InteliATS^{NT} PWR

SW version 2.5

Automatic Transfer Switch Controller

Reference guide
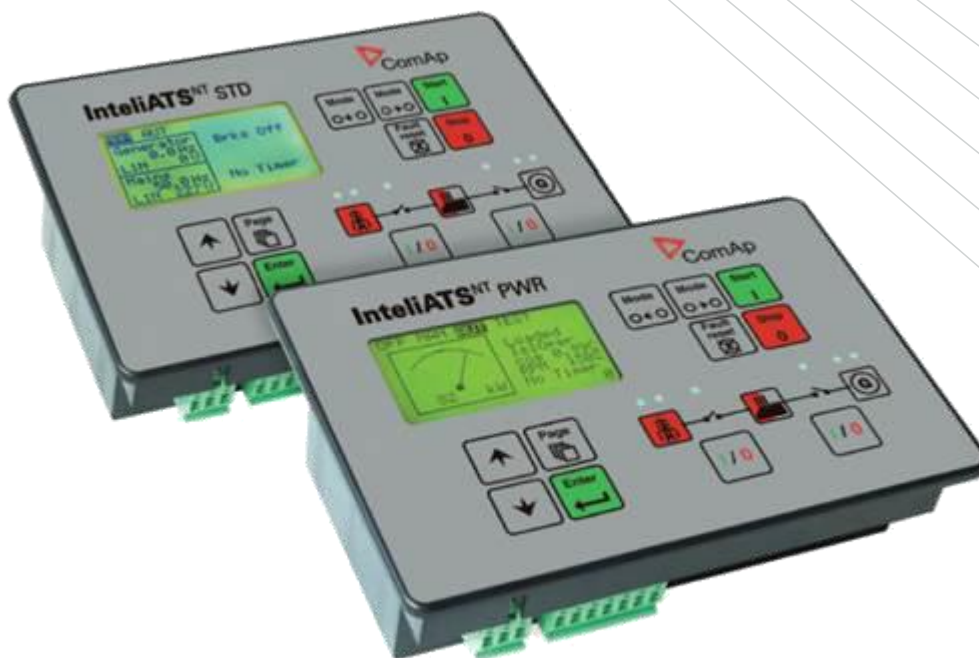
Table of Contents

Document information

Clarification of notation

HINT:
This type of paragraph points out details to help user installation/configuration.

NOTE:
This type of paragraph calls readers attention to a notice or related theme.

CAUTION!
This type of paragraph highlights a procedure, adjustment etc., which can cause a damage or unproper function of the equipment if not performed correctly and may not be clear at first sight.

WARNING!
This type of paragraph indicates things, procedures, adjustments etc. which need high level of attention, otherwise can cause personal injury or death.

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

Conformity Declaration

The following described machine complies with the appropriate basic safety and health requirement of the EC Low Voltage Directive No: 73/23 / EEC and EC Electromagnetic Compatibility Directive 89/336 / EEC based on its design and type, as brought into circulation by us.

General Guidelines

What is in this manual?

This manual describes the InteliATS^{NT} PWR (IA-NT-PWR) software, which is designed for automatic transfer switch applications and provides general information on how to install and operate the InteliATS^{NT} controller.

This manual is dedicated for
- Automatic transfer switch panel builders
- Operators of remote gen-sets (started remotely from InteliATS^{NT})
- For everybody who is concerned with installation, operation and maintenance of the gen-set

InteliATS controller SW and HW versions compatibility
Software InteliATS^{NT} is compatible with the InteliATS^{NT} hardware v. 1.3 and higher.

There are two modifications of the InteliATS^{NT} HW - STD and PWR and two modifications of the InteliATS^{NT} SW – STD and HW which together with the appropriate archive file (IA-NT-STD-HW_1.3-X.X.AIL for STD HW 1.3, IA-NT-STD-X.X.AIL for STD HW > 1.3 and IA-NT-PWR-X.X.AIL) form the InteliATS^{NT} PWR or STD controller.

Beside that the InteliATS^{NT} software is compatible with IL-NT AMF HW 1.3 and higher too, which is used when a low temperature ATS application is needed. In this case the InteliATS^{NT} SW must be combined (purchased) with the IL-NT AMF 25 LT HW to obtain the low temperature ATS controller.

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

<u>CAUTION!</u>
SW and HW must be compatible (e.g. IA-NT firmware and IA-NT 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.

<u>NOTE:</u>
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.

<u>WARNING!</u>
Remote control - InteliATS^{NT} controller can be remotely controlled. In case of the work on the controlled devices check, that nobody can perform remote operation. To be sure disconnect
- remote control via RS232 line
- input REM TRANSFER
- input REMOTE AUT
- input REMOTE TEST
or disconnect output Rem START/STOP and outputs GCB CLOSE/OPEN and MCB CLOSE/OPEN

WARNING!
Every time you want to disconnect following InteliATS^NT controller terminals:
- Mains voltage measuring   and / or
- Binary output for MCB control   and / or
- MCB Feedback

Switch InteliATS^NT to MAN or OFF Mode or disconnect the Binary outputs Rem Start/Stop and GCB Close/Open to avoid unexpected automatic start of gen-set and GCB closing.

WARNING!

Dangerous voltage

In no case touch the terminals for voltage and current measurement!

Always connect grounding terminals!

In any case do not disconnect InteliATS^NT current transformer terminals!

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

Description

Description of the controller system

InteliATS^NT is a comprehensive Automatic Transfer Switch controller designed to monitor the incoming AC mains supply (1 or 3 phases) for under & over voltage, under & over frequency and voltage unbalance. In the case of any mains supply disproportion it will send a remote start command to the gen-set and make changeover for both generator and mains contactors. The gen-set requires a remote start type control unit (e.g. the ComAp InteliLite^NT MRS 10 controller), at least a key-start box with an external input for the start/stop signal.

The controller is capable of providing the following three different types of changeover (transition)
- open delayed transition
- open in-phase transition with synch check
- closed short-time (100ms) parallel transition with synch check

In order to provide "synch check" the controller has been enhanced by the feature called passive synchronization. The passive sync (sync check) offers possibility to "synchronize" mains and gen-set without the need to use speed regulation or - better to say - it offers possibility to wait for the both sources to get in phase.
System is evaluated as to be in sync according to the predefined parameters – voltage and frequency difference – if the both sources will get in-phase before the synchronization timeout expires. Parameters defining breaker delay are taken into the account when the system computes/predicts exact moment when the both sources are "in phase".

InteliATS^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 & ATS Breaker.
The key features are:
- Easy-to-use operation and installation. Factory default configuration covers most of applications
- Different customer changes are possible thanks to the configurability
- Excellent remote communication capabilities
- High reliability

Example application
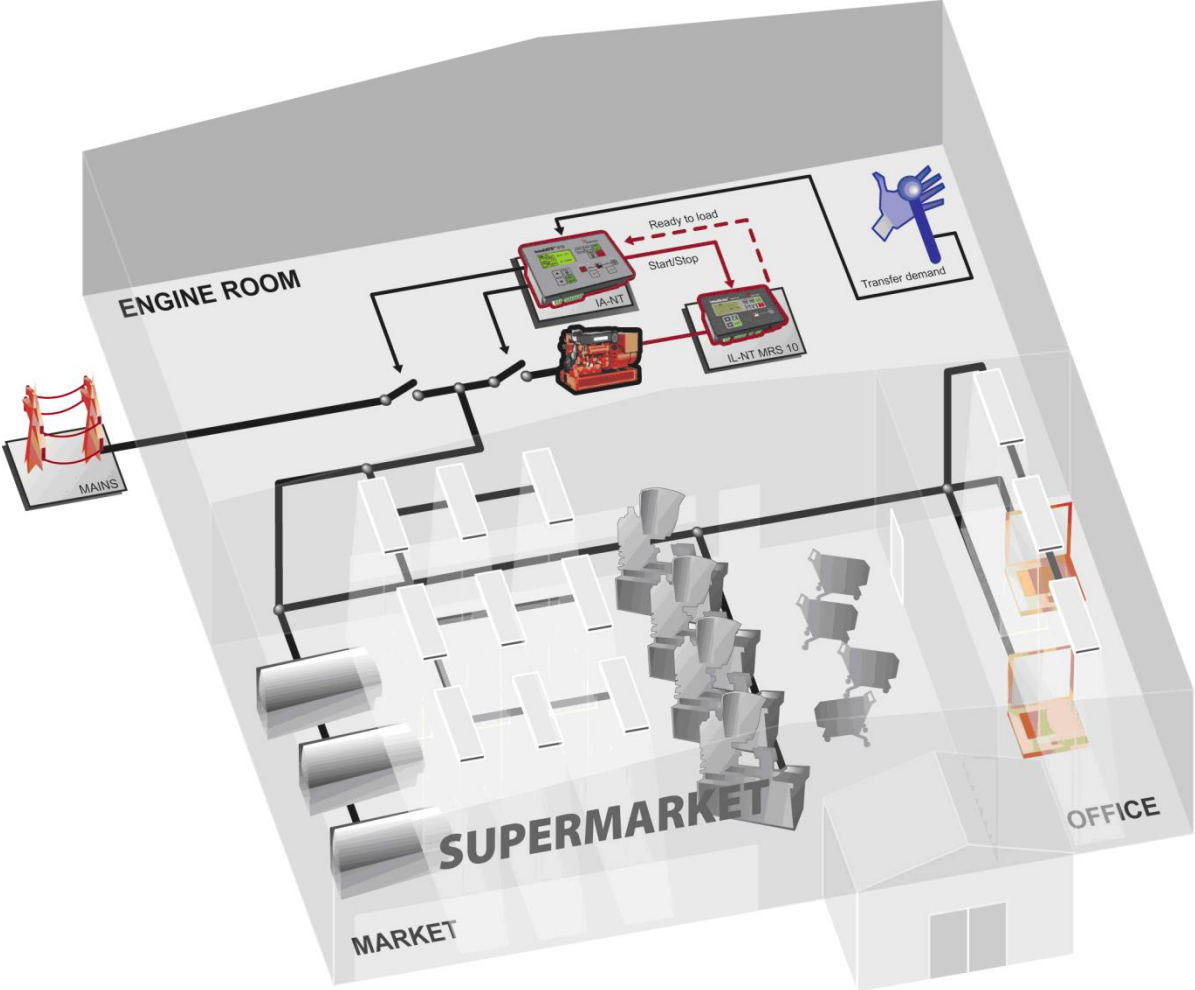
Configurability

One of the key features of the controller is high level of adaptability of the system to the needs of every particular application. The way, how to achieve this, is the configuration.

> **NOTE:**
> Use **LiteEdit** PC software to read configuration from the controller or disk, view it, modify it and write the configuration to controller or disk.

The firmware contains a number of binary inputs and outputs needed for all necessary functions available in the firmware. But not all functions are required at the same time on different gen-sets and also the controller hardware does not have so many input and output terminals. One of the main tasks of the configuration is mapping of "logical" firmware inputs and outputs to the "physical" hardware inputs and outputs.

Configuration parts:

1. Mapping of logical binary inputs (functions) or assigning alarms to physical binary input terminals
2. Mapping of logical binary outputs (functions) to physical binary output terminals
3. Changing language of the controller texts

The controller is delivered with a **default configuration, which should fit to most standard applications**. This default configuration can be changed only using PC and LiteEdit software. See LiteEdit documentation for details.

> **NOTE:**
> You need one of communication modules to connect the controller to a PC with LiteEdit. There is a special easy removable service module for cases, where there is no communication module permanently attached.

Once the configuration is modified, it can be stored in a file for later usage with another controller or for backup purposes. The file is called **archive** and has file extension ".ail". An archive contains full image of the controller at the moment of saving (if the controller is online to the PC) except firmware, i.e. besides configuration there are also current adjustment of all setpoints, all measured values, a copy of history log and a copy of alarm list.

The archive can be simply used for **cloning** of controllers, which means preparing controllers with identical configuration and settings.

What is in the package?

Accessories	Description	Optional / Obligatory
IA-NT PWR	InteliATS^NT central unit, PWR version	Obligatory
IL-NT-RS232	RS232 communication card	Optional
IL-NT-RS232-485	RS232 and RS485 communication card	Optional
IL-NT-S-USB	Service USB communication card	Optional
IB-Lite	Internet communication bridge	Optional
IL-NT-GPRS	GSM/GPRS modem card	Optional
IL-NT-AOUT8	Gauge driver plug-in card	Optional
IL-NT-BIO8	Configurable I/O plug-in card	Optional
*IL-NT RD	Remote display software	Optional
InternetBridge-NT	External communication module	Optional

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

IL-NT RS232 Communication module

IL-NT RS232 is optional plug-in card to enable InteliATS^{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 inserted it, the module will snap under plastic teeth. It is supposed to be installed permanently. Should you need to remove it, the safest way is to remove whole back cover and then remove module manually.

How to install RS 232 communication module:

NOTE:
The following procedure is analogic also for other communication modules.

1. Insert a screwdriver into the slot of the cover.
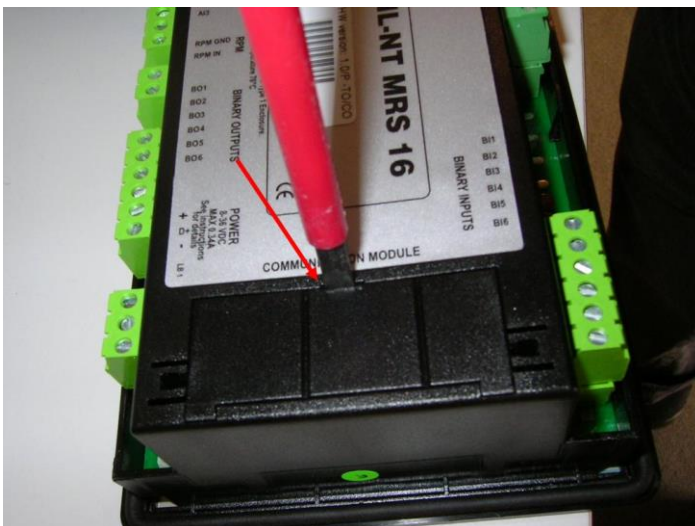
2. Move the screwdriver to set apart the small cover. **Be careful!**
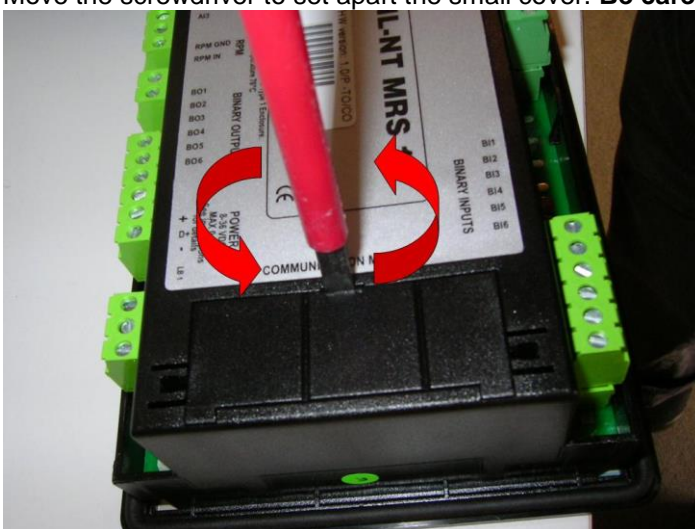
3. Remove the small cover.
4. Break apart the small cover into two pieces. **Do not throw away the smaller part!**
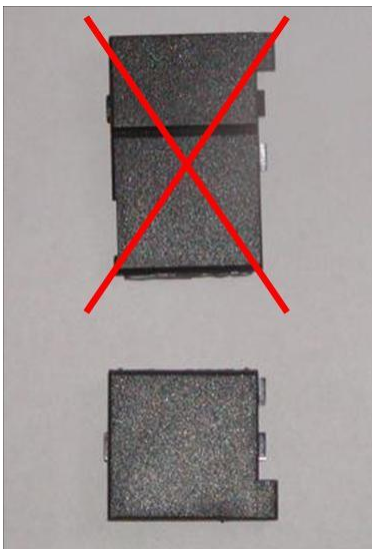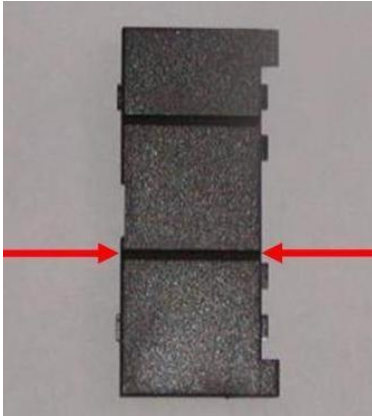
5. Take RS 232 communication module.

