InteliLite^{NT}

InteliLite NT® AMF

Modular Gen-set Controller

Compact Controller for Stand-by Operating Gen-sets

(IL-NT AMF20/25 unit)

SW version 1.3, July 2008

ComAp

Reference Guide

Ruitai Industry Co.,Ltd

Table of Contents

General Guidelines

What describes this manual?

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 InteliLite 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

InteliLite 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 InteliLite^{NT} parameters settings, it is not possible to describe any combination. Some of InteliLite 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.

InteliLite 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.

Text

PAGE	(Capital letters in the frame) buttons on the front panel
Break Return	(Italic) set points
Generator protections	(Bold) Set point group
REMOTE START/STOP	(Capital letters) binary inputs and outputs
*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 use Boot load (jumper) programming – close Boot jumper and follow instructions in LiteEdit, download correct software.

WARNING – VERY IMPORTANT !!!

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

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

Switch InteliLite 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 InteliLite^{NT} CT terminals !

Adjust set points

All parameters are preadjusted to their typical values. But the set points in the "**Basic settings**" settings group **!!must!!** be adjusted before the first startup of the gen-set.
!!! WRONG ADJUSTMENT OF BASIC PARAMETERS
CAN DESTROY THE GEN-SET !!!

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

General Description

Description of the controller system (with all options)

InteliLite^{NT} 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-S-USB	Service USB communication card	Optional for AMF20/25
IL-NT-AOUT8	Gauge driver card	Optional for AMF20/25
*IL-NT RD (SW)	Remote display software	Optional for AMF20/25
IGL-RA15	Remote annunciator	Optional for AMF20/25
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

*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 module

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!**
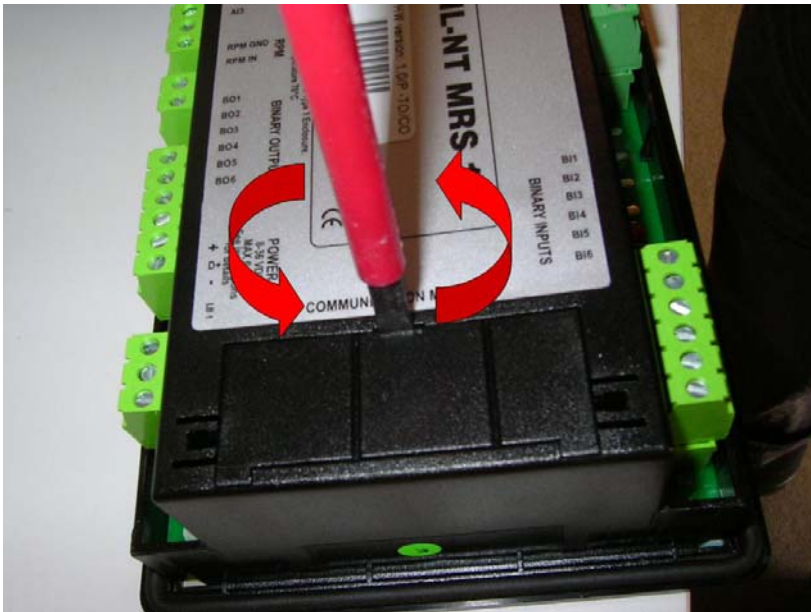
3. Remove the small cover.

4. Break apart the small cover into two pieces. **Do not throw away the smaller part!**
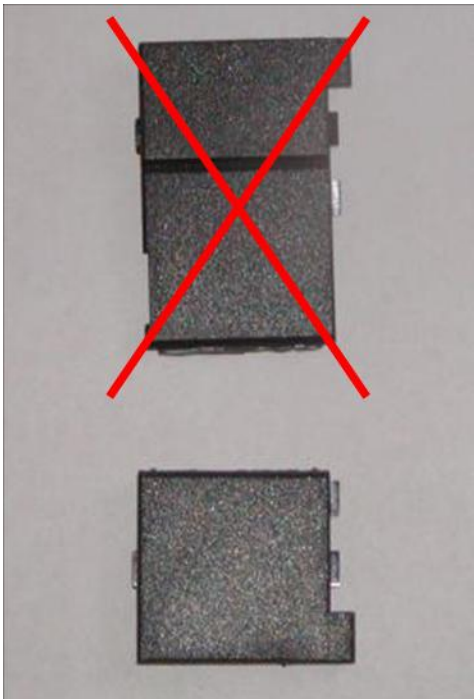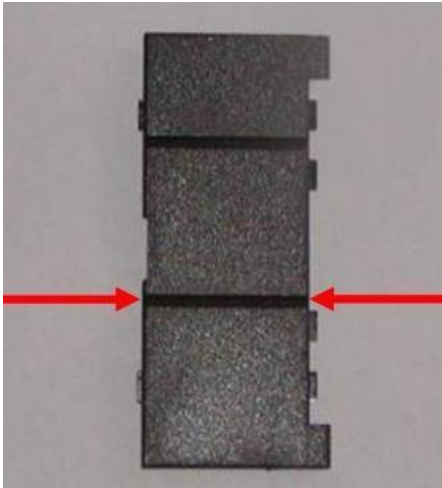
5. Take RS 232 communication module.

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:
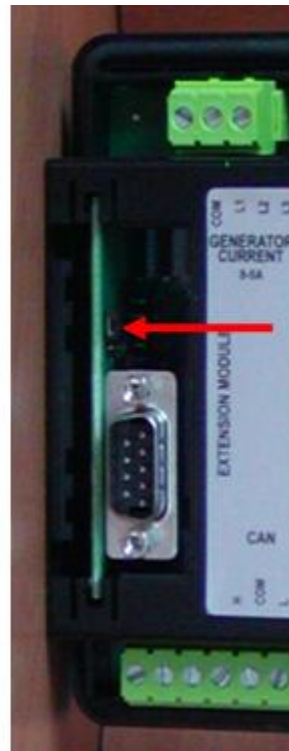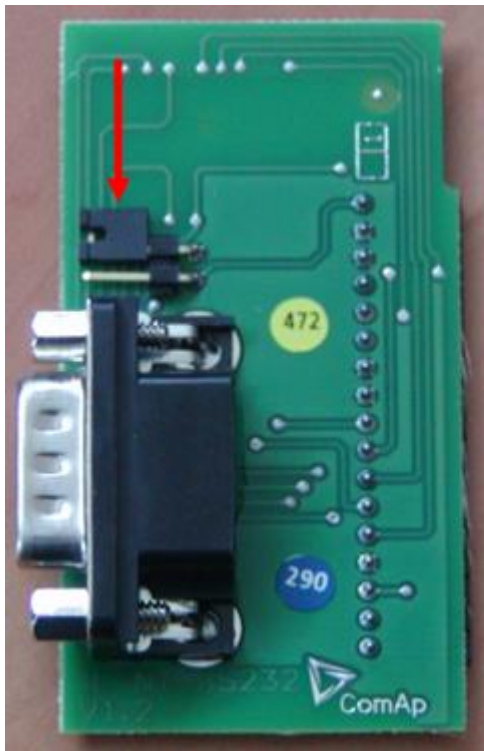
RS 232 communication module with the boot jumper.

IL-NT S-USB Service USB communication module

IL-NT S-USB is optional plug-in card to enable InteliLite[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.
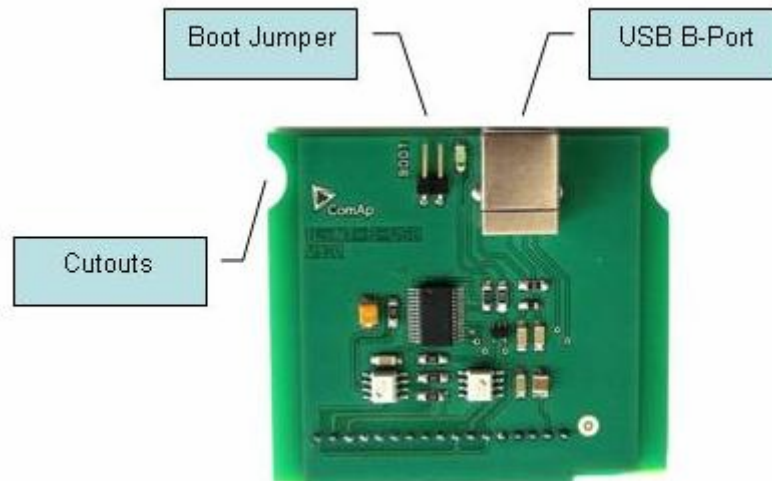
Hint:
Use the shielded USB A-B cable with this module! Recommended is ComAp cable – Order code: "USBCABLE".

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. 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 after installing IL-NT AOUT8 you do not put back the small cover.

IL-NT AOUT8 module:
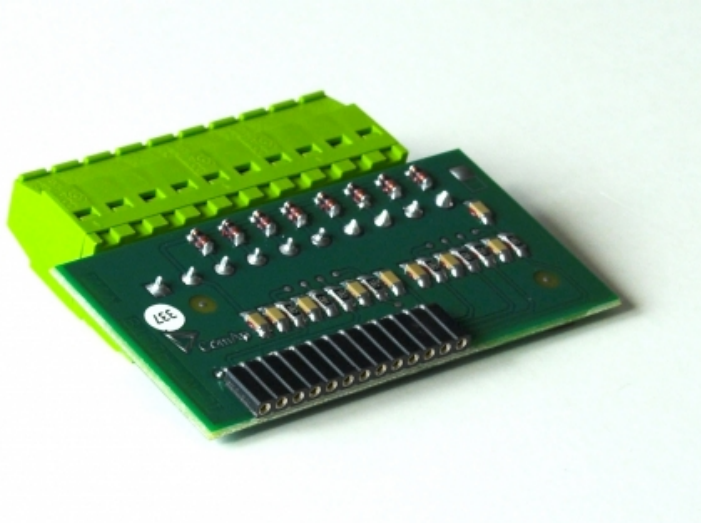
IL-NT RD (SW) Remote display software

IL-NT RD (SW) 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 programing of the display is required – unit is self configurable from the main controller. It is connected with the controller via RS232 line. Longer distances (up to 1200m) are possible when RS232/RS485 converters are used. In the future will be possible to use extension modules with RS485, specifically IL-NT-232-485 and IL-NT-ETH-485.

The IL-NT RD hardware version should fit to the master IL-NT, but it is also possible to use different HW version for remote display and master controller, of course losing some features, which are not present on the more simpler HW. For instance, if you use IL-NT AMF8 as a remote display for IL-NT AMF25, you will miss the Horn button on AMF8. You can use IL-NT MRS4 as a remote display for ILNT MRS16, but in case you would use IL-NT MRS3, you would miss the GCB control on MRS3.

Hint:
The remote display software is supposed to be available in the second half-year of 2008.

Remote announciator IGL - RA15

The remote announciator 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 announciator is not communicating with a controller via CAN bus, it activates a warning.

See the documentation of RA15 for the technical and function description.

Cutout
for Remote Announciator

167 x 108 mm
(6,6 x 4,3")
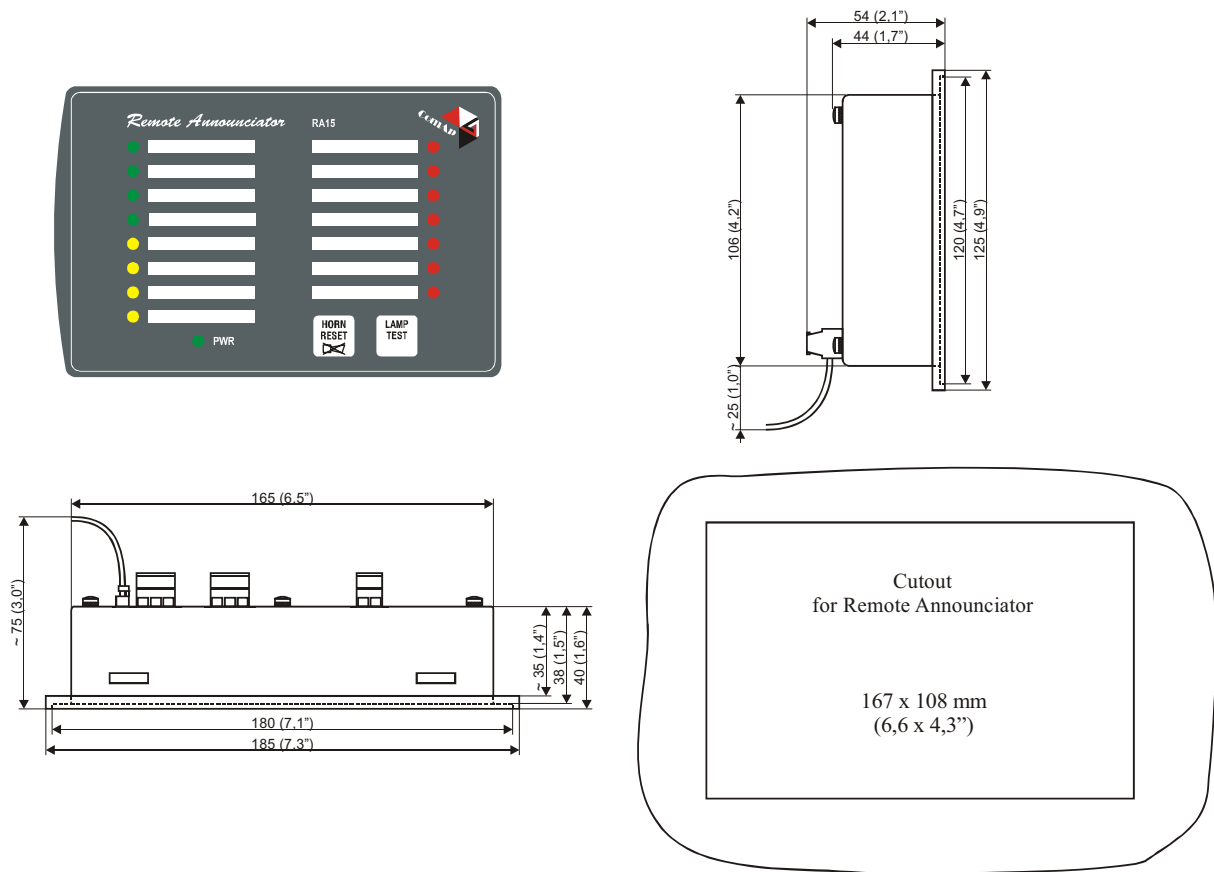
IG IOM/PTM module

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 kΩ. The module IOM is designed for especially VDO resistive sensors.
- IGS-PTM analogue inputs are configurable by jumpers to ranges 0-250Ω, 0-100mV, 0-20mA. The module can be used especially for Pt100 sensors and current sensors. The module PTM is not suitable for VDO temperature sensor.

Hint:

- 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

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

IG-IB Internet bridge

IG-IB Internet bridge enables InteliLite[NT] for Ethernet/Internet communicatons. It is connected to controller via RS232 line.

See InteliCommunication Guide for further details.

User Interface

Since IL-NT 1.3 SW there is an interchangable User Interface on controller. It allows two different modes of displaying controller menu.
The first mode called USER is dedicated for users who prefer easy function and need only monitor actual values of engine and generator, see alarms or change language settings.
Second mode is called ENGINEER and it is dedicated for advaced users, who desire to change the settings of controller, monitor all values and check the history of events.

