN cable shielding connect to IL-NT COM terminal.

IL-NT contains internal fix 120-ohm resistor and must be located on the CAN bus end. New units with HW version 1.3 have terminating resistor jumper located at CAN terminal.

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

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

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

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



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

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.

Binary inputs IL-NT - default

- BI1 GCB Feedback**
- BI2 MCB Feedback**
- BI3 Emergency Stop**
- BI4 Access Lock**
- BI5 Remote OFF**
- BI6 Remote TEST**
- BI7 Sd Override**

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

GCB Feedback

Use this input for indication, whether the generator circuit breaker is open or closed.

Hint:

IL-NT controller can work even without breaker feedbacks, in this case do not configure the feedback to binary inputs.

For more details see chapters [Circuit breakers timing](#) and [GCB, MCB fail detection](#).

MCB Feedback

This input indicates whether MCB is closed or opened.

Hint:

IL-NT controller can work even without breaker feedbacks, in this case do not configure the feedback to binary inputs.

For more details see chapters [Circuit breakers timing](#) and [GCB, MCB fail detection](#).

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.

Sd Override

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

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

Hint:

Warning *Sd Override* is indicated in the AlarmList if Sd Override mode is active to inform the operator that the engine is not protected.

Access Lock

If the input is closed, no setpoints can be adjusted from controller front panel and gen-set mode (OFF-MAN-AUT-TEST) cannot be changed.

Hint:

Access Lock does not protect setpoints and mode changing from LiteEdit. To avoid unqualified changes the selected setpoints can be password protected.

Also the buttons Fault reset, Horn reset are not blocked at all and buttons Start and Stop in MAN mode are not blocked.

Remote OFF

If closed, iL is switched to OFF mode (there are four modes OFF-MAN-AUT-TEST). When opens controller is switched back to previous mode.

Hint:

This binary input should be connected to schedule timer switch, to avoid start of engine.

Remote MAN

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

Remote AUT

If the input is active, 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.

Remote TEST

If closed, IL-NT is switched to TEST mode (there are four modes OFF-MAN-AUT-TEST). When opens controller is switched back to previous mode.

Rem TEST OnLd

Affects the behaviour in TEST mode. When input is closed, the controller automatically transfers load from the mains to the gen-set. Setpoint **AMF Settings: ReturnFromTEST** must be set to MANUAL. Load is automatically transferred back to the mains when any gen-set shut down protection activates. In case **AMF Settings: ReturnFromTEST** is set to AUTO, then only gen-set is started, but MCB is not opened and GCB is not closed, except there is a Mains fail. So controller behaves like in common TEST mode.

For more details see description of the setpoint **AMF Settings: [ReturnFromTEST \[MANUAL / AUTO\]](#)**.

Hint:

Function Test Onload was changed to combination Remote Test + Rem TEST OnLd.

RemControlLock

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

Emergency MAN

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

Detection of "running" engine and subsequent alarm message "Wrn Stop Fail" is blocked.

The controller shows "EmergMan" state and the engine can not be started.

Generator current and power measurement is active in this mode, regardless of the actual state of the engine.

After the input is open again, the controller recovers to previous state and behaves according to the actual situation .

Function is active in any controller mode.

Start Button

Binary input has the same function as [Start Button](#) on the IntelliLite front panel. It is active in MAN mode only.

Stop Button

Binary input has the same function as [Stop Button](#) on the IntelliLite front panel. It is active in MAN Mode only.

Hint:

Changed function of Stop Button. After the first pressing from running state, there is a standard delay and controller change state to cooling. After holding the button down for 2 seconds controller goes to stop state. The same holds true for BI "Stop Button".

FaultResButton

Binary input has the same function as [Fault Reset](#) button on the IntelliLite front panel.

HornResButton

Binary input has the same function as [Horn reset](#) button on the IntelliLite front panel.

GCB Button

Binary input has the same function as [GCB](#) button on the IntelliLite front panel. It is active in MAN mode only.

MCB Button

Binary input has the same function as [MCB](#) button on the IntelliLite front panel. It is active in MAN mode only.

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.

DualAMFRole

This binary input could be used for switching between Master and Slave controller in Mutual Standby Application (Dual AMF).

DualAMFCtrlIn

Control input for Mutual Standby Application. This binary input of controller 1 must be configured and interconnected with binary output [DualAMFCtrlOut](#) of controller 2 for correct Mutual Standby function.

Hint:

More information about [Dual mutual Standby](#) is in chapter Stand-by Application.

Lang Selection

Not configured

Language selection is done only through the controller display. Pressing ENTER and PAGE buttons concurrently and then only PAGE button separately.

Configured on any binary input

If the input is opened the first (default) language is active and if the input is closed then the second language is active. In case there is more languages available in the controller it is not possible to select any other language even through the controller display.

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.

Alt. Config.

This BI can switch between basic controller settings in [Alternate Cfg](#) setpoint group.

Binary outputs IL-NT - default

BO1	Starter
BO2	Fuel Solenoid
BO3	GCB Close/Open
BO4	MCB Close/Open
BO5	Prestart
BO6	Ready To Load
BO7	Alarm

Hint:

The description of binary outputs of a controller relates also to IOM/PTM modules.

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).

Stop Pulse

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

Ignition

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

Prestart

The output closes prior to the engine start (*Prestart*) and opens when *Starting RPM* speed is reached. During *Crank Attempts* the output is closed too.

The output could be used for pre-glow, pre-heat or prelubrication.

Cooling Pump

The output closes when gen-set starts and opens after stop of the engine.

Idle/Nominal

The output *Idle/Nominal* closes after the timer *Idle Time* elapses. The *Idle Time* counter starts to countdown when *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.

Air Valves

Closes together with *Prestart*. Opens after the engine is stopped.

Stopped engine conditions: RPM = 0, **Engine Params:** *Starting Oil P*, D+ (when enabled).

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.

Horn

The output closes if:

- any alarm comes up or
- the gen-set malfunctions

The output opens if:

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

The output closes again if a new fault comes up.

GCB Close/Open

The output controls the generator circuit breaker.

Hint:

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

IL-NT controller can work even without breakers feedback, in this case do not configure the feedback to binary inputs.

For more details see chapters [Circuit breakers timing](#) and [GCB, MCB fail detection](#).

GCB ON Coil

The output activates Generator Circuit Breaker coil.

GCB Off Coil

The output deactivates Generator Circuit Breaker coil.

GCB UV Coil

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

MCB Close/Open

The output controls the mains circuit breaker.

Hint:

IL-NT controller can work even without breaker feedbacks, in this case do not configure the feedback to binary inputs.

For more details see chapters [Circuit breakers timing](#) and [GCB, MCB fail detection](#).

MCB On Coil

The output activates Mains Circuit Breaker coil.

MCB Off Coil

The output deactivates Mains Circuit Breaker coil.

MCB UV Coil

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

Ready

The output is closed if following conditions are fulfilled:

- Gen-set is not running and
- No Shutdown protection 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* is active) or engine is already running and simultaneously the controller is in AUT Mode.

Ready To Load

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

Running

Output closes if the engine is in Running state.

Cooling

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

Supplying Load

Closed when the generator current is $> 0,5\%$ of the CT ratio.

Exact formulas:

Output is closed when the current at least in one phase is for 1 sec over $CT\ ratio/200+2$

Output is opened when the current in all three phases is for 1 sec below $CT\ ratio/200+2$

Hint:

Values are truncated after division, not rounded.

Fault Reset

The output is a copy of Fault Reset button on controller and binary input *FaultResButton*.

Gen Healthy

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

Mains Healthy

The output is copy of mains status LED on IL-NT front panel. The output is closed if mains voltage and frequency are within limits.

Exerc Timer 1

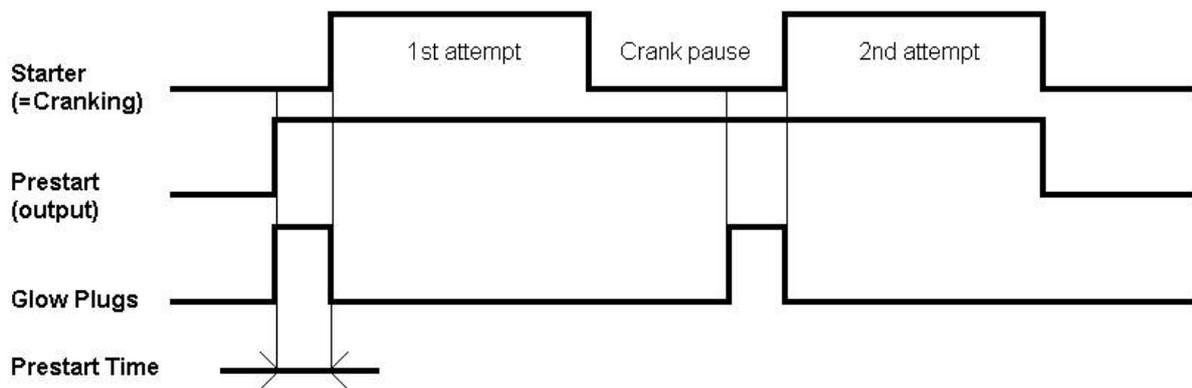
Output activates when Timer 1 is active. Simultaneously, gen-set is started when it is in AUT mode. See setpoint [Timer1..2Function \[No Func/TEST/TEST OnLd/MFail Blk/Mode OFF\]](#) for details.

Exerc Timer 2

Output activates when Timer 2 is active. See setpoint [Timer1..2Function \[No Func/TEST/TEST OnLd/MFail Blk/Mode OFF\]](#) for details.

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.



Fuel Pump

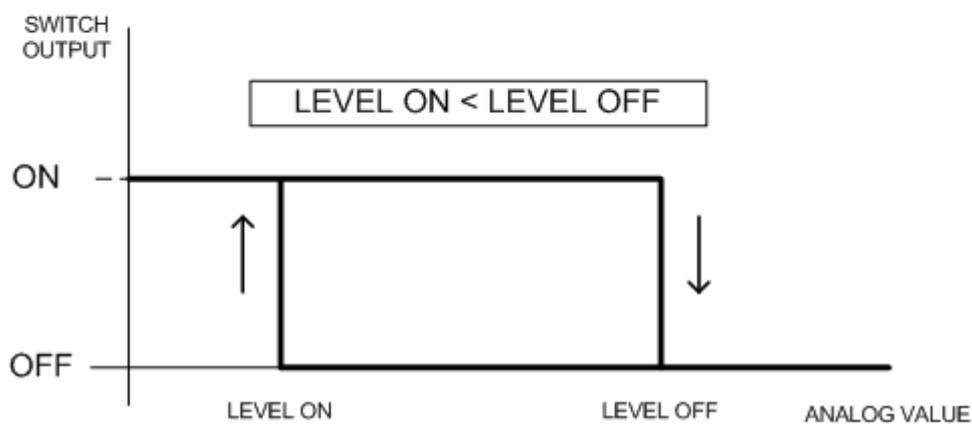
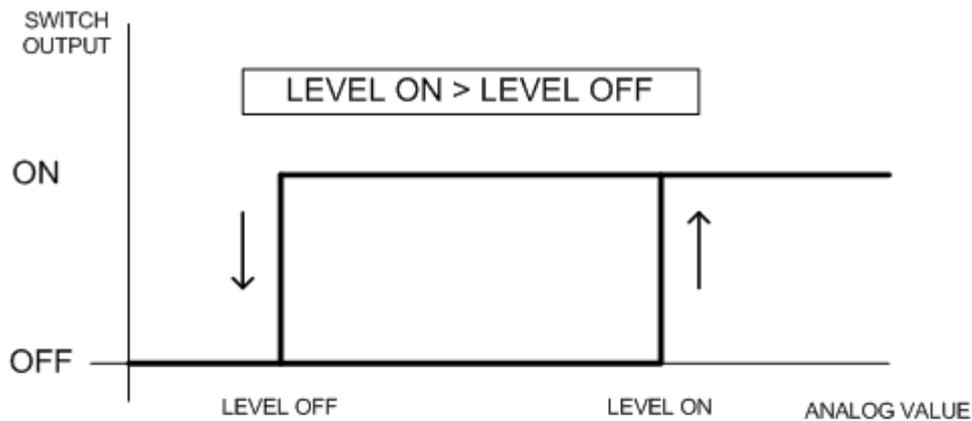
Output closes when the value of Fuel Level lies under the value of Fuel Pump ON setpoint and opens when value of Fuel Pump OFF is reached.

Hint:

Fuel pump function is internally connected to analog input 3 to monitor the actual fuel level in tank. It is a prerequisite for this function to use a fuel level sensor at this analog input.

Temp Switch

This switch is assigned to the controller's analog input 2 – commonly used for water temperature sensing. The setpoints [TempSwitch ON](#) and [TempSwitchOFF](#) for on and off level adjustment are located in the setpoint group [Engine Params](#). Typical usage for this binary output can be activation of fans or heaters. The output behaves based on the setpoint adjustment as described on picture lower:

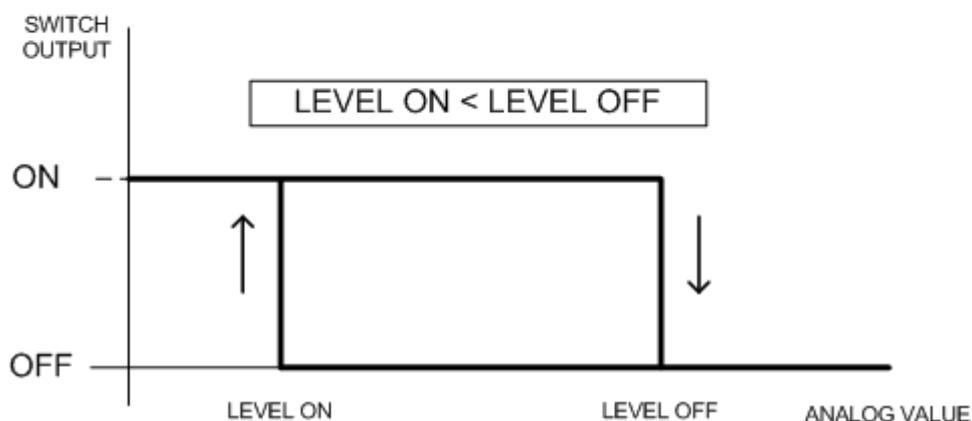
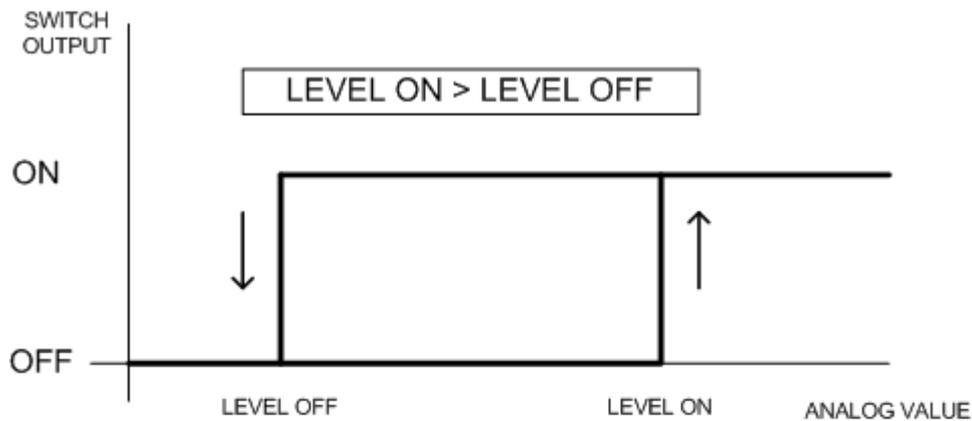


Power Switch

This switch is assigned to the gen-set active power. The setpoints [PowerSwitch ON \[kW\]](#) and [PowerSwitch OFF \[kW\]](#) for on and off level adjustment are located in the setpoint group [Engine Params](#). Typical usage for this binary output can be switching of dummy load. The output behaves based on the setpoint adjustment as described on picture lower:

Hint:

Power switch function and corresponding binary output is activated 30s after the engine is running.



Maintenance

Output closes if the Maintenance alarm activates, i.e. the gen-set has been running for more than **Engine Protect: WrnMaintenance**.

The output opens, if

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

Ctrl HeartBeat

Output signalizes Watchdog Reset. In a healthy state it blinks at 500ms : 500ms rate. When Watchdog Reset occurs, it stops blinking.

DualAMFCtrlOut

Control output for Mutual Standby Application. This binary output of controller 1 must be configured and interconnected with binary input [DualAMFCtrlIn](#) of controller 2 for correct Mutual Standby function

Mode OFF

The output is closed, if OFF Mode is selected.

Mode MAN

The output is closed, if MAN Mode is selected.

Mode AUT

The output is closed, if AUT Mode is selected.

Mode TEST

The output is closed, if TEST mode is selected.

AL D+ Fail

Output closes if gen-set is running and D+ input not energized.

The output opens, if

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

Hint:

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

AL Gen >V

The output closes if the generator overvoltage shutdown alarm activates.

The output opens, if

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

AL Gen <V

The output closes if the generator undervoltage shutdown alarm activates.

The output opens, if

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

AL Gen Volts

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

The output opens, if

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

AL Gen Freq

Output closes if the generator over/under frequency alarm activates.

The output opens, if

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

AL Gen >Freq

Output closes if the generator over frequency alarm activates.

The output opens, if

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

AL Gen <Freq

Output closes if the generator under frequency alarm activates.

The output opens, if

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

AL Mains Volts

The output closes if the mains over/under voltage alarm or voltage asymmetry alarm activates.

The output opens, if

- alarm is not active

AL Mains Freq

Output closes if the mains over/under frequency alarm activates.

The output opens, if

- alarm is not active

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

AL OverloadBOC

Output closes if the generator overload alarm activates.