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

NOTE:

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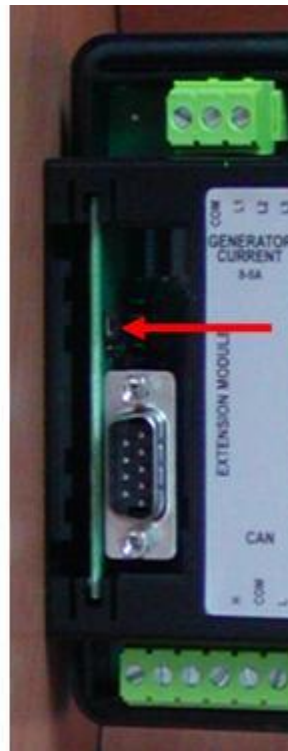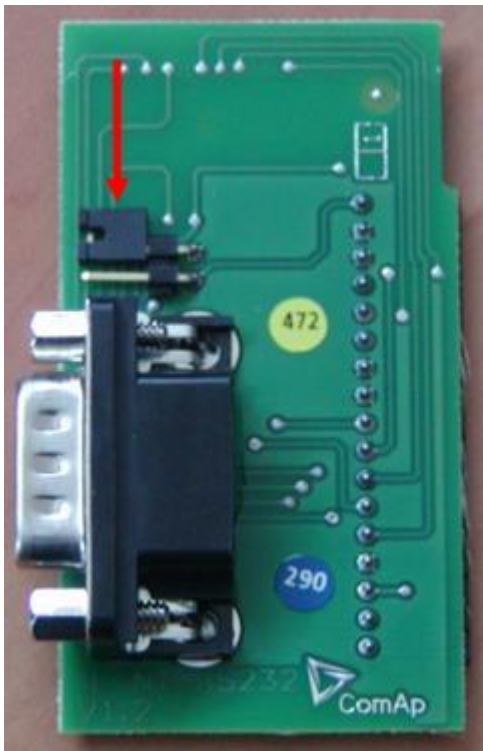
RS 232 communication module with the boot jumper.

IL-NT RS232-485 Communication module

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

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

RS485

RS232

Boot jumper
RS485 Terminator jumper

RS485 balancing resistor jumpers

Boot jumper

RS485 120R terminator jumper

B (RxTx -)
GND
A (RxTx +)

RS232 COM1

RS485 COM2

RS485 internal wiring

+5V
Balancing resistor
A
Terminator
GND
Balancing resistor
B

A
GND
B

NOTE:
- Balancing resistors shall be both closed at only one device in whole RS485 network.

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

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

IL-NT S-USB Service USB communication module

IL-NT S-USB is optional plug-in card to enable InteliATS^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.
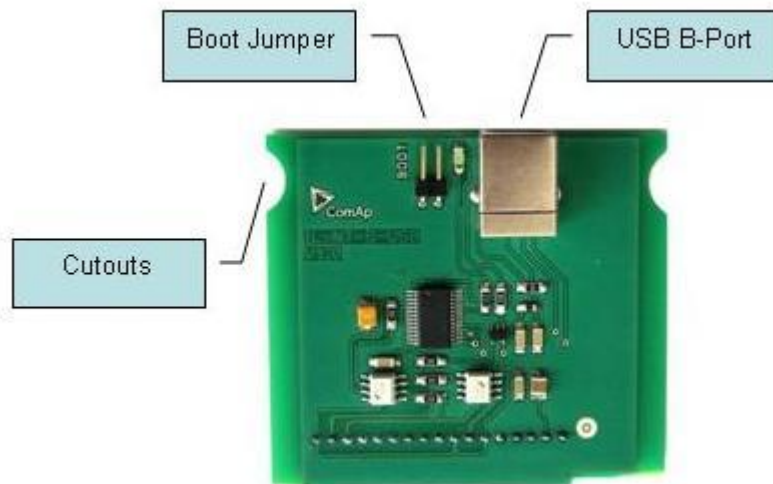
NOTE:
Use the shielded USB A-B cable with this module! Recommended is ComAp cable – Order code: "USB-LINK CABLE 1.8M".

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

Or follow video guide "**Boot Jumper Programming"** at http://www.comap.cz/support/training/training-videos/.
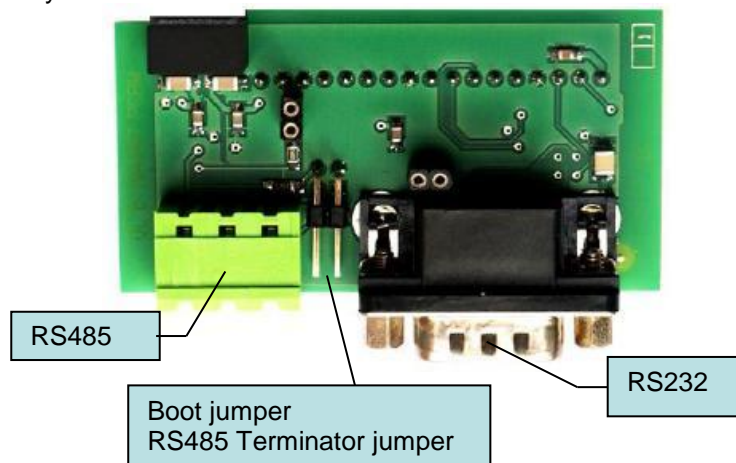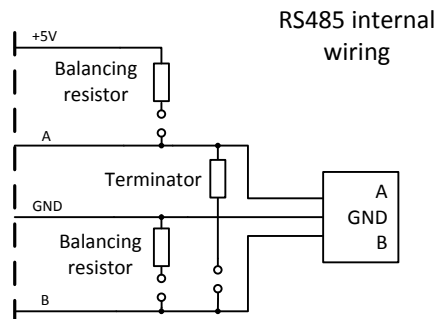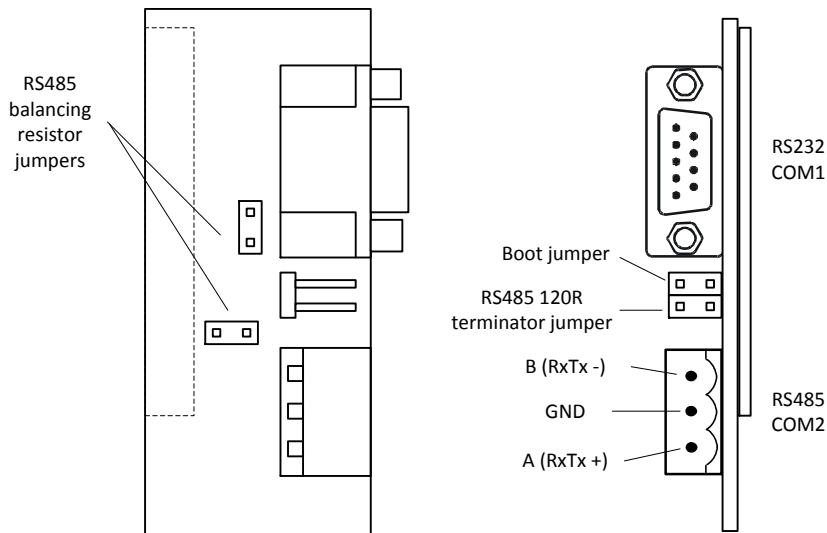
IL-NT RD Remote display software

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

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

NOTE:
Please see the "IL-NT-RD Remote display software" chapter for more details.

IB-Lite Communication module

IB-Lite is optional plug-in card to enable InteliATS^NT communication via Ethernet/Internet. 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 and pull it up manually.

See IB-Lite-Reference Guide for further details.
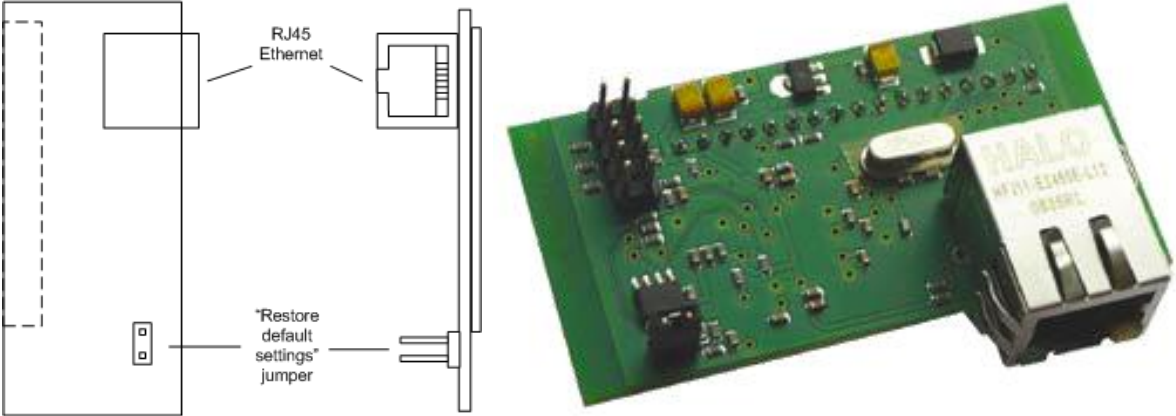
Use Ethernet UTP cable with RJ45 connector for connection of the module into your ethernet network. The module can be also connected directly to a PC using cross-wired UTP cable.
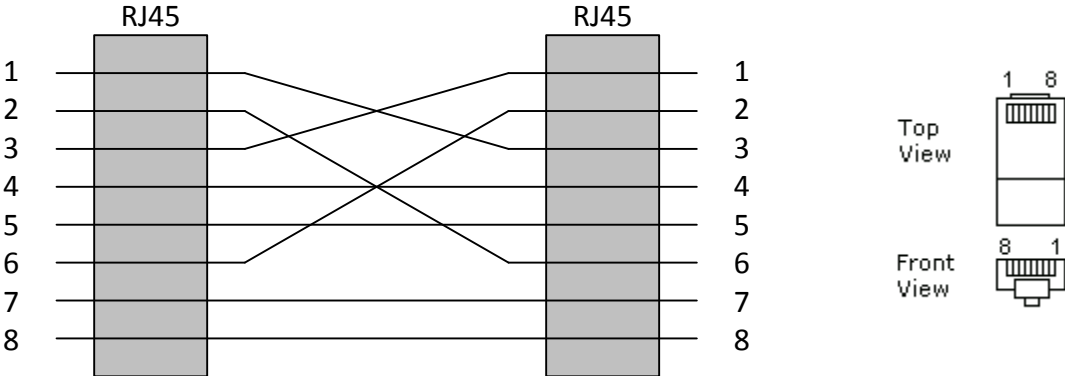
CROSS-WIRED UTP 10/100Mbit
CABLE

Web server for IB-Lite
Is a new secured way of monitoring and controlling the gen-set from any point in world using your web browser. It offers clear overview and control of the state of engine, its settings and history. User friendly.

See IB-Lite-Reference Guide and pictures below for further details.

Scada window:

Measurement window:

Setpoints window:

Groups	Basic Settings	
Basic Settings	ControllerName (-)	**IA-NT-PWR**
Engine Params	Nominal Power (1 - 5000)	**200** kW
Gener Protect	Nomin Current (1 - 10000)	**350** A
AMF Settings	CT Ratio (1 - 5000)	**2000** /5A
Sync Ctrl	PT Ratio (0.1 - 500.0)	**1.0** /1
Date/Time	Vm PT Ratio (0.1 - 500.0)	**1.0** /1
SMS/E-Mail	NomVolts Ph-N (80 - 20000)	**231** V
	NomVolts Ph-Ph (138 - 35000)	**400** V
	Nominal Freq (45 - 65)	**50** Hz
	ActivityAtOFF (DISABLED, ENABLED)	**ENABLED**

History window:

No.	Reason	Time	Date	Mode	Pwr	PF	LChr	Vg1	Vg2	Vg3	IL1	IL2	IL3	Gfrq	Vm1	Vm2	Vm3	Mfrq	UBat	BIN	BOUT
0	Mains <Freq	16:34:52	02/06/10	0	0	0.00		0	0	0	0	0	0	0.0	0	0	0	0.0	24.2	0000000	0001000
-1	FW Loaded	16:34:49	02/06/10	0	0	0.00		0	0	0	0	0	0	0.0	0	0	0	0.0	0.0	0000000	0001000
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HINT:
This feature requires IB-Lite optional plug-in module and visible connection of controller to Ethernet/Internet.

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

This plug-in module is a GSM/GPRS modem which can work in two modes of operation based on the settings in the setpoint COM1 Mode.

- Settings DIRECT = the module works in a GPRS network and enables connection via AirGate to LiteEdit and WebSupervisor as well as sending SMS alarms.

- Settings MODEM = the module works as a standard GSM modem enabling a CSD (Circuit Switch Data) connection to the controller with LiteEdit or InteliMonitor and sending SMS alarms.
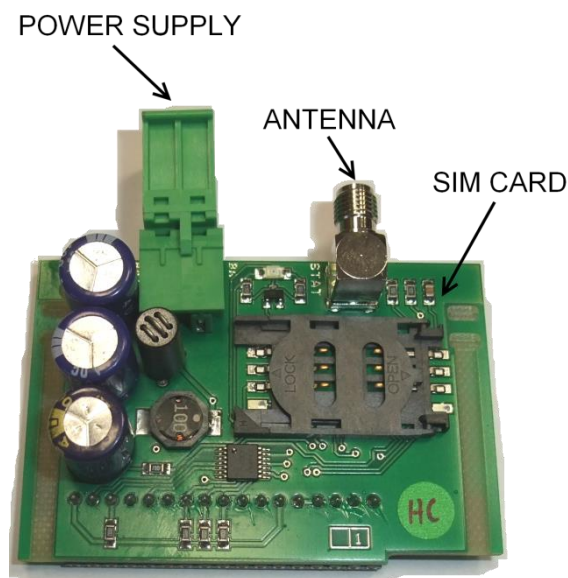
The communication module IL-NT GPRS works with:

- WebSupervisor – internet-based remote monitoring solution

- AirGate – powerful connection technology to make internet access as simple as possible

- Locate – localization technology

IL-NT AOUT8 Gauge driver module

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

To insert the module, you must open the cover first (use screwdriver to open) and then insert the module into slot. Once you have insert it, the module will snap under plastic teeth. It is supposed to be installed permanently. Should you need to remove it, the safest way is to remove whole back cover and then remove module manually.
Installing IL-NT AOUT8 module is similar to installing RS 232 module. The difference is that module fits to "extension module" slot and after installing IL-NT AOUT8 you do not put back the small cover.

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

IL-NT AOUT8 module:
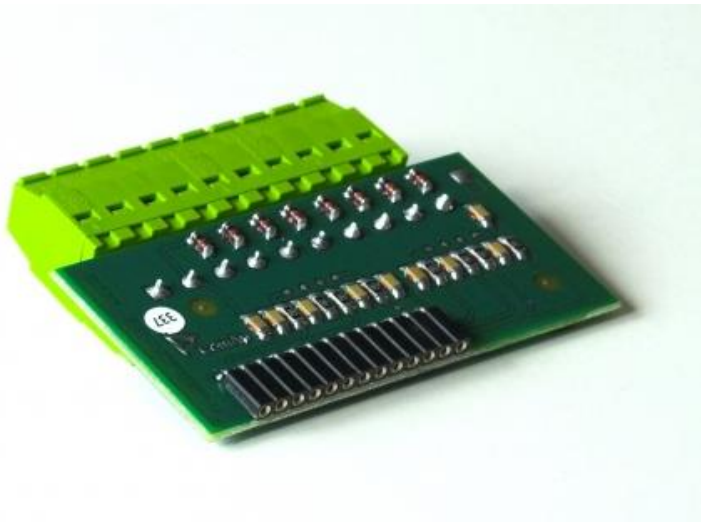
Typical wiring
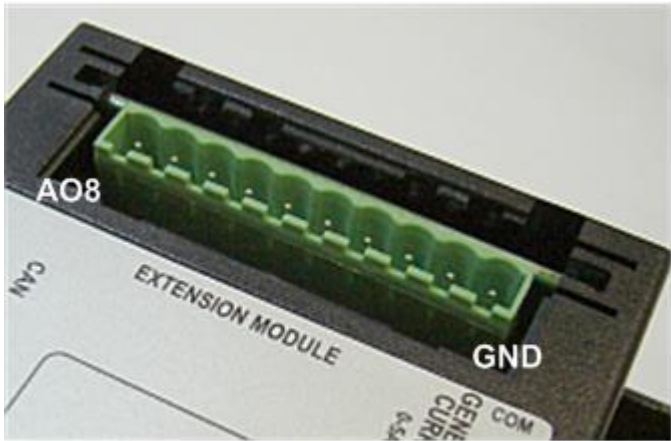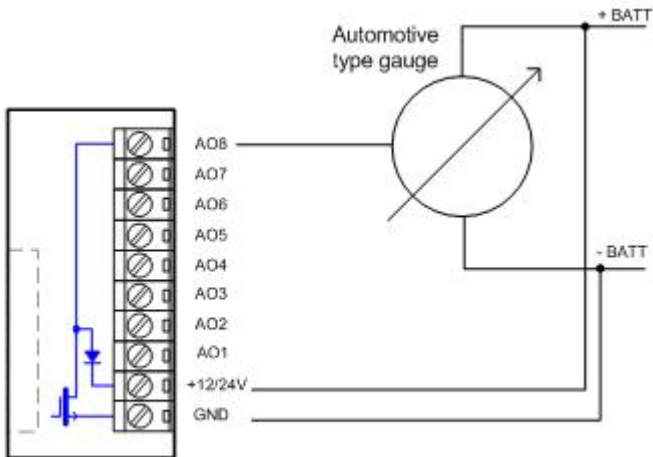
IL-NT BIO8 Hybrid binary input/output module

IL-NT BIO8 is optional plug-in card. Through this card controller can accommodate up to 8 binary inputs or outputs. In LiteEdit PC configuration tool (version 4.4 and higher) it is possible to easily choose if particular I/O will be binary input or output.
Installing IL-NT BIO8 module is similar to installing RS 232 module. The difference is that module fits to "Extension module" slot and after installing IL-NT BIO8 you do not put back the small cover.