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

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

IL-NT Terminals

IL-NT terminals and face
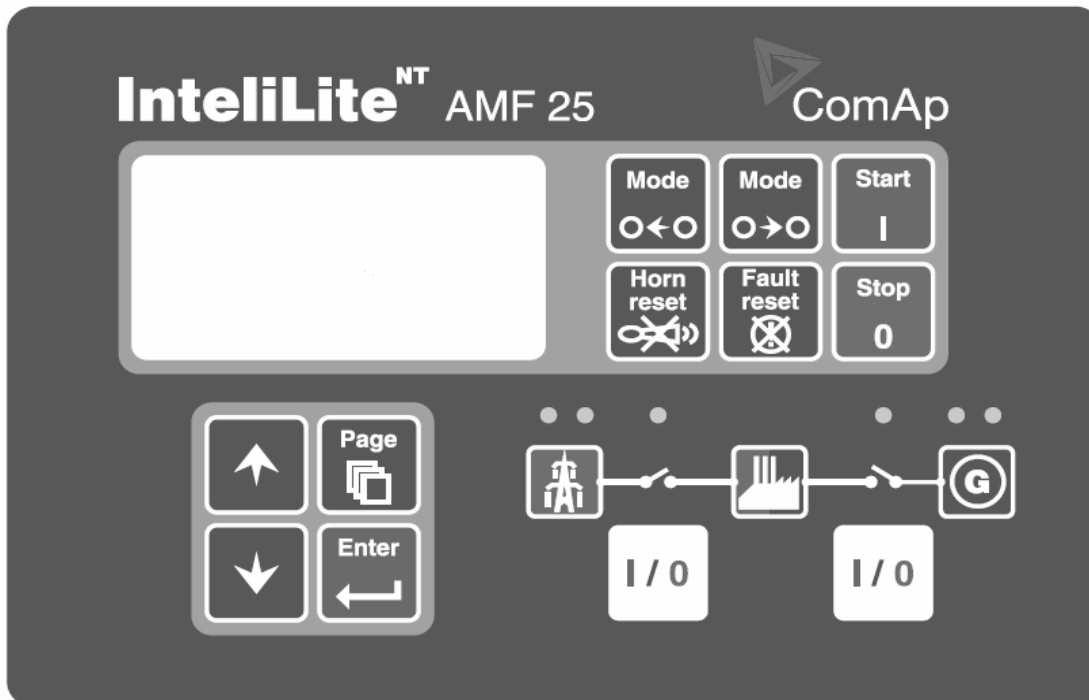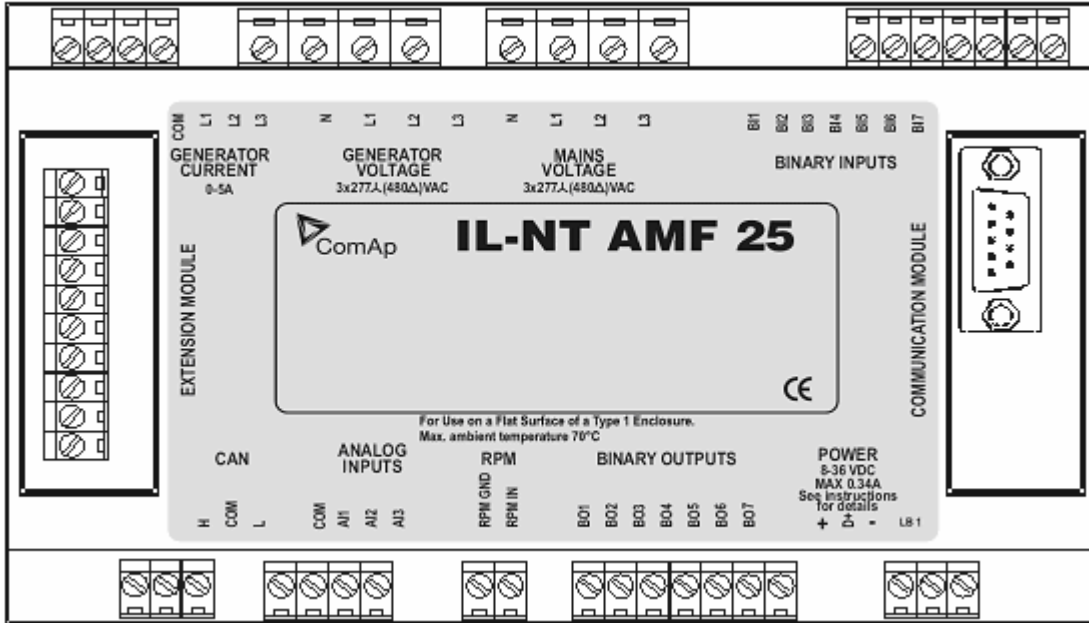
Recommended Wiring

AMF – Wiring Diagram
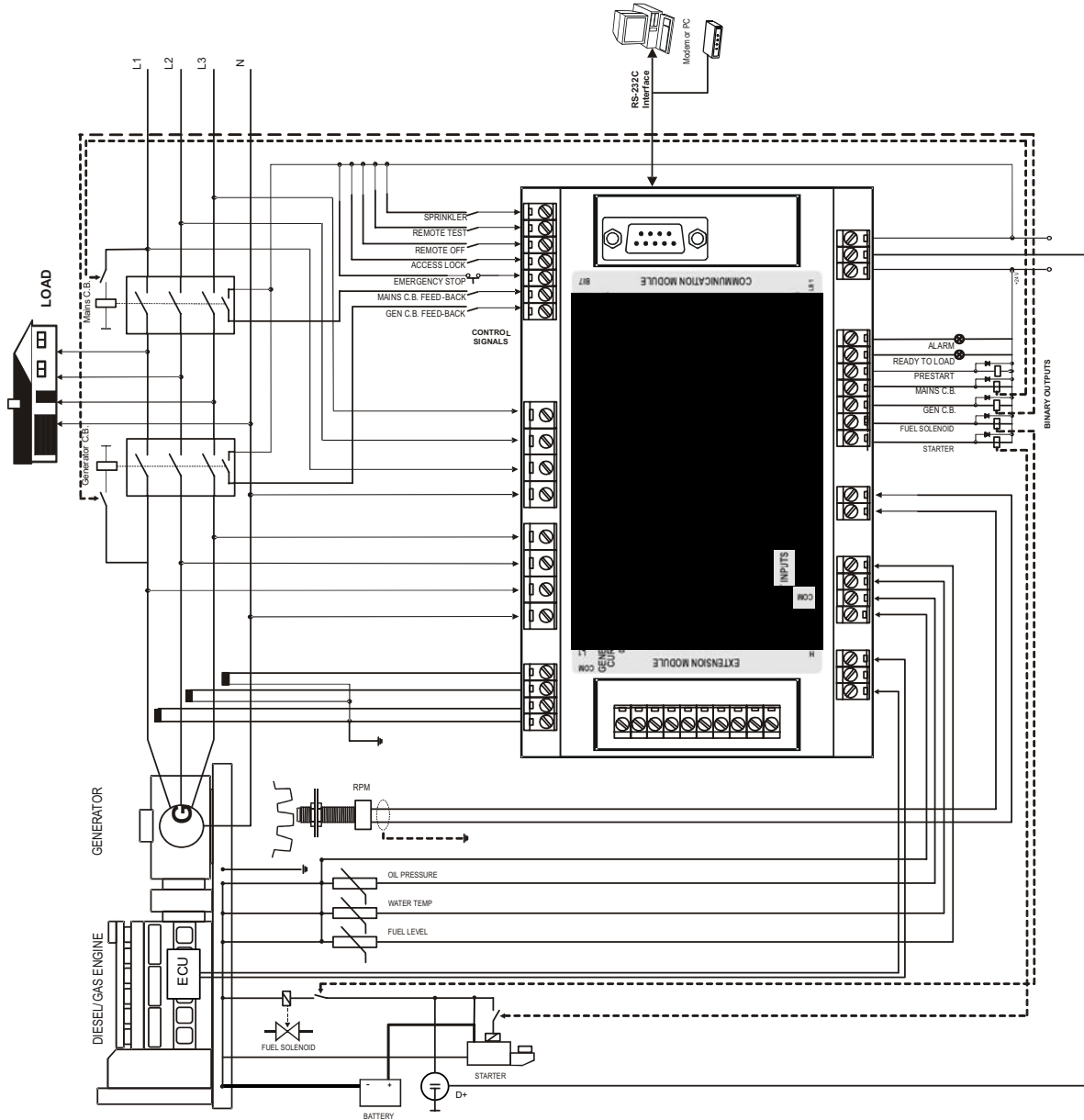
Hint:
MCB and GCB is recommended to be mechanically interlocked.
It is possible to start Volvo and Scania engines via CAN bus. See Engines started via CAN bus.

Stand-by Applications

Contactors (set point MCB Logic = "CLOSE-OFF")
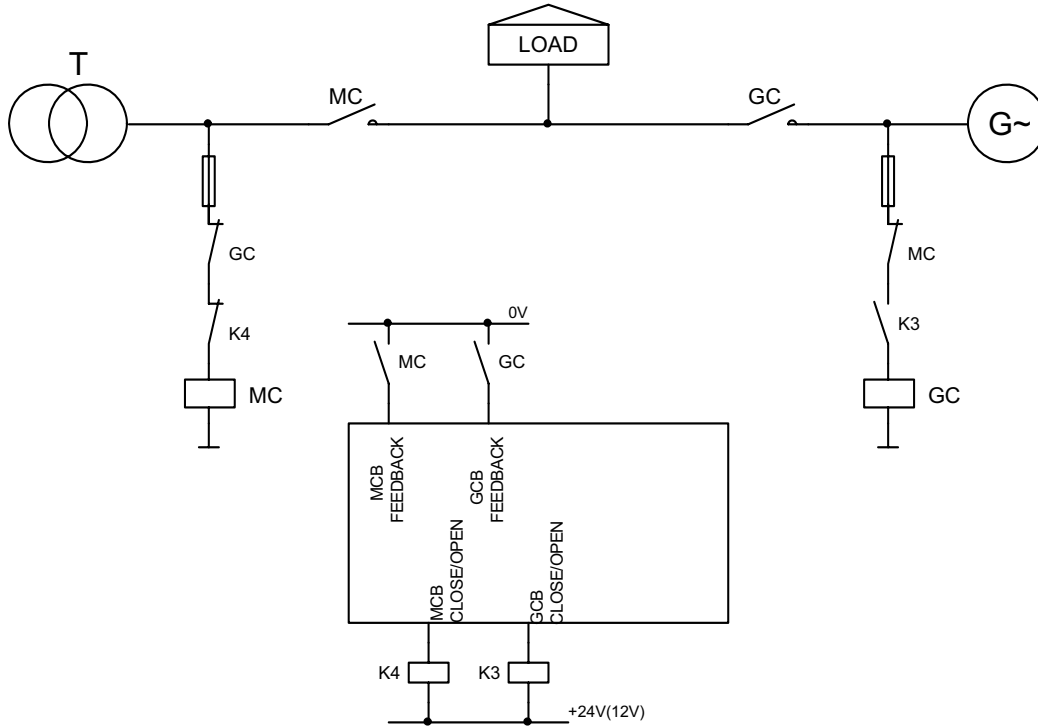
ATS with two stable positions (set point MCB Logic = "CLOSE-ON")
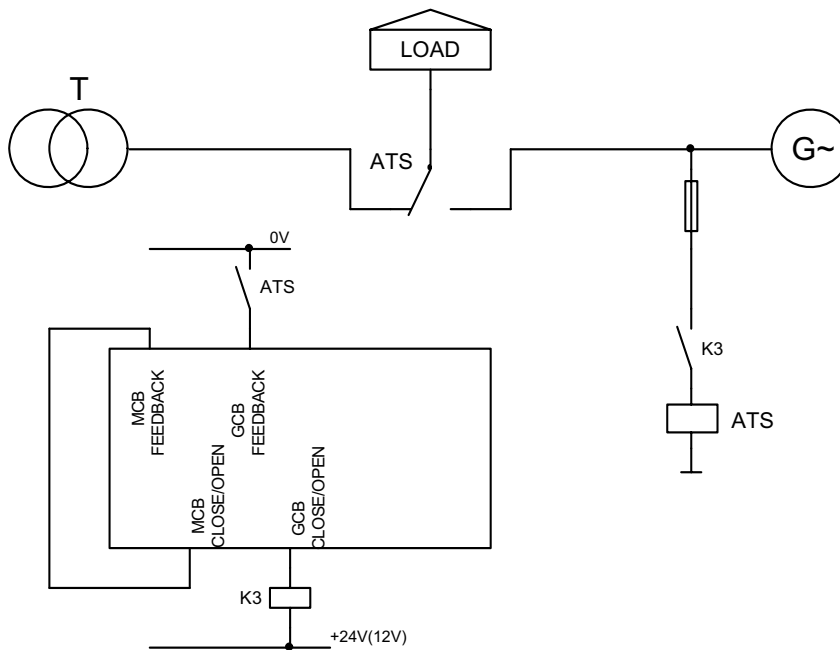
ATS with three stable positions
(set point MCB Logic = "CLOSE-OFF")
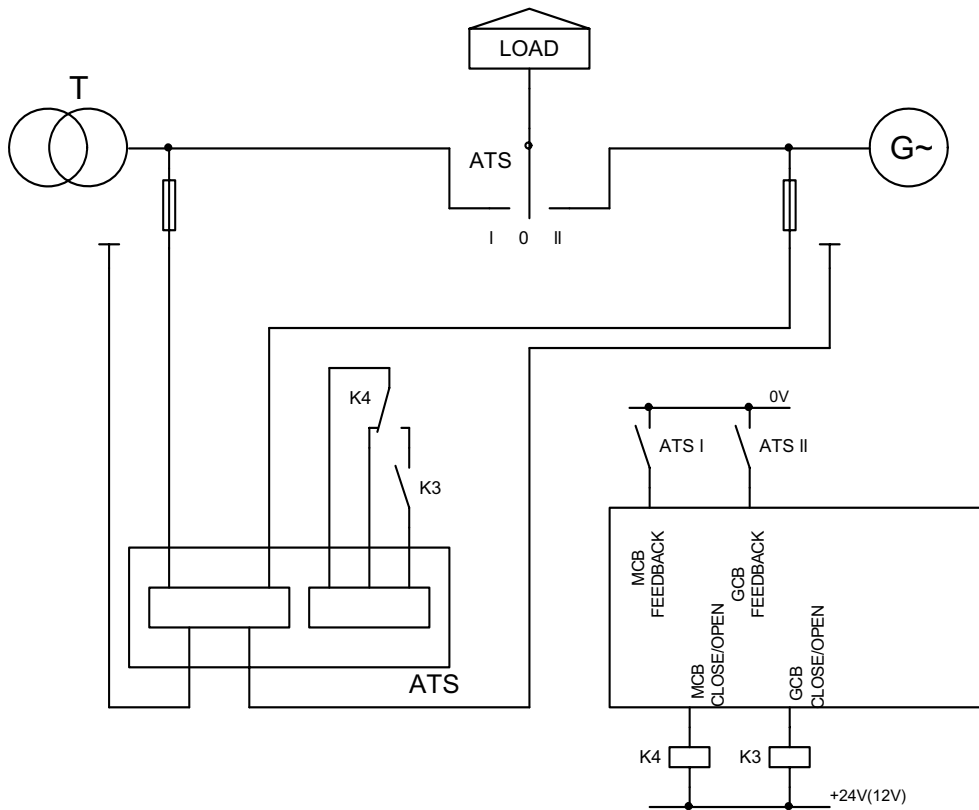
Getting Started

How to install

General

To ensure proper function:

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

Power supply

To ensure proper function:
Use min. power supply cable of 1.5mm^2
Maximum continuous DC power supply voltage is 36VDC. Maximum allowable power supply voltage is 39VDC. The InteliLite's power supply terminals are protected against large pulse power disturbances. When there is a potential risk of the controller being subjected to conditions outside its capabilities, an outside protection devise should be used.

Hint:

The InteliLite controller should be grounded properly in order to protect against lighting strikes!!
The maximum allowable current through the controller's negative terminal is 4A (this is dependent on binary output load).