The output opens, if

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

AL Stop Fail

Output closes when the engine has to be stopped, but speed or frequency or voltage or oil pressure is detected ("[Still Engine](#)" conditions). This protection goes active when *Stop Time* setpoint value exceed and any Running engine conditions are detected after stop command or under conditions for activating Wrm Stop Fail alarm on Still engine:

- for generator voltage < 50% of nominal voltage, Sd Stop Fail has delay 1s
- for generator voltage > 50% of nominal voltage, Sd Stop Fail has delay 200ms
- for oil pressure > starting oil pressure, Sd Stop Fail has delay 1s

For detected RPM, there is no delay.

Hint:

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

With start goes this protection inactive.

The output opens, if

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

AL Overspeed

Output closes if the gen-set overspeed alarm activates.

The output opens, if

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

AL Underspeed

Output closes if the gen-set underspeed alarm activates.

The output opens, if

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

AL Start Fail

Output closes after the gen-set start-up fails.

The output opens, if

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

AL Overcurrent

Output closes if the generator

- *IDMT over current or
- current unbalance or
- short current alarm activates.

The output opens, if
**Alarm is not active and
FAULT RESET** is pressed

AL BatteryFail

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

The output opens, if

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

AL EarthFault

Output closes when Earth Fault Current is detected (extension module is needed).

The output opens, if

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

Hint:

For more details see chapter [Earth Fault Measurement](#)

AL Common Wrn

Output closes when any warning alarm appears.

The output opens, if

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

AL Common Sd

Output closes when any shut-down alarm appears.

The output opens, if

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

AL Common BOC

The output closes when any BOC alarm appears.

The output opens, if:

- No BOC alarm is active and
- **FAULT RESET** is pressed

AL Common Fls

Output closes when any Sensor Fail alarm appears.

The output opens, if

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

AL AI1 Sd

Output closes if the engine oil pressure (configured to the first analog input) shutdown alarm activates.

The output opens, if

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

AL AI1 Wrn

Output closes if the engine oil pressure (configured to the first analog input) warning alarm activates.

The output opens, if

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

AL AI2 Sd

Output closes if the engine water temperature (configured to the second analog input) shutdown alarm activates.

The output opens, if

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

AL AI2 Wrn

Output closes if the engine water temperature (configured to the second analog input) warning alarm activates.

The output opens, if

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

AL AI3 Sd

Output closes if the engine Fuel Level (configured to the third analog input) shutdown alarm activates.

AL AI3 Wrn

Output closes if the engine Fuel Level (configured to the third analog input) warning alarm activates.

BI1..7 Status

* IOM BI1..7 Status

The outputs give an information about the assigned binary input.

In case the assigned binary input is configured to alarm type, then the output closes when the alarm activates. It opens if

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

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

* AL IOM AI1..4 Wrn

Output closes if warning alarm on the appropriate IOM/PTM analog input activates.

The output opens, if

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

* AL IOM AI1..4 Sd

Output closes if shutdown alarm on the appropriate IOM/PTM analog input activates.

The output opens, if

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

* ExtBI1..7 Status

The outputs give an information about the assigned binary input.

In case the assigned binary input is configured to alarm type, then the output closes when the alarm activates. It opens if

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

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

Hint:

Valid when extension module IL-NT BIO8 or IL-NT CT-BIO7 is configured.

ECU Comm OK

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

ECU Comm Error

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

ECU YellowLamp

The output copies warning information from ECU.

ECU Red Lamp

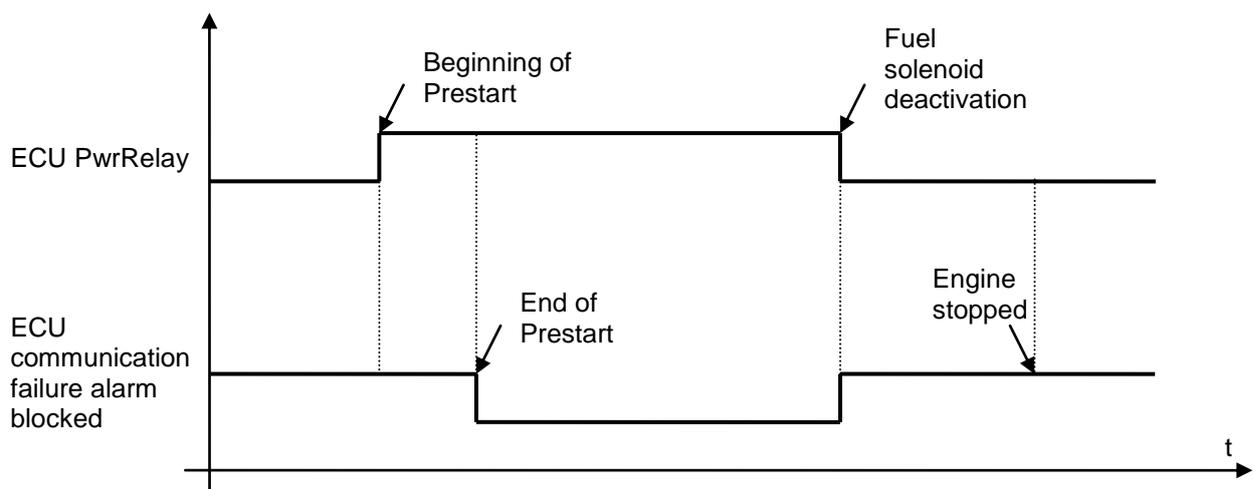
The output copies shutdown information from ECU.

ECU PowerRelay

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

This output can be used to indicate when the ECU should be powered up i.e. only while the engine is running.

This output also influences evaluation of communication failure with ECU and related FLS alarms from analog inputs read from the ECU. If the output is configured (which means configured on physical binary output or VPIO output), the issuing of communication error is blocked during Prestart and Stopping procedure as shown in the picture.



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](#) setpoints 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.

Water 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:

For further information about analog inputs configuration see [Analog inputs](#).

CAN J1939 interface

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

Value	Value is received from	
	J1939 enabled	J1939 disabled
RPM	ECU	IL-NT – RPM terminals
Oil pressure	ECU or IL-NT AI1	IL-NT AI1 terminals
Water temperature	ECU or IL-NT AI2	IL-NT AI2 terminals
Fuel Level	ECU or IL-NT AI3	IL-NT AI3 terminals
ECU State	ECU	
Fuel Rate	ECU	
Manifold temp	ECU	
Boost Pressure	ECU	
Percent Load	ECU	

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

Hint:

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

Analog outputs

Optional plug in card IL-NT AOU8 provides eighth 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

Password

EnterPassword

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

Hint:

There is only 1 level of a password.

ChangePassword

Use  or  keys to set and  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.

Nominal Power [kW]

Nominal power of the generator
 Step: 1kW
 Range: 1 – 5000 kW

Nomin 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

CT Ratio [/5A]

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

Hint:

Generator currents and power measurement is suppressed if current level is bellow <1% of CT range.

For firmware versions ≤ 1.4 :

For CT Ratio ≤ 250 the values of power and current are displayed in a controller with one decimal. For CT Ratio > 250 the values of power and current are displayed in a controller with integral numbers. 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! Check the statistical values. If necessary value change is possible by LiteEdit software (password is required).

WARNING! Change of CT ratio over value 250 without reconfiguring in LiteEdit can cause overflow of current measurement and improper function of controller!

WARNING! For CT Ratio ≤ 250 the measured current on generator or mains shall not be bigger than:

**6500A or
equivalent of 3200kVA on any phase or total kVA or
equivalent of 3200kW on any phase or in total kW.**

For CT Ratio > 250 are the same conditions with limits of 65000A,32000kVA and 32000kW.

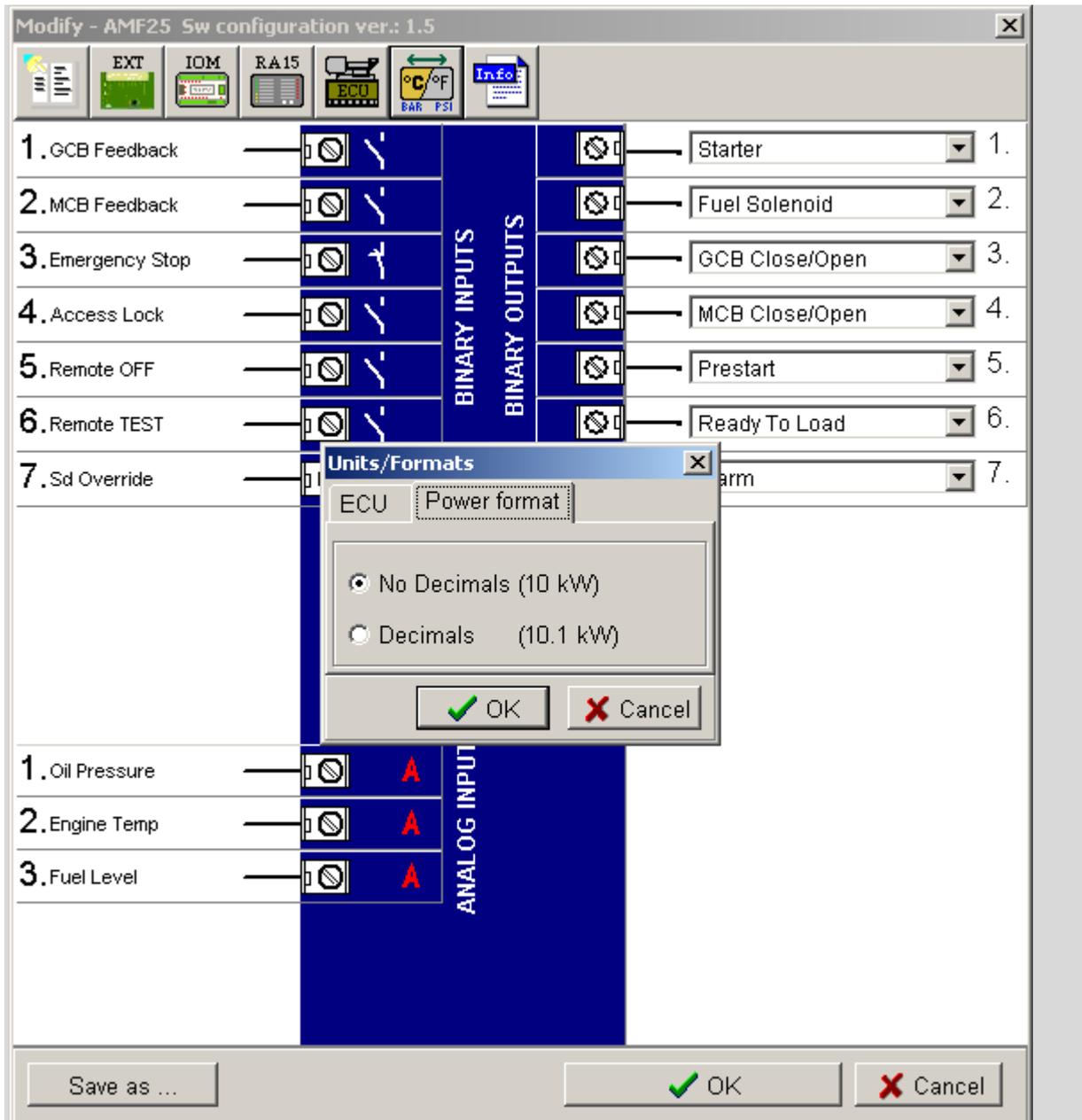
For firmware version >1.5 :

Decimal switching is not done via value of "CT ratio" setpoint, but in configuration window of LiteEdit software via icon „Units/Formats“.

WARNING! In case of one decimal displayed at power values the measured current on generator or mains shall not be bigger than:

**6500A or
equivalent of 3200kVA on any phase or total kVA or
equivalent of 3200kW on any phase or in total kW.**

For no decimal displayed are the same conditions with limits of 65000A,32000kVA and 32000kW.



PT Ratio [1]

Gen-set potential transformers ratio.

Step: 0,1 V / V

Range: 0,1 – 500,0 V / V

Vm PT Ratio [1]

Mains potential transformers ratio.

Step: 0,1 V / V

Range: 0,1 – 500,0 V / V

NomVolts Ph-N [V]

Nominal generator voltage (phase to neutral)

Step: 1V

Range: 80 – 20000 V

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.

NomVolts Ph-Ph [V]

Nominal generator voltage (phase to phase)

Step: 1V

Range: 138 – 35000 V

Nominal Freq [Hz]

Nominal generator frequency (usually 50 or 60 Hz)

Step: 1Hz

Range: 45 – 65 Hz

Gear Teeth [-]

Number of teeth on the engine gear for the pick-up.

Set to zero, if no pick-up is used. Engine speed is counted from the generator frequency.

Step: 1

Range: 0 – 500

Hint:

Generator frequency can be used only when generator voltage (min 10Vef) is present before reaching of the firing speed (*Starting RPM*) after start.

Nominal RPM [RPM]

Nominal engine speed.

Step: 1RPM

Range: 100 – 4000 RPM

ControllerMode [OFF, MAN, AUT,*TEST]

Equivalent to Controller mode changes by or buttons.

Hint:

Controller Mode change can be separately password protected.

Reset To MAN [ENABLED/DISABLED]

DISABLED: Controller stays in AUT Mode after Fault Reset .

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

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.

CT Location [Load/GenSet]

Load: Controller stays in AUT Mode after Fault Reset .
GenSet: Automatic switch from AUT (or TEST) to MAN Mode after Fault Reset to avoid automatic engine start. This function is active for Shut down protection only.

Hint:

More details about this function is introduced in chapter [CT Location](#).

Comms Settings

ControllerAddr (1 .. 32) [-]

Controller identification number. It is possible to set controller address different from the default value (1) so that more IL controllers can be interconnected (via RS485) and accessed e.g. from Modbus terminal.

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.

COM1 Mode [DIRECT/MODEM/MODBUS/ECU LINK]

Communication protocol switch for the COM1 channel.

DIRECT: LiteEdit communication protocol via direct cable.
MODEM: LiteEdit communication protocol via modem.
MODBUS: Modbus protocol. See detailed description in IntelliCommunication guide.
ECU LINK: Protocol for communication with Cummins engines via Modbus.

Hint:

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

For detail description see chapter [Modbus protocol](#). Since IL-NT version 1.3 controller supports register oriented modbus.

COM2 Mode [DIRECT/MODBUS/ECU LINK]

Communication protocol switch for the COM2 channel, if dual communication module is plugged in.

DIRECT: LiteEdit communication protocol via direct cable.
MODBUS: Modbus protocol. See detailed description in IntelliCommunication guide.
ECU LINK: Protocol for communication with Cummins engines via Modbus.

Hint:

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

For detail description see chapter [Modbus protocol](#). Since IL-NT version 1.3 controller supports register oriented modbus.

Hint:

Modbus TCP protocol using IB-Lite communication module requires setting [COM1 Mode](#) = DIRECT and [COM2 Mode](#) = MODBUS.

ModemIniString

If your modem needs some additional initialization AT commands (i.e. because of national telephony network differences), it can be entered here. Otherwise leave this setpoint blank.

ModbusComSpeed [9600,19200, 38400, 57600]

If the Modbus mode is selected on COM1 or COM2 channels, the Modbus communication speed in bps can be adjusted here.

IBLite IP Addr [-]

If DHCP is DISABLED this setpoint is used to adjust the IP address of the ethernet interface of the controller. Ask your IT specialist for help with this setting.

If DHCP is ENABLED this setpoint is used to display the IP address, which has been assigned by the DHCP server.

IBLite NetMask [-]

If DHCP is DISABLED this setpoint is used to adjust the IP address of the ethernet interface of the controller. Ask your IT specialist for help with this setting.

If DHCP is ENABLED this setpoint is used to display the IP address, which has been assigned by the DHCP server.

IBLite GateIP [-]

If DHCP is DISABLED this setpoint is used to adjust the IP address of the gateway of the network segment where the controller is connected.

If DHCP is ENABLED this setpoint is used to display the gateway IP address which has been assigned by the DHCP server.

A gateway is a device which connects the respective segment with the other segments and/or Internet.

IBLite DHCP [ENABLED/DISABLED]

The setpoint is used to select the method how the ethernet connection is adjusted.

DISABLED:

The ethernet connection is adjusted fixedly according to the setpoints *IP Addr*, *NetMask*, *GateIP*, *DNS IP Address*.

This method should be used for classic ethernet or Internet connection. When this type of connection is opening the controller is specified by it's IP address. That means it would be inconvenient if the IP address were not fixed (static).

ENABLED:

The ethernet connection settings is obtained **automatically from the DHCP server**. The obtained settings is then copied to the related setpoints.

If the process of obtaining the settings from DHCP server is not successful the value *000.000.000.000* is copied to the setpoint *IP address* and the module continues trying to obtain the settings.

ComAp Port [0 - 65535]

This setpoint is used to adjust the port number, which is used for ethernet connection to a PC with any of ComAp PC program (i.e. IntelliLite, IntelliMonitor). This setpoint should be adjusted to 23, which is the default port used by all ComAp PC programs. A different value should be used only in special situations as e.g. sharing one public IP address among many controllers or to overcome a firewall restrictions.

APN Name [-]

Name of APN access point for GPRS network provided by GSM/GPRS operator.

APN User Name [-]

User name for APN access point provided by GSM/GPRS operator.

APN User Pass [-]

User password for APN access point provided by GSM/GPRS operator.

AirGate [ENABLED/DISABLED]

This setpoint selects the ethernet connection mode.

DISABLED:

This is a standard mode, in which the controller listens to the incoming traffic and answers the TCP/IP queries addressed to him. This mode requires the controller to be accessible from the remote device (PC), i.e. it must be accessible at a public and static IP address if you want to connect to it from the Internet.

ENABLED:

This mode uses the "AirGate" service, which hides all the issues with static/public address into a black box and you do not need to take care about it. You just need only a connection to the Internet. The AirGate server address is adjusted by the setpoint *AirGate IP*.

AirGate IP [-]

This setpoint is used for entering the domain name or IP address of the AirGate server. Use the free AirGate server provided by ComAp at address airgate.comap.cz if your company does not operate it's own AirGate server.

SMTP User Name [-]

Use this setpoint to enter the user name for the SMTP server.