IL-NT-BIO8
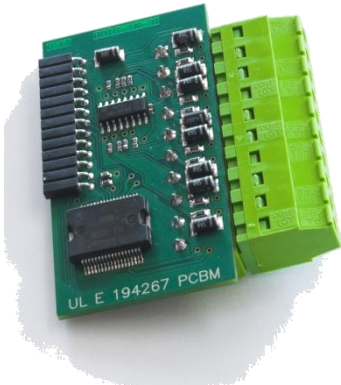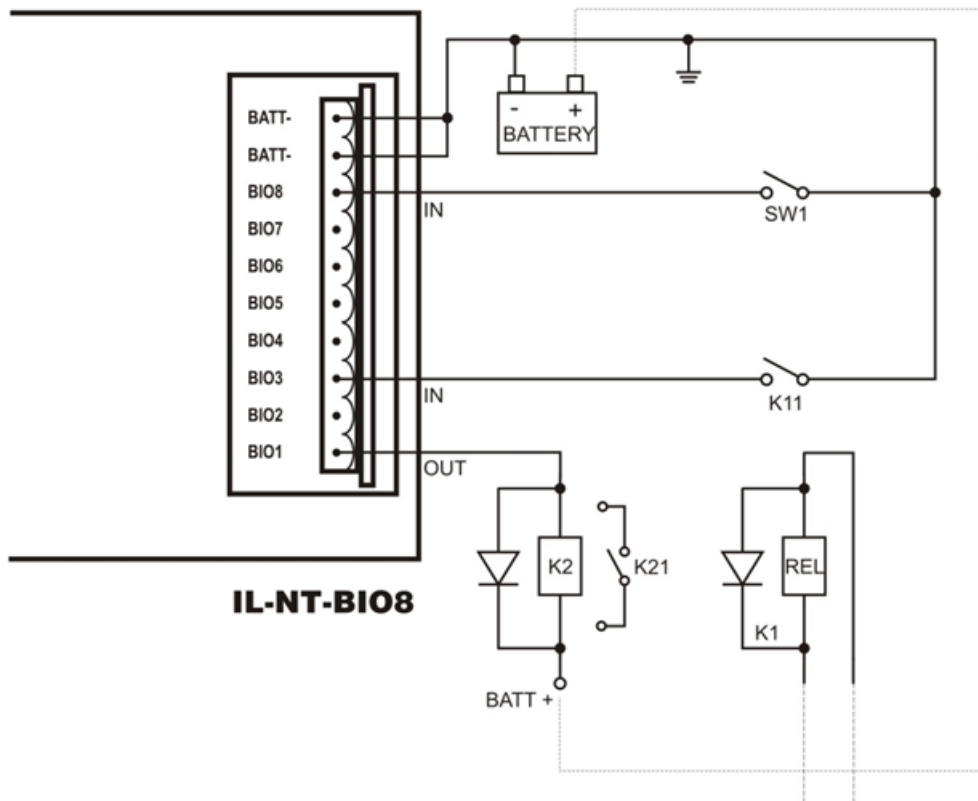
InternetBridge-NT

The InternetBridge-NT (IB-NT) is a communication module that allows connection of a single controller as well as a whole site to the internet or a Local Area Network. The internet connection can be enabled via the built-in cellular modem supporting 2G and 3G networks or via Ethernet cable.

For InteliATS^{NT} the following functions are available:

- Direct Ethernet connection to ComAp configuration and monitoring tools (LiteEdit, InteliMonitor or WebSupervisor)
- AirGate support
- Web interface

HINT:
Support of InteliATS^{NT} controllers is in IB-NT 1.2 SW and newer.
For further information and options that can be set, see IB-NT Reference Guide.

Programming of IA-NT controller

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

NOTE:
For more information on programming, see LiteEdit Reference Guide.

CAUTION!
Check the statistic values after firmware upgrade. Readjust the values if necessary.

User Interface

There is an interchangeable User Interface on controller. It allows two different modes of displaying controller menu.
The first mode called USER is dedicated for users who prefer easy function and need only monitor actual values, see alarms or change language settings.
Second mode is called ENGINEER and it is dedicated for advanced users, who desire to change the settings of controller, 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 then press again PAGE. On screen will be displayed the choice of two different User Interfaces.

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

Terminals

IA-NT PWR terminals and face
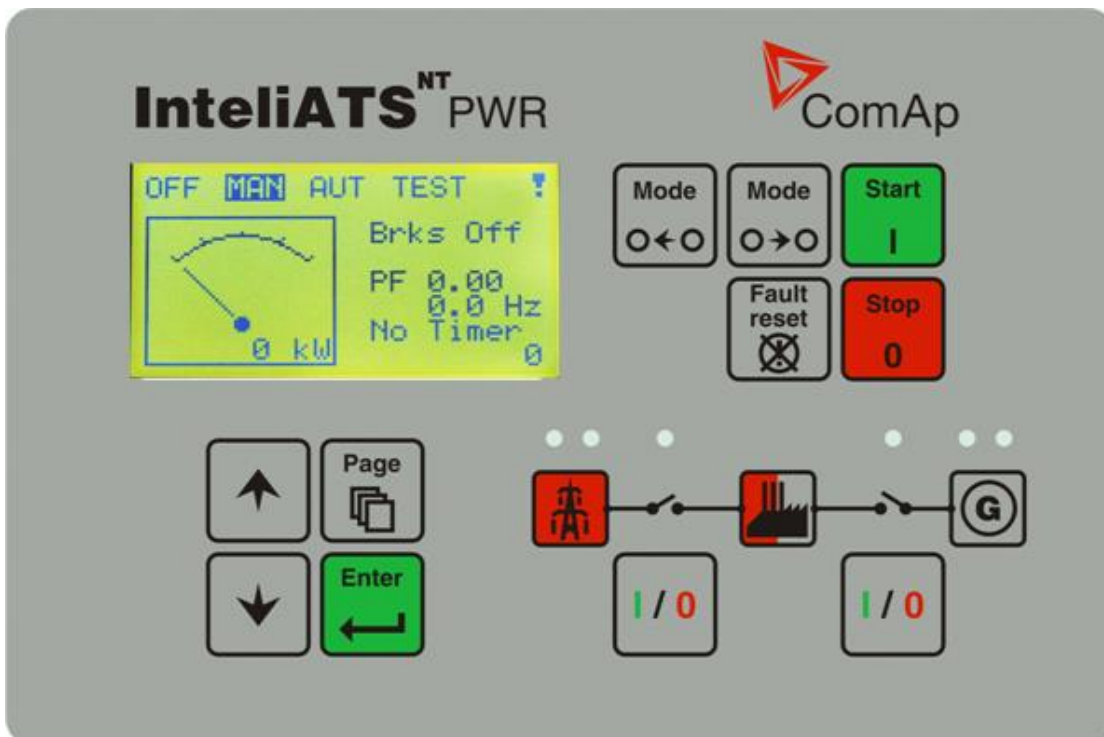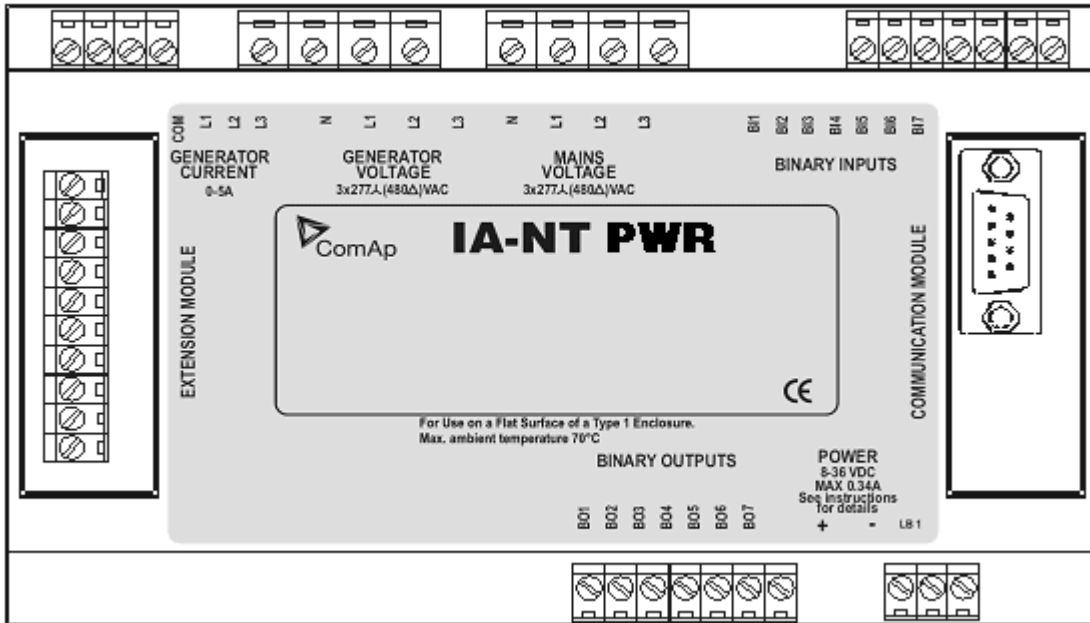
Installation

Mounting

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

Dimensions
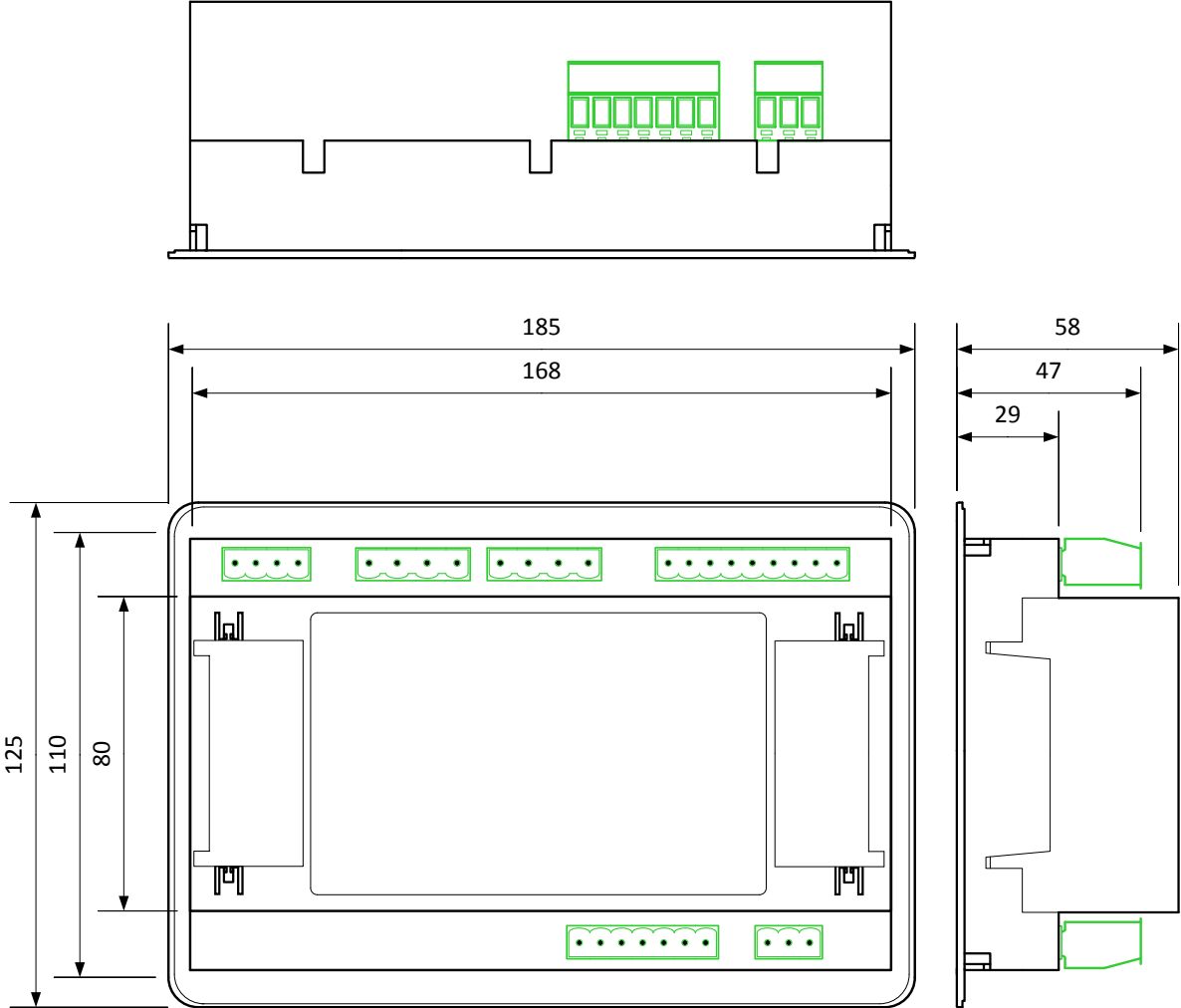
HINT:
Recommended mounting cutout size is 175 x 115 mm.

Recommended Wiring

IA-NT PWR – Wiring Diagram
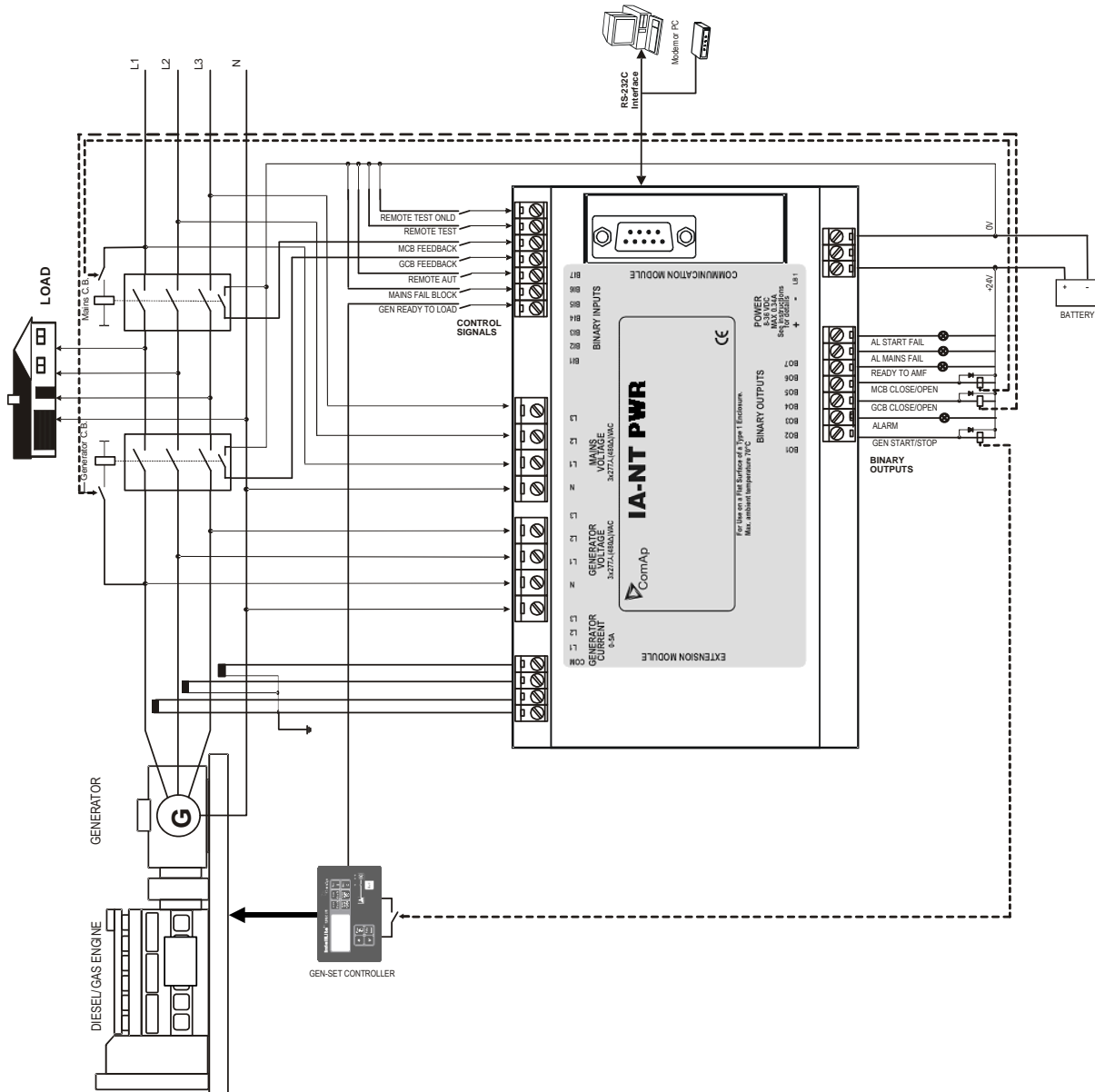
NOTE:
MCB and GCB are recommended to be mechanically interlocked in case of open delayed transition.
Stripping length of wires: 6-10mm.