For the connections with 12VDC power supply, the InteliLite^{NT} includes internal capacitors that allow the controller to continue operation during cranking if the battery voltage dip occurs. If the voltage before dip is 10V, after 100ms the voltage recovers to 7 V, the controller continues operating. During this voltage dip the controller screen backlight can turn off and on but the controller keeps operating. It is possible to further support the controller by connecting the external capacitor and separating diode:
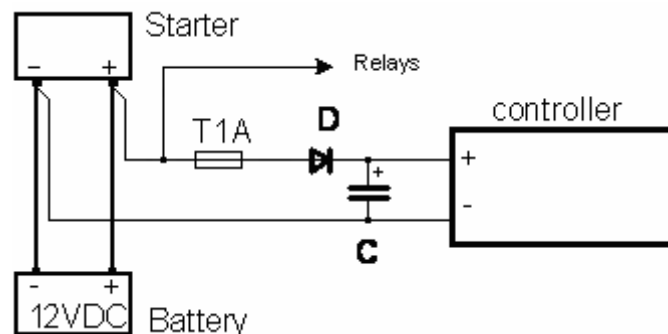
The capacitor size depends on required time. It shall be approximately thousands of microFarads. The capacitor size should be
5 000 microFarad to withstand 150ms voltage dip under following conditions:
Voltage before dip is 12V, after 150ms the voltage recovers to min. allowed voltage, i.e. 8V.

Hint:

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

Or by connecting special I-LBA module:
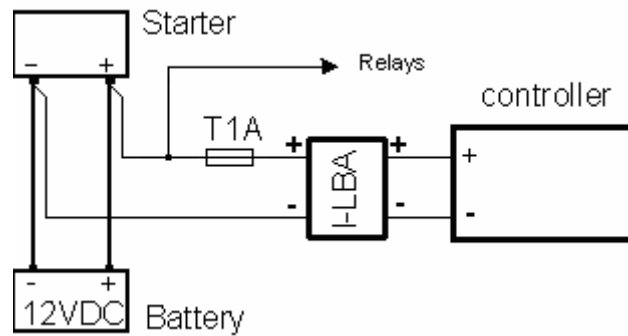
Hint:

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.
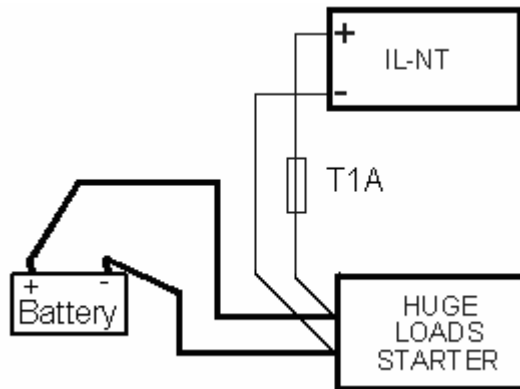
Binary output protections

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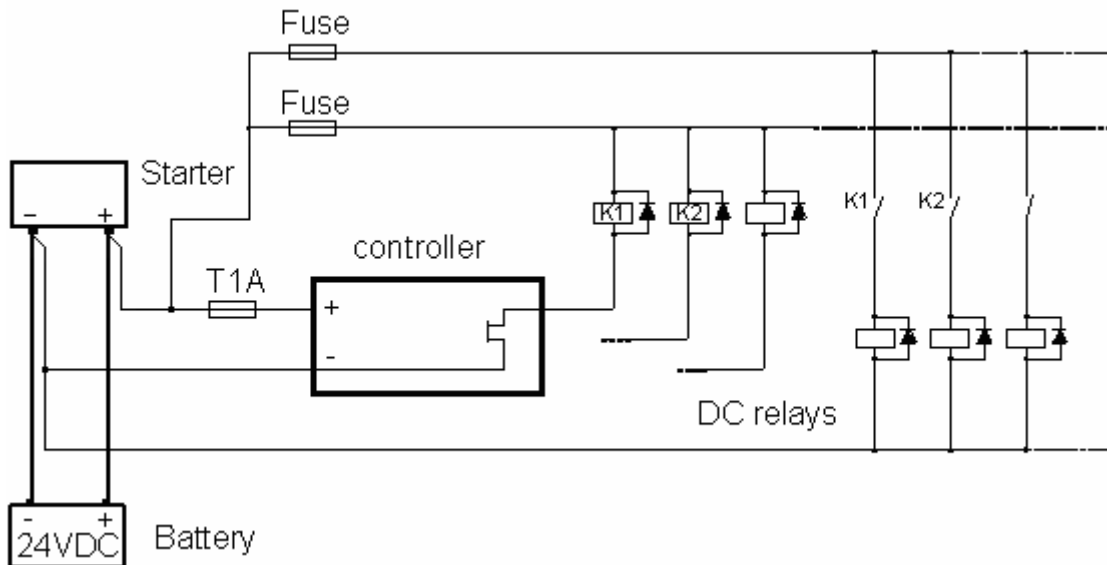
Grounding

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

Magnetic pick-up

To ensure proper function:
Use a shielded cable
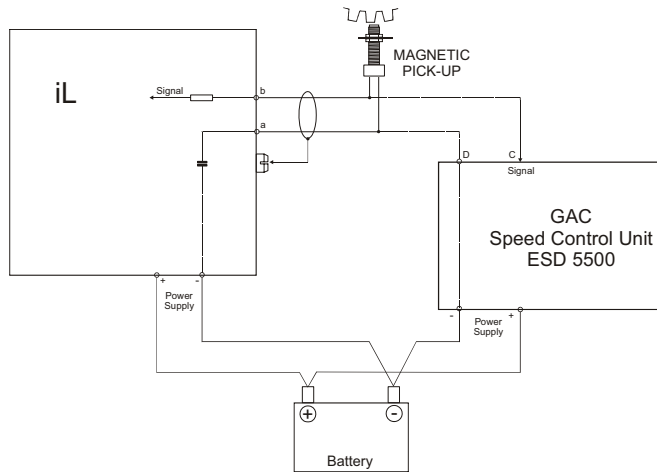
Be aware of interference signal from Speed governor when one speed pick-up is used.
If engine will not start:
- Check ground connection from pick-up to controllers, eventually disconnect ground connection to one of them
- Galvanically separate InteliLite RPM input using ComAp separation transformer RPM-ISO (1:1)
- Use separate pick-up for Speed governor and InteliLite[NT]

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

Current measurement

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

Voltage measurement

N   L1   L2   L3   N   L1   L2   L3
GENERATOR   **MAINS**

N   L1   L2   L3   N   L1   L2   L3
GENERATOR   **MAINS**
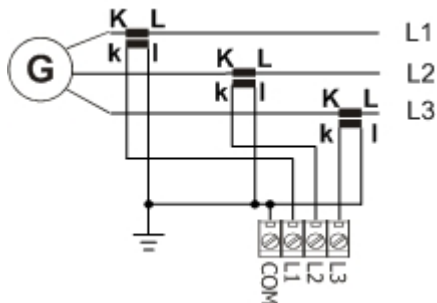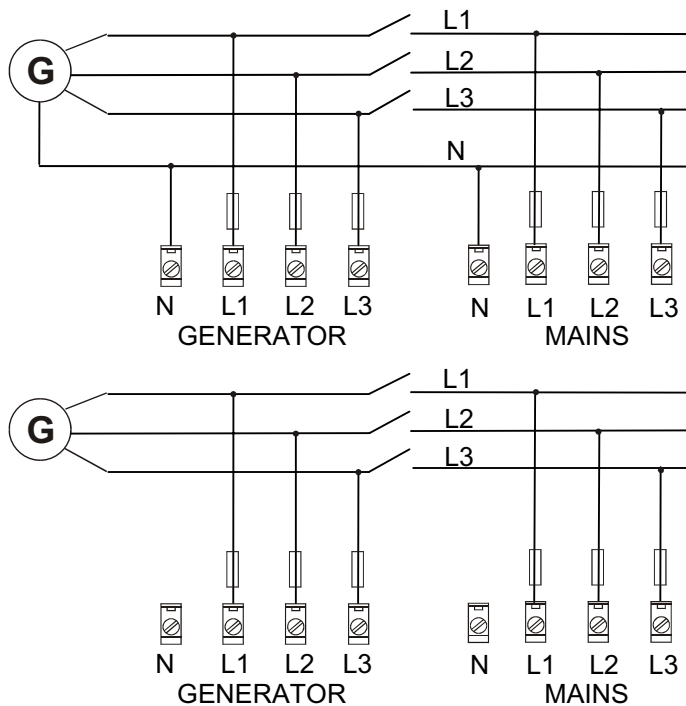
Hint:

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

Single phase applications

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

Recommended wirings

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

Voltage measurement

N   L1   L2   L3   N   L1   L2   L3
GENERATOR   **MAINS**
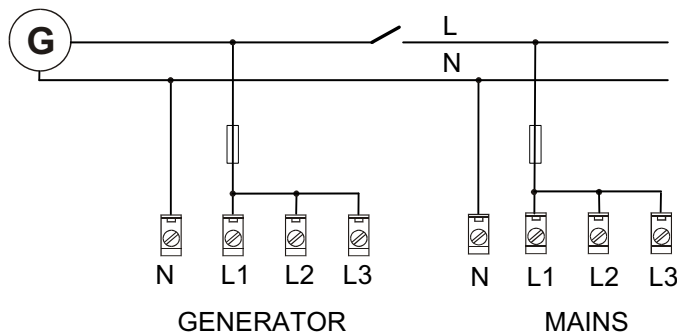
Hint:

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

Current measurement

To ensure proper function
      Use cables of 2,5mm^2
      Use transformers to 5A
Connect CT according to following drawings. Terminals L2l and L3l are opened.
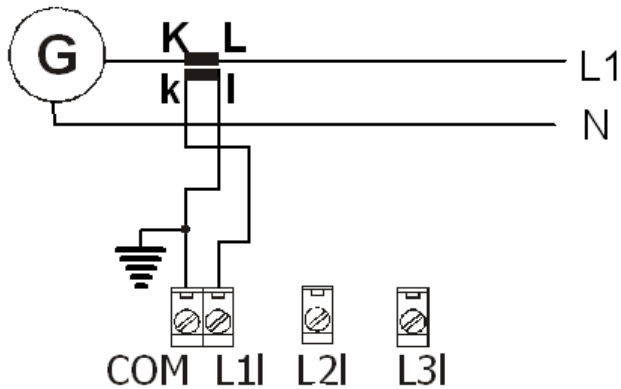
Set points adjustment

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

Gener Protect: *Amps Unbal Sd* to 200 %
Gener Protect: *Amps Unbal Del* to 60,0 s

Analog inputs

Three analog inputs are available on the IL-NT

Configuration

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

Analog input item	LiteEdit		Possibility
Type	Type	Not used	Analog input isn't used
		Alarm	
Analog input name	Name		Up to 14 ASCII characters
Config of input	Config	Analog	Analog measuring in specified range.
		Binary (not supp. by PTM)	Binary: open/close - threshold 750 Ω.
		Tri-state (not supp. by PTM)	Three-state: open/close - threshold 750 Ω, Failure <10 Ω or > 2400 Ω
		ECU	Value is read from ECU
Physical dimension	Dim	bar,%,°C, …	Up to 4 ASCII characters (Valid only for analog inputs)
Polarity	Contact type	NC	Valid only for binary and three-state inputs
		NO	Valid only for binary and three-state inputs
Protection direction	Protection	Over	Overstep. Sensor fail does not activate protection.
		Over+Fls	Overstep and Sensor fail activates protection.
		Under	Under step. Sensor fail does not activate protection.
		Under+Fls	Under step and Sensor fail activates protection.
Sensor characteristic	Sensor	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.

Connection of IL-NT analog inputs
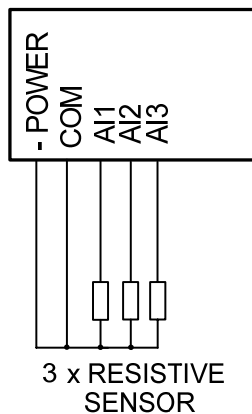
Standard connection of three resistive sensors to analog inputs.

3 x RESISTIVE SENSOR
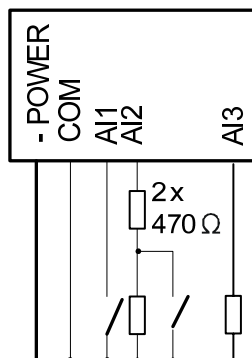
Mixed connection of InteliLite analog inputs:

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

2 x 470 Ω

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

As binary input

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

As three state input

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

Hint:

Protections on binary and three state inputs are following:					
IL-NT:	AI1	Shutdown	*IG-IOM*:	AI1	Shutdown
	AI2	Shutdown		AI2	Shutdown
	AI3	Warning		AI3	Shutdown
				AI4	Shutdown

Unused analog inputs

Configure   Type = Not used

Example of analog input configuration

Configure Engine Temp input for measuring in °C, VDO 40-120°C sensor, range -16 to 120 °C. Alarm protection level set to 90 °C, shut down level 110 °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

<u>**Sensor**</u>: selection of sensor characteristic
„Unused input" - when Analog input is not used. On the InteliLite screen is displayed „####" value, no
alarm is detected.
Default user curves predefined on AI1 – AI3:
„VDO 10 Bar" – VDO pressure sensor
„VDO 40-120 °C" – VDO temperature sensor
„VDO level %" – VDO level sensor
Set to: VDO 40-120 °C

When you choose the predefined or user curve the Sensor Name, Dim and Resolution are setted
automaticly 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.

Binary inputs
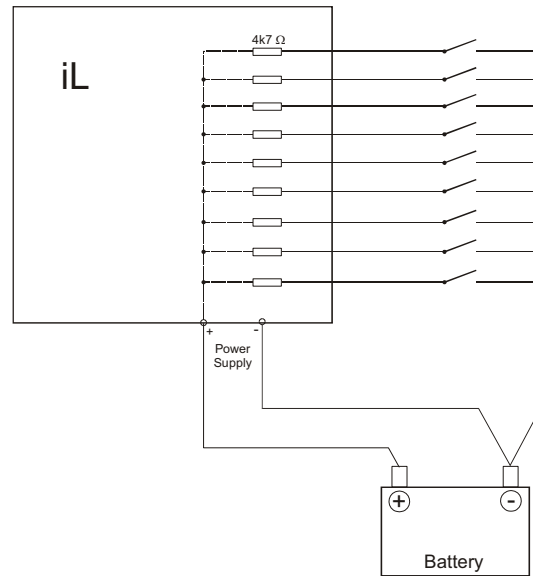
Binary outputs
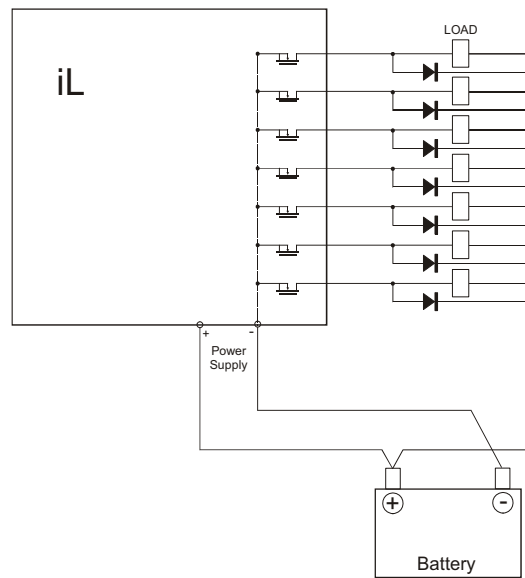
Extension modules (CAN bus) connection
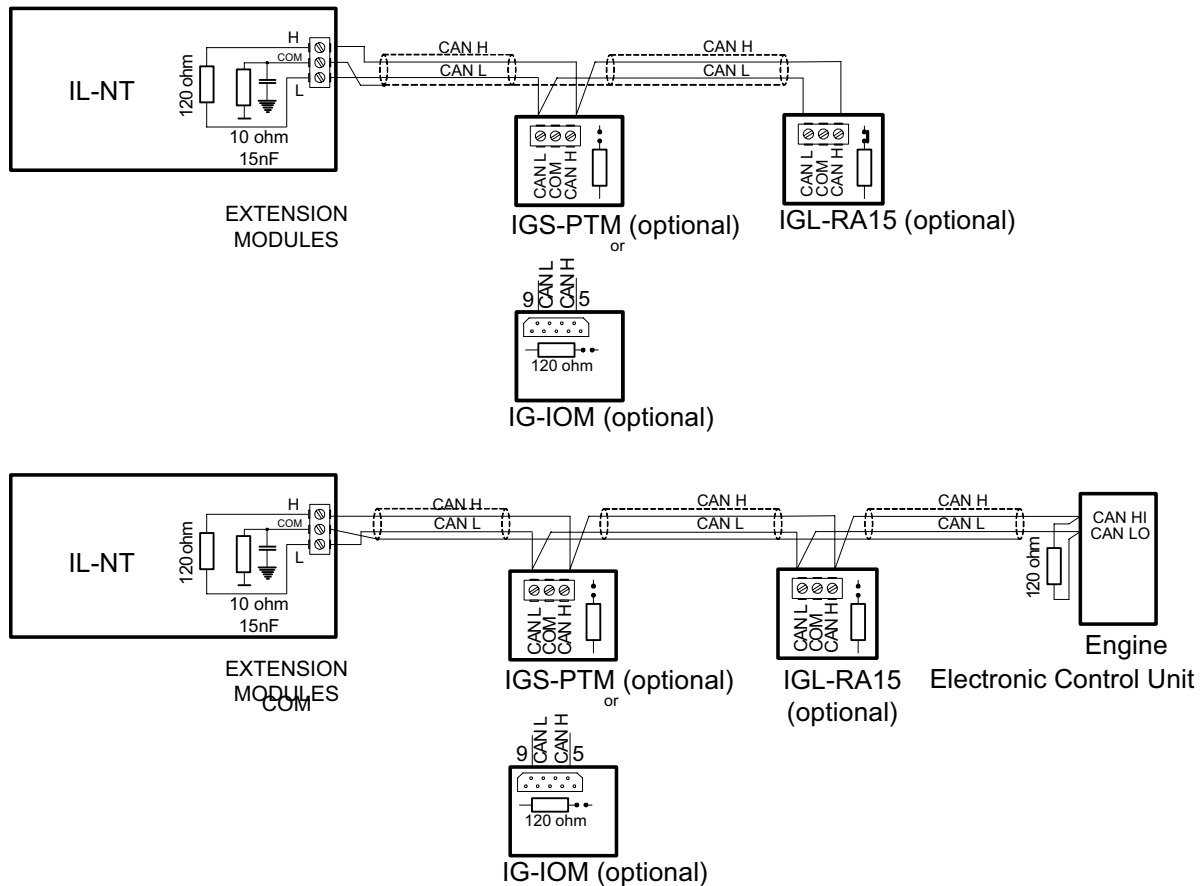
Connection rules