SMTP User Pass [-]

Use this setpoint to enter the password for the SMTP server.

SMTP Server IP [-]

This setpoint is used for entering the domain name (e.g. smtp.yourprovider.com) or IP address (e.g. 74.125.39.109) of the SMTP server. Please ask your internet provider or IT manager for this information.

Hint:

You may also use one of free SMTP servers, e.g. smtp.gmail.com. However, please note that some free SMTP servers may cause delays (in hours..) when sending e-mails. If you do not want to send active e-mails, you may leave this setpoint blank, as well as other setpoints related to SMTP server and e-mail settings. Proper setting of SMTP-related setpoints as well as controller mailbox are essential for sending alerts via e-mails.

Contr Mail Box [-]

Enter an existing e-mail address into this setpoint. This address will be used as sender address in active e-mails that will be sent from the controller.

Time Zone [-]

This setpoint is used to select the time zone where the controller is located. See your computer time zone setting (click on the time indicator located in the rightmost position of the the windows task bar) if you are not sure about your time zone.

Hint:

If the time zone is not selected properly the active e-mails may contain incorrect information about sending time, which may result in confusion when the respective problem actually occurred.

DNS IP Address [-]

If DHCP is DISABLED this setpoint is used to adjust the domain name server (DNS), which is needed to translate domain names in e-mail addresses and server names into correct IP addresses. If DHCP is ENABLED this setpoint is used to display DNS server, which has been assigned by the DHCP server.

Engine Params

Starting RPM [%]

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

Step: 1% of nominal RPM

Range: 5 – 50 %

Starting Oil P [Bar]

When reached controller stops cranking (starter goes OFF).

Step: 0,1 bar

Range: 0,0 – 10,0

Hint:

There are three conditions for stop cranking: RPM > *Starting RPM*, Oil Pressure > *Starting Oil P* and D+ (when enabled) => 80% of battery voltage. Starter goes off when any of these conditions is void.

Prestart Time [s]

Time of closing of the *Prestart* output prior to the engine start.

Set to zero if you want to leave the output *Prestart* open.

Step: 1s

Range: 0 – 600 s

MaxCrank Time [s]

Maximum time limit of cranking.

Step: 1s

Range: 1 – 255 s

CrnkFail Pause [s]

Pause between Crank Attempts.

Step: 1s

Range: 5 – 60 s

Crank Attempts [-]

Max number of Crank Attempts.

Step: 1

Range: 1 – 10

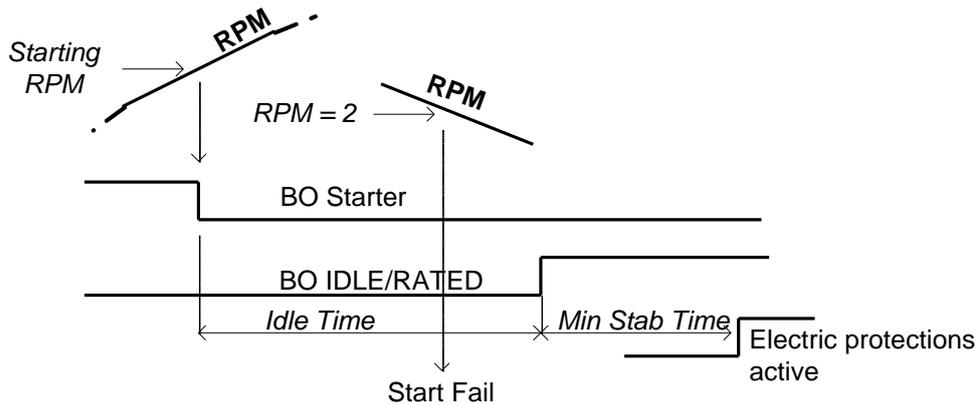
Idle Time [s]

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



Min Stab Time [s]

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

Step: 1s

Range: 1 – 300 (Max Stab Time) s

Max Stab Time [s]

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

Step: 1s

Range: 1 (Min Stab Time) – 300 s

Hint:

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

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

Cooling Time [s]

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

Step: 1s

Range: 0 – 3600 s

Hint:

Cooling is executed at nominal speed and generator protections are active.

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 / GAS]

Determines behavior of the Binary output FUEL SOLENOID.

DIESEL: Output closes 1 sec before Binary output STARTER.

The output opens if Emergency Stop comes or Cooled gen-set is stopped and in pause between repeated starts.

GAS: Output closes together with Binary output IGNITION if RPM is over the 30 RPM (fix value).

Output opens after stop command or in pause between repeated start.

D+ Function [ENABLED/CHRGFAIL/DISABLED]

ENABLED: The D+ terminal is used for both functions – “running engine” detection and charge fail detection.

CHRGFAIL: The D+ terminal is used for charge fail detection only

DISABLED: The D+ terminal is not used.

Hint:

The magnetization current is provided independently on this setpoint value.

The D+ charge fail protection becomes active after **Engine Params:Idle Time** reaches zero.

ECU FreqSelect [PRIMARY/SECONDARY/DEFAULT]

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

Volvo – “Volvo Aux” is selected in ECU configuration:

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

Scania – “Scania S6 Singlespeed” is selected in ECU configuration:

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

Frequency change for Volvo Penta engines with EMS2

This description refers to the Volvo Penta Application bulletin 30-0-003.

The procedure for changing engine speed on the D9 and D16 engines is different from the D12 engine.

There is no system reset on the EMS2 unit; therefore the procedure is changed.

Procedure if ECU not energized:

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

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

Procedure with ECU powered on:

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

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

ECU SpeedAdj [%]

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

Step: 1%

Range: 0 – 100%

Hint:

The minimum value 0% is equal to 90% of nominal speed. Maximum value 100% is equal to 110% of nominal speed.

Fuel Pump ON [%]

When the actual value of Fuel Level is lower or equals to this value then the binary output Fuel Pump is activated.

Step: 1
Range: 0 – 100 %

Fuel Pump OFF [%]

When the actual value of Fuel Level is higher or equals to this value then the binary output Fuel Pump is deactivated.

Step: 1
Range: 0 – 100 %

Hint:

The two setpoints above are compared to Analog Input 3 (usually used for Fuel Level) It is a prerequisite for this function to use a fuel level sensor at this analog input.

TempSwitch ON [-]

Threshold level for switching on the binary output TempSwitch. This function is connected with controller's analog input 2.

Step: 1
Range: -100 .. 10000 [-]

TempSwitchOFF [-]

Threshold level for switching off the binary output TempSwitch. This function is connected with controller's analog input 2.

Step: 1
Range: -100 .. 10000 [-]

Hint:

The description of Power Switch function is in chapter [Binary outputs - list](#) at [Temp Switch](#).

PowerSwitch ON [kW]

Threshold level for switching the binary output "Power Switch" on.

Step: 1
Range: 0 – 32000 kW

PowerSwitchOFF [kW]

Threshold level for switching the binary output "Power Switch" off.

Step: 1
Range: 0 – 32000 kW

Hint:

The description of Power Switch function is in chapter [Binary outputs - list](#) at [Power Switch](#).

FuelTankVolume [l]

Define a capacity of Genset fuel tank.

Step: 1
Range: 1 – 10000l

Hint:

This setpoint have to be set properly to correct evaluation of Fuel Theft.

MaxFuelDrop [%/h]

Setpoint indicates the maximum allowable drop of fuel in fuel tank per running hour. When the engine is not running the maximal allowed fuel drop-off is preset to 5% of total tank volume per hour.

In case of detection of theft/leak the alarm "Wrn FuelTheft" is raised and same alarm is send via SMS and displayed by WebSupervisor (if used).

Step: 1
Range: 0 – 50%

Hint:

Set 0 to disable Fuel Theft Protection function into MaxFuelDrop setpoint.

Engine Protect

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*.

Step: 1s
Range: 0 – 300 s

Hint:

The protections sequence diagram can be found in [Alarm time chart](#) in chapter [Alarm Management](#). It displays when and what protections are active.

Horn Timeout [s]

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

Step: 1s
Range: 0 – 600 s

Overspeed Sd [%]

Threshold for over speed protection

Step: 1% of nominal RPM
Range: 100 – 150%

Hint:

The Overspeed protection value is increasing by 10% of "Overspeed Sd" setpoint, e.g. from default 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. It holds true if the value Gear Teeth = 0.

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)

Batt Overvolt [V]

Warning threshold for hi battery voltage.

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

Batt Volt Del [s]

Delay for low battery voltage alarm.

Step: 1s
Range: 0 – 600 s

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

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

Overload BOC [%]

Threshold for generator overload (in % of Nominal power) protection. Protection is BOC (Breaker Open and genset Cooldown).

Step: 1% of Nominal power
 Range: 0 – 200%

Overload Del [s]

Delay for generator overload alarm.

Step: 0.1s
 Range: 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

***Amps IDMT Del [s]**

IDMT curve shape selection. *Amps IDMT Del* is Reaction time of IDMT protection for 200% overcurrent $I_{gen} = 2 * Nomin Current$.

Step: 0,1 s
 Range: 0,1 - 600,0 s

IDMT is “very inverse” generator over current protection. Reaction time is not constant but depends on generator over current level according following formula.

$$\text{Reaction time} = \frac{\text{Amps IDMT Del} * \text{Nomin Current}}{I_{gen} - \text{Nomin Current}}$$

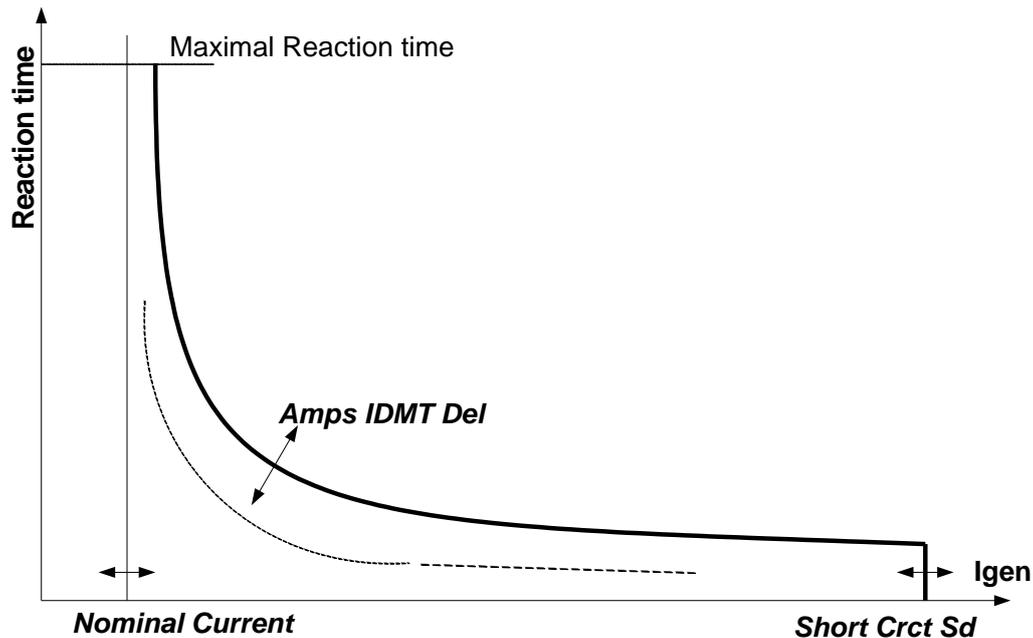
Hint:

Reaction time is limited up to 3600 sec = 1 hour. IDMT protection is not active for Reaction time values longer than 1 hour.

I_{gen} is maximal value of all measured phases of generator current.

EXAMPLE of Reaction time for different over current levels. Values in column 200% are *IDMT Curr Del*.

	Overcurrent			
	200 % = IDMT Curr Del	≤ 100 %	101 %	110 %
Reaction time	0,2 s	No action	20 s	2 s
	2 s	No action	200 s	20 s
	20 s	No action	2000 s	200 s
	40 s	No action	No action (Reaction time ≥ 1 hour)	400 s



Amps Unbal BOC [%]

Threshold for generator current asymmetry (unbalance). Protection is BOC (Breaker Open and genset Cooldown).

Step: 1% of Nominal current
Range: 1 – 200% of Nominal current

Amps Unbal Del [s]

Delay for generator current unbalance

Step: 0.1 s
Range: 0.0 – 600.0 s

Gen >V Sd [%]

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

Step: 1% of Nominal voltage
Range: 0(Gen <V 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: ConnectionType](#) 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

Volt Unbal BOC [%]

Threshold for generator voltage unbalance alarm.

Step: 1% of Nominal voltage
Range: 0 – 200% of Nominal voltage

Volt Unbal Del [s]

Delay for generator voltage unbalance alarm.

Step: 0.1s
Range: 0.0 – 600.0 s

Gen >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

AMF Settings

Operation Mode [AMF/MRS/SLAVE/MASTER]

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.

SLAVE/MASTER:

When SLAVE or MASTER is selected the controller will perform [Dual Mutual Standby](#) function.

Hint:

MASTER or SLAVE can be also defined by binary input [DualAMFRole](#) with higher priority than Operation Mode setpoint.

DualAMFTime [h]

Within this time period are gen-sets switching in supplying the load.

Step: 1h

Range: 1 – 24h

RetFromIsland [MANUAL/AUTO]

MANUAL: After closing GCB, IL goes to MAN Mode automatically.
 AUTO: No automatic switching to MAN Mode.

EmergStart Del [s]

Delay after the mains failure to the start of the gen-set
 Step: 1s
 Range: 0 – 6000 s

MainsReturnDel [s]

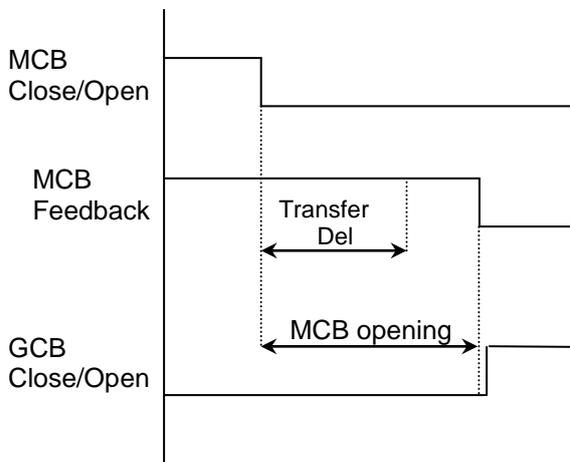
Delay after the mains return to the GCB opening.
 Step: 1s
 Range: 1 – 3600 s

Transfer Del [s]

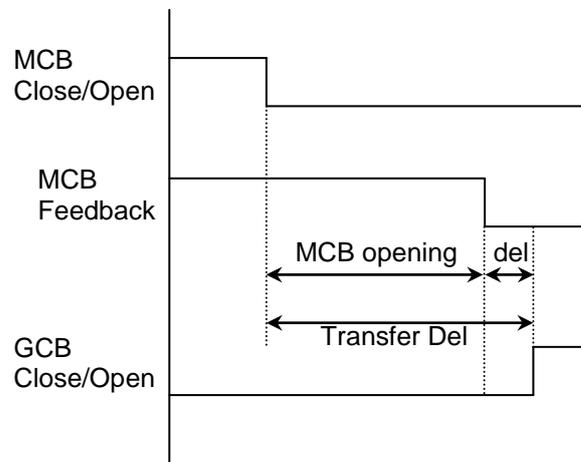
Delay after GCB opening to MCB closing during the return procedure.
 Delay after MCB opening to GCB closing if the setpoint *MCB Opens On* set to GENRUN
 Step: 0.1s
 Range: 0 – 600.0 s

The time charts bellow show recommended setting of **AMF Settings: Transfer Del** setpoint.

If the *Transfer Del* setpoint is set shorter than the time required for opening of the circuit breaker, the controller closes *GCB Close/Open* output straight away (100 ms) after the *MCB feedback* input deactivates.



If some delay between *MCB feedback* deactivation and closing of *GCB Close/Open* output is required, then the *Transfer Del* must be set to sum of "MCB opening" + "del" time.



MCB Close Del [s]

Delay after mains returns to MCB closing, if gen-set is not running (e.g. is in start-up procedure)
 Step: 0.1s
 Range: 0 – 60.0 s

Mains >V [%]

Threshold for mains overvoltage. All three phases are checked. Maximum out of three is used.
 Step: 1% of Nominal voltage
 Range: 50 (Mains <V) – 150%

Mains <V [%]

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

Step: 1% of nominal voltage
Range: 50% – 150 (Mains >V)%

Mains V Del [s]

Delay for mains undervoltage and overvoltage

Step: 0.1 s
Range: 0 – 600.0 s

Mains V Unbal [%]

Threshold for mains voltage unbalance

Step: 1% of Nominal voltage
Range: 1 – 150%

Mains VUnb Del [s]

Delay for mains voltage unbalance

Step: 0.1 s
Range: 0- 60.0

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 <Freq) – 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 >Freq)%

Mains Freq Del [s]

Delay for mains underfrequency and overfrequency

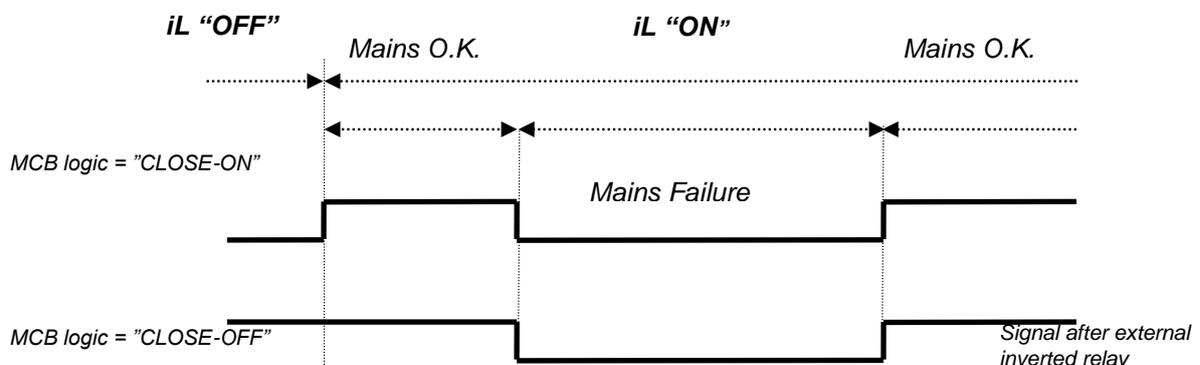
Step: 0.1s
Range: 0 – 60.0 s

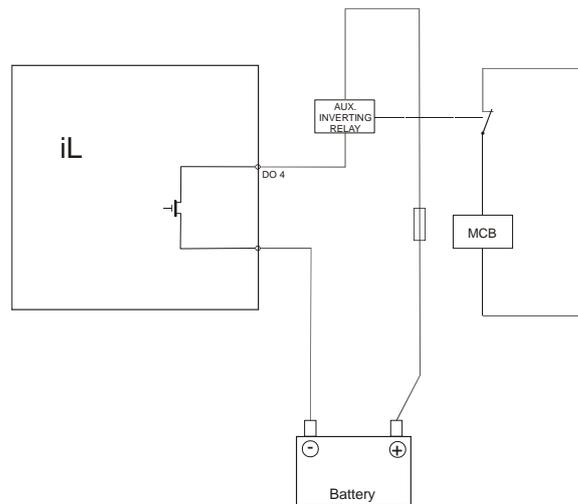
MCB Logic [CLOSE-ON / CLOSE-OFF]

The set point influences the behavior of the output MCB CLOSE/OPEN

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

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





Hint:

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

ReturnFromTEST [MANUAL / AUTO]

The set point influences the behavior of the TEST mode.