Applications

The most typical application for the ATS controllers is Auto Mains Failure (AMF) application, where the controller watches for the mains power supply fault and then starts a load transfer process.
Next possible application is manually controlled load transfer between two power supply sources (mains x generator).

AMF using two separate breakers with feedbacks (MCB and GCB)
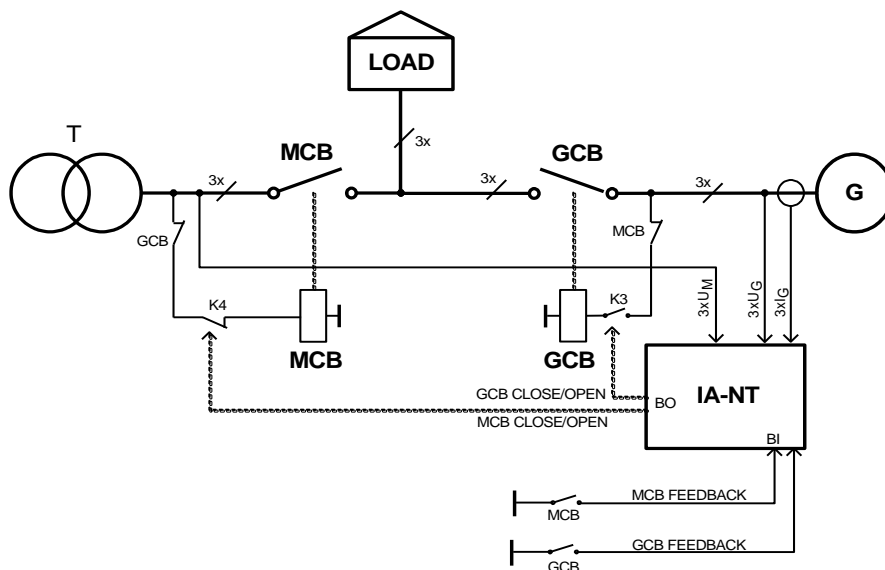
Specification

- Automatic remote gen-set start when the mains fails (AUT mode)
- GCB & MCB full control with feedbacks
- Break transfer on mains failure
- Break return on mains return (Load reclosing)
- Test mode (set running and waiting for mains failure)

Hardware requirements

1x   IA-NT PWR

Setpoints

MCB Logic = "CLOSE-OFF"

AMF using two separate breakers with feedbacks (MCB and GCB) + Test on Load
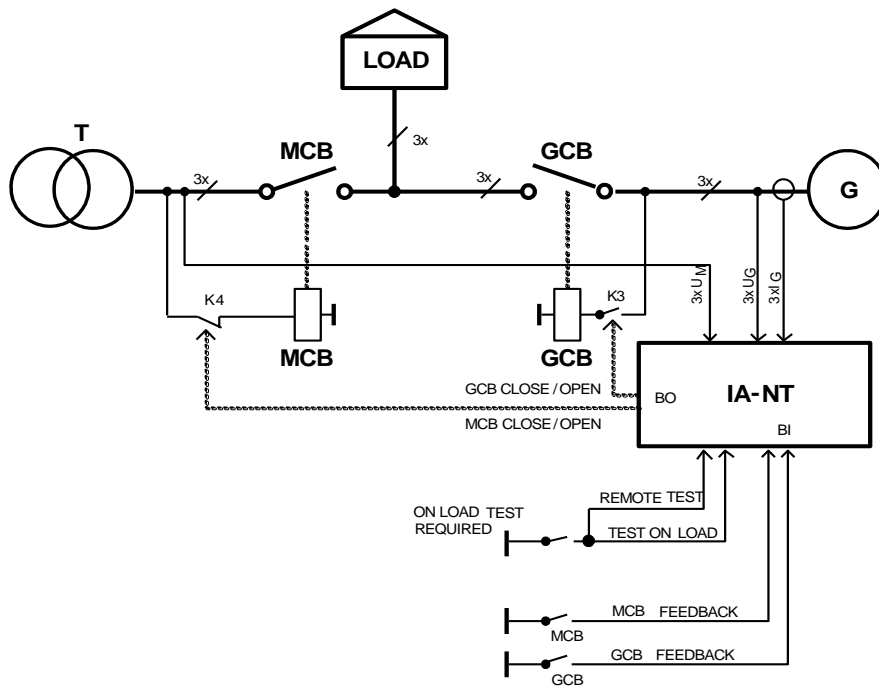
Specification

- Automatic remote gen-set start when the mains fails (AUT mode)
- GCB & MCB full control with feedbacks
- Break transfer on mains failure
- Break return on mains return (Load reclosing)
- Test mode (set running and waiting for mains failure)
- On Load Test - load transfer to gen-set (Island operation) and back to mains in TEST mode on **BI Test on load** activation/deactivation. There are 2 breaks in this operation. Controller may be forced to TEST mode by **BI Remote TEST**

Hardware requirements

1x   IA-NT PWR

Setpoints

MCB Logic =   "CLOSE-OFF"
RetFromIsland =   "AUTO" – automatic return (MCB Close) to mains after TEST
RetFromIsland =   "MANUAL" – manual return to mains (MCB Close) after TEST – IA-NT goes to MAN mode.
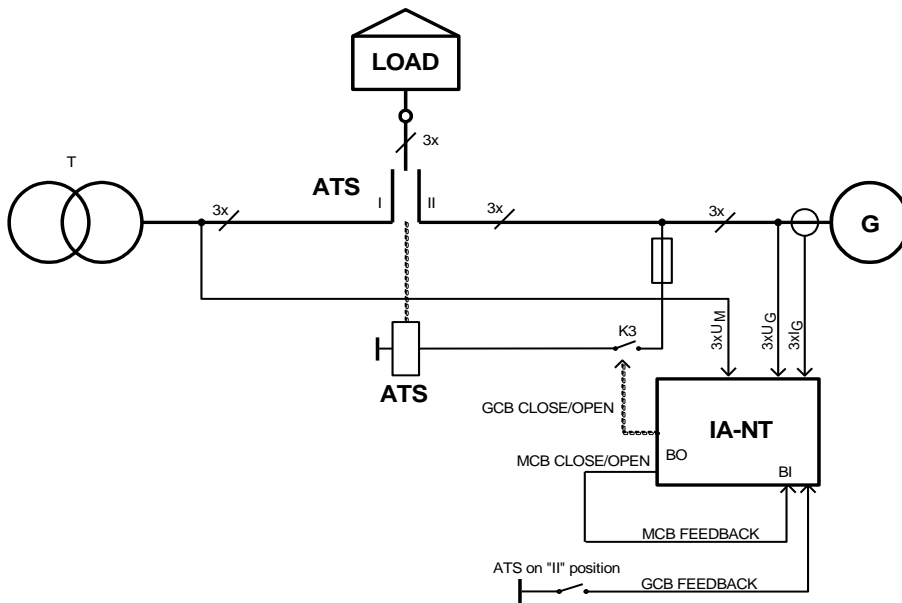
Specification

- Automatic remote gen-set start when the mains fails (AUT mode)
- Two-position ATS control with feedback
- Break transfer on mains failure
- Break return on mains return (Load reclosing)
- Test mode (set running and waiting for mains failure)

Hardware requirements

1x   IA-NT PWR

Setpoints

MCB Logic = "CLOSE-ON"
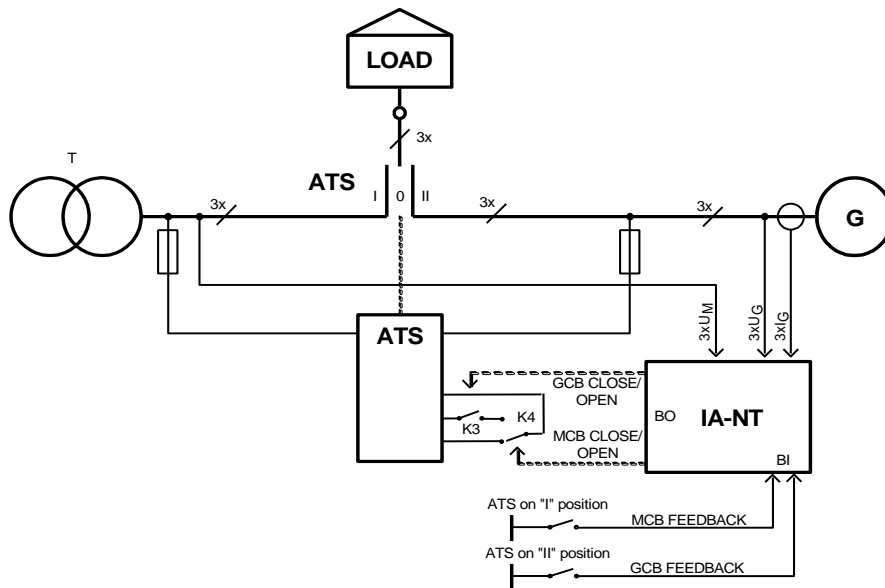
Specification

- Automatic remote gen-set start when the mains fails (AUT mode)
- Three-position ATS control with feedbacks, pass through neutral position
- Break transfer on mains failure
- Break return on mains return (Load reclosing)
- Test mode (set running and waiting for mains failure)

Hardware requirements

1x   IA-NT PWR

Setpoints

MCB Logic = "CLOSE-ON"
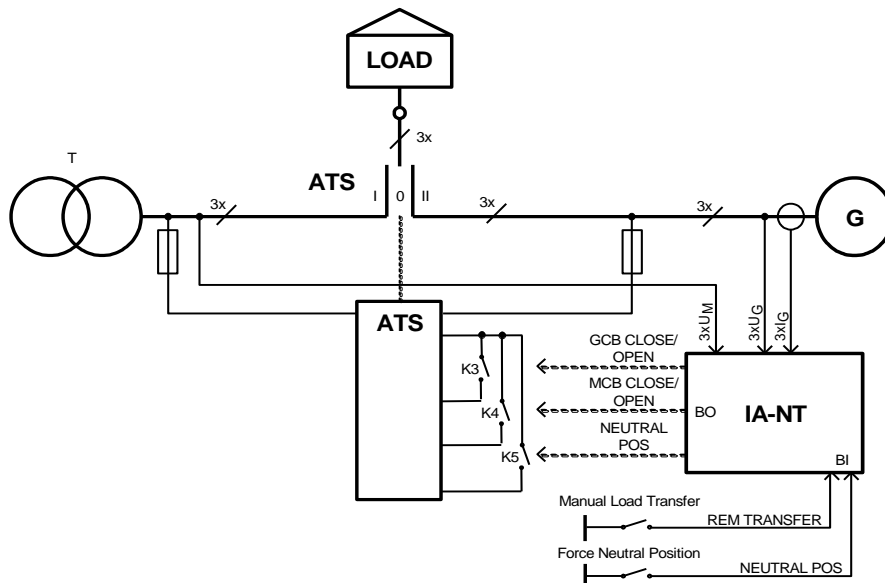
Specification

- Automatic remote gen-set start when the mains fails (AUT mode)
- Three-position ATS control without feedback, pass through neutral position
- Manual request for load transfer (AUT mode)
- Request for switching to neutral position – the highest priority, overrides MCB & GCB state, forces switch to neutral position. After deactivating return to previous state (MCB or GCB)

Hardware requirements

1x   IA-NT PWR

Setpoints

MCB Logic = "CLOSE-ON"
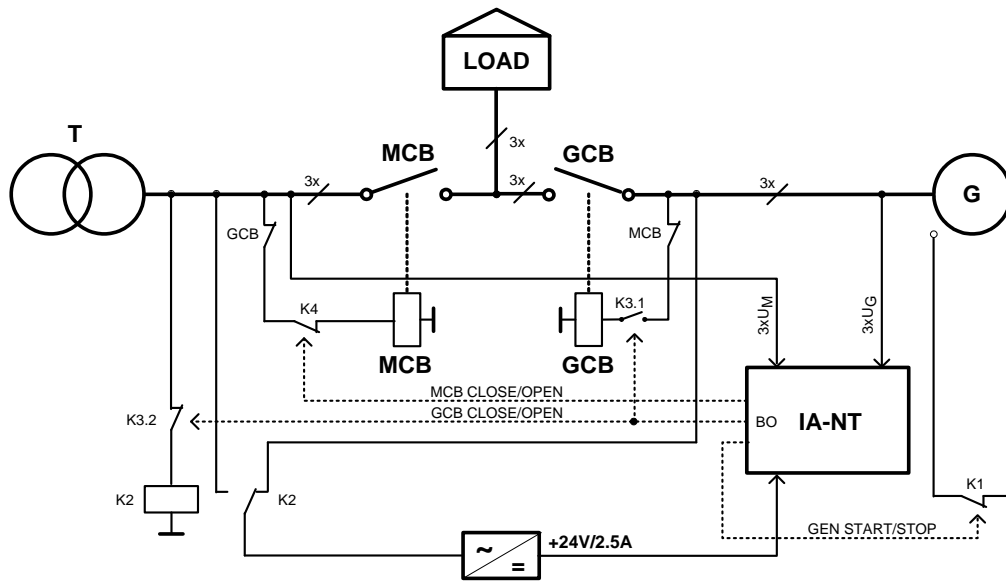
Specification

It is possible to operate controller without a battery supplying the controller. For such operation the following conditions have to be fulfilled:

- Controller is supplied from 24V/2.5A AC/DC power supply whose source is switched between Mains and Gen-set via relay (another contacts of the relay for GCB switching) according to the Mains state (OK/Fault). See the schematic diagram for more details
- Normally closed relay contacts have to be used for the gen-set start command. Setpoint "GenStart Logic" has to be set to CLOSE-OFF
- Switching of the 24V AC/DC power supply is blocked when GCB is closed, so the power supply is not switched to Mains if voltage on the mains bus appears – protection against "Flip-flopping" of the power supply when voltage changes arise on Mains.
  It (power supply) will be switched to Mains when GCB is opened.

Then in the case of Mains failure:

- 24V AC/DC power supply source is switched to gen-set
- Voltage supplying controller disappears
- Gen Start relay is deenergized and contacts closed
- Gen-set is started
- Controller is supplied from running gen-set
- Controller is initialized, waits for Gen OK conditions
- MCB is opened, GCB closed and the 24V AC/DC power supply source is locked in gen-set position.

If Mains returns:

- GCB is opened, 24V AC/DC power supply source is unlocked and switched to Mains
- MCB is closed
- Gen-set is stopped

Hardware requirements

1x   IA-NT PWR
1x   24V/2.5A AC/DC power supply

Getting Started

How to install

General

To ensure proper function:
Wiring for binary inputs and analog inputs must not be run with power cables.
Binary inputs should use shielded cables, especially when length >3m.

CAUTION!
This device is dedicated for enviroment conditions type A. Usage of this device in enviroment conditions type B can cause electromagnetic disturbance. In this case it can be demand to make adequate steps to reduce this electromagnetic disturbance.

Power supply

To ensure proper function use min. power supply cable of 1.5mm^2
Maximum continuous DC power supply voltage is 36VDC. The InteliATS^{NT}'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.

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

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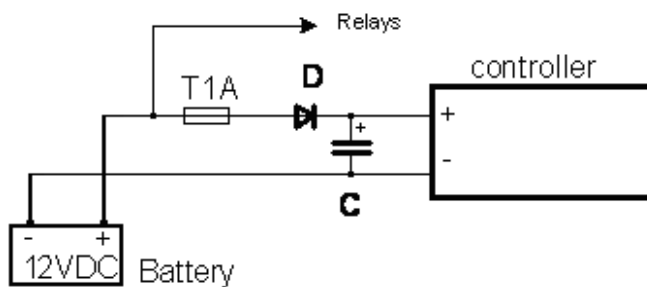
The capacitor size depends on required time. It shall be approximately thousands of microfarads.
The capacitor size should be 5 000 microfarad to withstand 150ms voltage dip under following conditions:
Voltage before dip is 12V, after 150ms the voltage recovers to min. allowed voltage, i.e. 8V

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

Or by connecting special I-LBA Low Battery Adaptor module:
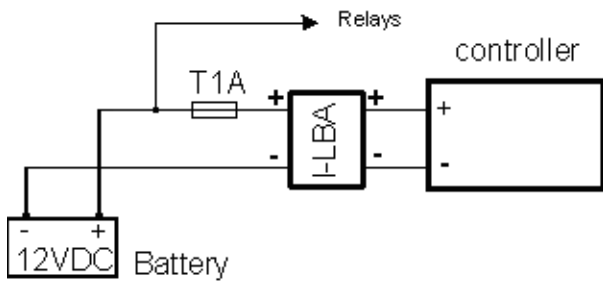
The I-LBA module ensures min. 350ms voltage dip under following conditions:
RS232 and other plug-in module are connected.
Voltage before dip is 12V and after 350ms the voltage recovers to min. allowed voltage 5V.
The I-LBA enables controller operation from 5VDC (for 10 to 30 sec).
The wiring resistance from battery should be up to 0.1 Ohm for I-LBA proper function.