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

For CAN data cables details see chapter Technical data – Communication interface. 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 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-CU.

Use ![J1939 button] button in LiteEdit configuration window to activate CAN (J1939) interface.

Inputs and Outputs

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	
	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.
If the feedback is not used, connect this input to the output GCB CLOSE/OPEN

MCB Feedback

This input indicates whether MCB is closed or opened.

Rem Start/Stop

External request for engine run. AUT mode only.

Emergency Stop

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

Hint:

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

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 **AutoMains Fail**: *ReturnFromTEST* must be set to MANUAL. Load is automatically transferred back to the mains when any gen-set shut down protection activates.

Hint:

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 "Sd 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 InteliLite front panel. It is active in MAN mode only.

Stop Button

Binary input has the same function as Stop Button on the InteliLite 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 InteliLite front panel.

HornResButton

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

GCB Button

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

MCB Button

Binary input has the same function as MCB button on the InteliLite 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 the GCB is opened, gen-set goes to Cooling procedure and stops.
The input simulates healthy Mains.

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.
The output is active at least for *Stop Time*, if the stop lasts longer, it stays active until all symptoms say the engine is stopped.
The engine is stopped if:
    RPM < 2 and
    Generator voltage < 10V and
    Oil pressure < **Engine Params**: *Starting Oil P.*

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 S*top 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 repeated *Crank Attempts* the output is closed too.
The output could be used for pre-glow, pre-heat or prelubrication.

Cooling Pump

The output closes when gen-set starts and opens 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 idle period. 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. If the IDLE contact is not supported on the governor, set the *Idle Time* nevertheless to minimum 5s to avoid *Underspeed* possibly caused by instability of the engine short after start.

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.

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.

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 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

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 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.

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 and
- FAULT RESET is pressed

AL Mains Freq

Output closes if the mains over/under frequency alarm activates.
The output opens, if
- alarm is not active and
- FAULT RESET is pressed

AL Mains Fail

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

The output opens, if
- alarm is not active and
- FAULT RESET is pressed

AL Overload Sd

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 have to be stopped, but speed or frequency or voltage or oil pressure is detected. This protection goes active 60s after stop command. 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 AI1 Sd

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

AL AI3 Wrn

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

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 Fls

Output closes when any sensor fail alarm appears.
The output opens, if
- No warning alarm is active and
- FAULT RESET is pressed

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

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

Maintenance

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

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.

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.

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

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 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.
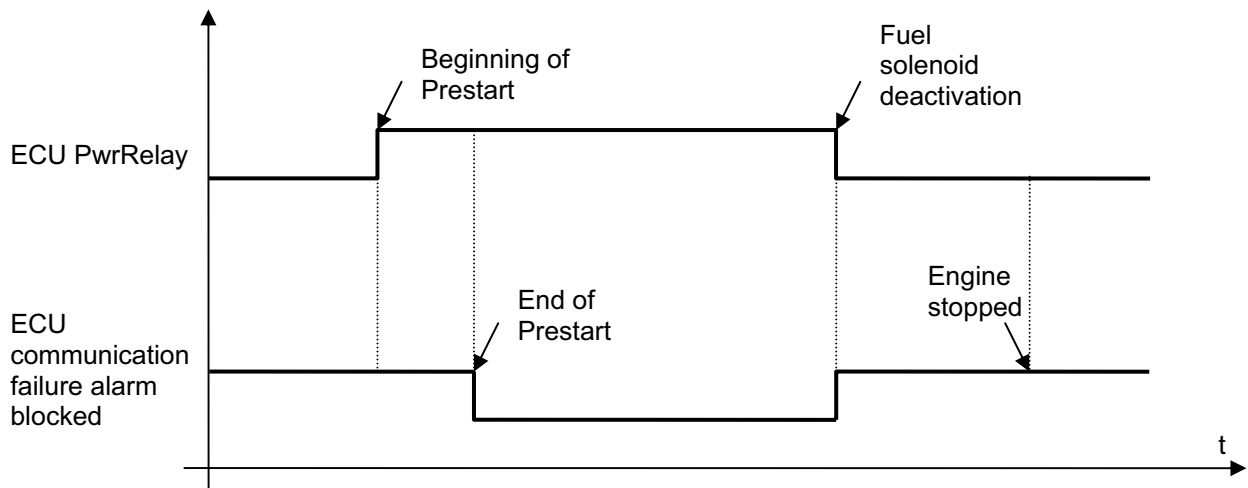
Exerc Timer 1

Output activates when Timer 1 is active. Simultaneously, gen-set is started when it is in AUT mode.

Exerc Timer 2

Output activates when Timer 2 is active

Glow Plugs

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

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.

Analog inputs

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

It is possible to configure on each Analog input:
- Reading from IL Analog inputs or from Engine Control Unit via CAN bus (J1939)
- Sensor characteristics – from the list, or custom sensor curve
- Value dimension (e.g. psi - bars, °F - °C, % - l)
- Sensor resolution

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

Oil Pressure

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

Water Temp

Water temperature analog input. Default range 0 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

Use LiteEdit 3.0 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 eigth 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 aditional sensors on the engine. PWM signal emulates sensor which would be typically mounted on the engine.
Any value from controler may be configured to the outputs. Use LiteEdit PC SW to configure coresponding 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 ENTER key to enter the password.

Hint:
There is only 1 level of a password.

ChangePassword

Use ↑ or ↓ keys to set and ENTER key to change the password.

Hint:
At first the password has to be entered before the new password can be changed.

Basic Settings

Gen-set Name

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

Nominal Power   [kW]

Nominal power of the generator
Step: 1kW
Range: 1 –32000 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:
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!

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

Nomin Voltage   [V]

Nominal generator voltage (phase to neutral)
Step: 1V
Range: 80 – 20000 V

Nominal Freq   [Hz]

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

Gear Teeth   [-]

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

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

Nominal RPM   [RPM]

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

ControllerMode   [OFF, MAN, AUT,*TEST]

Equivalent to Controller mode changes by MODE→ or ←MODE buttons.

Hint:
Controller Mode change can be separately password protected.

FltResGoToMAN   [ENABLED/DISABLED]

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

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 InteliCommunication guide.

ECU LINK: Protocol for communication with Cummins engines via Modbus.

Hint:
For detail description see chapter Modbus protocol. Since IL-NT 1.3 controller support register oriented modbus.

COM2 Mode   [DIRECT/MODBUS/ECU LINK]

Communication protocol switch for the COM2 channel, if dual communication module is pluged in.
DIRECT: LiteEdit communication protocol via direct cable.
MODBUS: Modbus protocol. See detailed description in InteliCommunication guide.
ECU LINK: Protocol for communication with Cummins engines via Modbus.

Hint:
For detail description see chapter Modbus protocol. Since IL-NT 1.3 controller support register oriented modbus.

ModemIniString

If your modem needs some additional initialization AT commands (i.e. because of national telephony network differencies), 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.

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: *Starting RPM*, *Starting Oil P* and D+ (when enabled). Starter goes off when any of these conditions is vaid.

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 – 60 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
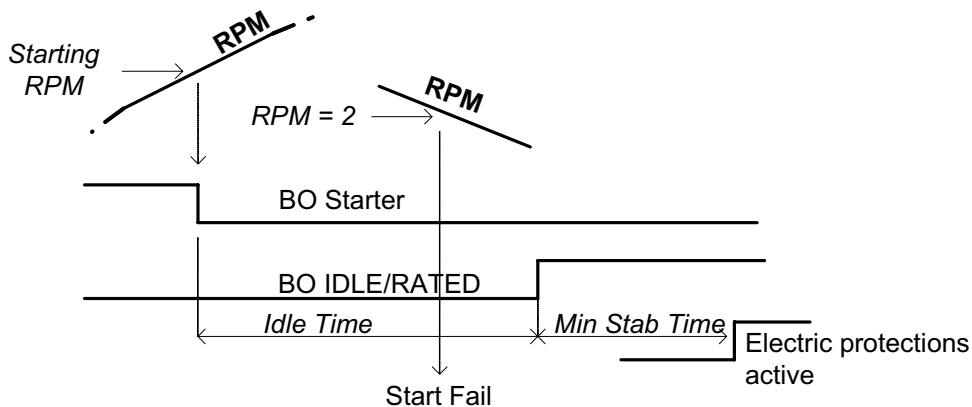
Hint:
If the IDLE function not supported on the governor, set the *Idle Time* nevertheless to minimum 5s to avoid *Underspeed* possibly caused by instability of the engine short after start.

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:
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

Stop Time [s]

Under normal conditions the engine must certainly stop within this period. The period starts by issuing stop command.

Step: 1s
Range: 0 – 240 s

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.

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 minumim 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 %

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

Horn Timeout   [s]

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

Overspeed   [%]

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

Hint:
The Overspeed protection value is increasing from 115 % to 125% of nominal RPM for the duration of 5sec (Engine Protection delay). Engine Protection 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 GeerTeeth = 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

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

Maintenance   [h]

Counts down when engine running. If reaches zero, an alarm appears. When the value 9999 is set, than the Maintanance function is disabled and counter does not count. Counter value disappear in controllers statictics.
Step: 1h
Range: 0 – 9999 h

Gener Protect

Hint:
All electric protections when activated result in shutdown.

Overload   [%]

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

Overload Del   [s]

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

Short Crct Sd   [%]

Shutdown occurs when generator current reaches *Short Crct Sd* limit.
Step: 1 % of *Nominal current*
Range: 100 - 500 %

Short Crct Del   [s]

Delay for generator shorcurrent alarm.
Step: 0.01s
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 Igen = 2* *Nomin Current*.
Step: 0,1 s
Range: 0,1 - 60,0 s
IDMT is "very inverse" generator over current protection. Reaction time is not constant but depends on generator over current level according following formula.

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

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

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

EXAMPLE of Reaction time for different over current levels. Values in column 200% are *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	No action (time > 900 s)	200 s

Nominal Current   *Short Crct Sd*
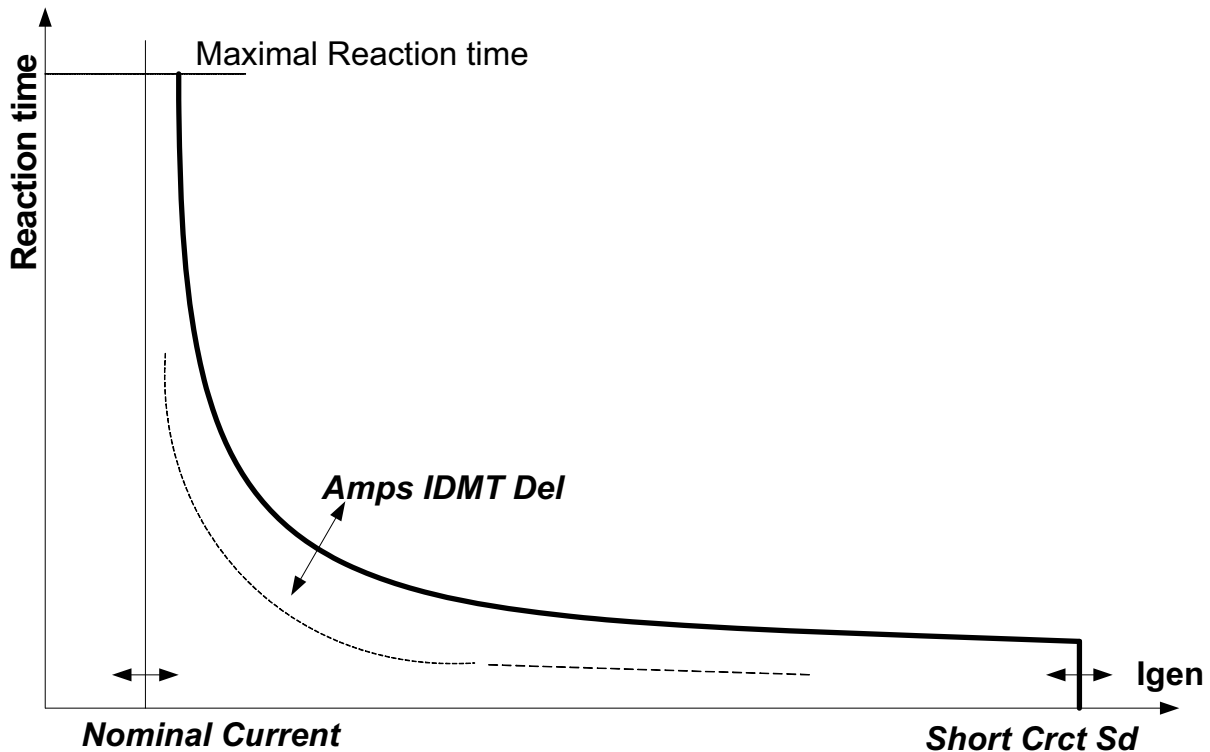
Amps Unbal Sd   [%]

Threshold for generator current asymmetry (unbalance).
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 Sd) – 200%

Gen <V Sd   [%]

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

Step: 1% of Nominal voltage
Range: 0% – 200 (Gen >V Sd)%

Gen V Del   [s]

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

Volt Unbal Sd   [%]

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 Sd   [%]

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

Gen <Freq Sd   [%]

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

Gen Freq Del   [s]

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

AutoMains Fail

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

Fwd Return 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 **AutoMains fail**:*Fwd Return Del* setpoint.