MANUAL:

- 1) Select TEST, gen-sets starts and running unloaded
- 2) To transfer load from mains to the gen-set press **MCB ON/OFF** or wait for power-cut.
- 3) When mains recovers, the gen-set remains running loaded.
- 4) To stop the gen-set select AUTO Mode
- 5) In AUT Mode:
 - a) After the *MainsReturnDel* IntelliLite opens the GCB
 - b) After the *Transfer Del* delay IntelliLite closes the MCB.
 - c) The gen-set is cooled and stopped

AUTO:

- 1) Select TEST, gen-sets starts and running unloaded
- 2) To transfer load from mains to the gen-set wait for the power-cut. the controller does not response for **MCB ON/OFF** button.
- 3) When the mains recovers:
 - a) After the *MainsReturnDel* the controller opens the GCB
 - b) After the *Transfer Del* delay the controller closes the MCB.
- 4) The gen-set remains running.
- 5) To stop the gen-set select a different mode than TEST.

MCB Opens On [MAINSFAIL / GENRUN]

MAINSFAIL

The command to open the MCB is given immediately after mains fail condition is evaluated. If the mains will return into parameters (*MainsReturnDel* passed)) after MCB was opened and before GCB is closed, timer *MCBCloseDel* is applied before MCB closing.

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.

If the mains will return into parameters (*MainsReturnDel* passed) after MCB was opened and before GCB was closed, again new timer *TransferDel* is applied before is MCB reclosed.

Hint:

This option should be used for MCBs using 230V control and not equipped with the undervoltage coil.

***Extension I/O**

IOM AI1..4 Wrn []

The warning level for IOM ANALOG INPUT 1..4 alarm detection.

Step: 1
Range: -100 - +10000

IOM AI1..4 Sd []

The shutdown level for IOM ANALOG INPUT 1..4 alarm detection.

Step: 1
Range: -100 - +10000

IOM AI1..4 Del [s]

Delay for IOM ANALOG INPUT 1..4 alarm.

Step: 1 s
Range: 0 - 900 s

Hint:

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

Configuration	Protection
Under	Protection is activated only when measured value is under measured level.
Over	Protection is activated only when measured value is over measured level.
Under+fIs	Level 2 protection is activated by Sensor Fail as well.
Over+fIs	Level 2 protection is activated by Sensor Fail as well.

IOM AI1..4 Calibr [...]

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

Step: 1
Range: -1000 – +1000

Date/Time

Some of parameters in this group are only available at specific models of IL-NT.

***Time Stamp Per [min]**

Time interval for periodic history records.

Step: 1 min
Range: 0 – 200min

Hint:

Time stamps are only recorded into history while gen-set is running. When is engine stopped there are no time stamps records made.

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

DISABLED: Automatic switching between summer and wintertime is disabled.

WINTER (SUMMER) : Automatic switching between summer and wintertime is enabled and it is set to winter (summer) season.

WINTER-S (SUMMER-S) : Modification for southern hemisphere.

***#Time [HHMMSS]**

Real time clock adjustment.

***#Date [DDMMYYYY]**

Actual date adjustment.

Timer1..2Function [No Func / TEST / TEST OnLd / MFail Blk / Mode OFF]

It is possible to choose out of 5 following Timer functions. Binary output Exerc Timer X is always activated when Timer is active regardless of chosen Timer function. Timer functions require controller running in AUT mode.

Timer1 has higher priority over Timer2. So if Timer1 is configured for TEST mode and Timer2 is over the same time configured for OFF mode, controller will work in TEST mode. Controller activates timer whenever it is powered up even in period, where timer should be already running.

- No Func: There is no any other function, but binary output Timer1..2 activation.
- TEST: When this option is chosen then the Timer output is also internally connected to the Remote TEST binary input.
- TEST OnLd: When this option is chosen then the Timer output is also internally connected to the Rem TEST OnLd binary input.
- MFail Blk: When this option is chosen then the Timer output is also internally connected to the MainsFailBlock binary input.
- Mode OFF: When this option is chosen then the Timer output is also internally connected to the Remote OFF binary input.

***Timer 1..2 Repeat [NONE/MONDAY/TUESDAY/WEDNESDAY/THURSDAY/WEDNESDAY/FRIDAY/SATURDAY/SUNDAY/MON-FRI/MON-SAT/MON-SUN/SAT-SUN]**

Defines TIMER 1,2 activation. Binary output TIMER 1,2 is internally linked with Rem Start/Stop binary input. Refer to binary outputs „Exerc Timer X“ and particular binary inputs related to setpoint Timer1..2Function for details.

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

***Timer1..2 ON Time**

Day time interval, for how long will Timer stay active and activate defined binary output „Exerc Timer X“.

***Timer1..2Duration**

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

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 AMF20.

Test Duration [min]

Time interval, when engine is running after expiring the Test Period setpoint.
Range: 0 – 240 minutes
^ Available only in AMF20.

Hint:

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

Sensors Spec

AI1, AI2, AI3 Calibration [...]

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

Step: 1
Range: -1000 – +1000

Hint:

Calibration constants have to be adjusted when measured value is near the alarm level. User curves can be defined by LiteEdit software.

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 and/or emails 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 and/or e-mail address to the setpoints TelNo/Addr Ch1 and TelNo/Addr Ch2. It is possible to put either a GSM number or e-mail to both setpoints.

NOTE:

An internet module must be available for sending of e-mails. Similarly, a GSM modem is necessary 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 or e-mail address) must be set correctly to the setpoint(s) TelNo/Addr Ch1 resp. TelNo/Addr Ch2.

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 or e-mail address) must be set correctly to the setpoint(s) TelNo/Addr Ch1 resp. TelNo/Addr Ch2.

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 or e-mail address) must be set correctly to the setpoint(s) TelNo/Addr Ch1 resp. TelNo/Addr Ch2.

TelNo/Addr Ch1, 2

Enter either a valid GSM phone number or e-mail address to this setpoint, where the alarm messages shall be sent. Type of active call is considered from the value of this parameter. If it consist „@“ it is supposed to be e-mail address and active e-mail is sent. If the value is number, without „@“, it is supposed to be the telephone number and active SMS is sent.

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

Particular numbers/character can take values: from “0” to “9”, “a” to “z”, various symbols and empty space.

SMS Language [1/2]

Select 1 to receive a messages in primary controller language or 2 for secondary one.

Alternate Cfg

Based on the value on BI [Alt. Config](#) is selected controller configuration 1 or configuration 2 (all related setpoints are placed in Alternate Cfg group).

Hint:

Controller will react on change of binary input only while engine is stopped. On successful change of input the new record in history ("Nominal1Active", "Nominal2Active") is added.

Hint:

If the configuration 1 will contain setting for 50Hz and configuration 2 for 60Hz it is possible to use this feature for 50/60 Hz switch.

Nominal RPM 1..2 [RPM]

Nominal engine speed.

Step: 1RPM

Range: 100 – 4000 RPM

Nominal Freq 1..2 [Hz]

Nominal generator frequency (usually 50 or 60 Hz)

Step: 1Hz

Range: 45 – 65 Hz

NomVolts Ph-N 1..2 [V]

Nominal generator voltage (phase to neutral)

Step: 1V
Range: 80 – 20000 V

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.

NomVolts Ph-Ph1..2 [V]

Nominal generator voltage (phase to phase)
Step: 1V
Range: 138 – 35000 V

Nomin Current 1..2 [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

ConnectionType 1..2 [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.

ECU FreqSelect1..2 [PRIMARY/SECONDARY/DEFAULT]

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

Volvo – “Volvo Aux” is selected in ECU configuration:

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

Scania – “Scania S6 Singlespeed” is selected in ECU configuration:

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

Frequency change for Volvo Penta engines with EMS2

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

Procedure if ECU not energized:

5. Switch the IL controller to MAN Mode.
6. Power up the ECU.
7. Change the setpoint *ECU FreqSelect* and confirm it by pressing Enter
8. Press the Stop button on the IL controller.

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

Procedure with ECU powered on:

5. Switch the IL controller to MAN Mode.
6. Press the Stop button on the IL controller.
7. Change the setpoint *ECU FreqSelect* and confirm it by pressing Enter
8. Press the Stop button on the IL controller.

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

ECU SpeedAdj 1..2 [%]

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

Step: 1%
Range: 0 – 100%

Hint:

The minimum value 0% is equal to 90% of nominal speed. Maximum value 100% is equal to 110% of nominal speed.

***EarthFaultProt**

Hint:

More information are available in [Earth fault Measurement](#) chapter.

EF Protection [ENABLED/DISABLED]

This setpoint can block or allow Earth fault Current protection.

EF CT Ratio [/5A]

Earth Fault current transformer ratio.

Step: 1 A
Range: 1 – 2000 A /5A

EarthFault Sd [A]

Shutdown threshold level for Earth Fault current.

Step: 0,01A
Range: 0,03 – 5 A

EarthFault Del [s]

Earth Fault current measurement delay.

Step: 0,01s
Range: 1 – 5s

*ECU-controlled engine support

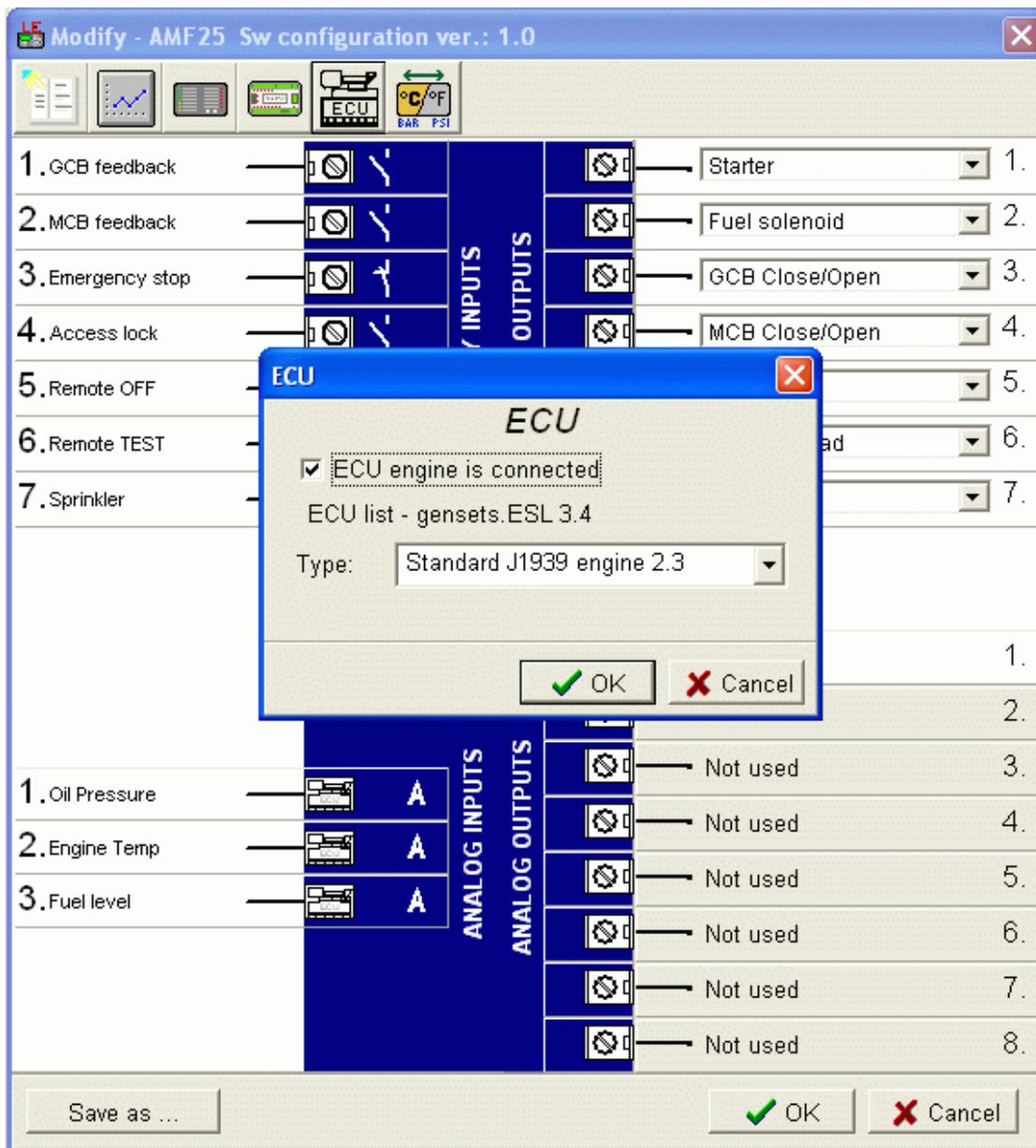
There exists only one firmware branch for both standard and electronic controlled (monitored) engines.

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 Electronic Engines Support* manual.



If the connected engine is Cummins with GCS engine control unit communicating via Modbus it is

necessary to set the setpoint **Basic settings**: *COM1 Mode* = ECU LINK or *COM2 Mode* = ECU LINK.

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 Comm OK* follows the real situation which means it is not active anytime when the ECU does not communicate.

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.

Identifying configured ECU

It is possible to identify what ECU is currently configured in IL-NT (FW version ≥ 1.5) controller on init screens. Navigate to default screen with gauge and press buttons **PAGE** and **ENTER** at the same time. Than browse through inits screen by button **PAGE** until you find value "ESF:xx.y - (zzz)", where xx.y = ESF version number, zzz= Motor ID.

Explanation of Motor ID is in table below:

Motor ID	ESF - Electronic Engine
1	Volvo EMSI Singlespeed / EMSII
3	Scania S6 Singlespeed
4	Cummins CM570
5	Cummins MODBUS
7	John Deere
8	Deutz EMR2
9	DDC DDEC IV/V
10	Caterpillar J1939
12	Perkins ECM
14	Iveco NEF&Cursor
16	Scania S6 Singlespeed from ver.1794335
18	SISU EEM3 Gen-set
20	MTU ADEC J1939
23	JCB Delphi DCM
24	Daimler Chrysler ADM2
25	Deutz EMR3
26	Cummins CM850
28	Iveco Vector
29	MAN MFR
31	VM Marine
32	VM Industrial
35	GM SECM
36	ISUZU ECM
43	Cummins CM850/CM2150/CM2250
44	GM e-control ECU
58	GM e-control LCI
60	MTU SMART Connect
68	Scania S8 Singlespeed
71	GM MEFI6
255	Standard J1939 engine

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 selected, following values are read from Modbus Register Data (for QSK15, 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

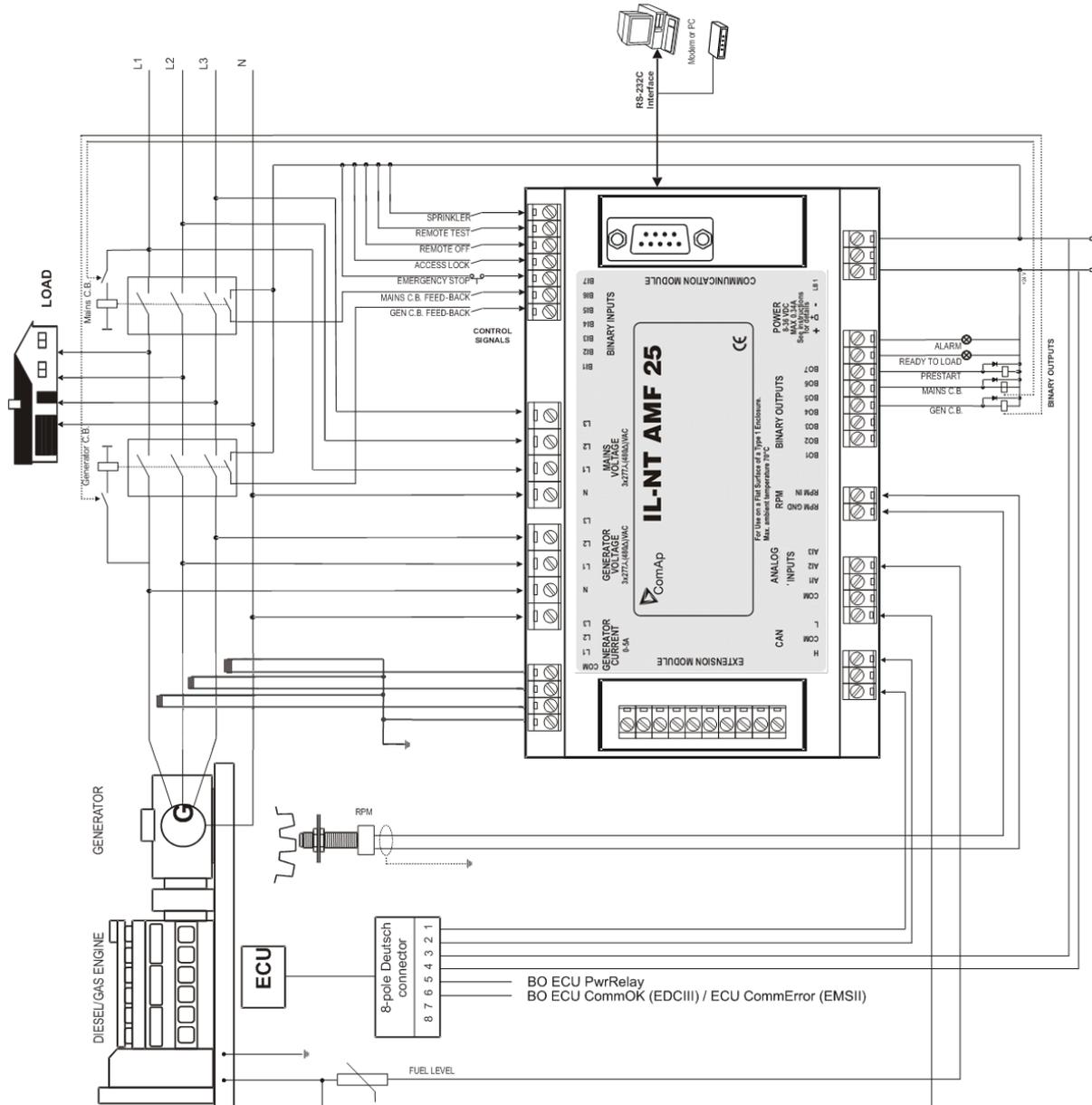
Reading of mentioned values from ECU enables to use analog inputs of the unit for other purposes, e.g. measuring, displaying and alarm activation related to various quantities. The configuration thus allows to use three analog inputs on the central unit and four analog inputs on IG-IOM/IGS-PTM module if connected.