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

Power supply fusing

A one-amp fuse should be connected in-line with the battery positive terminal to the controller and modules.
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

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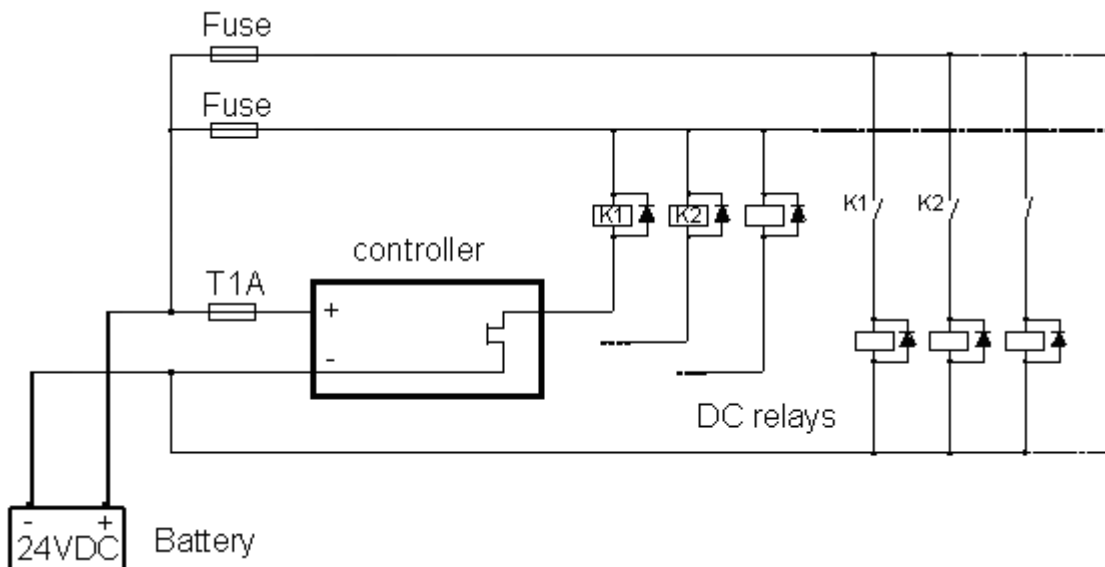
Grounding

To ensure proper function:
Use as short as possible cable to the grounding point on the switchboard
Use cable min. 2,5mm²
The "-" terminal of the battery has to be properly grounded

Current measurement

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

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

To ensure proper function:
Use cables of 2,5mm²
Use transformers to 5A
Connect CT according to following drawings:

Three phase application:

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

Single phase application:

Connect CT according to following drawings. Terminals L2l and L3l are opened.
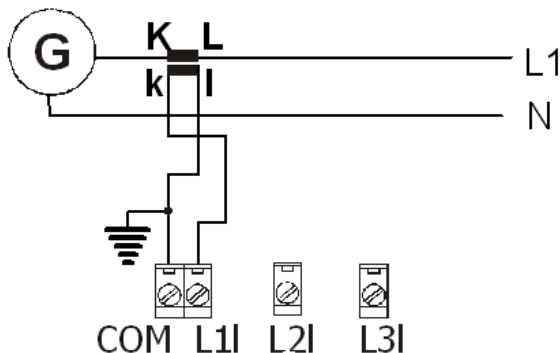
CT location

It is possible to set the location of CT s.
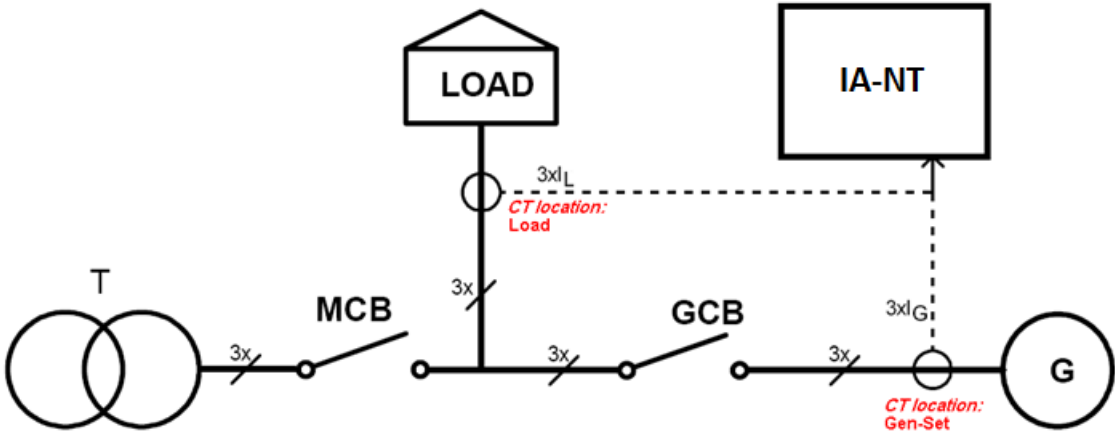
There are two options of *CT location*.

- Load
- Gen-Set

According to the connection you have to set the setpoint CT location value to Load or Gen-Set

Voltage measurement and generator connection types

There are 4 voltage measurement **ConnectionTypes** *(setpoint* ConnectionType [3Ph4Wire / 3Ph3Wire / Split Ph / Mono Ph].*)* options. Use 1A fuse on voltage measurement inputs. Every type matches to corresponding generator connection type:

1. *ConnectionType*: 3 Phase 4 Wires
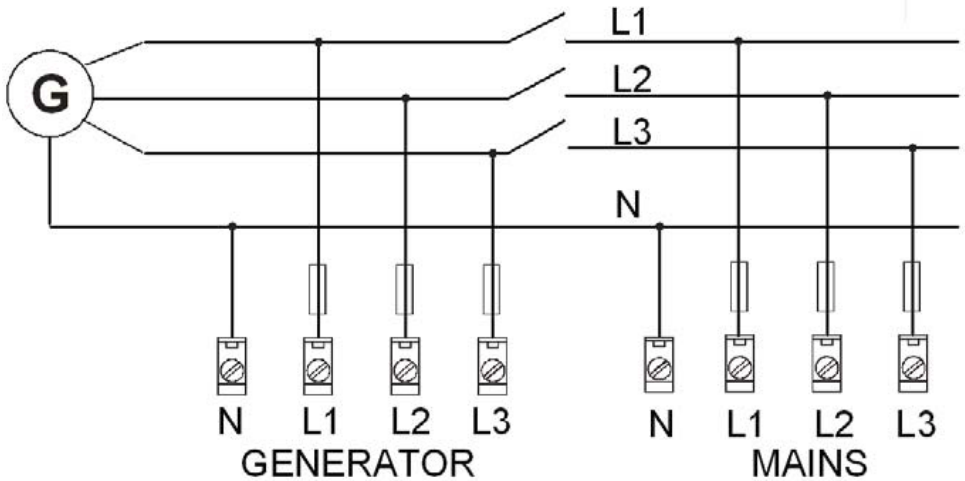
Three phase "wye" measurement – 3PY

3 Phase 4 Wires - STAR Connection
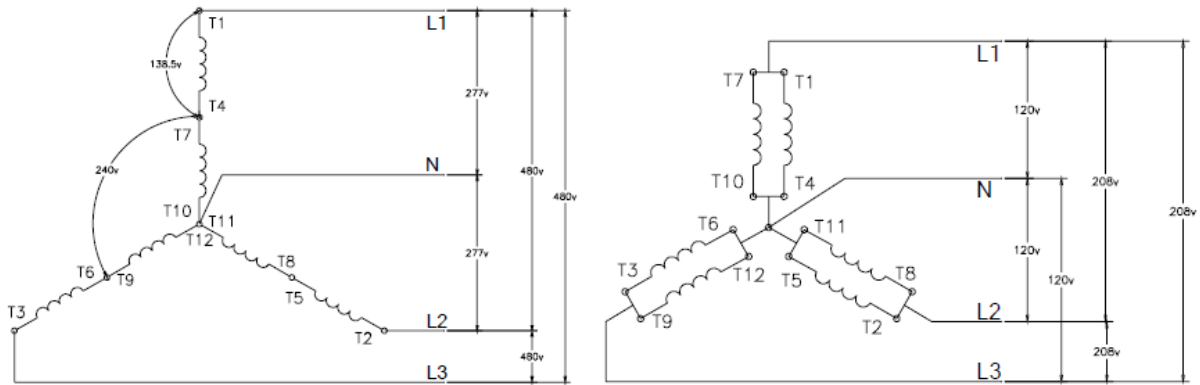
2. *ConnectionType*: 3 Phase 3 Wires
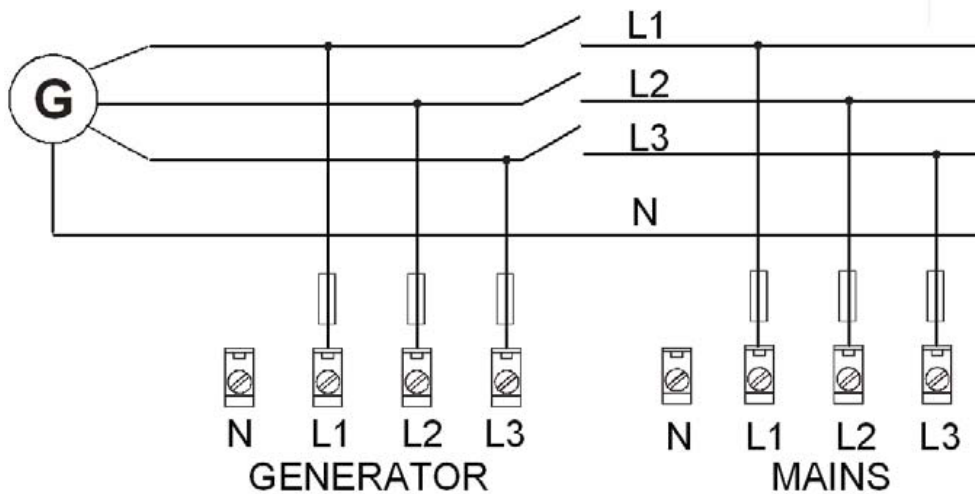
Three phase "delta" measurement – 3PD

3 Phase 3 Wires
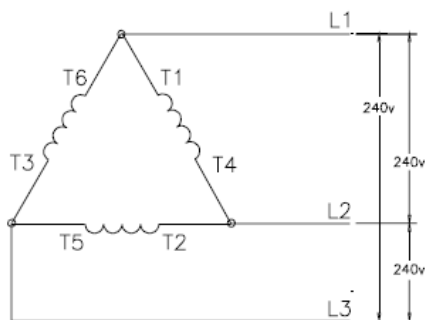
– DELTA Connection   – HI-LEG (wild-leg, red-leg) DELTA Connection
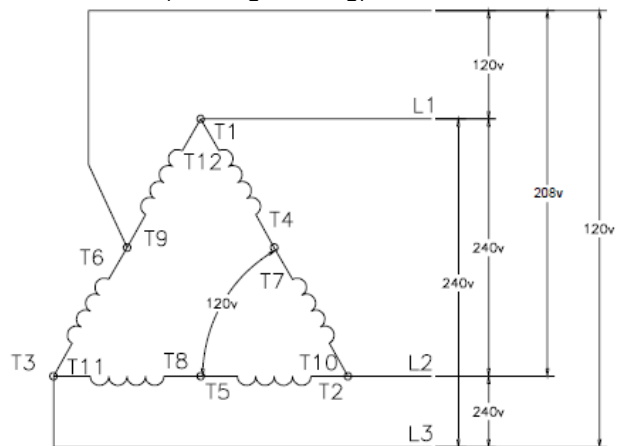
NOTE:
Only L1, L2 and L3 wires should be connected. In case of HI-LEG DELTA connection the N (neutral) wire (in the diagram connected between T6 and T9) has to be disconnected.
No separation transformers for three wires voltage connection (without N) are needed.

3. *ConnectionType*: **Split Phase**
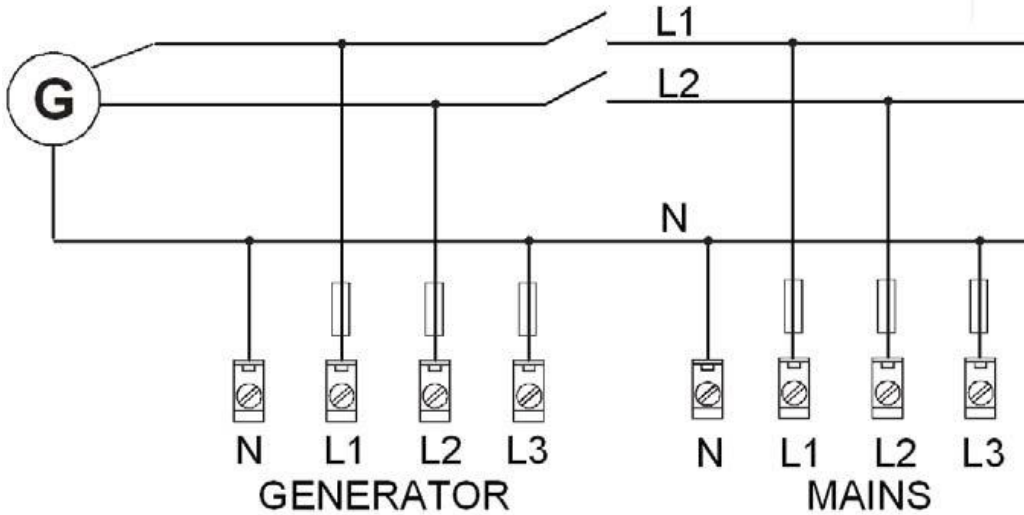
Single-phase measurement – 1PH

Split Phase
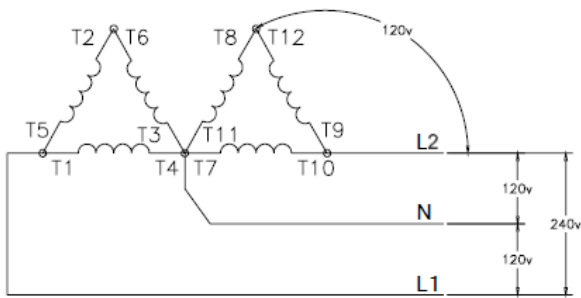
    – DOUBLE DELTA Connection   – ZIG ZAG (DOG LEG) Connection
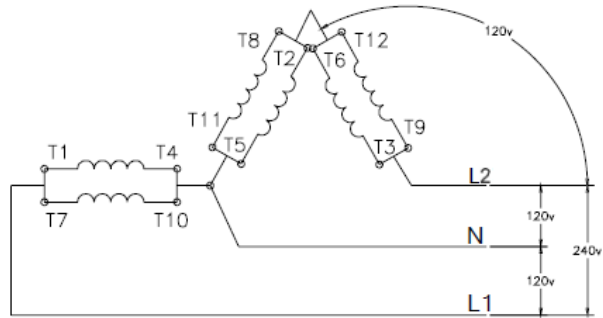
4. *ConnectionType*: **Mono Phase**
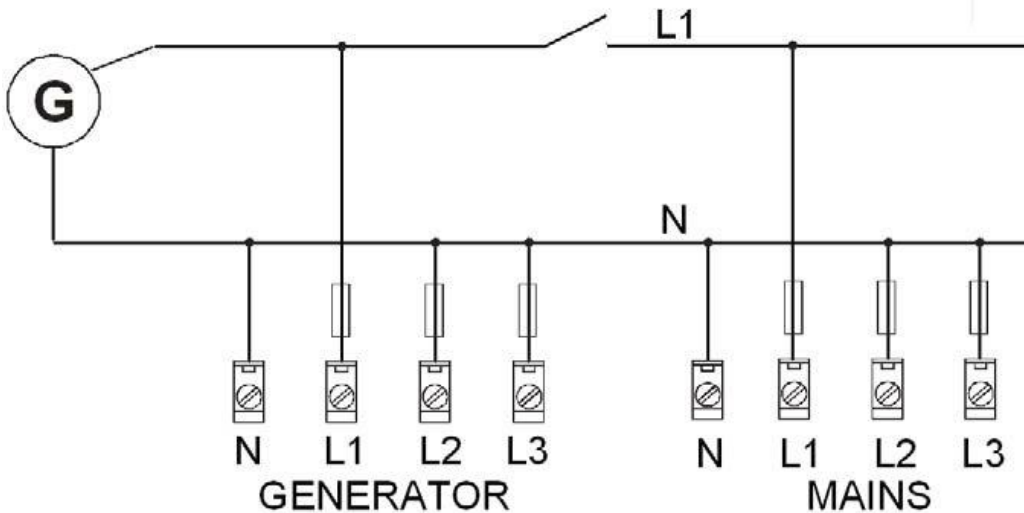
Single-phase measurement – 1PH

Mono Phase – MONOPHASE Connection
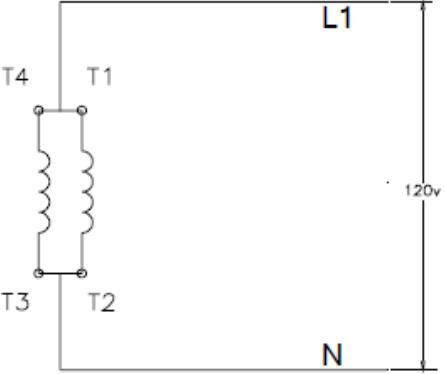
NOTE:
Switchboard lighting strike protection according standard regulation is expected for all 4 connection types!!!