         If the *Fwd Return Del* setpoint is set shorter   If some delay between *MCB feedback*

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.

deactivation and closing of *GCB Close/Open* output is required, then the *Fwd Return Del* must be set to sum of "MCB opening" + "del" time.

```
MCB
Close/Open

MCB
Feedback        Fw Return
                   Del

GCB              MCB opening
Close/Open
```

```
MCB
Close/Open

MCB
Feedback                 MCB opening    del

GCB                      Fwd Return
Close/Open                  Del
```
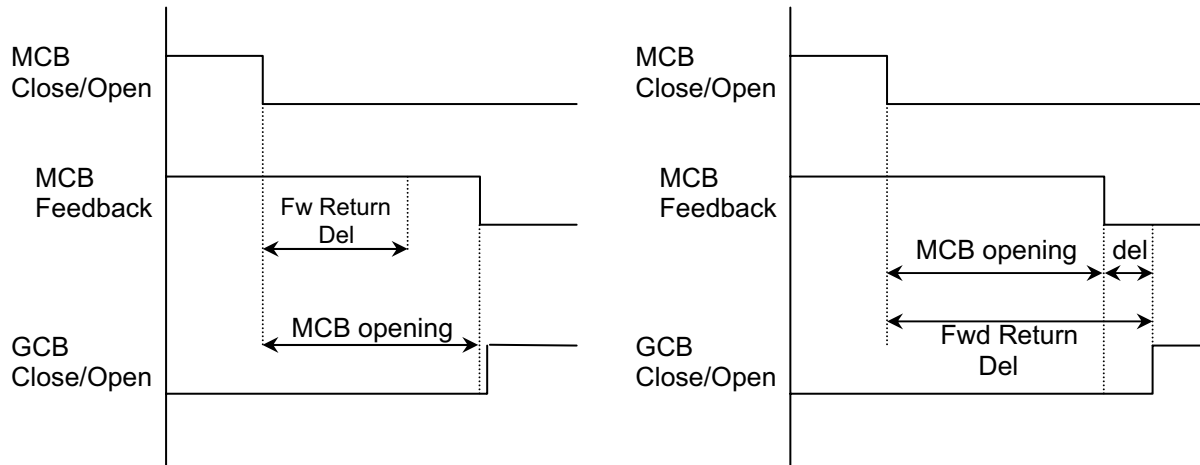
MCB Close Del   [s]

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. Maximum out of three 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.
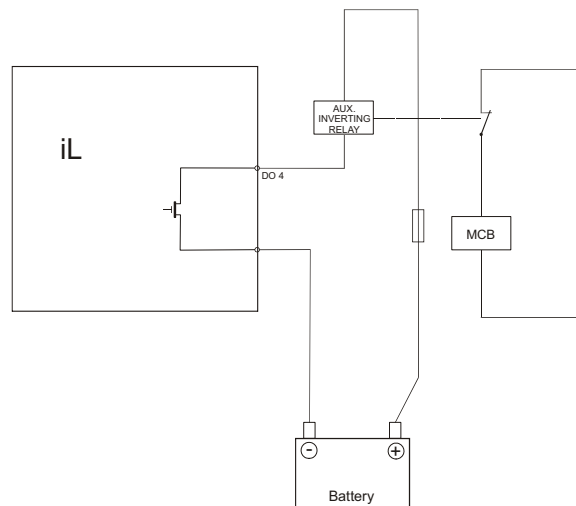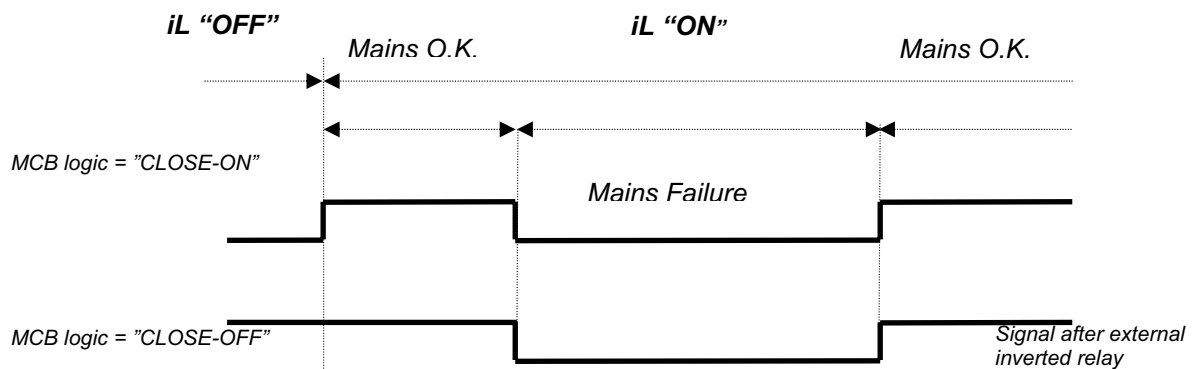
Hint:

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* InteliLite opens the GCB
   b) After the *Fwd Return Del* delay InteliLite closes the MCB.
   c) The gen-set is cooled and stopped

AUT:
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 *Fwd Return 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 evaluated.

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, *Fwd Return Del* timer is started and the GCB is closed after the timer elapses.

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

Date/Time

Time Stamp Per   [min]
Time interval for periodic history records.
Step: 1 min
Range: 0 – 200min

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

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

#Time   [HHMMSS]
Real time clock adjustment.

#Date   [DDMMYYYY]
Actual date adjustment.

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

Defines TIMER 1 activation. Binary output TIMER 1 is internally linked with Rem Start/Stop binary input. Refer to binary inputs for details.

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

Timer1..2 ON Time

Day time when Timer output activates.

Timer1..2Duration

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

Sensors Spec

AI1,AI2,AI3Calibration   […]

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.

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+fls	Level 2 protection is activated by sensor fail as well.
Over+fls	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

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   [DISABLED, ENABLED]

Set this setpoint to YES 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   [DISABLED, ENABLED]

Set this setpoint to YES if you want to get messages when a **red** (shutdown) 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*.

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.
This setpoint can be modified from PC only!

*ECU-controlled engine support

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

Presence of the ECU on the CAN bus/RS232 is configured via LiteEdit like other peripheries (IG-IOM, IGL-RA15). Pressing the [ECU] button in Configuration window of LiteEdit opens ECU dialog window where the appropriate engine/ECU type should be selected. The actual list of ECU types is available on ComAp website in "ECU list - x.y.iwe" package. Download this package and import it into LiteEdit in the same way as standard firmware IWE package.

More information about ECU list packages, configuration and wiring recommendations can be found in *Comap Electroni Engines Support* manual.
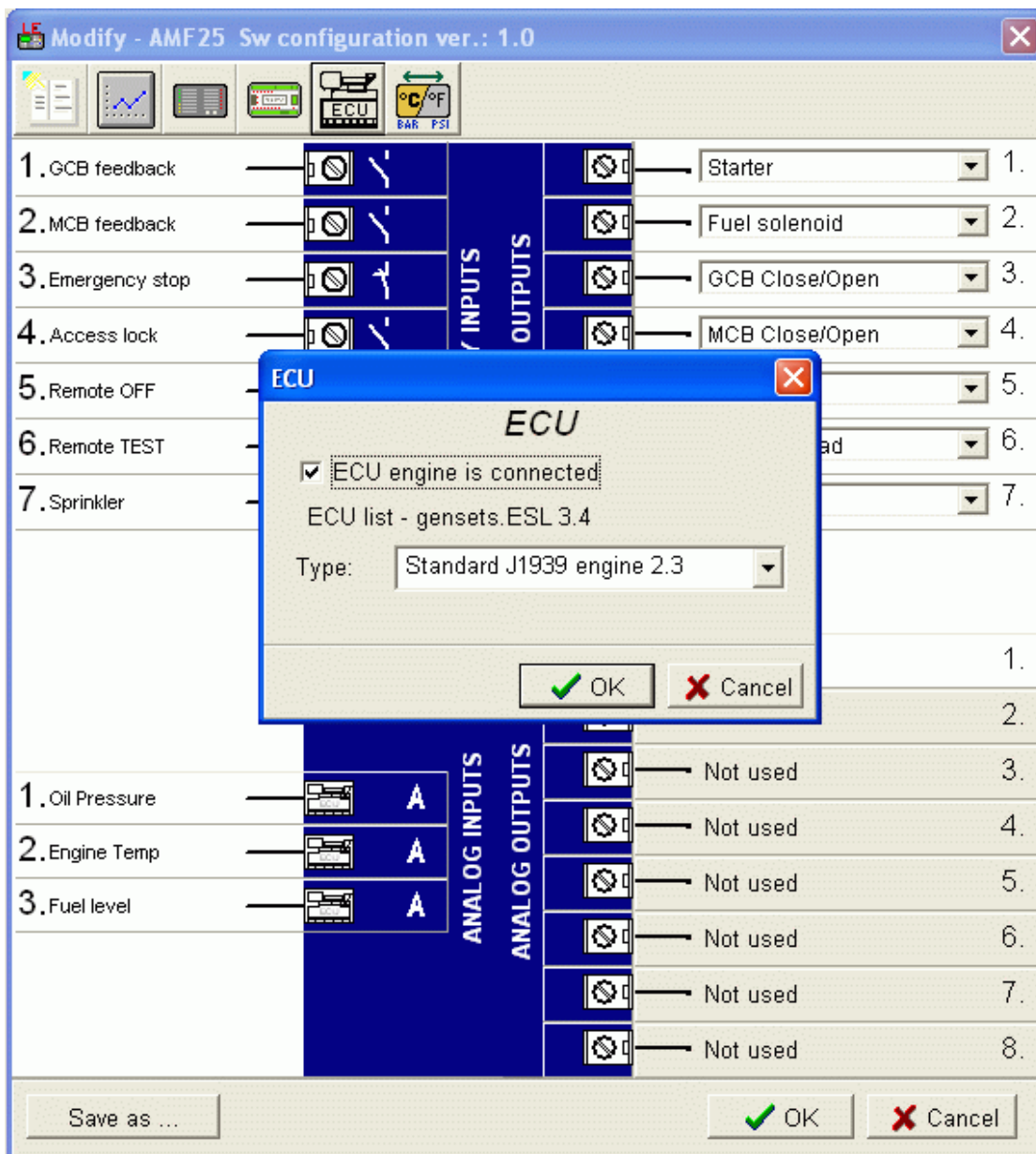
If the connected engine is Cummins with GCS engine control unit communicating via Modbus it is

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.

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 QSX15,QSK45, QSK60):
- ➜ Engine Speed (Register Address:30001)
- ➜ Oil Pressure (Register Address:30003)
- ➜ Coolant Temperature (Register Address:30002)
- ➜ Engine Running Time (Register Address:30008-30009)
- ➜ Fuel Consumption Rate (Register Address:30018)
- ➜ Intake Manifold Absolute Pressure (Register Address:30530 (QSK45, QSK60 only))
- ➜ Intake Manifold Temperature (Register Address:30531 (QSK45, QSK60 only))

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

Diagnostic messages read from ECU

Diagnostic messages are read and displayed in extra ECU Alarm list. For Standard J1939 SPN (Suspect Parameter Number), FMI (Failure Mode Identifier) and OC (Occurrence Counter) are shown together with text description if available.
One SPN (Suspect Parameter Number) / FMI (Failure Mode Identify) couple describes one fail information. If FMI is equal to 0 or 1, WRN is displayed in the ECU Alarm list. For any other FMI values, FLS is displayed.
Detail SPN/FMI code specification see in:
- SAE Truck and Bus Control and Communications Network Standards Manual, SAE HS-1939 Publication
- Or refer to corresponding engine manufacturer's ECU error codes list.

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

Hint:
InteliLite controller doesn't support J1587 diagnostic line on Volvo engines. This can cause in some cases a J1939 alarm message FC:000608 due to missing J1587 bus. Contact your Volvo distributor to update ECU firmware.
For Scania engines the fault codes are displayed in hexadecimal format.

Analog inputs

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

Engines with J1939 support started via CAN bus
VOLVO PENTA engines (EMS II, EDC III units)
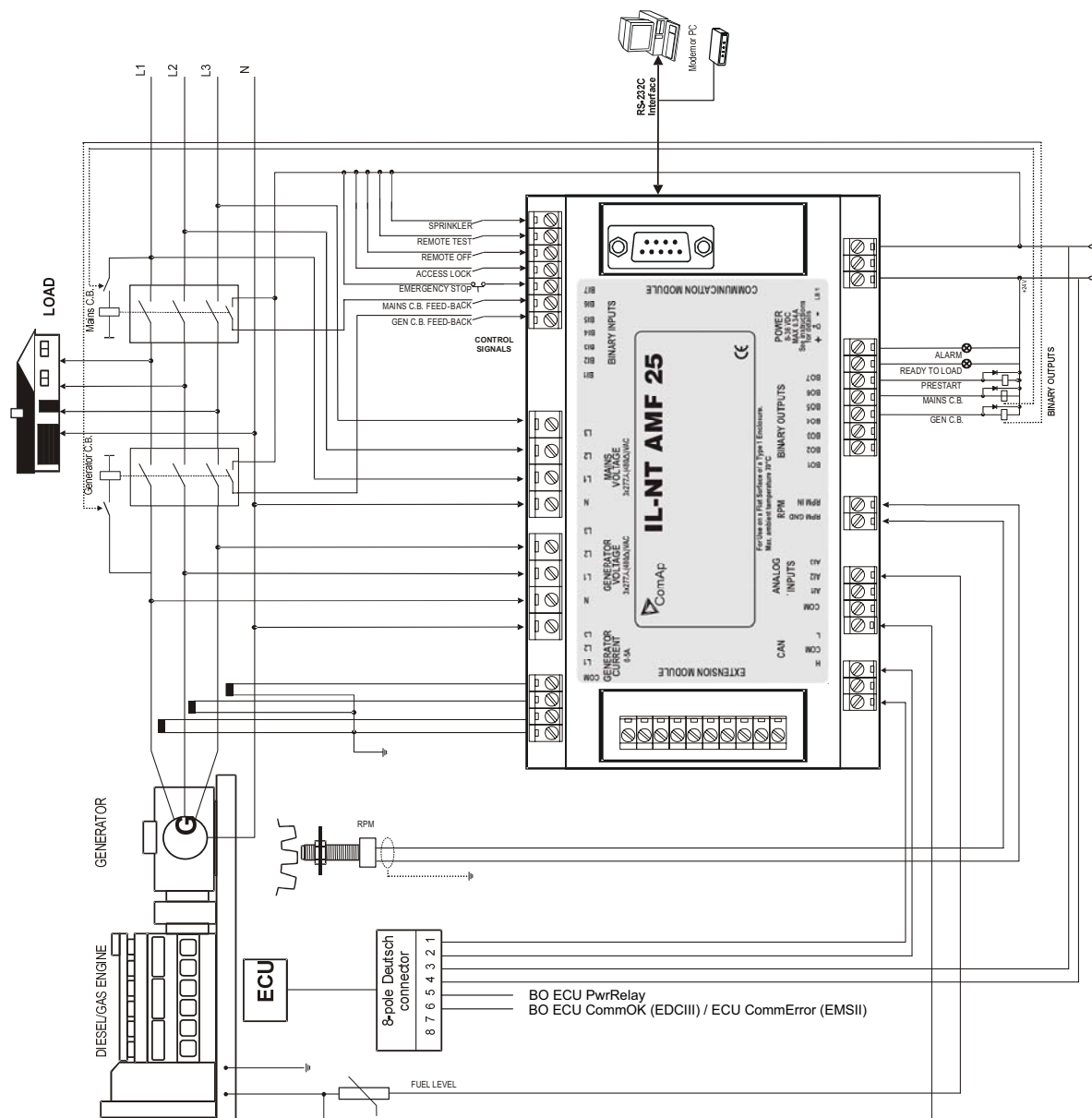
SCANIA S6
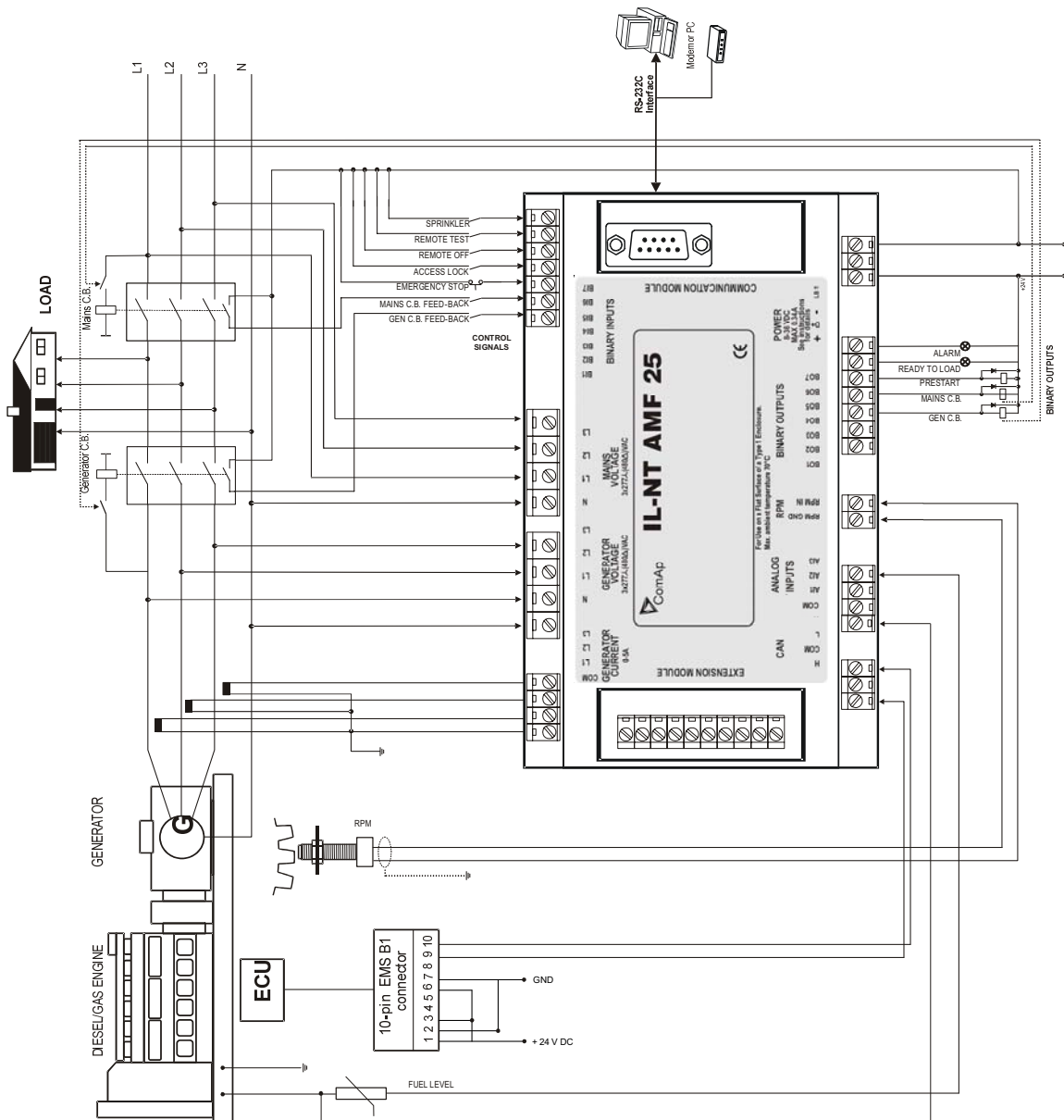
Cummins engines with MODBUS communication