Connection description

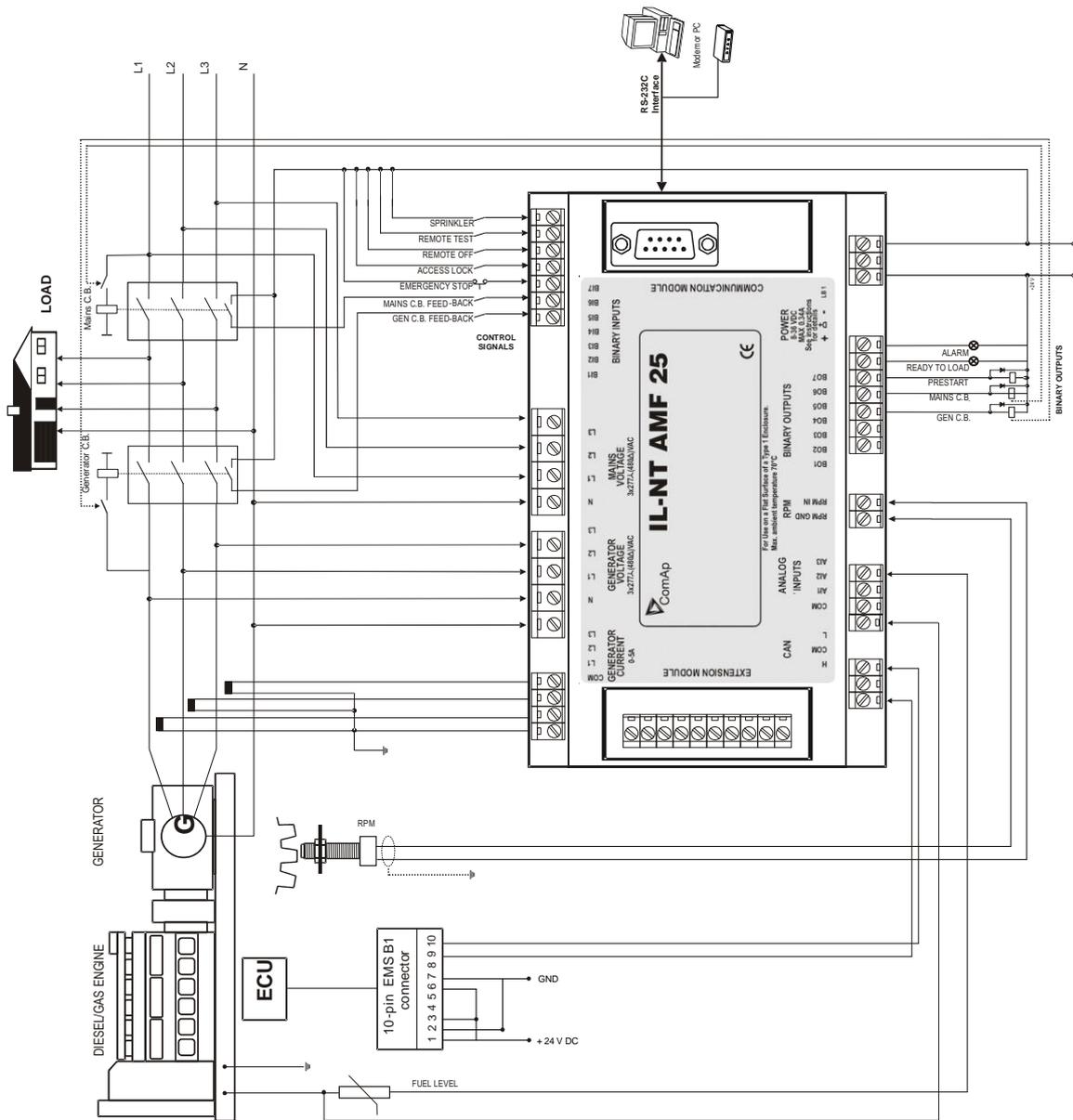
The following diagrams show how to connect the engine control unit to the IntelliLite controller:

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:

Basic settings: COM1 Mode = ECU LINK or COM2 Mode = ECU LINK

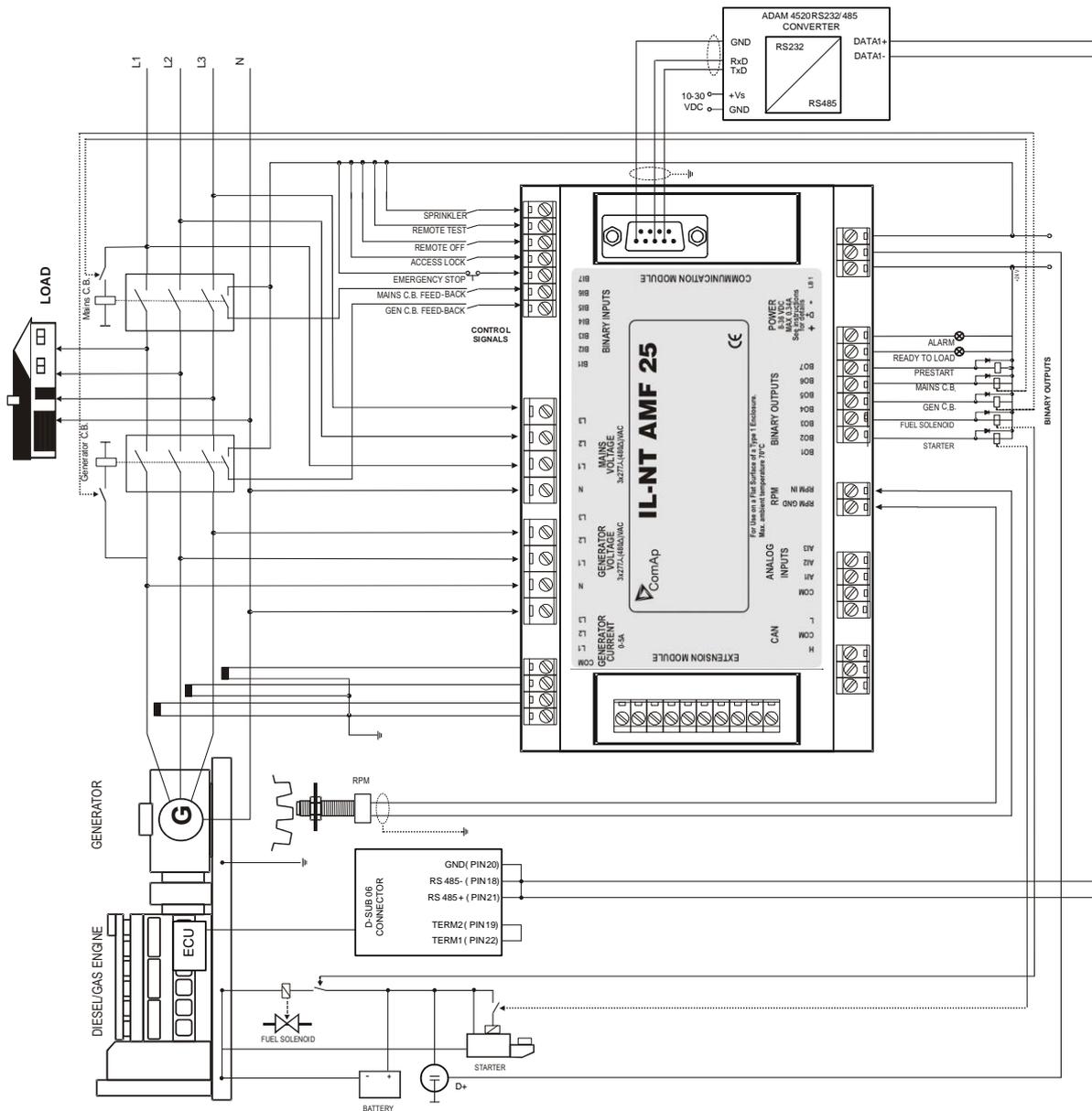
Software configuration: ECU → ECU engine is connected → Type: Cummins MODBUS

RS232/RS485 converter (see following diagram) set up:

Data format settings (SW1) 11 bits (1 start bit, 8 data bits, 2 stop bits)

Baud rate settings (SW2) 9600 bps

(more info available on http://www.advantech.com/products/Model_Detail.asp?model_id=1-D6FLH)



Sensor Specification

Background of the sensor calibration

To correct measuring error of each analog input (pressure, temperature, level) calibrating constants within 10 % of measure range should be set. Two calibrating constants are set in physical units - bar, °C, % .Calibration is made by adding the value of setpoint *AlxCalibration* directly to the calculated value at analog input.

Hint:

The calibration must be done at the operational point of the analog input (e.g. 80°C, 4.0Bar etc..)

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

OFF Mode

No start of the gen-set is possible. Outputs STARTER, GCB CLOSE/OPEN and FUEL SOLENOID are not energized.

No reaction if buttons **START**, **STOP**, **GCB ON/OFF**, **MCB ON/OFF** are pressed.

When power-cut comes, MCB CLOSE/OPEN opens. After mains returns, MCB CLOSE/OPEN closes with *MCB close del.*

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 to 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 ³	<i>Prestart time elapsed</i>	<i>STARTER on</i> <i>FUEL SOLENOID on</i> ⁴ <i>MaxCrank Time</i> counter started	<i>Cranking</i>

State	Condition of the transition	Action	Next state
Cranking ³	<i>RPM > Starting RPM</i>	<i>STARTER off PRESTART off</i>	<i>Starting</i>
	<i>D+ input activated or oil pressure detected or Gen voltage > 25% Vgnom or D+ active for 1s</i>	<i>STARTER off PRESTART off</i>	<i>Cranking</i>
	<i>MaxCrank Time elapsed, 1st attempt</i>	<i>STARTER off FUEL SOLENOID off STOP SOLENOID on CrankFail Pause timer started</i>	<i>Crank pause</i>
	<i>MaxCrank Time elapsed, last attempt</i>	<i>STARTER off PRESTART off</i>	<i>Shutdown (Start fail)</i>
Crank pause ³	<i>CrankFail Pause elapsed</i>	<i>STARTER on FUEL SOLENOID on⁴ STOP SOLENOID off MaxCrank Time counter started</i>	<i>Cranking</i>
Starting ³	<i>80% Nominal RPM reached</i>	<i>READY TO LOAD on¹ Min, Max Stab Time counter started</i>	<i>Running</i>
	<i>RPM = 0 or any other shutdown condition</i>	<i>FUEL SOLENOID off STOP SOLENOID on</i>	<i>Shutdown</i>
	<i>60 sec. Elapsed</i>	<i>FUEL SOLENOID off STOP SOLENOID on</i>	<i>Shutdown (Start fail)</i>
Running	<i>Stop request</i>	<i>READY TO LOAD off Cooling Time timer started</i>	<i>Cooling</i>
	<i>RPM = 0 or any other shutdown condition</i>	<i>READY TO LOAD off² FUEL SOLENOID off</i>	<i>Shutdown</i>
	<i>GCB CLOSE/OPEN closed</i>		<i>Loaded</i>
Loaded	<i>GCB CLOSE/OPEN opened</i>		<i>Running</i>
	<i>RPM = 0 or any other shutdown condition</i>	<i>FUEL SOLENOID off STOP SOLENOID on READY TO LOAD off</i>	<i>Shutdown</i>
Cooling	<i>Cooling Time elapsed</i>	<i>FUEL SOLENOID off STOP SOLENOID on</i>	<i>Stop</i>
	<i>RPM = 0 or any other shutdown condition</i>	<i>FUEL SOLENOID off STOP SOLENOID on</i>	<i>Shutdown</i>
	<i>Start request</i>	<i>READY TO LOAD on¹</i>	<i>Running</i>
Stop	<i>RPM = 0, Oil pressure not detected, Vgen < 10V, D+ not active</i>		<i>Ready</i>
	<i>If at least one of engine running indication is detected when Setpoint Stop Time elapsed. See more details in chapter Gen-Set Operation state – Stop engine conditions</i>		<i>Stop (Stop fail)</i>

¹ 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.

² If GCB output used GCB opens automatically

³ The start-up sequence can be interrupted in any time by coming stop request

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

Hint:

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

AUT Mode

The controller does not respond to buttons **START**, **STOP**, **MCB ON/OFF**, **GCB ON/OFF**. Engine start/stop request is evaluated from Mains failure/return.

AMF sequence (simplified)

State	Condition of the transition	Action	Next state
Mains Oper / Mains operation	Mains failed ¹ or MCB feedback dropout <i>MCB Opens On</i> = MAINSFAIL	MCB CLOSE/OPEN off <i>EmergStart Del</i> timer started	Mains failure
	Mains failed ¹ 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 ²	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 ²	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 ³	Mains operation

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

² 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.

³ 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.

TEST mode

The setpoint *ReturnFromTEST* influences the behavior of TEST mode.

Caution: The gen-set starts automatically and is always running in TEST mode!

The setpoint *ReturnFromTEST* = MANUAL

While TEST mode is selected, gen-set starts and is running unloaded.

To load the gen-set

- a) Power cut comes or
- b) **MCB ON/OFF** is pressed

When power cut: MCB is opened, after *Transfer Del* elapses, GCB is closed.

When the mains recovers gen-set stays supplying island load. To transfer the load back to the healthy mains, press **MCB ON/OFF** button while controller is in AUT Mode. If genset will fail (shutdown or other reason) and mains is healthy controller will transfer the load automatically back to mains.

Hint:

The controller does not respond to **GCB ON/OFF**, **STOP**, **START**

The load is automatically transferred back to the mains when any gen-set shut down protection activates.

Test on load

When binary input Rem TEST OnLd is closed, the controller automatically transfers load from the mains to the gen-set. Setpoint AMF Settings: *ReturnFromTEST* must be set to MANUAL, otherwise controller will not transfer the load to gen-set. If the setpoint *ReturnFromTEST* is set to AUTO, controller behaves like in common TEST mode (eg. gen-set remains running but will not automatically transfer the load, it will wait for mains fail).

The setpoint *ReturnFromTEST* = AUTO

While TEST mode is selected, gen-set is running unloaded.

When power cut comes the controller opens MCB.

After *Return break* elapses, GCB is closed.

When the mains recovers:

- a) After *MainsReturn Del* the controller opens the GCB
- b) After *Transfer Del* delay MCB is closed.
- c) The engine stays running

To stop the gen-set select other mode than TEST

Hint:

The controller does not respond to **GCB ON/OFF**, **MCB ON/OFF**, **STOP**, **START**

Circuit breakers timing

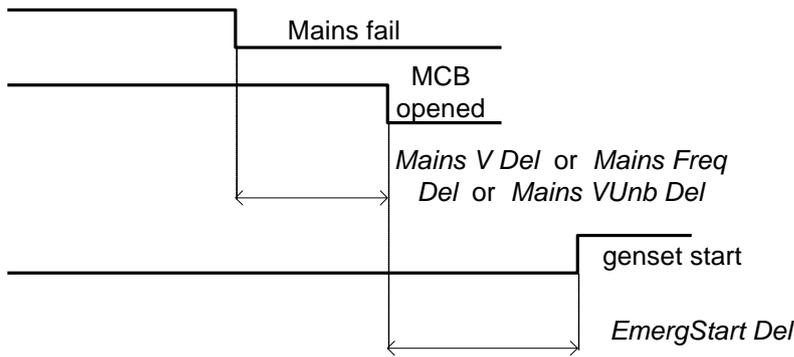
Relation between Mains fail and MCB and start of gen-set

MCB Opens On = MAINSFAIL:

Mains fail is detected as Mains <V, Mains >V, Mains V Unbal, Mains <Freq, Mains >Freq. After detection MCB is opened.