Binary inputs
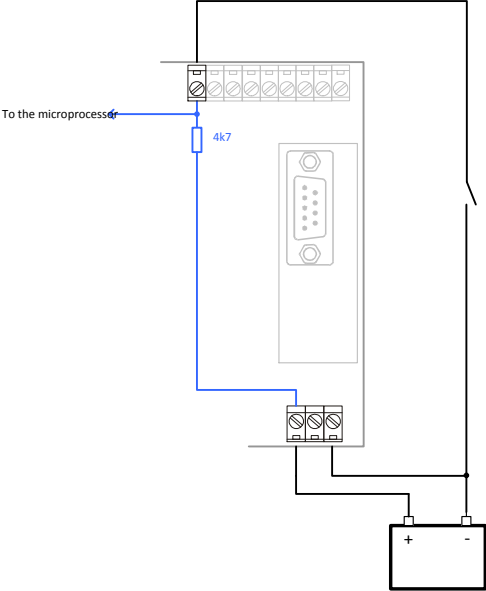
NOTE:
Maximal length of wire connected to any binary input is 30 meters.

Binary outputs
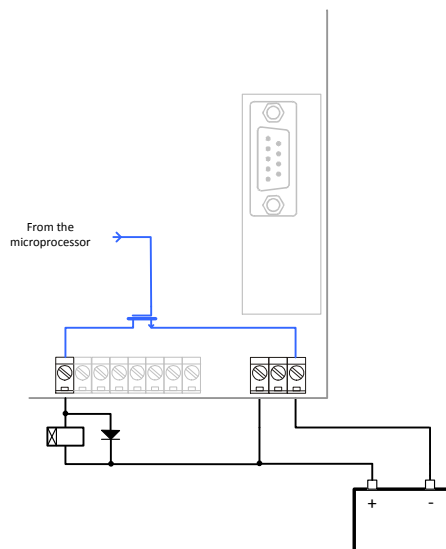
NOTE:
Maximal length of wire connected to any binary output is 30 meters.

RS485 connection

The line has to be terminated by 120 Ohm resistors at both ends.
External units can be connected on the RS485 line in any order, but keeping line arrangement (no tails, no star) is necessary.
Standard maximum link length is 1000m.
Shielded cable has to be used, shielding has to be connected to PE on one side (controller side).

A) For shorter distances (all network components within one room) – **picture 1**
interconnect A and B; shielding connect to PE on controller side
B) For longer distances (connection between rooms within one building) – **picture 2**
interconnect A, B, COM; shielding connect to PE in one point
C) In case of surge hazard (connection out of building in case of storm etc.) – **picture 3**

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

Recommended data cables: BELDEN (http://www.belden.com)
A) For shorter distances: 3105A Paired - EIA Industrial RS-485 PLTC/CM (1x2 conductors)
B) For longer distances: 3106A Paired - EIA Industrial RS-485 PLTC/CM (1x2+1 conductors)
C) In case of surge hazard: 3106A Paired - EIA Industrial RS-485 PLTC/CM (1x2+1 conductors)

Picture 1 - shorter distances (all network components within one room)
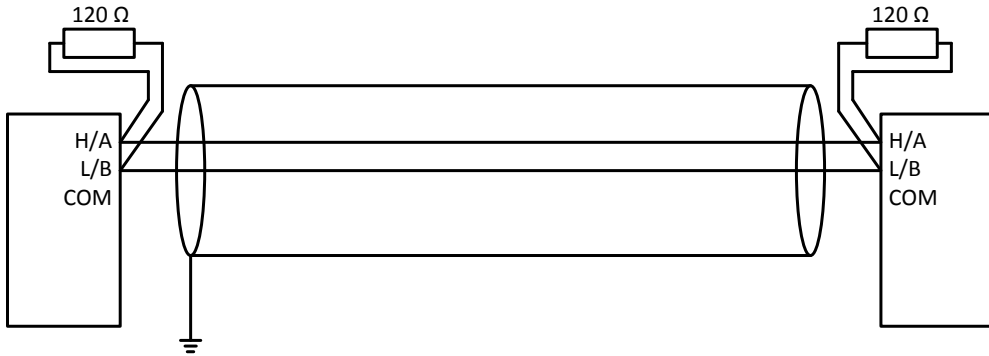
Picture 2 - longer distances (connection between rooms within one building)

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

PT5-HF-12DC-ST (CAN)
PT5HF-5DC-ST (RS485)
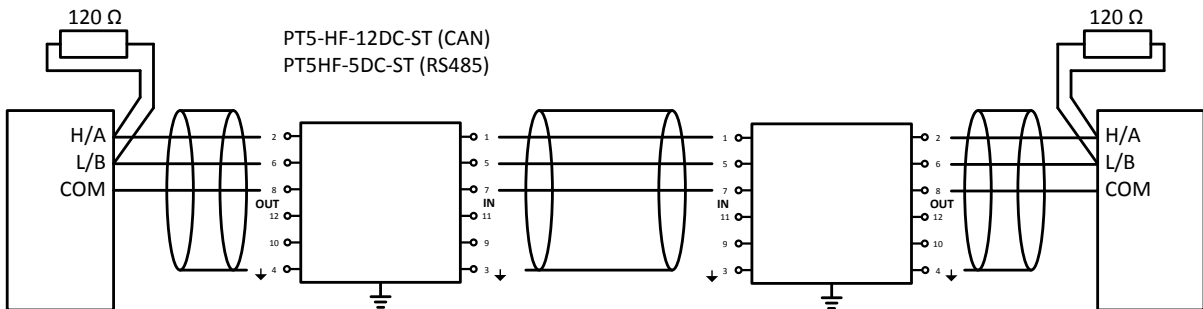
Inputs and Outputs

For Inputs/Outputs overview table see chapter Technical Data.

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

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.
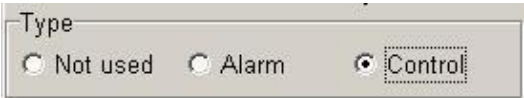
Binary Alarm configuration items

Name		14 characters ASCII string
Contact type	NC	Normally closed
	NO	Normally opened
Alarm type	Warning	
	Trip	

Control

Use this setting to configure the desired function from the list below.

Binary inputs IA-NT - default

BI1 GCB Feedback

BI2 MCB Feedback

BI3 GenReadyToLoad

BI4 MainsFailBlock

BI5 Remote Transfer

BI6 Remote TEST

BI7 Remote TEST OnLd

Binary inputs – list

Rem Start/Stop

External request for engine run. AUT mode only.

```
Name
Rem start/stop    ▼
```

NOTE:
If the binary input *Rem Start/Stop* is active and mains failure occurs, the MCB breaker opens and after the *Trans Del* delay the GCB breaker is closed. Once the mains is OK, the *MainsReturnDel* delay elapses and the GCB breaker is opened. Then after **the** *Trans Del* delay is MCB breaker closed. Gen-set remains running as long as *Rem Start/Stop* is active. See AMF time chart for more details.

Rem Transfer

External request for an immediate transfer from mains to generator without waiting for the **AMF Settings**: *EmergStart Del* has elapsed. In the case the transfer not succeeded the system will stay in neutral position. The *MainsFailBlock* input performs its work normally*.*

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.

Emergency Stop

If the input is opened, Trip is immediately activated. Stop signal for the gen-set is sent and the GCB is opened.

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.

NOTE:
Access Lock does not protect setpoints and mode changing from LiteEdit. To avoid unqualified changes the selected setpoints can be password protected. Also the button Fault reset, is not blocked at all and buttons Start and Stop in MAN mode are not blocked.

Remote OFF

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

<u>HINT:</u>
The Remote OFF has higher priority than Remote TEST, MAN, AUT.

<u>NOTE:</u>
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.

<u>HINT:</u>
The Remote MAN has higher priority than Remote AUT.

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

<u>HINT:</u>
The Remote TEST has higher priority than Remote MAN, AUT.

Rem TEST OnLd

Affects the behavior in TEST mode. When input is closed, the controller automatically transfers load from the mains to the gen-set. Setpoint **AMF Settings**: *ReturnFromTEST* must be set to MANUAL. Load is automatically transferred back to the mains when any gen-set shut down protection activates.

RemControlLock

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

FaultResButton

Binary input has the same function as Fault Reset button on the InteliATS^{NT} front panel.

GCB Button

Binary input has the same function as GCB button on the InteliATS^{NT} front panel. It is active in MAN mode only.

MCB Button

Binary input has the same function as MCB button on the InteliATS^{NT} 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.

GenReadyToLoad

Indicates wither the gen-set is ready to undertake load. Conditions for successful gen-set start and readiness to undertake load can be evaluated from the voltage and the frequency of the generator or from the state of *GenReadyToLoad* input or from both sources. The conditions have to be fulfilled

during time defined by **Basic Settings**: *Max Start Del* setpoint (which can be even unlimited). More info can be found in the description of setpoints *Max Start Del* and *GenerProtect* or in chapter *Source evaluation*.

<u>NOTE:</u>
When this binary input isn't configured, the setpoint *GenerProtect* is adjust to value ENABLED and this value can't be changed.

Neutral Pos

In MAN mode this input switches a three position ATS switch to its neutral position – it activates the binary output *NeutralPosition* and switches the MCB and GCB off.

MainsHealthy

Indicates wither the mains is ready to undertake load. Conditions for undertake load can be evaluated from the voltage and the frequency of the mains or from the state of *MainsHealthy* input or from both sources. More info can be found in the description of setpoints Mains*Protect* or in chapter *Source evaluation*.

<u>NOTE:</u>
When this binary input isn't configured, the setpoint *MainsProtect* is adjust to value ENABLED and this value can't be changed.

Total Stop

If the input is opened, Trip is immediately activated. Stop signal for gen-set is sent and the GCB and MCB are opened.

MCB Disable

The input is used disable issuing the MCB closing command.
- If the input is active and the MCB is opened, the MCB will not be closed until the input is deactivated.
- If the input is active and the MCB is closed, the MCB will be opened.
- If the input is active, MCB Disable alarm is activated.

GCB Disable

The input is used disable issuing the MCB closing command.
- If the input is active and the MCB is opened, the MCB will not be closed until the input is deactivated.
- If the input is active and the MCB is closed, the MCB will be opened.
- If the input is active, MCB Disable alarm is activated.

Programmable delay on alarms

Possibility to set programmable delay on alarms configured for binary input 6 and 7 has been added. If set, it blocks alarms of the respective binary input for the whole time the delay is active. If the reason for the alarm persists after the delay time expired, the alarm is activated. If not, the alarm does not appear. This feature allows the user to perform "filtering" of alarms within a specified period of time. The delay length can be set via the following setpoints *BI6 Delay* and *BI7 Delay*.

Binary outputs IA-NT - default

BO1   GenStart/Stop

BO2   Alarm

BO3   GCB Close/Open

BO4   MCB Close/Open

BO5   Ready To AMF

BO6   AL Mains Fail

BO7   AL Start Fail

Binary outputs - list

Not Used

Output has no function.

GenStart/Stop

The closed relay sends remote start signal to the gen-set. Generator protections are blocked when the output is inactive and the GCB is blocked too. Output can be inverted (CLOSE-OFF) using **Basic Settings:** *GenStart Logic* setpoint.

Prestart

The output closes when the gen-set start is requested and opens after the **AMF Settings**: *Prestart Time* has elapsed. Afterwards the *GenStart/Stop* output is activated as a start signal for the remote gen-set.

Pretransfer

Is activated during the Prestart phase when the Mains Fail had occurred and the gen-set start is the result of this event. See the **AMF Settings**: *Prestart Time* setpoint for more info.

Alarm

The output closes if :
 • any alarm comes up or
The output opens if
 • FAULT RESET is pressed
    The output closes again if a new fault comes up.

GCB Close/Open

The output controls the generator circuit breaker.

> **NOTE:**
> Supposed time to close (reaction time) of GCB is depend of breaker type and related to setpoint GCB Delay.

GCB ON Coil

The output activates Generator Circuit Breaker coil. The impulse length is double of GCB Delay timer.

GCB OFF Coil

The output deactivates Generator Circuit Breaker coil. The impulse length is double of GCB Delay timer.

GCB UV Coil

The output controls Generator Circuit Breaker coil after voltage drop-out. The impulse length is double of GCB Delay timer.

MCB Close/Open

The output controls the mains circuit breaker.

> **NOTE:**
> Supposed time to close (reaction time) of MCB is depend of breaker type and related to setpoint GCB Delay.

MCB ON Coil

The output activates Mains Circuit Breaker coil. The impulse length is double of MCB Delay timer.

MCB OFF Coil

The output deactivates Mains Circuit Breaker coil. The impulse length is double of MCB Delay timer.

MCB UV Coil

The output controls Mains Circuit Breaker coil after voltage drop-out. The impulse length is double of MCB Delay timer.

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 IA-NT front panel. The output is closed if gen-set is running and all gen-set electric values are in limits.

Gen On Load

(LBO) **Gener On Load <=**   (LBO) **Gen Params OK and**   (LBI) **GCB Feedback OK**

Ready To AMF

This output is activated when the controller is in AUT mode and no Trip alarm is active or unconfirmed. It remains active when the engine is running.

Ready

The output is closed if following conditions are fulfilled:
- Gen-set is not running and
- 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.

Mains Healthy

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

Mains On Load

(LBO) **Mains On Load <=** **(**LBO) **Mains Healthy** **and** (LBI) **MCB Feedback OK**

AL Gen >V

The output closes if the generator overvoltage Trip alarm activates.
The output opens, if
- alarm is not active and
- FAULT RESET is pressed

AL Gen <V

The output closes if the generator under voltage Trip alarm activates.
The output opens, if
- alarm is not active and
- FAULT RESET is pressed

AL Gen Volts

The output closes if the generator over/under voltage alarm or voltage asymmetry alarm activates.
The output opens, if
- alarm is not active and
- FAULT RESET is pressed

AL Gen Freq

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

AL Gen >Freq

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

AL Gen <Freq

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

AL Mains Volts

The output closes if the mains over/under voltage alarm or voltage asymmetry alarm activates.
The output opens, if
- alarm is not active

AL Mains Freq

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

AL 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 has to be stopped, but voltage, frequency or signal GenReadyToLoad is detected. With start goes this protection inactive. If setpoint Stop Time is adjusted to value 3601 than stop time is infinite and alarm will never be active.
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

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

Note:
See setpoint Max Start Del for more information.

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 IA-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 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 Trip

Output closes when any trip alarm appears.
The output opens, if
- No trip 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.

Exerc Timer 1

Output activates when Timer 1 is active. See setpoint Timer1..2Function [No Func/TEST/TEST OnLd/MFail Blk/Mode OFF/Rem Trans] for details.

Exerc Timer 2

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

Not In AUT

Output activates when the controller is not in AUT mode.

Neutral Pos

Switches ATS switch to its neutral position. It is a complement to the MCB and GCB Close/Open binary outputs and it switches the ATS switch to its neutral position by applying voltage level change (log. 0/ log. 1).
- MCB Close/Open output switches the ATS three way switch to the position I.
- GCB Close/Open output switches the ATS three way switch to the position II.
- Neutral Pos output switches the ATS three way switch to the position 0 (middle).

The resulting behavior of the ATS output differs depending on the priority of the inputs of the particular type of the ATS switch.

If the neutral position input of the switch has the highest priority it overrides the current position of the switch and forces the switch to the neutral position.

Neutral Coil

Activates the neutral position coil of the ATS switch. It is a complement to the MCB and GCB ON Coil and it switches the ATS switch to its neutral position by applying a voltage pulse.
- MCB ON Coil output switches the ATS three way switch to the position I.
- GCB ON Coil output switches the ATS three way switch to the position II.
- Neutral Coil output switches the ATS three way switch to the position 0 (middle).