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)
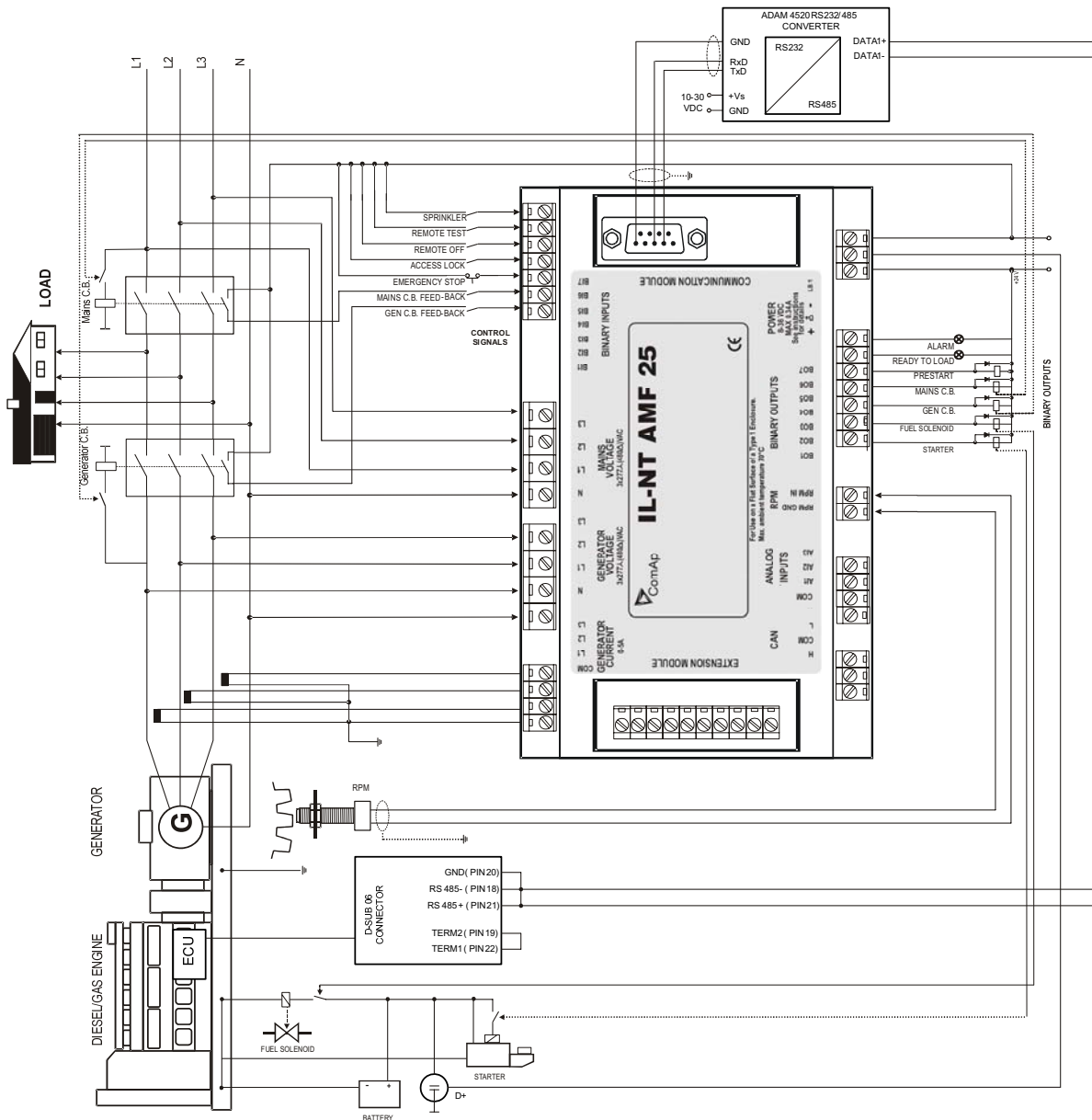
Sensor Specification

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 AIx*Calibration* 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 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:
When measured value is 6% out of range the Sensor fail FLS is detected. You can find detail information on sensores in LiteEditu Reference Guide.

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 *Prestart Time* counter started	*Prestart*
	RPM > 2 or Oil pressure detected or Gen voltage > 10V or D+ active		*Stop (Stop fail)*
	OFF Mode selected or Shut down alarm active		*Not Ready*
Not Ready	RPM < 2, Oil pressure not detected, Vgen < 10V, D+ not Active no shutdown alarm active, other than OFF Mode selected		*Ready*
Prestart [3]	Prestart time *elapsed*	*STARTER on FUEL SOLENOID on[4] MaxCrank Time* counter started	*Cranking*

State	Condition of the transition	Action	Next state
Cranking [3]	RPM> Starting RPM	STARTER off PRESTART off	Starting
	D+ input activated or oil pressure detected or Gen voltage > 25% Vgnom or D+ active for 1s	STARTER off PRESTART off	Cranking
	MaxCrank Time elapsed, 1st attempt	STARTER off FUEL SOLENOID off STOP SOLENOID on CrankFail Pause timer started	Crank pause
	MaxCrank Time elapsed, last attempt	STARTER off PRESTART off	Shutdown (Start fail)
Crank pause [3]	CrankFail Pause elapsed	STARTER on FUEL SOLENOID on[4] STOP SOLENOID off MaxCrank Time counter started	Cranking
Starting [3]	80% Nominal RPM reached	READY TO LOAD on [1] Min, Max Stab Time counter started	Running
	RPM = 0 or any other shutdown condition	FUEL SOLENOID off STOP SOLENOID on	Shutdown
	60 sec. Elapsed	FUEL SOLENOID off STOP SOLENOID on	Shutdown (Start fail)
Running	Stop request	READY TO LOAD off Cooling Time timer started	Cooling
	RPM = 0 or any other shutdown condition	READY TO LOAD off [2] FUEL SOLENOID off	Shutdown
	GCB CLOSE/OPEN closed		Loaded
Loaded	GCB CLOSE/OPEN opened		Running
	RPM = 0 or any other shutdown condition	FUEL SOLENOID off STOP SOLENOID on READY TO LOAD off	Shutdown
Cooling	Cooling Time elapsed	FUEL SOLENOID off STOP SOLENOID on	Stop
	RPM = 0 or any other shutdown condition	FUEL SOLENOID off STOP SOLENOID on	Shutdown
	Start request	READY TO LOAD on [1]	Running
Stop	RPM = 0, Oil pressure not detected, Vgen < 10V, D+ not active		Ready
	60 sec. Elapsed		Stop (Stop fail)

[1] if all generator parameters OK and 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 comming stop request

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

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

AUT Mode

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

AMF sequence (simplified)

State	Condition of the transition	Action	Next state
Mains operation	Mains failed[1] or MCB feedback dropout *MCB Opens On* = MAINSFAIL	MCB CLOSE/OPEN off *EmergStart Del* timer started	Mains failure
	Mains failed[1] or MCB feedback dropout *MCB Opens On* = GENRUN	*EmergStart Del* timer started	Mains failure
Mains failure	Mains voltage and frequency OK *MCB Opens On* = MAINSFAIL	After elapsing *MCB Close Del* MCB CLOSE/OPEN on	Mains operation
	Mains voltage and frequency OK *MCB Opens On* = GENRUN	None	Mains operation
	EmergStart Del elapsed *MCB Opens On* = MAINSFAIL	Engine start sequence performed, then GCB CLOSE/OPEN on [2]	Island operation
	EmergStart Del elapsed *MCB Opens On* = GENRUN	Engine start sequence performed, then MCB CLOSE/OPEN off, time delay *Fwd Return Del* performed and GCB CLOSE/OPEN on [2]	Island operation
Island operation	Mains voltage and frequency OK	*MainsReturnDel* timer started	Mains return
Mains return	Mains failed		Island operation
	MainsReturnDel elapsed	GCB CLOSE/OPEN off, then after *Fwd Return Del* 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 reclosedclosed with delay *Fwd Return Del.*

See also chapter **Circuit breakers timing.**

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 *Fwd Return Del* elapses, GCB is closed.
When the mains recovers gen-set stays supplying island load. To transfer the load back to the healthly mains, switch the controller to AUT Mode.

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 (if TEST mode selected) transfers load from the mains to the gen-set. Setpoint AutoMainsFail: ReturnFromTEST must be set to MANUAL.

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 *Fwd Return 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.
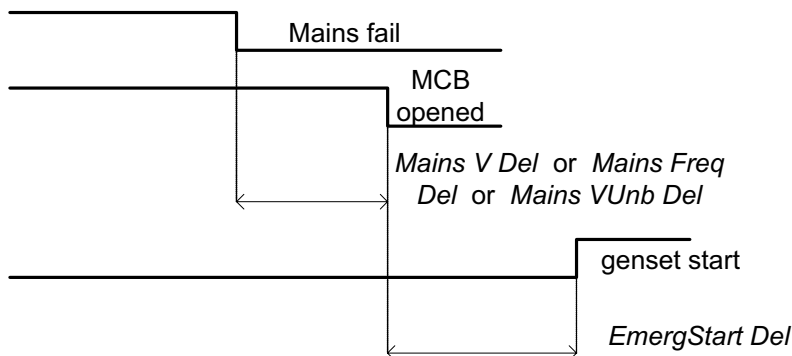
MCB Opens On = GENRUN:

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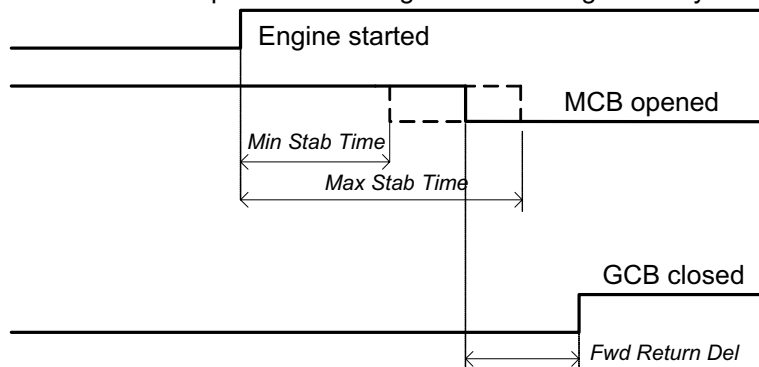
Relation between Mains return and MCB

OFF Mode, GCB and MCB are opened
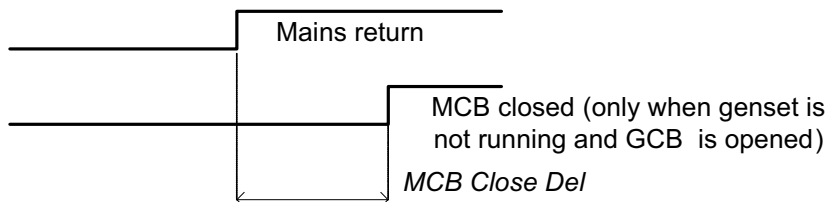
Relation between GCB and MCB

Conditions: AUTO Mode, Mains =off, MCB = opened, GCB = closed, gen-set loaded.
Mains returns: GCB opens (according 3., *MainsReturnDel*), MCB closes (*Fwd Return Del*)
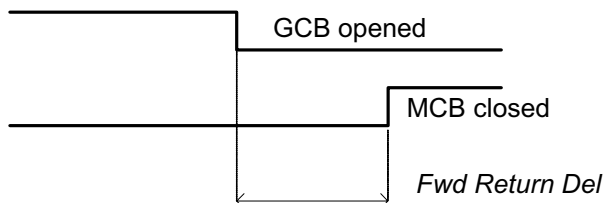
Relation between GCB and MCB (Test mode)

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 (*Fwd Return Del*)

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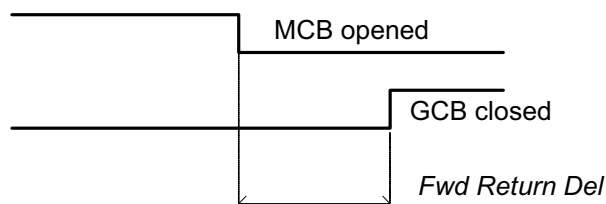
Alarm Management

Following alarms are available:
- Sensor fail
- Warning
- Shut down
- Mains failure

Sensor fail (FLS)

Sensor fail is detected when measured value is 6% out of selected sensor characteristic, or data from ECU is missing. Sensor fail is indicated by ##### symbol instead measured value.