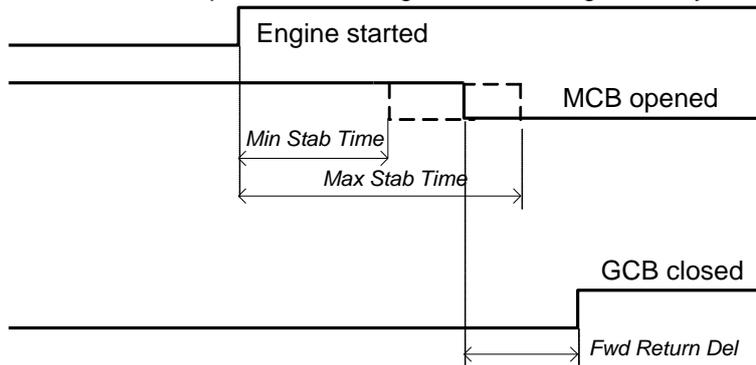
Hint:

When MCB feedback drop-out and measured mains electrical limits (voltage, frequency) are still in limits, the controller switches MCB ON again.



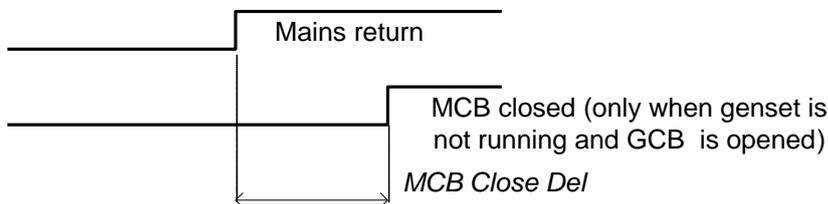
MCB Opens On = GENRUN:

The MCB is not opened till the engine starts and gets ready to take the load.



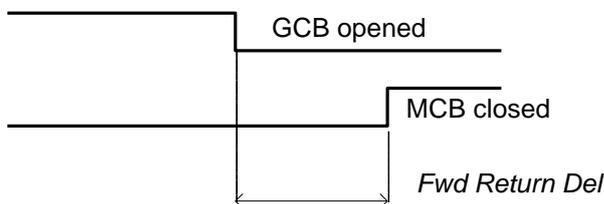
Relation between Mains return and MCB

OFF Mode, GCB and MCB are opened



Relation between GCB and MCB

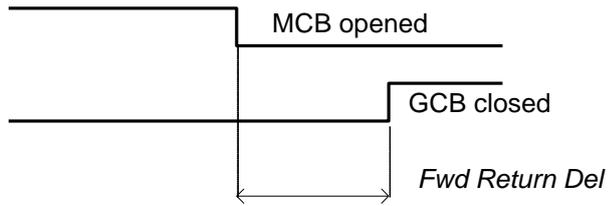
Conditions: AUTO Mode, Mains =off, MCB = opened, GCB = closed, gen-set loaded.
 Mains returns: GCB opens (according 3., *MainsReturnDel*), MCB closes (*Transfer Del*)



Relation between GCB and MCB (Test mode)

Situation 1: Mains =OK, MCB = closed, GCB = opened, RPM=0.
 Change mode to TEST: gen-set starts, GCB = opened.
 Mains cut: MCB opens (according 1.) , GCB closes (*Transfer Del*)

Situation 2: *ReturnFromTEST*=MANUAL, Mains =OK, MCB is closed, gen-set is running.
 Press **MCB on/off** -> MCB opens, GCB closes (*Transfer Del*), gen-set is running loaded.

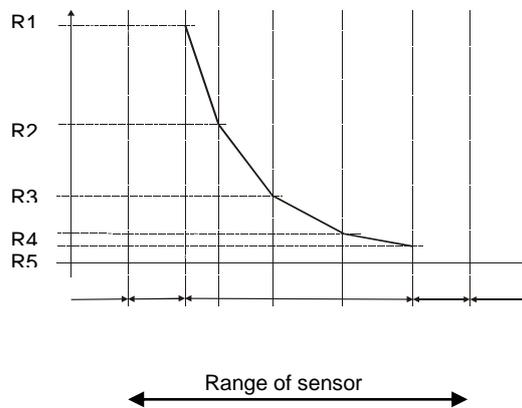


Alarm Management

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.

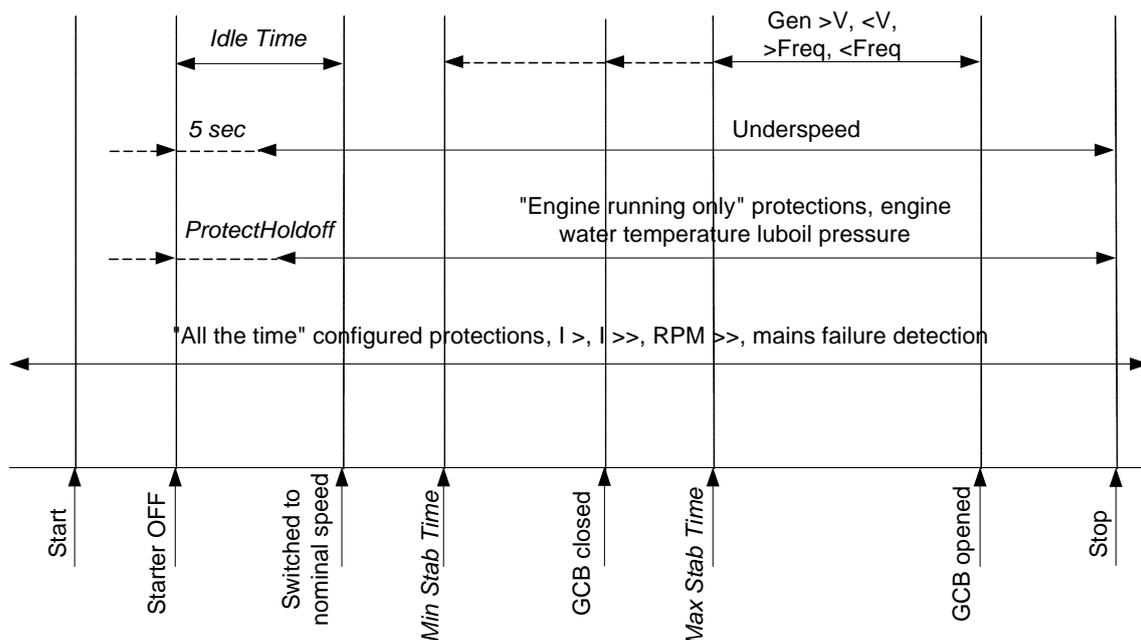
Possible mains failure reasons:

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

GCB, MCB fail detection

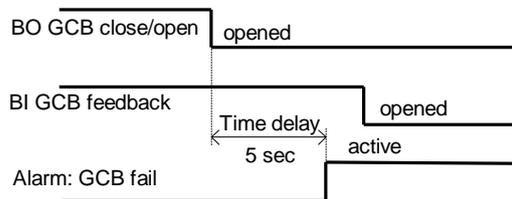
MCB and/or GCB fail detection is based on binary output CB close/open comparing with binary input binary input MCB and/or GCB FEEDBACK.

There are three different time delays for CB fail detection – see following diagrams.

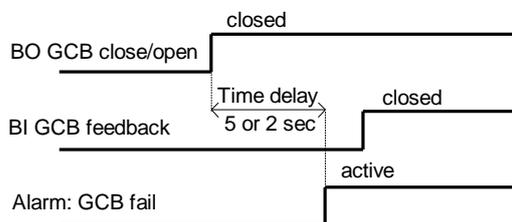
When is BO GCB close/open (MCB Close/Open) in steady state and GCB feedback (MCB feedback) is changed the GCB fail is detected immediatelly (no delay).



When BO GCB close/open (MCB Close/Open) opens there is 5 sec delay for GCB fail (MCB fail) detection.



When BO GCB close/open (MCB Close/Open) closes, there is 5sec delay for GCB fail (MCB fail) detection:



Hint:

You can solve state of MCB fail by pressing Fault Reset button.

Generally it is possible to use IL-NT controller without feedback inputs (not configured). Controller will work with breakers anyway.

Gen-set Operation States

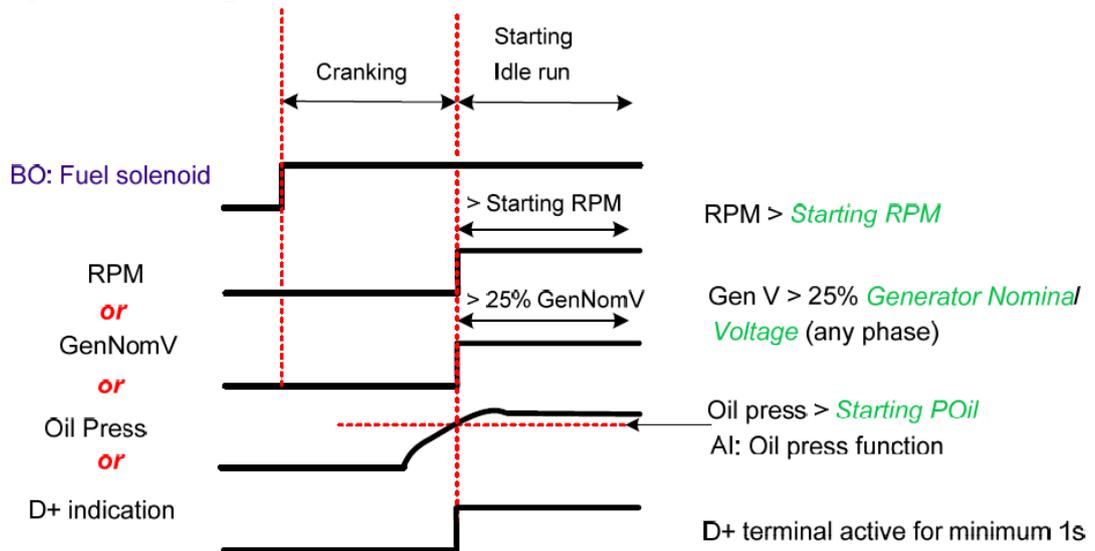
Engine state machine

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) ≤ 1 RPM
- AI: Oil press $<$ Starting POil
- Generator voltage $<$ 10V (all phases)

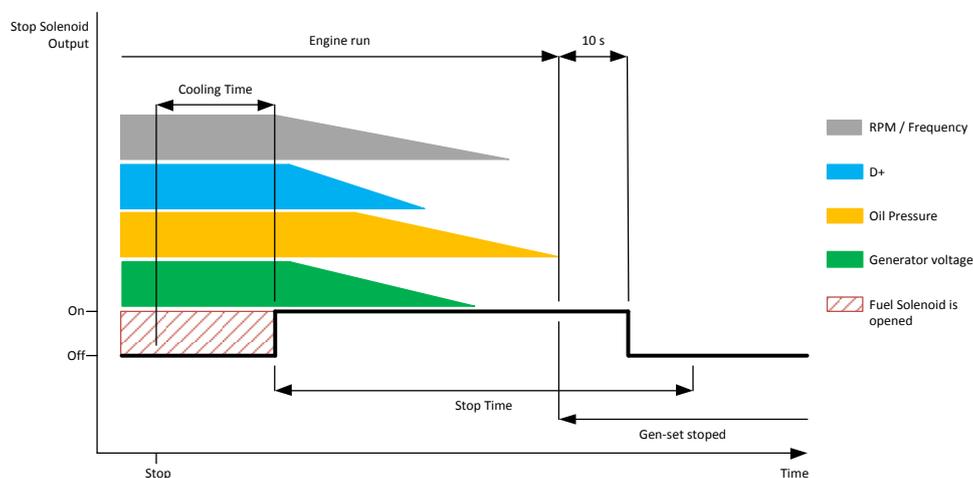
When the engine was running before and all above conditions are fulfilled, additional 2s delay is necessary to confirm “still engine”.

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

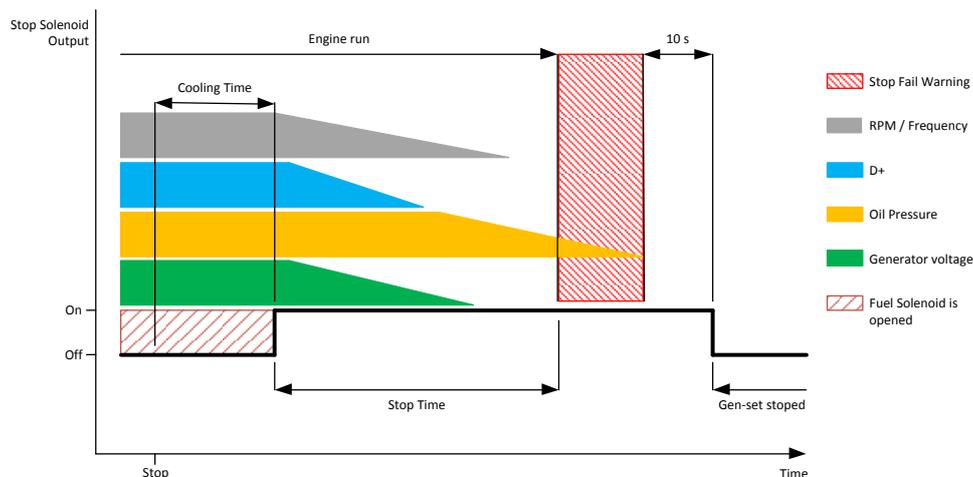
- for generator voltage $<$ 50% of nominal voltage, Wrn Stop Fail has delay 1s
- for generator voltage $>$ 50% of nominal voltage, Wrn Stop Fail has delay 200ms
- for oil pressure $>$ starting oil pressure, Wrn Stop Fail has delay 1s
- for detected RPM, there is no delay.

“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 Binary outputs)	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.
IOM Alx Wrn	WRN	YES	Warning alarm configurable on the input of IG-IOM/IGS-PTM.
IOM Alx Sd	SD	YES	Shutdown alarm configurable on the input of IG-IOM/IGS-PTM.
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 <V BOC</i> and <i>Gen >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

Events specification	Protection type	Information on binary output available (See list of Binary outputs)	Description
			limits given by <i>Gen >Freq BOC</i> and <i>Gen <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 current</i> and <i>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 Gen-set Operation States 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.
Wrn FuelThef	WRN		Fuel theft indication alarm.
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 RA15 Fail	WRN	NO	Warning alarm in case of lost connection to IGL-RA15 module.
*Sd IOM Fail	SD	NO	Shutdown alarm in case of lost connection to IG-IOM/IGS-PTM module.
Wrn ECU Alarm	WRN	NO	ECU alarm list is not empty
Low BackupBatt	WRN	NO	RTC backup battery is flat
Mains CCW Rot	WRN	NO	Mains voltage phases are not wired correctly. MCB closing is prohibited by chontroller.

Events specification	Protection type	Information on binary output available (See list of Binary outputs)	Description
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. 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.

Hint:

Some of the controller models doesn't have RTC. In this case there is no Date column and the Time column contains information about running hours.

Record structure

Abbreviation	Historical value
Num	Number of historical event
Reason	Event specification
Date	Date of historical event in format DD/MM/YY
Time	Time of historical event in format HH:MM:SS
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)
AIM1*	IG-IOM, IGS-PTM Analog input 1 value (when configured IG-IOM, IGS-PTM)
AIM2*	IG-IOM, IGS-PTM Analog input 2 value (when configured IG-IOM, IGS-PTM)
AIM3*	IG-IOM, IGS-PTM Analog input 3 value (when configured IG-IOM, IGS-PTM)
AIM4*	IG-IOM, IGS-PTM Analog input 4 value (when configured IG-IOM, IGS-PTM)
BIM*	IG-IOM, IGS-PTM Binary inputs (when configured IG-IOM, IGS-PTM)
BOM*	IG-IOM, IGS-PTM Binary outputs (when configured IG-IOM, IGS-PTM)
EF	Earth fault current

*Depends if enabled in configuration (see more details in LiteEdit-4.4-Reference Guide.pdf)

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.

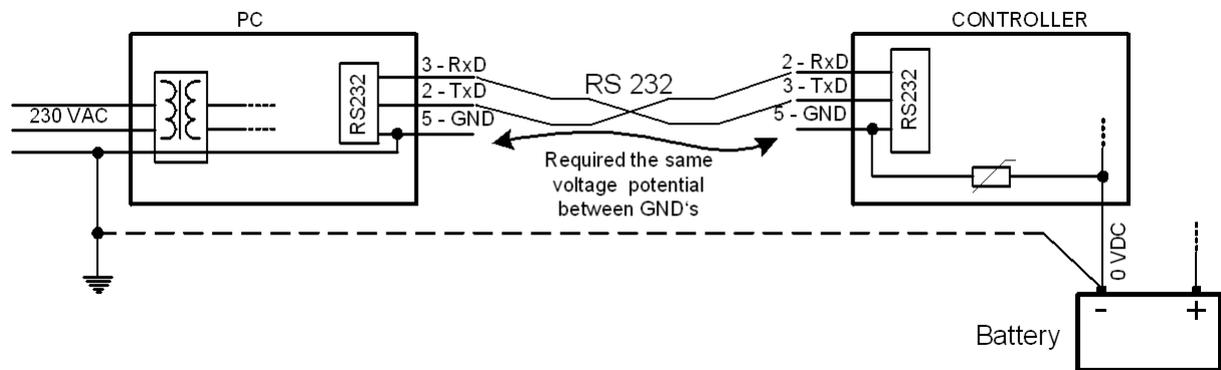
Remote Control and Data Logging

Direct connection to the PC

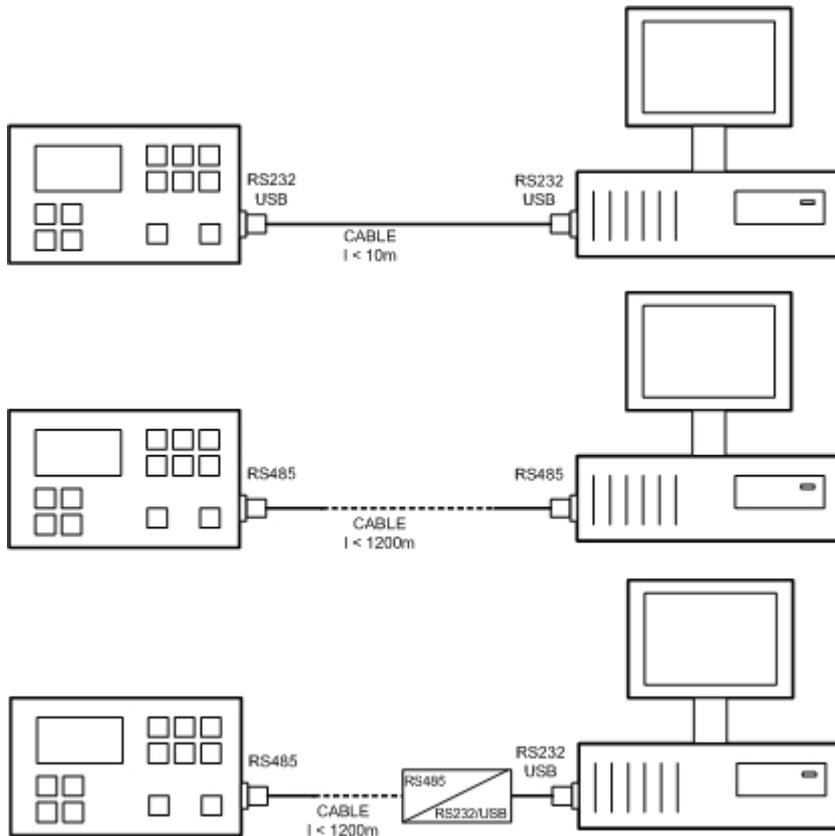
InteliLite can be connected directly with PC via optional IL-NT RS232 interface. Use the recommended ComAp AT-LINK CABLE 1.8M or cross-wired serial communication cable with DB9 female connectors and signals Rx, Tx, GND for RS232 connection.