Power Switch

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

based on the setpoint adjustment as described on picture lower:
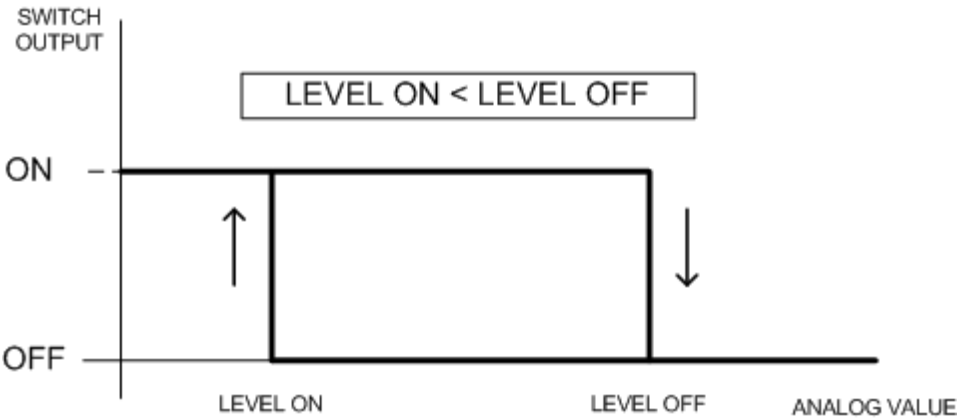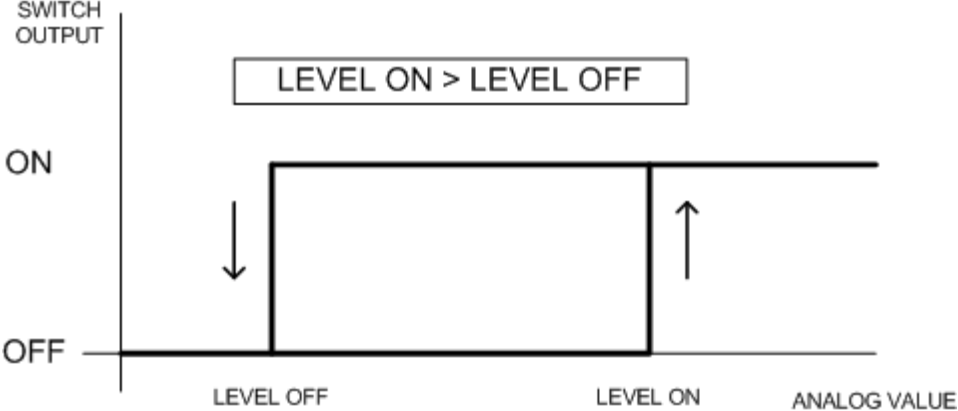
Shunt Trip

Activates when the system is running in short time parallel with mains (closed transition) and the time of the parallel run is longer than 300ms. It is a kind of protection against long time parallel run with mains when closed transition takes place.

Ctrl HeartBeat

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

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.

ChangePassword

Use ⇑ or ⇓ keys to set and ENTER key to change the password.

Basic Settings

ControllerName

User defined name, used for Inteli^{NT} identification at remote phone or mobile connection.
ControllerName is max 14 characters long and have to be entered using LiteEdit software.

Nominal Power   [kW]

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

Nomin Current   [A]

It is current limit for generator IDMT over current and short current protection and means maximal
continuous generator current. See **Gener Protect**: *Amps IDMT Del, Short Crct Trip* setpoints*.*
Nominal Current can be different from generator rated current value.
Step: 1 A
Range: 1 – 10000 A

CT Ratio   [/5A]

Gen-set or Load phases current transformers ratio. See CT Location setpoint.
Step: 1 A
Range: 1 – 5000 A / 5A

For firmware version ≥ 2.0:
Decimal switching is not done via value of "CT ratio" setpoint, but in configuration window of LiteEdit software via icon „Units/Formats":
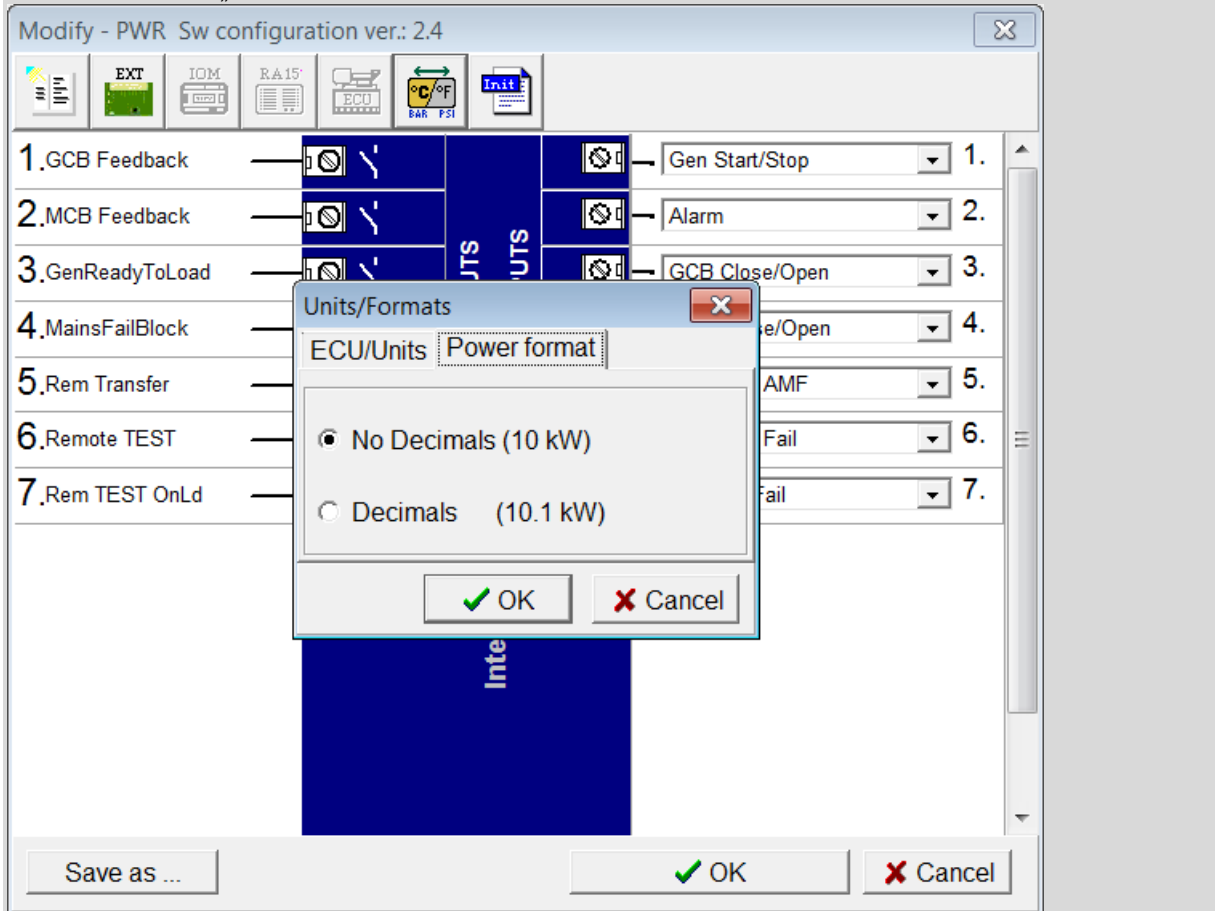
PT Ratio   [/1]

Gen-set potential transformers ratio.
Step: 0.1 V / V
Range: 0.1 – 500,0 V / V

Vm PT Ratio   [/1]

Mains potential transformers ratio.
Step: 0.1 V / V
Range: 0.1 – 500,0 V / V

NomVolts Ph-N   [V]

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

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

NomVolts Ph-Ph   [V]

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

Nominal Freq [Hz]

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

GenerProtect [ENABLED/DISABLED]

Setpoint enable or disable evaluating of generator voltage and frequency values.
ENABLED: Values are used for evaluating of state of source and for protections.
DISABLED: Values are not used for evaluating of state of source and for protections. If terminal for measurement are connected to controller, values are just shown on measuring screen. More info can be found in chapter *Source evaluation* or in description of binary input *GenReadyToLoad*.

NOTE:
When binary input GenReadyToLoad isn't configured, the setpoint *GenerProtect* is adjust to value ENABLED and this value can't be changed.

MainsProtect [ENABLED/DISABLED]

Setpoint enable or disable evaluating of mains voltage and frequency values.
ENABLED: Values are used for evaluating of state of source and for protections.
DISABLED: Values are not used for evaluating of state of source and for protections. If terminal for measurement are connected to controller, values are just shown on measuring screen. More info can be found in chapter *Source evaluation* or in description of binary input *MainsReadyToLoad*.

NOTE:
When binary input MainsHealthy isn't configured, the setpoint *MainsProtect* is adjust to value ENABLED and this value can't be changed.

ActivityAtOFF [ENABLE/DISABLE]

ENABLE: Controller at OFF mode stays at standard behavior of OFF mode.
DISABLE: Controller at OFF mode opens all binary outputs (MCB Close/Open and Gen Start/Stop outputs are depend on MCB Logic and GenStartLogic setpoints) and there is Fault reset active all the time.

ControllerMode [OFF, MAN, AUT,TEST]

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

NOTE:
Controller Mode change can be separately password protected.

GenStart Logic [CLOSE-ON/CLOSE-OFF]

The set point influences the behavior of the output *Gen Start/Stop*.
CLOSE-ON: Gen-set should start when the output *Gen Start/Stop* is closed.
CLOSE-OFF: Gen-set should start when the output *Gen Start/Stop* is opened.

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: 8 V – 40 (Battery <Volts)

Batt Volt Del [s]

Delay for low battery voltage alarm.

Step: 1 s
Range: 0 – 600 s

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

Generator winding connection.

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

CT Location   [Load / GenSet]

Load: CT (current measurement) is located next to the load.
GenSet: CT (current measurement) is located next to the gen-set.

Transition   [OPEN/INPHASE/CLOSED/INPH-OPEN/CLOS-OPEN]

Ability to perform passive synchronization dramatically enhances controller function and brings possibility to provide Open In-phase Transition and Closed Transition (short time parallel). Controller provides below described types of changeover between Mains and Gen-set power sources depending on following setpoint value:

OPEN   Open Delayed Transition
IN-PHASE   Open In-phase Transition
CLOSED   Closed Transition
INPH-OPEN   Open In-phase Transition or Open Delayed Transition
CLOS-OPEN   Closed Transition or Open Delayed Transition

1. Open Delayed Transition

Open Delayed Transition is standard type of changeover provided by most common AMF or ATS controllers supplied by other vendors. Controllers perform load transfer between both power sources with break (blackout). Delayed Transition means there is delay between source breaker opening and target breaker closing.

Two or three position ATS switch or two independent breakers/contactors can be used as switching mechanism.

Bellow you can see how is Open Delay Transition implemented by IA-NT controllers. Our controllers offer possibility to setup load transfer delay via **Transfer Del** setpoint.
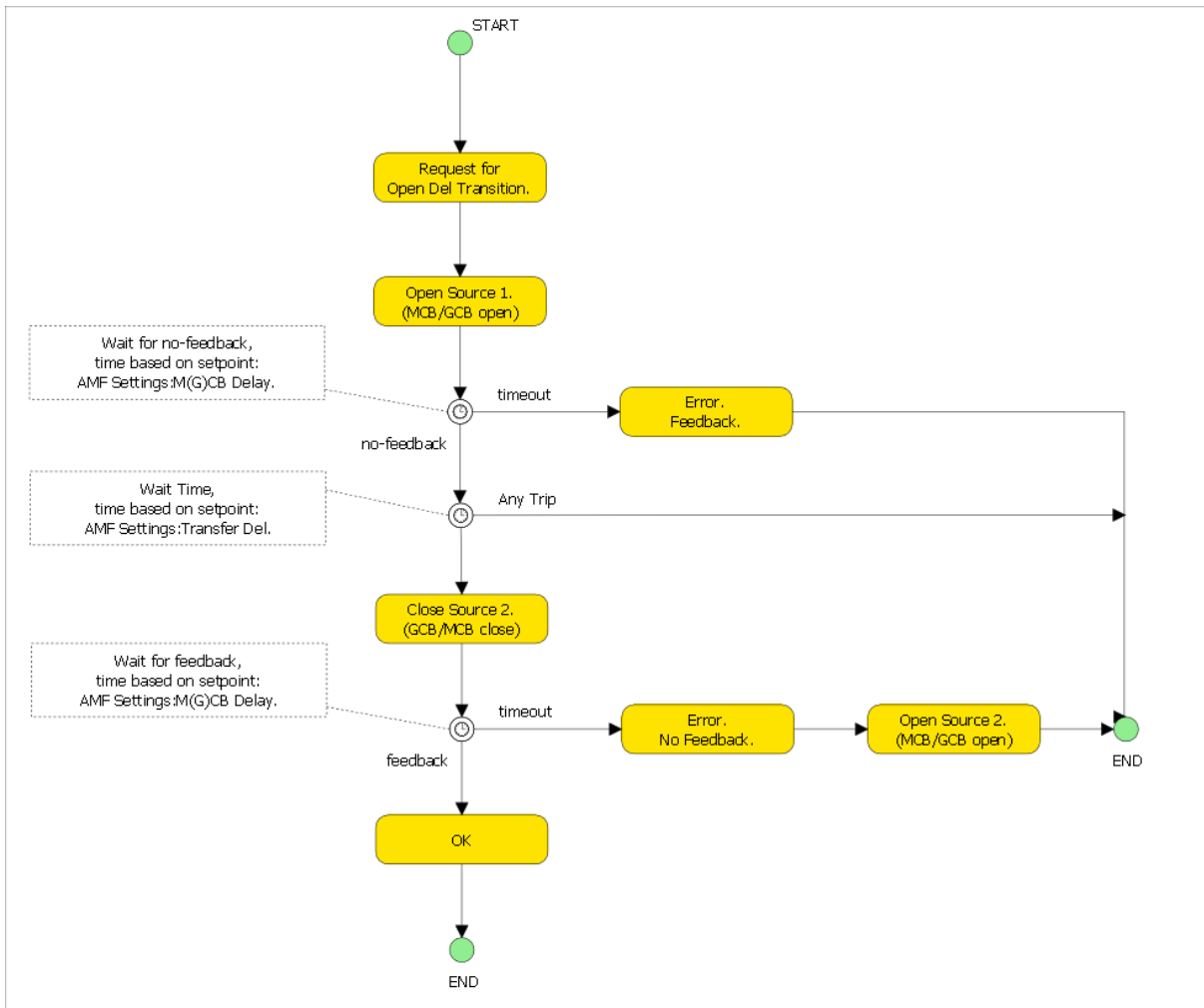
HINT:
This transition can perform fastest possible changeover if **Transfer Del** is set to zero value.
Overall blackout time then equals to 20 ms + breaker reaction time.

HINT:
Use longer delay time to avoid problems with motor starters. (Motor starts prefer to see break of a few seconds so they can initialize properly).

HINT:
To avoid issues with contactor mechanical interlocks use delay 0.75s or longer (mech. interlock on contactors takes some time to clear). If you try to close one contactor before interlock has cleared it can jam and you end up without supply to load).

2. Open In-phase Transition

Open In-phase Transition represents special kind of Open Delayed Transition where delay during changeover is reduced to minimal possible value and transition initiates only when both power sources are in sync. **Transfer Del** setpoint value is ignored (equals to zero). See description of passive synchronization for more info.

This kind of transition is suitable for such systems where fast changeover (very short blackout) is required, huge inductive load (e.g. large electric motor) is involved and it is not possible to use Closed Transition due to some reason.

Two or three position ATS switch or two independent breakers/contactors can be used as switching element. Reaction time of whole switching mechanism (including control relays) affects overall changeover time and in-phase transfer accuracy.