Warning (WRN)

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

Possible warnings:

See List of possible events

Shut down (SD)

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

Possible shut-down alarms:

See List of possible events

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
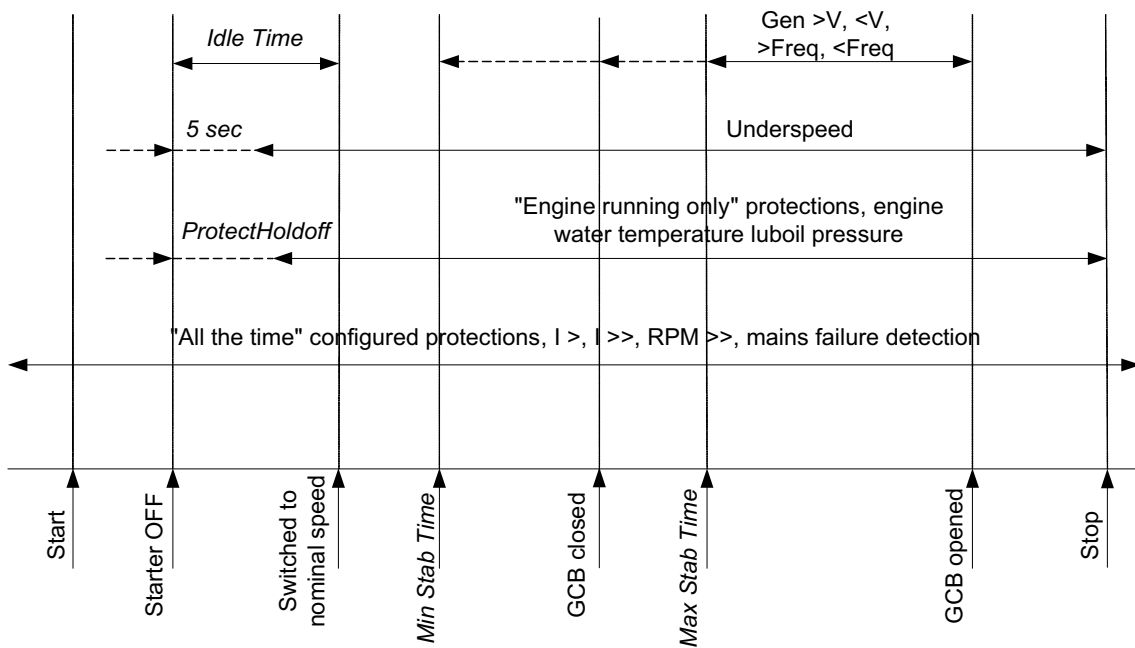
Voltage phase sequence detection

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

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

Sensor fail detection

Sensor fail Fls is detected when measured value is 6 percent out of range. Controller screen displays in this case string   #### instead measured value.
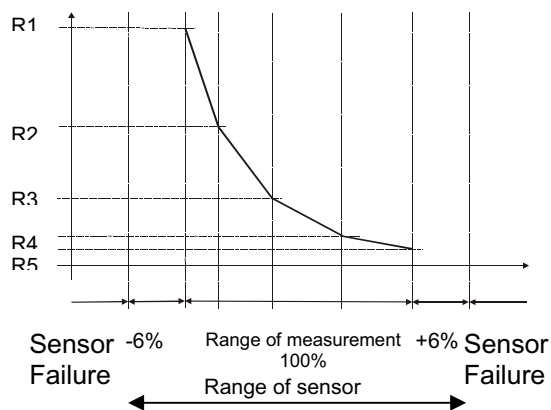
GCB, MCB fail detection

MCB or GCB fail detection is based on binary output CB close/open comparing with binary input CB 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 immediately (no delay).

BO GCB close/open — opened
BI GCB feedback — closed
Alarm: GCB fail — active
Alarm detection: immediatelly

BO GCB close/open — closed
BI GCB feedback — opened
Alarm: GCB fail — active
Alarm detection: immediatelly
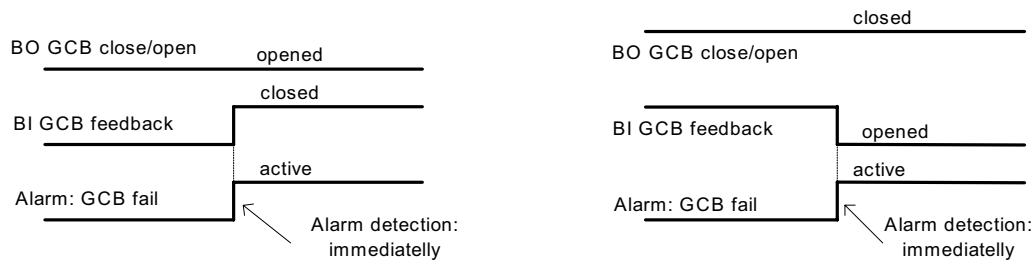
When BO GCB close/open (MCB close/open) opens there is 5 sec delay for GCB fail (MCB fail) detection.

BO GCB close/open — opened
BI GCB feedback — opened
Time delay 5 sec
Alarm: GCB fail — active
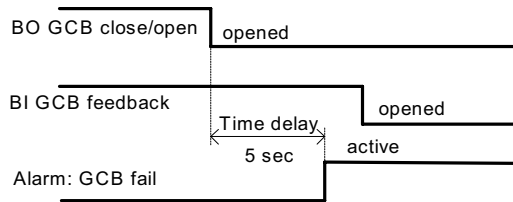
When BO GCB close/open (MCB close/open) closes, there is 5sec delay for GCB fail (MCB fail) detection:

BO GCB close/open — closed
BI GCB feedback — closed
Time delay 5 or 2 sec
Alarm: GCB fail — active
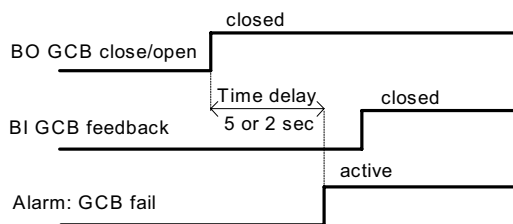
Hint:
You can solve state of MCB fail by pressing Fault Reset button.

Gen-set Operation States

Engine state machine

Init	Autotest during controller power on
Not ready	Gen-set is not ready to start
Prestart	Prestart sequence in process, Prestart output is closed
Cranking	Engine is cranking
Pause	Pause between start attempts
Starting	Starting speed is reached and the *Idle timer* is running
Running	Gen-set is running at nominal speed
Loaded	Gen-set is running at nominal speed and GCB OPEN/CLOSE is closed
Stop	Stop
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

Electric state machine

MainsOper	Mains is present
MainsFlt	Mains cut off – immediate state
ValidFlt	Mains cut off – takes EmergStart del
IslOper	Island operation
MainsRet	Mains recover
Brks Off	GCB, MCB opened
MinStabTO	Minimal Stabilization Timeout
MaxStabTO	Maximal Stabilization Timeout
FwRet Brk	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
AI1 Wrn	WRN	YES	Value measured on analog input 1 is lower than *AI1 Wrn* setpoint.
AI1 Sd	SD	YES	Value measured on analog input 1 is lower than *AI1 Sd* setpoint.
AI2 Wrn	WRN	YES	Value measured on analog input 2 is greater than *AI2 Wrn* setpoint.
AI2 Sd	SD	YES	Value measured on analog input 2 is greater than *AI2 Sd* setpoint.
AI3 Wrn	WRN	YES	Value measured on analog input 3 is greater than *AI3 Wrn* setpoint.
AI3 Sd	SD	YES	Value measured on analog input 3 is greater than *AI3 Sd* setpoint.
Wrn Batt Volt	WRN	YES	Battery voltage is out of limits given by *Batt Undervolt/Batt OverVolt* setpoints.
IOM AIx Wrn	WRN	YES	Warning alarm configurable on the input of IG-IOM/IGS-PTM.
IOM AIx Sd	SD	YES	Shutdown alarm configurable on the input of IG-IOM/IGS-PTM.
Binary input	Configurable	YES	Configurable Warning/Shutdown

Events specification	Protection type	Information on binary output available (See list of Binary outputs)	Description
			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.
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	SD	YES	The generator voltage is out of limits given by *Gen <V Sd* and *Gen >V Sd* setpoints.
Sd Gen V Unbal	SD	YES	The generator voltage is unbalanced more than the value of *Volt Unbal Sd* setpoint.
Sd Gen >Freq	SD	YES	The generator frequency is out of limits given by *Gen >Freq Sd* and *Gen <Freq Sd* setpoints.
Wrn Amps Unbal	SD	NO	The generator current is unbalanced.
Sd Overload	SD	YES	The load is greater than the value given by *Overload* setpoint.
Sd Overspeed	SD	YES	The protection comes active if the speed is greater than *Overspeed* setpoint.
Sd Underspeed	SD	YES	During starting of the engine when the RPM reach the value of *Starting RPM* setpoint the starter is switched off and the speed of the engine can drop under *Starting RPM* again. Then the Underspeed protection becomes active. Protection evaluation starts 5 seconds after reaching *StartingRPM*.
EmergencyStop	SD	NO	If the input *Emergency Stop* is opened shutdown is immediately activated.
GCB Fail	SD	NO	Failure of generator circuit breaker.
MCB Fail	MF	NO	Failure of mains circuit breaker.
SD RPMMeasFail	SD	NO	Failure of magnetic pick-up sensor for speed measurement.
Sd Stop Fail	SD	YES	Gen-set stop failed.
WrnMaintenance	WRN	NO	The period for servicing is set by the *Maintenance* setpoint. The protection comes active if the running hours of the engine reach this value.
ChargeAlt Fail	WRN	YES	Failure of alternator for charging the battery.
Sd Override	WRN	NO	The protection is active if the output *Sd Override* 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

Events specification	Protection type	Information on binary output available (See list of **Binary outputs**)	Description
Low BackupBatt	WRN	NO	RTC backup battery is flat

History file

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

Hint:

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

Record structure

Abbreviation	Historical value
Num	Number of historical event
Reason	Event specification
Date	Date of historical event in format DD/MM/YY
Time	Time of historical event in format HH:MM:SS
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
Vg2	Generator voltage L2
Vg3	Generator voltage L3
Ig1	Generator current L1
Ig2	Generator current L2
Ig3	Generator current L3
Mfrq	Mains frequency
Vm1	Mains voltage L1
Vm2	Mains voltage L2
Vm3	Mains voltage L3
UBat	Battery voltage
OilP	IL-NT Analog input 1 value (default Oil pressure)
EngT	IL-NT Analog input 2 value (default Water temperature)
FLvl	IL-NT Analog input 3 value (default Fuel level)
BIN	Binary inputs IL-NT
BOUT	Binary outputs IL-NT
FC	ECU alarm FailureCode
FMI	ECUalarm Failure Mode Identifier
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)

User Interface

InteliLite NT controller 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.

For details how to change the User Interface, please see the IL-NT Operator Guide.

Remote Control and Data Logging

Direct connection to the PC

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

Hint:

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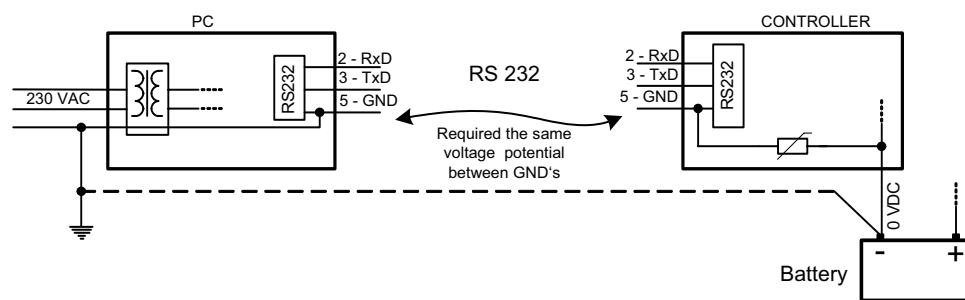
PC software – LiteEdit

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

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

Modbus protocol

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

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

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

Communication object vs. Register

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

Hint:

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

Communication object list (exported from default IL-NT-AMF25 archive)

Setpoints of AMF25:

Name	Firmware ver.	Application	Date	App. ver.	Ser. num.	Filename
IL-NT	IL-NT-1.3 R:11.07.2008	AMF25	11.7.2008	1,3	12345678	IL-NT-AMF25-1.3.AIL

Group	Name	Value	Dimension	Password	Com. obj.	Low limit	High limit	Data type
Basic Settings	Gen-set Name	IL-NT		No	8637			Short string
Basic Settings	Nominal Power	200	kW	No	8276	1	32000	Unsigned 16
Basic Settings	Nomin Current	350	A	No	8275	1	10000	Unsigned 16
Basic Settings	CT Ratio	2000	/5A	No	8274	1	5000	Unsigned 16
Basic Settings	PT Ratio	1,0	/1	No	9579	0,1	500,0	Unsigned 16
Basic Settings	Vm PT Ratio	1,0	V/V	No	9580	0,1	500,0	Unsigned 16
Basic Settings	Nominal Volts	231	V	No	8277	80	20000	Unsigned 16
Basic Settings	Nominal Freq	50	Hz	No	8278	45	65	Unsigned 16
Basic Settings	Gear Teeth	120		No	8252	0	500	Unsigned 16
Basic Settings	Nominal RPM	1500	RPM	No	8253	100	4000	Unsigned 16
Basic Settings	ControllerMode	OFF		No	8315			String list
Basic Settings	FltResGoToMAN	DISABLED		No	9983			String list
Basic Settings	ControllerAddr	1		Yes	24537	1	32	Unsigned 8
Basic Settings	COM1 Mode	DIRECT		Yes	24522			String list
Basic Settings	COM2 Mode	DIRECT		Yes	24451			String list
Basic Settings	ModemIniString			No	24436			Long string
Basic Settings	ModbusComSpeed	9600	bps	No	24477			String list
Engine Params	Starting RPM	25	%	No	8254	5	50	Unsigned 8
Engine Params	Starting Oil P	4,5	Bar	No	9681	0,0	10,0	Integer 16
Engine Params	Prestart Time	2	s	No	8394	0	600	Unsigned 16
Engine Params	MaxCrank Time	5	s	No	8256	1	60	Unsigned 8
Engine Params	CrnkFail Pause	8	s	No	8257	5	60	Unsigned 8

Engine Params	Crank Attempts	3		No	8255	1	10	Unsigned 8
Engine Params	Idle Time	12	s	No	9097	0	600	Unsigned 16
Engine Params	Min Stab Time	2	s	No	8259	1	10	Unsigned 16
Engine Params	Max Stab Time	10	s	No	8313	2	300	Unsigned 16
Engine Params	Cooling Speed	NOMINAL		No	10046			String list
Engine Params	Cooling Time	30	s	No	8258	0	3600	Unsigned 16
Engine Params	Stop Time	60	s	No	9815	0	240	Unsigned 16
Engine Params	Fuel Solenoid	DIESEL		No	9100			String list
Engine Params	D+ Function	DISABLED		No	9683			String list
Engine Params	ECU FreqSelect	DEFAULT		No	10266			String list
Engine Params	ECU SpeedAdj	50	%	No	9948	0	100	Unsigned 16
Engine Params	Fuel Pump ON	20	%	No	10100	-100	90	Integer 16
Engine Params	Fuel Pump OFF	90	%	No	10101	20	10000	Integer 16
Engine Protect	ProtectHoldoff	5	s	No	8262	0	300	Unsigned 16
Engine Protect	Horn Timeout	10	s	No	8264	0	600	Unsigned 16
Engine Protect	Overspeed Sd	115	%	No	8263	50	150	Unsigned 16
Engine Protect	AI1 Wrn	2,0	Bar	No	8369	-10,0	1000,0	Integer 16
Engine Protect	AI1 Sd	1,0	Bar	No	8370	-10,0	1000,0	Integer 16
Engine Protect	AI1 Del	3	s	No	8365	0	900	Unsigned 16
Engine Protect	AI2 Wrn	80	°C	No	8375	-100	10000	Integer 16
Engine Protect	AI2 Sd	90	°C	No	8376	-100	10000	Integer 16
Engine Protect	AI2 Del	5	s	No	8371	0	900	Unsigned 16
Engine Protect	AI3 Wrn	20	%	No	8381	-100	10000	Integer 16
Engine Protect	AI3 Sd	10	%	No	8382	-100	10000	Integer 16
Engine Protect	AI3 Del	10	s	No	8377	0	900	Unsigned 16
Engine Protect	Batt Overvolt	36,0	V	No	9587	18,0	40,0	Integer 16
Engine Protect	Batt Undervolt	18,0	V	No	8387	8,0	40,0	Integer 16
Engine Protect	Batt Volt Del	5	s	No	8383	0	600	Unsigned 16
Engine Protect	Maintenance	9999	h	No	9648	0	10000	Unsigned 16
Gener Protect	Overload Sd	120	%	No	8280	0	200	Unsigned 16
Gener Protect	Overload Del	5,0	s	No	8281	0,0	600,0	Unsigned 16
Gener Protect	Short Crct Sd	250	%	No	8282	100	500	Unsigned 16
Gener Protect	Short Crct Del	0,00	s	No	9991	0,00	10,00	Unsigned 16
Gener Protect	Amps IDMT Del	4,0	s	No	8283	1,0	60,0	Unsigned 16
Gener Protect	Amps Unbal Sd	50	%	No	8284	1	200	Unsigned 16
Gener Protect	Amps Unbal Del	5,0	s	No	8285	0,0	600,0	Unsigned 16