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).



RS232, USB or RS485 interface can be used for direct cable connection to a PC. The setpoint COM1 Mode or COM2 Mode (according to the interface used) must be set to DIRECT position for this kind of connection.



DIRECT CABLE CONNECTION TYPES

Following modules are available for direct connection to a PC:

1. IL-NT-232
2. IL-NT-RS232-485
3. IL-NT-S-USB (USB easy removable service module)

The RS232 or USB interface uses COM1 port of the controller. The RS485 uses COM2.

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-AMF25 archive)

Setpoints of AMF25:

Name	Firmware ver. IL-NT-2.0 R:18.05.2012	Application	Date	App. ver.	Ser. num.	Filename
IL-NT		AMF25	25.5.2012	2,0	12345678	IL-NT-AMF25-2.0.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	Nominal Power	200	kW	8276	1	5000	Unsigned 16
Basic Settings	Nomin Current	350	A	8275	1	10000	Unsigned 16
Basic Settings	CT Ratio	2000	/5A	8274	1	5000	Unsigned 16
Basic Settings	PT Ratio	1	/1	9579	0,1	500	Unsigned 16
Basic Settings	Vm PT Ratio	1	V/V	9580	0,1	500	Unsigned 16
Basic Settings	NomVolts Ph-N	231	V	8277	80	20000	Unsigned 16
Basic Settings	NomVolts Ph-Ph	400	V	11657	80	40000	Unsigned 16
Basic Settings	Nominal Freq	50	Hz	8278	45	65	Unsigned 16
Basic Settings	Gear Teeth	120		8252	0	500	Unsigned 16
Basic Settings	Nominal RPM	1500	RPM	8253	100	4000	Unsigned 16
Basic Settings	ControllerMode	OFF		8315			String list
Basic Settings	Reset To MAN	DISABLED		9983			String list
Basic Settings	ConnectionType	3Ph4Wire		11628			String list
Basic Settings	CT Location	Load		11625			String list
Comms Settings	ControllerAddr	1		24537	1	32	Unsigned 8
Comms Settings	COM1 Mode	DIRECT		24522			String list
Comms Settings	COM2 Mode	DIRECT		24451			String list

Comms Settings	ModemIniString			24436			Long string
Comms Settings	ModbusComSpeed	9600	bps	24477			String list
Comms Settings	IBLite IP Addr	192.168.1.254		24376			Short string
Comms Settings	IBLite NetMask	255.255.255.0		24375			Short string
Comms Settings	IBLite GateIP	192.168.1.1		24373			Short string
Comms Settings	IBLite DHCP	ENABLED		24259			String list
Comms Settings	ComAp Port	23		24374	0	65535	Unsigned 16
Comms Settings	APN Name			24363			Long string
Comms Settings	APN User Name			24361			Long string
Comms Settings	APN User Pass			24360			Short string
Comms Settings	AirGate	ENABLED		24365			String list
Comms Settings	AirGate IP	airgate.comap.cz		24364			Long string
Comms Settings	SMTP User Name			24370			Long string
Comms Settings	SMTP User Pass			24369			Short string
Comms Settings	SMTP Server IP			24368			Long string
Comms Settings	Contr MailBox			24367			Long string
Comms Settings	Time Zone	GMT+1:00		24366			String list
Comms Settings	DNS IP Address	8.8.8.8		24362			Short string
Engine Params	Starting RPM	25	%	8254	5	50	Unsigned 8
Engine Params	Starting Oil P	4,5	Bar	9681	0	10	Integer 16
Engine Params	Prestart Time	2	s	8394	0	600	Unsigned 16
Engine Params	MaxCrank Time	5	s	8256	1	255	Unsigned 8
Engine Params	CrnkFail Pause	8	s	8257	5	60	Unsigned 8
Engine Params	Crank Attempts	3		8255	1	10	Unsigned 8
Engine Params	Idle Time	12	s	9097	0	600	Unsigned 16
Engine Params	Min Stab Time	2	s	8259	1	10	Unsigned 16
Engine Params	Max Stab Time	10	s	8313	2	300	Unsigned 16
Engine Params	Cooling Speed	NOMINAL		10046			String list
Engine Params	Cooling Time	30	s	8258	0	3600	Unsigned 16
Engine Params	Stop Time	60	s	9815	0	600	Unsigned 16
Engine Params	Fuel Solenoid	DIESEL		9100			String list
Engine Params	D+ Function	DISABLED		9683			String list
Engine Params	Fuel Pump ON	20	%	10100	-100	90	Integer 16
Engine Params	Fuel Pump OFF	90	%	10101	20	10000	Integer 16
Engine Params	TempSwitch ON	90	-	8688	-100	10000	Integer 16
Engine Params	TempSwitch OFF	75	-	8689	-100	10000	Integer 16
Engine Params	PowerSwitch ON	100	kW	11658	0	32000	Integer 16
Engine Params	PowerSwitchOFF	50	kW	11659	0	32000	Integer 16
Engine Params	FuelTankVolume	200	L	11103	0	10000	Unsigned 16
Engine Params	MaxFuelDrop	25	%/h	12373	0	50	Unsigned 8
Engine Protect	ProtectHoldOff	5	s	8262	0	300	Unsigned 16
Engine Protect	Horn Timeout	10	s	8264	0	600	Unsigned 16
Engine Protect	Overspeed Sd	115	%	8263	50	150	Unsigned 16
Engine Protect	Al1 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 Overvolt	36	V	9587	18	40	Integer 16
Engine Protect	Batt Undervolt	18	V	8387	8	40	Integer 16
Engine Protect	Batt Volt Del	5	s	8383	0	600	Unsigned 16
Engine Protect	WrnMaintenance	9999	h	9648	0	10000	Unsigned 16
Gener Protect	Overload BOC	120	%	8280	0	200	Unsigned 16
Gener Protect	Overload Del	5	s	8281	0	600	Unsigned 16
Gener Protect	Short Crct BOC	250	%	8282	100	500	Unsigned 16
Gener Protect	Short Crct Del	0,04	s	9991	0	10	Unsigned 16
Gener Protect	Amps IDMT Del	4	s	8283	1	60	Unsigned 16
Gener Protect	Amps Unbal BOC	50	%	8284	1	200	Unsigned 16
Gener Protect	Amps Unbal Del	5	s	8285	0	600	Unsigned 16
Gener Protect	Gen >V Sd	110	%	8291	70	200	Unsigned 16
Gener Protect	Gen <V BOC	70	%	8293	0	110	Unsigned 16
Gener Protect	Gen V Del	3	s	8292	0	600	Unsigned 16
Gener Protect	Volt Unbal BOC	10	%	8288	1	200	Unsigned 16
Gener Protect	Volt Unbal Del	3	s	8289	0	600	Unsigned 16
Gener Protect	Gen >Freq BOC	110	%	8296	85	200	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
AMF Settings	Operation Mode	AMF		12157			String list
AMF Settings	DualAMFTime	6	h	12155	1	24	Unsigned 8
AMF Settings	RetFromIsland	AUTO		9590			String list
AMF Settings	EmergStart Del	5	s	8301	0	6000	Unsigned 16
AMF Settings	MainsReturnDel	20	s	8302	1	3600	Unsigned 16
AMF Settings	Transfer Del	1	s	8303	0	600	Unsigned 16
AMF Settings	MCB Close Del	1	s	8389	0	60	Unsigned 16
AMF Settings	Mains >V	110	%	8305	60	150	Unsigned 16
AMF Settings	Mains <V	60	%	8307	50	110	Unsigned 16
AMF Settings	Mains V Del	2	s	8306	0	600	Unsigned 16
AMF Settings	Mains V Unbal	10	%	8446	1	150	Unsigned 16
AMF Settings	Mains VUnb Del	2	s	8447	0	60	Unsigned 16
AMF Settings	Mains >Freq	102	%	8310	98	150	Unsigned 16
AMF Settings	Mains <Freq	98	%	8312	50	102	Unsigned 16
AMF Settings	Mains Freq Del	0,5	s	8311	0	60	Unsigned 16
AMF Settings	MCB Logic	CLOSE-OFF		8444			String list
AMF Settings	ReturnFromTEST	MANUAL		8618			String list

AMF Settings	MCB Opens On	GENRUN		9850			String list
Date/Time	Time Stamp Per	60	min	8979	0	240	Unsigned 8
Date/Time	SummerTimeMod	DISABLED		8727			String list
Date/Time	Time	0:00:00		24554			Time
Date/Time	Date	1.1.2006		24553			Date
Date/Time	Timer1Function	No Func		11660			String list
Date/Time	Timer1 Repeat	NONE		10045			String list
Date/Time	Timer1 ON Time	5:00:00		10042			Time
Date/Time	Timer1Duration	5	min	10044	1	1440	Unsigned 16
Date/Time	Timer2Function	No Func		11661			String list
Date/Time	Timer2 Repeat	NONE		10202			String list
Date/Time	Timer2 ON Time	5:00:00		10199			Time
Date/Time	Timer2Duration	5	min	10201	1	1440	Unsigned 16
Sensors Spec	AI1Calibration	0	Bar	8431	-100	100	Integer 16
Sensors Spec	AI2Calibration	0	°C	8407	-1000	1000	Integer 16
Sensors Spec	AI3Calibration	0	%	8467	-1000	1000	Integer 16
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	TelNo/Addr Ch1			9597			Long string
SMS/E-Mail	TelNo/Addr Ch2			9598			Long string
SMS/E-Mail	SMS Language	1		11394	1	2	Unsigned 8
Alternate Cfg	Nominal RPM 1	1500	RPM	9915	100	4000	Unsigned 16
Alternate Cfg	Nominal Freq 1	50	Hz	9913	45	65	Unsigned 16
Alternate Cfg	NomVoltsPh-N 1	230	V	12052	80	20000	Unsigned 16
Alternate Cfg	NomVoltsPh-Ph1	400	V	12055	80	40000	Unsigned 16
Alternate Cfg	Nomin Current1	350	A	12049	1	10000	Unsigned 16
Alternate Cfg	Connect Type 1	3Ph4Wire		12058			String list
Alternate Cfg	Nominal RPM 2	1800	RPM	9916	100	4000	Unsigned 16
Alternate Cfg	Nominal Freq 2	60	Hz	9914	45	65	Unsigned 16
Alternate Cfg	NomVoltsPh-N 2	120	V	12053	80	20000	Unsigned 16
Alternate Cfg	NomVoltsPh-Ph2	208	V	12056	80	40000	Unsigned 16
Alternate Cfg	Nomin Current2	350	A	12050	1	10000	Unsigned 16
Alternate Cfg	Connect Type 2	3Ph4Wire		12059			String list

Values of AMF25:

Name	Firmware ver.	Application	Date	App. ver.	Ser. num.	Filename
IL-NT	IL-NT-2.0 R:18.05.2012	AMF25	25.5.2012	2,0	12345678	IL-NT-AMF25-2.0.AIL

Group	Name	Value	Dimension	Com. obj.	Data type
Engine	RPM	0	RPM	8209	Unsigned 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
Load	Load kW	0	kW	8202	Integer 16
Load	Load kW L1	0	kW	8524	Integer 16
Load	Load kW L2	0	kW	8525	Integer 16
Load	Load kW L3	0	kW	8526	Integer 16
Load	Load kVAr	0	kVAr	8203	Integer 16
Load	Load kVAr L1	0	kVAr	8527	Integer 16
Load	Load kVAr L2	0	kVAr	8528	Integer 16
Load	Load kVAr L3	0	kVAr	8529	Integer 16
Load	Load kVA	0	kVA	8565	Integer 16
Load	Load kVA L1	0	kVA	8530	Integer 16
Load	Load kVA L2	0	kVA	8531	Integer 16
Load	Load kVA L3	0	kVA	8532	Integer 16
Load	Load PF	0		8204	Integer 8
Load	Load Char			8395	Char
Load	Load PF L1	0		8533	Integer 8
Load	Load Char L1			8626	Char
Load	Load PF L2	0		8534	Integer 8
Load	Load Char L2			8627	Char
Load	Load PF L3	0		8535	Integer 8
Load	Load Char L3			8628	Char
Load	Load A L1	0	A	8198	Unsigned 16
Load	Load A L2	0	A	8199	Unsigned 16
Load	Load 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	[0000000]		8235	Binary 16
Controller I/O	Bin Outputs	[0000000]		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	AirGate Diag:	0		11271	Unsigned 8
Controller I/O	AirGate ID:	No Connection		12385	Long string
Controller I/O	Modem Status:	No Connection		12485	Short string
Statistics	Genset kWh	0		8205	Integer 32
Statistics	Genset kVArh	0		8539	Integer 32
Statistics	Mains kWh	0		11025	Integer 32
Statistics	Mains kVArh	0		11026	Integer 32
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
Statistics	TotFuelConsum	0	L	9040	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	6		8480	Unsigned 8
IL Info	FW Branch	1		8707	Unsigned 8
IL Info	PasswordDecode	#####		9090	Unsigned 32
IL Info	DiagData	#####		10050	Unsigned 32
Date/Time	Time	#####		24554	Time
Date/Time	Date	#####		24553	Date

Remote Communication

Hint:

Refer to IntelliCommunication guide for all additional information.

Internet connection

IL-NT controllers can be monitored from LiteEdit over the Internet using Internet Bridge (IG-IB) connected to the controller RS232 port. Or via plug-in card IB-Lite directly plugged in communication slot on back side of the controller.

SNMP connection

For SNMP protocol support it is possible to use converter Modbus RTU - SNMP with ComAp order code "GNOME SNMP CONVERTER IL-NT".

- For connection of 1-32 IL-NT controllers to a SNMP supervision system
- Supports GET, SET, TRAP transactions

For more details see IL-NT, IA-NT, IC-NT Communication Guide available here:
<http://www.comap.cz/products/detail/intellilite-nt-amf-25/downloads/#tabs>

Recommended ISDN modem

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

Recommended GSM modem

- Siemens M20, TC35, TC35i, ES75, MC39 (Cinterion MC55i is NOT recommended)
- Wavecom M1200/WMOD2
- Wavecom - Maestro 20, dual 900/1800MHz.
- Wavecom – Fastrack M1306B, dual 900/1800 MHz (Fastrack M1206B is NOT recommended)
- FALCOM A2D, dual 900/1800MHz.

GSM Modem setup

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

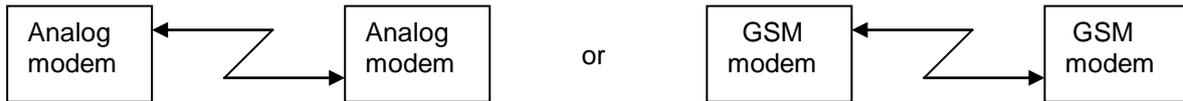
This program runs independent on LiteEdit:

- Start MS Windows-Start-Program files - LiteEdit -Gm_setup.exe.
- Select COM port
- Select iG-CU (=IS-CU) or iG-MU unit
- Press Setup button
- Follow commands in GSM Modem Setup window

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

Hint:

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



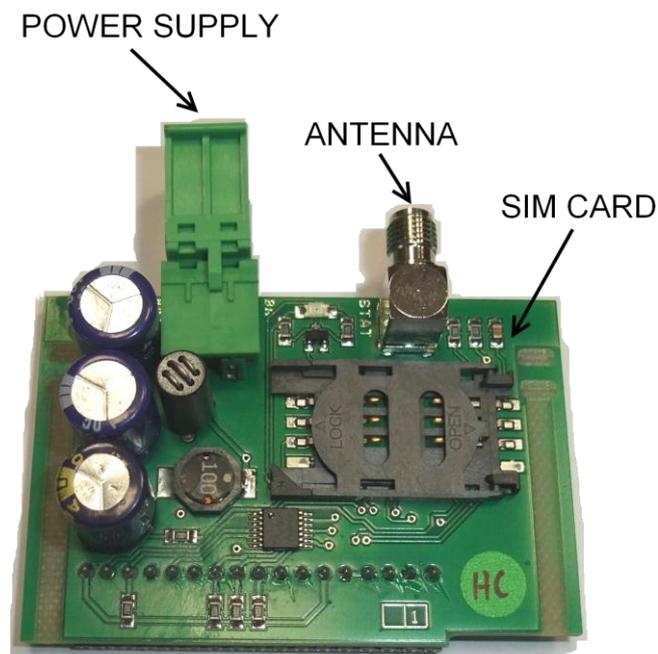
Mobile SIM card setting

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

Short guide how to start using IL-NT-GPRS module

CAUTION!