Gener Protect	Gen >V Sd	110	%	No	8291	70	200	Unsigned 16
Gener Protect	Gen <V Sd	70	%	No	8293	0	110	Unsigned 16
Gener Protect	Gen V Del	3,0	s	No	8292	0,0	600,0	Unsigned 16
Gener Protect	Volt Unbal Sd	10	%	No	8288	1	200	Unsigned 16
Gener Protect	Volt Unbal Del	3,0	s	No	8289	0,0	600,0	Unsigned 16
Gener Protect	Gen >Freq Sd	110,0	%	No	8296	85,0	200,0	Unsigned 16
Gener Protect	Gen <Freq Sd	85,0	%	No	8298	0,0	110,0	Unsigned 16
Gener Protect	Gen Freq Del	3,0	s	No	8297	0,0	600,0	Unsigned 16
AutoMains Fail	RetFromIsland	AUTO		No	9590			String list
AutoMains Fail	EmergStart Del	5	s	No	8301	0	6000	Unsigned 16
AutoMains Fail	MainsReturnDel	20	s	No	8302	1	3600	Unsigned 16
AutoMains Fail	Fwd Return Del	1,0	s	No	8303	0,0	600,0	Unsigned 16
AutoMains Fail	MCB Close Del	1,0	s	No	8389	0,0	60,0	Unsigned 16
AutoMains Fail	Mains >V	110	%	No	8305	60	150	Unsigned 16
AutoMains Fail	Mains <V	60	%	No	8307	50	110	Unsigned 16
AutoMains Fail	Mains V Del	2,0	s	No	8306	0,0	600,0	Unsigned 16
AutoMains Fail	Mains V Unbal	10	%	No	8446	1	150	Unsigned 16
AutoMains Fail	Mains VUnb Del	2,0	s	No	8447	0,0	60,0	Unsigned 16
AutoMains Fail	Mains >Freq	102,0	%	No	8310	98,0	150,0	Unsigned 16
AutoMains Fail	Mains <Freq	98,0	%	No	8312	50,0	102,0	Unsigned 16
AutoMains Fail	Mains Freq Del	0,5	s	No	8311	0,0	60,0	Unsigned 16
AutoMains Fail	MCB Logic	CLOSE-OFF		No	8444			String list
AutoMains Fail	ReturnFromTEST	MANUAL		No	8618			String list
AutoMains Fail	MCB Opens On	GENRUN		No	9850			String list
Extension I/O	IOM AI1 Wrn	0	U4	No	8762	-100	10000	Integer 16
Extension I/O	IOM AI1 Sd	0	U4	No	8766	-100	10000	Integer 16
Extension I/O	IOM AI1 Del	5	s	No	8770	0	900	Unsigned 16
Extension I/O	IOM AI2 Wrn	0	U5	No	8763	-100	10000	Integer 16
Extension I/O	IOM AI2 Sd	0	U5	No	8767	-100	10000	Integer 16
Extension I/O	IOM AI2 Del	5	s	No	8771	0	900	Unsigned 16
Extension I/O	IOM AI3 Wrn	0	U6	No	8764	-100	10000	Integer 16
Extension I/O	IOM AI3 Sd	0	U6	No	8768	-100	10000	Integer 16
Extension I/O	IOM AI3 Del	5	s	No	8772	0	900	Unsigned 16
Extension I/O	IOM AI4 Wrn	0	U7	No	8765	-100	10000	Integer 16
Extension I/O	IOM AI4 Sd	0	U7	No	8769	-100	10000	Integer 16
Extension I/O	IOM AI4 Del	5	s	No	8773	0	900	Unsigned 16
Extension I/O	IOM AI1 Calibr	0	U4	No	8793	-1000	1000	Integer 16

Extension I/O	IOM AI2 Calibr	0	U5	No	8794	-1000	1000	Integer 16
Extension I/O	IOM AI3 Calibr	0	U6	No	8795	-1000	1000	Integer 16
Extension I/O	IOM AI4 Calibr	0	U7	No	8796	-1000	1000	Integer 16
Date/Time	Time Stamp Per	60	min	No	8979	0	240	Unsigned 8
Date/Time	SummerTimeMod	DISABLED		No	8727			String list
Date/Time	Time	0:00:00		No	24554			Time
Date/Time	Date	1.1.2006		No	24553			Date
Date/Time	Timer1 Repeat	NONE		No	10045			String list
Date/Time	Timer1 ON Time	5:00:00		No	10042			Time
Date/Time	Timer1Duration	5	min	No	10044	1	1440	Unsigned 16
Date/Time	Timer2 Repeat	NONE		No	10202			String list
Date/Time	Timer2 ON Time	5:00:00		No	10199			Time
Date/Time	Timer2Duration	5	min	No	10201	1	1440	Unsigned 16
Sensors Spec	AI1Calibration	0,0	Bar	No	8431	-100,0	100,0	Integer 16
Sensors Spec	AI2Calibration	0	°C	No	8407	-1000	1000	Integer 16
Sensors Spec	AI3Calibration	0	%	No	8467	-1000	1000	Integer 16
SMS/E-Mail	Yel Alarm Msg	OFF		No	8482			String list
SMS/E-Mail	Red Alarm Msg	OFF		No	8484			String list
SMS/E-Mail	TelNo/Addr Ch1			No	9597			Long string
SMS/E-Mail	TelNo/Addr Ch2			No	9598			Long string

Values of AMF25:

Name	Firmware ver.	Application	Date	App. ver.	Ser. num.	Filename
IL-NT	IL-NT-1.3 R:11.07.2008	AMF25	11.7.2008	1,3	12345678	IL-NT-AMF25-1.3.AIL

Group	Name	Value	Dimension	Com. obj.	Data type
Engine	RPM	1500	RPM	8209	Unsigned 16
Engine	Diagnostic ECU	[010]		10034	Binary 8
Engine	Fuel Rate ECU	0,0	L/h	9860	Unsigned 16
Engine	Cool Temp ECU	22	°C	9855	Integer 16
Engine	IntakeTemp ECU	20	°C	9878	Integer 16
Engine	Oil Press ECU	0,0	Bar	10354	Integer 16
Engine	BoostPress ECU	0,0	Bar	9877	Unsigned 8
Engine	Oil Temp ECU	22	°C	9857	Integer 16
Generator	Gen kW	150	kW	8202	Integer 16
Generator	Gen kW L1	50	kW	8524	Integer 16
Generator	Gen kW L2	50	kW	8525	Integer 16
Generator	Gen kW L3	50	kW	8526	Integer 16
Generator	Gen kVAr	15	kVAr	8203	Integer 16

Generator	Gen kVAr L1	5	kVAr	8527	Integer 16
Generator	Gen kVAr L2	5	kVAr	8528	Integer 16
Generator	Gen kVAr L3	5	kVAr	8529	Integer 16
Generator	Gen kVA	153	kVA	8565	Integer 16
Generator	Gen kVA L1	51	kVA	8530	Integer 16
Generator	Gen kVA L2	51	kVA	8531	Integer 16
Generator	Gen kVA L3	51	kVA	8532	Integer 16
Generator	Gen PF	1,00		8204	Integer 8
Generator	Gen Load char	R		8395	Char
Generator	Gen PF L1	1,00		8533	Integer 8
Generator	Gen Ld Char L1	R		8626	Char
Generator	Gen PF L2	1,00		8534	Integer 8
Generator	Gen Ld Char L2	R		8627	Char
Generator	Gen PF L3	1,00		8535	Integer 8
Generator	Gen Ld Char L3	R		8628	Char
Generator	Gen freq	50,0	Hz	8210	Unsigned 16
Generator	Gen V L1-N	230	V	8192	Unsigned 16
Generator	Gen V L2-N	230	V	8193	Unsigned 16
Generator	Gen V L3-N	230	V	8194	Unsigned 16
Generator	Gen V L1-L2	398	V	9628	Unsigned 16
Generator	Gen V L2-L3	398	V	9629	Unsigned 16
Generator	Gen V L3-L1	398	V	9630	Unsigned 16
Generator	Gen A L1	41	A	8198	Unsigned 16
Generator	Gen A L2	41	A	8199	Unsigned 16
Generator	Gen A L3	41	A	8200	Unsigned 16
Mains	Mains V L1-N	231	V	8195	Unsigned 16
Mains	Mains V L2-N	230	V	8196	Unsigned 16
Mains	Mains V L3-N	230	V	8197	Unsigned 16
Mains	Mains V L1-L2	398	V	9631	Unsigned 16
Mains	Mains V L2-L3	398	V	9632	Unsigned 16
Mains	Mains V L3-L1	398	V	9633	Unsigned 16
Mains	Mains freq	50,0	Hz	8211	Unsigned 16
Controller I/O	Battery Volts	24,3	V	8213	Integer 16
Controller I/O	D+	5,7	V	10603	Integer 16
Controller I/O	Oil Pressure	15,6	Bar	8227	Integer 16
Controller I/O	Engine Temp	50	°C	8228	Integer 16
Controller I/O	Fuel Level	99	%	8229	Integer 16
Controller I/O	Bin Inputs	[1111001]		8235	Binary 16
Controller I/O	Bin Outputs	[1111000]		8239	Binary 16
Extension I/O	IOM AI1	10	U4	8978	Integer 16

Extension I/O	IOM AI2	20	U5	8759	Integer 16
Extension I/O	IOM AI3	30	U6	8760	Integer 16
Extension I/O	IOM AI4	40	U7	8761	Integer 16
Extension I/O	IOM Bin Inp	[01000110]		8602	Binary 16
Extension I/O	IOM Bin Out	[11011001]		8604	Binary 16
Extension I/O	RA Bin Out	[100010010000000]		9849	Binary 16
Statistics	Energy kWh	0		8205	Integer 32
Statistics	Energy kVArh	0		8539	Integer 32
Statistics	Run Hours	0,0	h	8206	Integer 32
Statistics	Num Starts	0		8207	Unsigned 16
Statistics	Maintenance	9999	h	9648	Unsigned 16
Statistics	Num E-Stops	0		11195	Unsigned 32
Statistics	Shutdowns	0		11196	Unsigned 32
IL Info	Engine State	#####		8330	Unsigned 16
IL Info	Breaker State	#####		8455	Unsigned 16
IL Info	Timer Text	#####		8954	Unsigned 16
IL Info	Timer Value	0	s	8955	Unsigned 16
IL Info	FW Version	0,0		8393	Unsigned 8
IL Info	Application	6		8480	Unsigned 8
IL Info	FW Branch	1		8707	Unsigned 8
IL Info	PasswordDecode	#####		9090	Unsigned 32
Date/Time	Time	#####		24554	Time
Date/Time	Date	#####		24553	Date

[1] In case of software malfunction DiagData shows the value that enables to locate possible bug in software. Include this number when reporting a software problem.

Remote Communication

Internet connection

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

Recommended ISDN modem

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

Recommended GSM modem

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

GSM Modem setup

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.

| Analog modem | ↔ | Analog modem | or | GSM modem | ↔ | GSM modem |
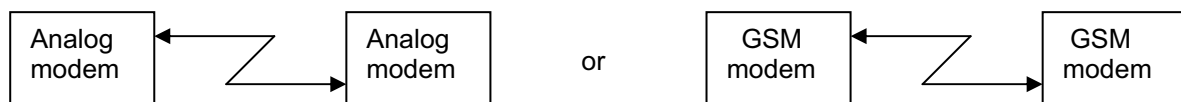
Mobile SIM card setting

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

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.

Technical Data

Power supply

Voltage supply	8-36V DC
Consumption	40-430mA depend on supply voltage and temperature

Consumption depends on supply voltage	0,104A at 8VDC
	0,080A at 12VDC
	0,051A at 24VDC
	0,044A at 30VDC
	0,040A at 36VDC

Allowed supply voltage drop-out:	100ms from min. 10V, return to min. 8V
Battery voltage measurement tolerance	2 % at 24V

Hint:

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

Operating conditions

Operating temperature 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 ^{o}C - + 70 ^{o}C even if the other electronic components work in wider temperature range.

Internal preheating foil is mounted in InteliLite^{NT} LT to extend display operational temperature range. Preheating starts at temperature below 5 ^{o}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 ^{o}C..+70°C	-40 ^{o}C..+70°C
Storage temperature	-30 ^{o}C..+80°C	-30 ^{o}C..+80°C

Preheating foil increases controller current consumption

Controller consumption at	No preheating	Preheating at ambient temperature		
		0 ^{o}C	-20 ^{o}C	-40 ^{o}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 ^{o}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
Switching voltage level for close contact indication   0-2 V
Max voltage level for open contact indication   8-36 V

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

Analog inputs

Not electrically separated
Number of inputs   3
Resolution   10 bits
Jumper selectable range   V, Ohm(default), mA
Maximal resistance range   2500 Ω

Maximal voltage range	2.5 V
Current range	0 – 20 mA
Input impedance	180 Ω for mA measuring
Input impedance	> 100 kΩ for V measuring
Resistance measurement tolerance	± 2 % ± 2 Ω out of measured value
Voltage measurement tolerance	± 1 % ± 1mV out of measured value
Current measurement tolerance	± 2.5 % ± 0,5mA out of measured value

Speed pick-up input

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

D+ Function

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

**CAN bus interface*

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

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

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

Recommended Industrial Automation & Process Control Cables:
BELDEN (see http://www.belden.com):
- 3082A DeviceBus for Allen-Bradley DeviceNet
- 3083A DeviceBus for Allen-Bradley DeviceNet
- 3086A DeviceBus for Honeywell SDS
- 3087A DeviceBus for Honeywell SDS
- 3084A DeviceBus for Allen-Bradley DeviceNet
- 3085A DeviceBus for Allen-Bradley DeviceNet
- 3105A Paired EIA Industrial RS485 cable

LAPP CABLE (see http://www.lappcable.com)
- Unitronic BUS DeviceNet Trunk Cable
- Unitronic BUS DeviceNet Drop Cable
- Unitronic BUS CAN
- Unitronic-FD BUS P CAN UL/CSA

IL-NT RS232 interface (optional card)

Plugs into IL-NT controller COMMUNICATIN 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

IL-NT S-USB interface (optional card)

Plugs into IL-NT controller COMMUNICATIN MODULE port.

Maximal distance	5m
Maximum Speed	Up to 57.6 kBd (DIRECT), 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:
USBCABLE – ComAp A-B USB cable.

IL-NT AOUT8 interface (optional card)

Plugs into IL-NT controller EXTENSION MODULE port.

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

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