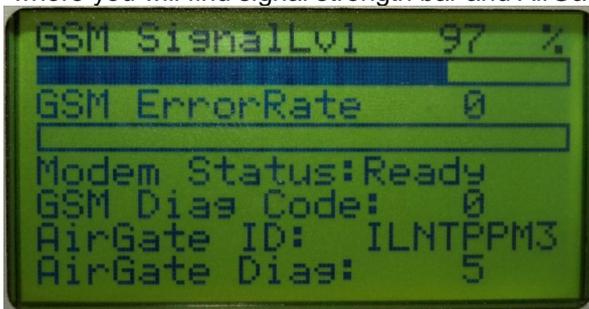
Any manipulation with plug-in module shall be done with disconnected power supply to both controller and module. Power supply shall be switched on also is same time to both module and controller. Fail to follow these instructions (power supply active only in controller or only in module) can lead to module or controller failure!



1. You will need one of supported ComAp controllers (IL-NT/IC-NT/ID-Lite), IL-NT-GPRS, antenna, SIM card with GPRS service and optionally IL-NT-RS232 or IL-NT-S-USB module. Firmware supporting IL-NT-GPRS module is IL-NT-WSUP 1.0 or selected customer branches (contact support@comap.cz for details). It is available here: <http://www.comap.cz/products/detail/IL-NT-GPRS/support/software/>
2. Contact SIM card operator for getting GPRS APN (APN = Access Point Name) name, username and password. Some operator's APNs are listed here: <http://www.quickim.com/support/gprs-settings.html#Australia> or here: <http://www.flexispy.com/Mobile%20APN%20Setting%20to%20use%20GPRS.htm>
Example: APN Name = internet.t-mobile.cz, UserName = [blank], Password = [blank].
3. Make sure SIM card does not require PIN code. If it does, it is possible to disable it in any common network unlocked mobile telephone.
4. Power up the ComAp controller.
5. Enter correct APN Name, APN UserName and APN UserPass in controller's setpoint group Comms Settings. Set COM1 Mode = DIRECT. Comms settings as every setpoint group are

accessible by PAGE button from any measurement screen on controller. Setpoints can be set on controller's front panel keyboard or by LiteEdit 4.5 and higher.

6. Switch off ComAp controller.
7. Place the SIM card into slot on IL-NT-GPRS card, plug in the IL-NT-GPRS card into communication slot on back side of ComAp controller.
8. Connect the antenna to designated SMA connector.
9. Connect power supply to IL-NT-GPRS module. It supports 8-36V DC voltage.
10. Power up the system.
11. Wait for approx 2 - 4 minutes for first connection of the system to AirGate. AirGate will generate automatically the AirGate ID value. Then navigate to last of measurement screens where you will find signal strength bar and AirGate ID identifier.



Once this AirGate ID is displayed, connection via AirGate was successful. This value will be needed for LiteEdit or WebSupervisor connection. Kindly make a note for future reference.

AirGate Connection dialog in LiteEdit:



Add new gen-set dialog in WebSupervisor:



Should you encounter any troubles with connection, check the faultcodes on the same screen and find detailed description in Diagnostic codes listed lower.

12. Open LiteEdit PC software or enter your WebSupervisor account at <http://websupervisor.comap.cz>.

Hint: For opening a new WebSupervisor account kindly send e-mail to admin.websupervisor@comap.cz your Name, Login name, E-mail address and Timezone. We will create free account for you. Details at: <http://www.comap.cz/products/detail/WebSupervisor> .

Communication is now ready for use.

Hint: To reduce the data traffic over GPRS network you can set in setpoint group „Comms Settings“

the parameter „AirGate IP“ = 80.95.108.26. This will save significant data amount needed for translation of Airgate server IP address. In case of changing the server IP address this settings has to be updated or returned to default „airgate.comap.cz“.

Hint: From it's nature the GPRS connection can from time to time drop for a short time due to a number of reasons affecting the cellular network. However the system is designed in the way that controller will automatically reconnect back.



- GSM Diag Code – Diagnostic code for IL-NT-GPRS modem

Table of Diagnostic Codes:

Code	Description
0	OK. No error.
1	Not possible to hang up.
2	IL-NT-GPRS is switched off
3	IL-NT-GPRS is switched on
4	IL-NT-GPRS – error in initialization
5	IL-NT-GPRS – not possible to set the APN
6	IL-NT-GPRS – not possible to connect to GPRS network
7	IL-NT-GPRS – not possible to retrieve IP address
8	IL-NT-GPRS – not accepted DNS IP address
9	Error in modem detection
10	Error in initialization of analog modem
11	SIM card is locked (Possibly PIN code required, PIN needs to be deactivated) or unknown status of SIM locking
12	No GSM signal
13	Not possible to read the SIM card parameters
14	GSM modem did not accepted particular initialization command, possibly caused by locked SIM card
15	Unknown modem
16	Bad answer to complement initialization string
17	Not possible to read GSM signal strength
18	CDMA modem not detected
19	No CDMA network
20	Unsuccessful registration to CDMA network
255	Only running communication is needed to indicate

- AirGate Diag – Diagnostic Code for AirGate connection

Table of Diagnostic Codes:

Code	Description
0	Waiting for connection to AirGate Server
1	Controller registered, waiting for authorization
2	Not possible to register, controller blacklisted
3	Not possible to register, server has no more capacity
4	Not possible to register, other reason
5	Controller registered and authorized

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 !

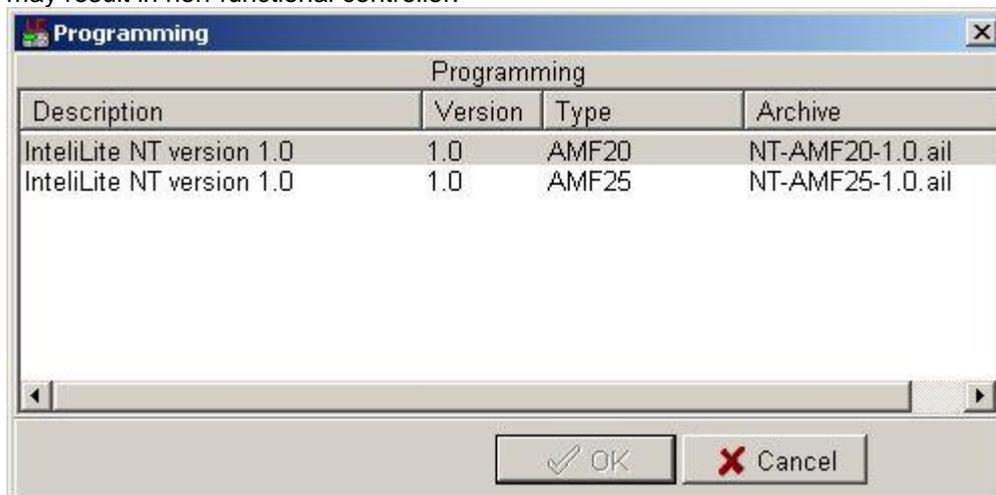
It is highly recommended to use the same type and model of controller for master and remote display. Only in such case is assured the proper function of all buttons, LED diods and display. Another combinations of HW types and models from Master controller and remote display are not supported nor tested!

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 program 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. Change of statistical values if necessary is possible only by LiteEdit software (password is required).

IL-NT-RD Wiring

IL-NT-RD can be connected to IntelliLite-NT or IntelliDrive 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. Then 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:

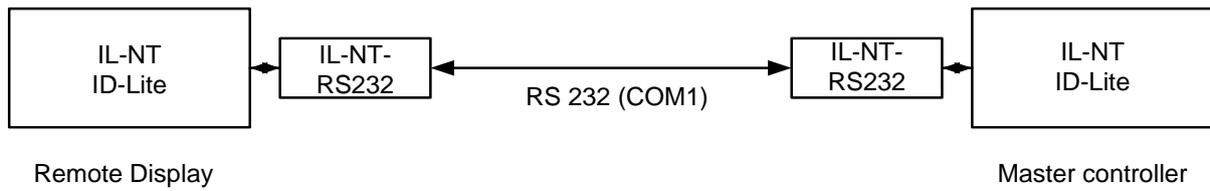
1. Not supported type of controller connected (Eg. IGS-NT, ID-DCU, IC-NT, IGS-CU, etc.)
2. Not supported firmware in master controller
3. Configuration table error in master controller
4. Wrong settings of setpoint COMx Mode in master controller
5. Wrong connection, wiring, communication fail

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:

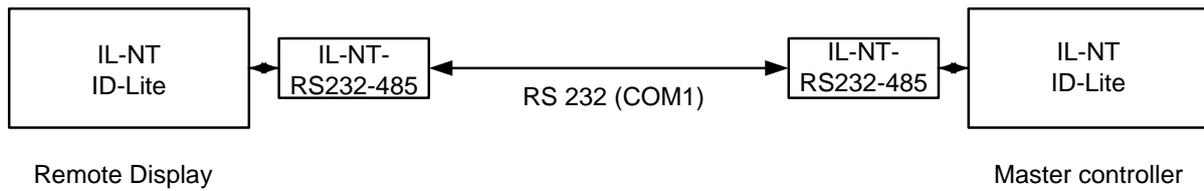
IL-NT/ID-Lite connector D-SUB9 female	IL-NT-RD connector D-SUB9 female
RxD 2	3 TxD
TxD 3	2 RxD
GND 5	5 GND

Remote RS485 and/or direct RS232 connection

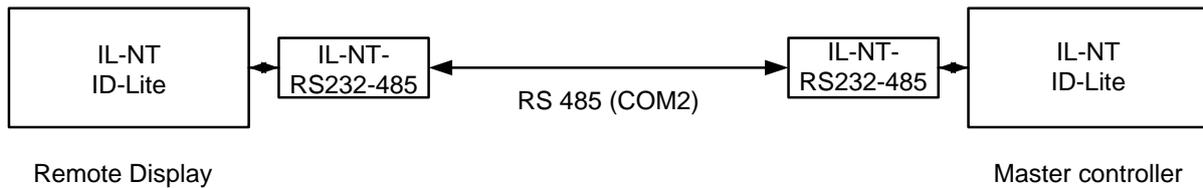
HW module:

IL-NT-RS232-485

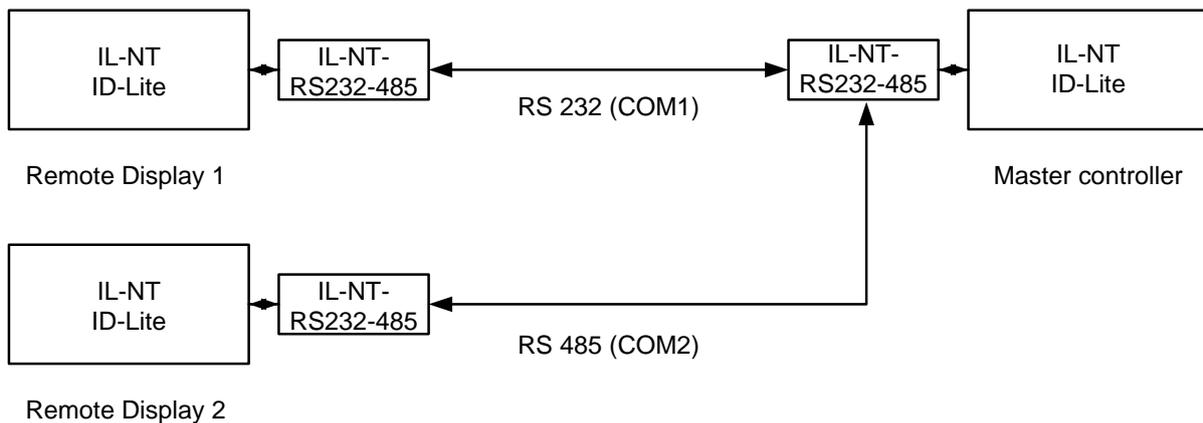
Up to 1000 meters (only with RS485):



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 1.1 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.

Maintenance

Backup battery replacement

The internal backup battery should be replaced approx. every 5-7 years. Replace the battery, if the alarm *Low BackupBatt* occurs. Follow these instructions:

1. Disconnect all terminals from the controller and remove the controller from the switchboard.
2. Release the rear cover using a flat screwdriver or another suitable tool.



3. Remove all plug-in modules.
4. The battery is located in a holder on the circuit board. Remove the old battery with a small sharp screwdriver and push with a finger the new battery into the holder. Use only CR1225 lithium battery.



5. Put the rear cover back. Use slight pressure to lock the snaps into the housing. **Pay attention that the cover is in correct position and not upside down!**
6. Plug the modules back into the slots.
7. Power the controller on, adjust date and time and check all setpoints.

Hint:

When internal RTC battery becomes flat, controller function (e.g. Ready for stand by) does not change until controller power supply is switched off. Some time before the battery is completely exhausted, a warning message appears in Alarmlist: "RTCbatteryFlat".

After the next power switch on (with flat battery already) controller:

- Genset is still possible to run
- All new history records will have not valid date and time stamp.
- Time and Date values are set not valid value
- Statistics values are random
- Timers (Timer1..2 Function) will not be executed
- Fuel theft protection may not work

Technical Data

Inputs/Outputs overview

Model	BIN	BOUT	AI	AOUT	COM1	COM2	CAN	RPM	Gen. Voltage	Mains Voltage	Gen. Current
IL-NT AMF20	7+8* +8**	7+8* +8**	3+ 4*	8**	Y**	Y**	N	Y	Y	Y	Y
IL-NT AMF25	7+8* +8**	7+8* +8**	3+ 4*	8**	Y**	Y**	Y	Y	Y	Y	Y

Note:

* With optional extension module
IGS-PTM or IG-IOM

** 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 AMF20	IL-NT AMF25
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

Language support

IL-NT in firmware version 1.5 supports following language code pages:

Code page	Language	Windows code
0	West European languages	Windows 1252
134	Chinese	GB 2312
162	Turkish	Windows 1254
177	Hebrew	Windows 1255
204	Russian	Windows 1251
238	East European languages	Windows 1250

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

#Low Temperature modification

LCD display limits controller operating temperature range to -20 °C - + 70 °C even if the other electronic components work in wider temperature range.

Internal preheating foil is mounted in IntelliLite^{NT} LT to extend display operational temperature range. Preheating starts at temperature below 5 °C and preheating power depends on temperature and power supply voltage.

Technical data

	IL-NT Standard	Order code:IL-NT-xxxxx LT
Operating temperature	-20 °C..+70°C	-40 °C..+70°C
Storage temperature	-30 °C..+80°C	-30 °C..+80°C

Preheating foil increases controller current consumption

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

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

Dimensions and weight

Dimensions	180x120x55mm
Weight	450g

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 (In=5A)
Max. measured current from CT	10 A
Current measurement tolerance	2% from the Nominal current
Max. peak current from CT	150 A / 1s
Max. continuous current	12 A

Voltage inputs

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

Binary inputs and outputs

Binary inputs

Number of inputs	7
Input resistance	4,2 kΩ
Input range	0-36 VDC
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	7
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 Ω
Resistance measurement tolerance	$\pm 2 \% \pm 2 \Omega$ out of measured value

Speed pick-up input

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

D+ Function

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

***CAN bus interface**

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

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

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

Recommended Industrial Automation & Process Control Cables:

BELDEN (see <http://www.belden.com>):

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

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

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

IL-NT RS232 interface (optional card)

Plugs into IL-NT controller COMMUNICATION MODULE port.

Maximal distance	10m
Maximum Speed	Up to 57.6 kBd (DIRECT), 38.4kBd Analog modem, 9.6 kBd digital modem, 57.6 kBd (MODBUS)

Recommend external converter:

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

Recommended internal converter:

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

Hint:

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

With SW version IL-NT 1.2 and older, the communication speeds are 19.2kBd (STD/DIRECT), 19.2kBd Analog modem, 9.6 kBd digital modem, 9.6kBd (MODBUS)

IL-NT RS232-485 interface (optional card)

Plugs into IL-NT controller COMMUNICATION MODULE port.

Maximal distance	10m (RS232), 1200m (RS485)
Maximum Speed	Up to 57.6 kBd (DIRECT), 38.4kBd Analog modem, 9.6 kBd digital modem, 57.6 kBd (MODBUS)

Hint:

This module is supported with SW version IL-NT 1.3 and newer.

IL-NT S-USB interface (optional card)

Plugs into IL-NT controller COMMUNICATION MODULE port.

Maximal distance	5m
Maximum Speed	Up to 57.6 kBd (DIRECT), 38.4kBd Analog modem, 9.6 kBd digital modem, 57.6 kBd (MODBUS)

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

Recommend USB cable:

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

Hint:

With SW version IL-NT 1.2 and older, the communication speeds are 19.2kBd (STD/DIRECT), 19.2kBd Analog modem, 9.6 kBd digital modem, 9.6kBd (MODBUS)

IL-NT AOUT8 interface (optional card)

Plugs into IL-NT controller EXTENSION MODULE port.

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

IC-NT CT-BIO7 interface (optional card)

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

CURRENT MEASURING INPUT	Number of inputs 1 Nominal input current (from CT) 5A Load (CT output impedance) < 0.1 Max measured current from CT 10A Current measurement tolerance 2% from Nominal current Max peak current from CT 150A / 1s Max continuous current 10A (All values in RMS)
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BINARY INPUTS	Number of inputs 7 Input resistance 4.7k 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
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BINARY OPEN COLLECTOR OUTPUTS	Number of outputs 7 Maximum current per pin 0.5 A Maximum switching common current 2A Maximum switching voltage 36 VDC
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Hint:

Binary inputs are not galvanically isolated.

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](#).

IGS-PTM

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

Analog inputs

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

IGL-RA15

Power supply

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

Operating conditions

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

Dimensions and weight

Dimensions	180x120x55mm
Weight	950g

Horn output

Maximum current	1 A
Maximum switching voltage	36 VDC

IG-IB

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