**It is recommended to use as fast switches as possible (overall switching time <<
200 ms). The faster the better to ensure real in-phase transition –> once sync
moment is calculated and source is disconnected from load, electrical parameters
of load are changing dynamically and could fall out of sync rapidly. Real phase
difference depends on that switching time.**
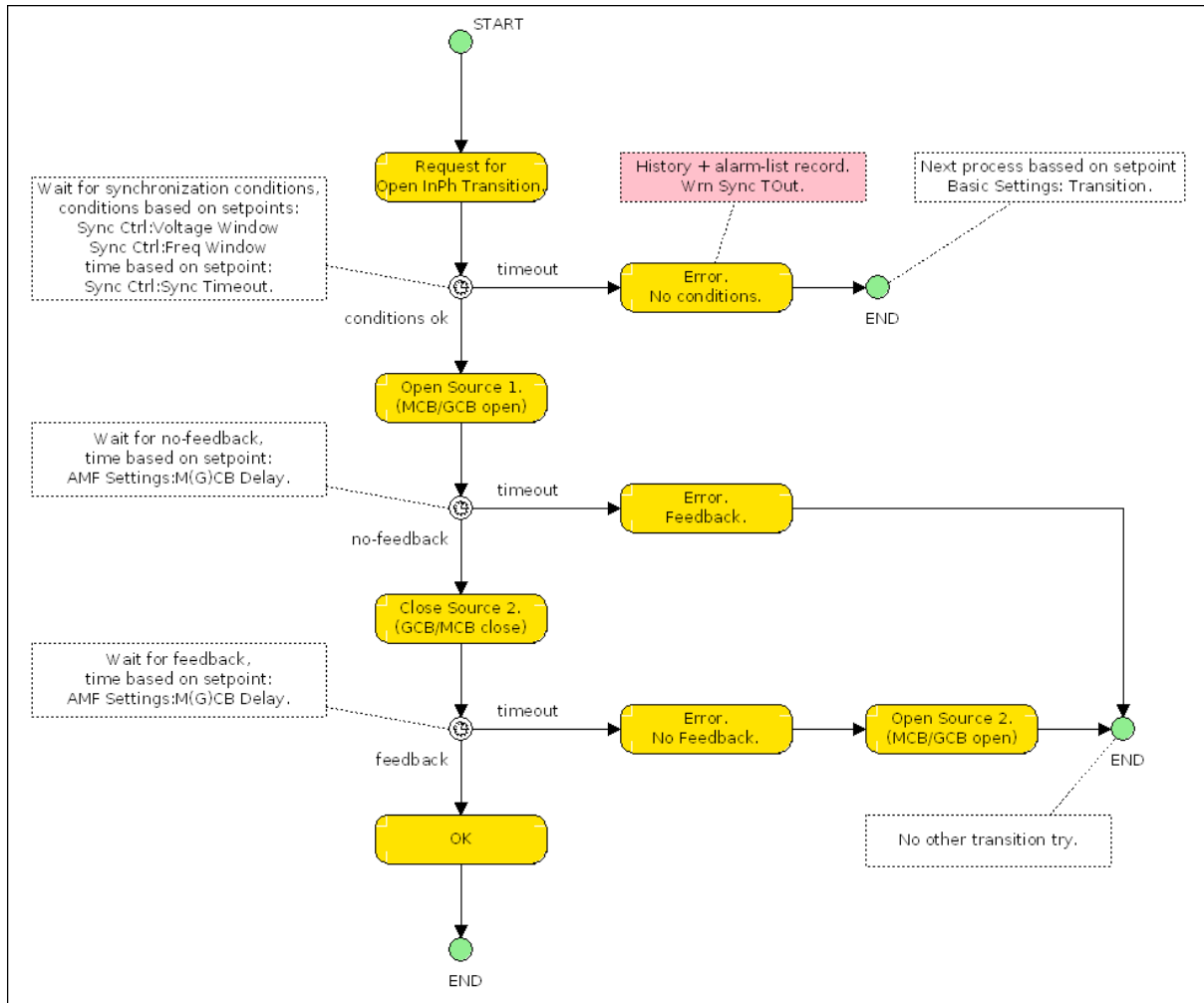
Picture above shows how is Open In-phase Transition implemented by IA-NT controllers.

In case of system using two separate breakers/contactors controller ensures no overlap between
both switches during changeover however mechanical interlock can still be useful.
Two or three position ATS switches ensure this by its nature.

HINT:
It is necessary to use fast breakers with known closing/opening time when Open In-phase
Transition takes place. Breaker switching time is used as parameter (MCB Delay, GCB Delay) for
calculation/prediction of exact in-sync moment.
Overall blackout time equals to 100 ms + one breaker reaction time (incl. control relay delay).

HINT:
In case of source (e.g. mains) failure changeover from source is always performed as open
delayed, not as in-phase.

HINT:
During system tests two separate breakers/contactors with switching time below 50ms were used
along with fast ATS switches (e.g. SOCOMEC ATyS M 3s, switching time 180 ms).
We do not recommend usage of switching elements their reaction time exceeds these values!

3. Closed Transition

Closed Transition presents transition type where both breakers/contactors overlap for 100 ms and transition initiates only when both power sources are in sync. This kind of transition is suitable for such systems where no break (no blackout) changeover is required. **Transfer Del** setpoint value is ignored (equals to zero).

See description of passive synchronization for more info.

Two independent breakers/contactors are required as switching elements. Reaction time of whole switching mechanism (including control relays) affects overall changeover time.

It is required to use as fast switches as possible (breaker opening time < 100 ms including control relay). If parallel run exceeds 200 ms both breakers are opened and alarm is activated. If parallel run still continues (breakers are closed for at least 100 additional milliseconds), binary output Shunt Trip is activated (if configured).

During system tests two separate breakers/contactors with switching time below 50ms were used. We do not recommend usage of switching elements their reaction time exceeds these values.

<u>HINT:</u>
Breaker delay default value for both breakers (MCB Delay, GCB Delay) is set to 50ms.

4. In-phase + Open Delayed Transition, Closed + Open Delayed Transition

If Setpoint **Transition** equals to **[INPH-OPEN]** or **[CLOS-OPEN],** system continues with Open Delayed Transition after requested synchronized transition failed (sync timeout expired sooner than both sources reached synchronized state)

GCB Delay   [s]

By means of this setpoint system gets information about breaker/contactor switching time. This value is needed for exact sync moment/ time prediction.
Step: 0.01 s
Range: 0.01 – 60.00 s
Default: 0.05 s

MCB Delay   [s]

By means of this setpoint system gets information about breaker/contactor switching time. This value is needed for exact sync moment/ time prediction.
Step: 0.01 s
Range: 0.01 – 60.00 s
Default: 0.05 s

<u>HI NT:</u>
Value of breaker switching time **MUST** contain all the parts of breaker delay (i.e. breaker switching time plus switching time of relay used for breaker control).
The more exact value is given, the more exact is the sync result.

Comms Settings

ControllerAddr (1 .. 32)   [-]

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

<u>NOTE:</u>
When opening connection to the controller its address has to correspond with the setting in PC tool.

COM1 Mode   [DIRECT/MODEM/MODBUS]

Communication protocols 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.

<u>NOTE:</u>
For details on comm. speed and other technical parameters please see chapter Technical Data.
For detail description see chapter Modbus protocol. Register oriented modbus is supported.

COM2 Mode   [DIRECT/MODBUS]

Communication protocols switch for the COM2 channel, if dual communication module is plugged in.
DIRECT: LiteEdit communication protocol via direct cable.
MODBUS: Modbus protocol. See detailed description in InteliCommunication guide.

ModbusComSpeed [9600, 19200, 38400, 57600]

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

IBLite IP Addr [-]

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

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

IBLite NetMask [-]

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

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

IBLite GateIP [-]

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

If DHCP is ENABLED this setpoint is used to display the gateway IP address which has been assigned by the DHCP server.
A gateway is a device which connects the respective segment with the other segments and/or Internet.

IBLite DHCP [ENABLED/DISABLED]

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

DISABLED:
The ethernet connection is adjusted manually according to the setpoints
IP Addr, *NetMask*, *GateIP*, *DNS IP Address*.
This method should be used for classic ethernet or Internet connection. When this type of connection is opening the controller is specified by its IP address. That means it would be inconvenient if the IP address were not fixed (static).

ENABLED:
The ethernet connection settings is obtained **automatically from the DHCP server.** The obtained settings is then copied to the related setpoints.
If the process of obtaining the settings from DHCP server is not successful
the value *000.000.000.000* is copied to the setpoint *IP address* and the
module continues trying to obtain the settings.

ComAp Port [0 - 65535]

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

APN Name [-]

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

APN User Name   [-]

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

APN User Pass   [-]

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

AirGate   [ENABLED/DISABLED]

This setpoint selects the ethernet connection mode.

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

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

AirGate IP   [-]

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

SMTP User Name   [-]

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

SMTP User Pass   [-]

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

SMTP Server IP   [-]

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

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

Contr Mail Box   [-]

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

Time Zone   [-]

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

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

DNS IP Address   [-]

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

Engine Params

Prestart Time   [s]

Time of closing of the *Prestart* and/or *Pretransfer* output prior to the engine start.
Set to zero if you want to leave the output *Prestart/Pretransfer* open.
Step: 1 s
Range: 0 – 600 s

Cooling Time   [s]

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

Max Start Del   [s]

This timeout starts after closing binary output GEN START/STOP. When generator does not reach defined limits **Basic Settings:** *Nominal Freq*) within *Max Start Del, Trp Start Fail* alarm occurs and the gen-set will shut down. See the table below for a description of the engine start evaluation.
If Max Start Del is longer than 600 s it means there is NO TIMEOUT.
Step: 1 s
Range: 0 – 600 s, 601 s = NO TIMEOUT

Engine start evaluation diagram:

BI: GenReadytoLoad	The BO: GCB close/open closes itself AND Gen Start Fail does not occur when:
Configured	Gen V and Gen f are in limits AND BI: GenReadytoLoad is closed until MaxStartDel is to be elapsed *MaxStartDel* BO: Gen Start/Stop BO: Gen OK (i.e. GenV and Genf in limits) BI: GenReadyToLoad BO: GCB close/open
Not configured	Gen V and Gen f are in limits until MaxStartDel is to be elapsed *MaxStartDel* BO: Gen Start/Stop BO: Gen OK (i.e. GenV and Genf in limits) BO: GCB close/open
Configured	BI: GenReadytoLoad is closed until MaxStartDel is to be elapsed *MaxStartDel* BO: Gen Start/Stop BI: GenReadyToLoad BO: GCB close/open

Min Stab Time   [s]

Minimum time interval between defined generator voltage is reached to GCB is closed.
If **BI:** *GenReadyToLoad* is not configured, timer is not used.
Step: 1 s
Range: 0 – 300 s

Stop Time   [s]

Period given by the value of the Stop Time setpoint tells the controller how long should it wait for the engine to change to the stop state (stop state means GenReadyToLoad signal is deactivated or generator voltages disappeared). If the engine is still running after the stop time expires the Wrn Stop Fail alarm is announced. Stop Fail starts counting always when the controller sends Stop command to the engine (Start/Stop output is deactivated).
Step: 1 s
Range: 0 – 3601 sec   Value 3601 means the controller doesn't care for the engine is stopped (Wrn Stop Fail is never announced).

Power switch function

This switch is assigned to the gen-set active power. Typical usage for this binary output can be switching of dummy load. The output behaves based on the setpoint adjustment as described on picture below:
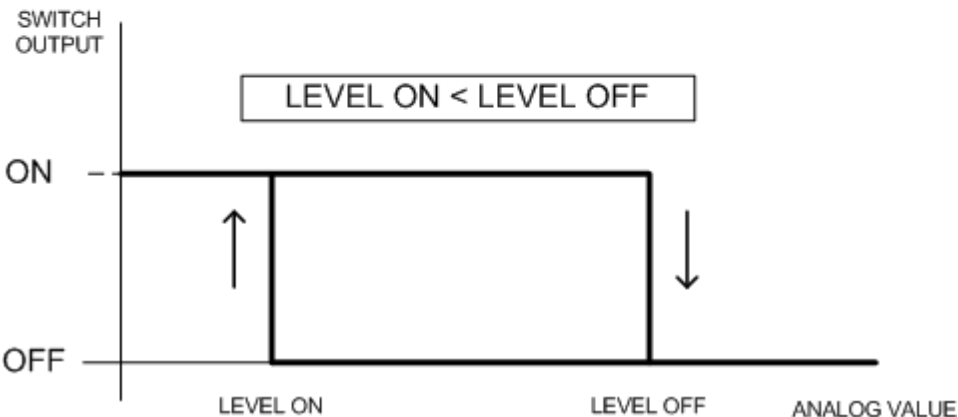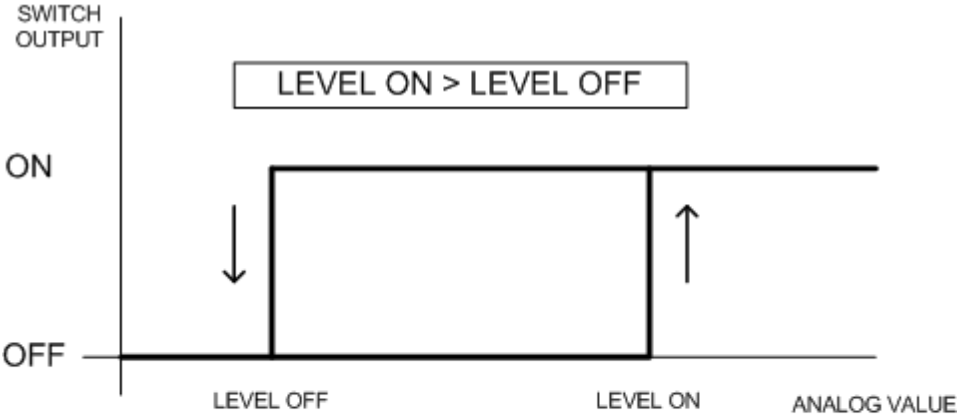
PowerSwitch ON   [kW]

Threshold level for switching the binary output "Power Switch" on.
Step: 1
Range: 0 – 32000 kW

PowerSwitchOFF   [kW]

Threshold level for switching the binary output "Power Switch" off.
Step: 1
Range: 0 – 32000 kW

Gener Protect

GenerProtect   [ENABLE/DISABLE]

ENABLE: Generator protections of the controller are active.
DISABLE: Generator protections of the controller are inactive.

Overload Trp   [%]

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: 0.1 s
Range: 0 – 600.0 s

Short Crct Trp   [%]

Trip occurs when generator current reaches *Short Crct Trp* limit.
Step: 1 % of *Nominal current*
Range: 100 – 500 %

Short Crct Del   [s]

Delay for generator shortcurrent alarm.
Step: 0.01 s
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.

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

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

EXAMPLE of Reaction time for various 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
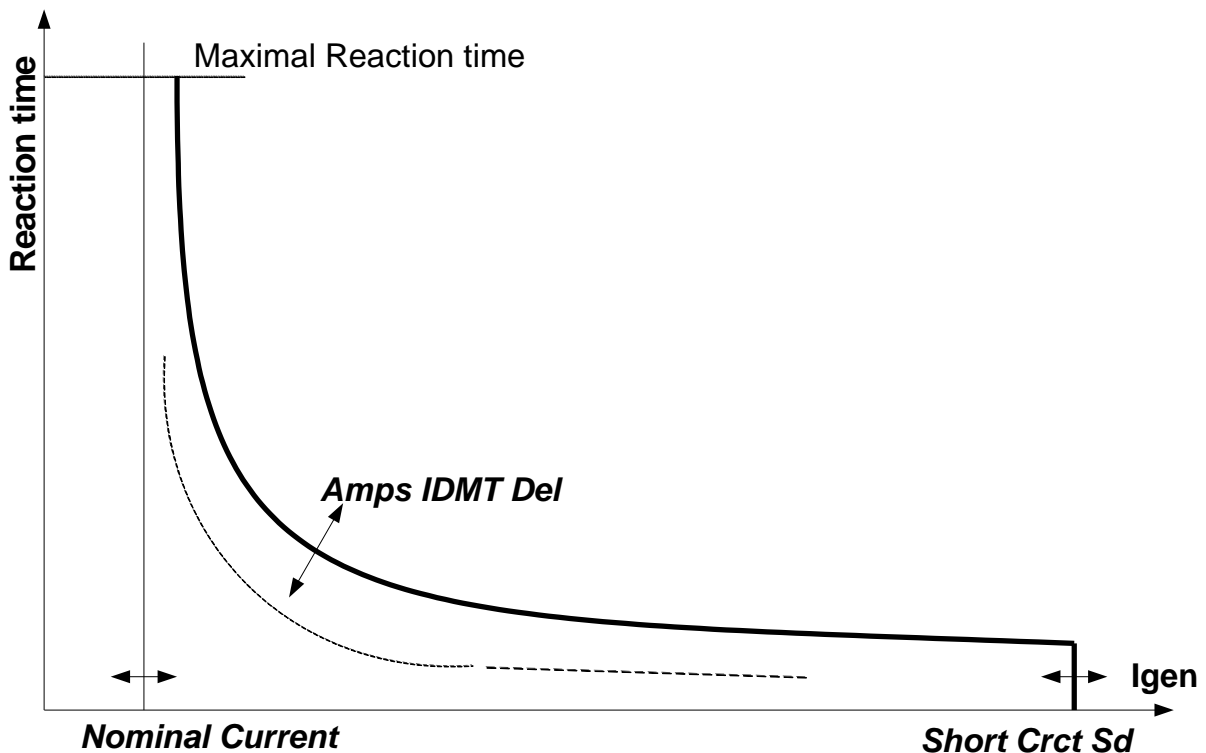
Amps Unbal Trp   [%]

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 Trp   [%]

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

Gen <V Trp   [%]

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 Trp)%

Gen V Del [s]

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

Volt Unbal Trp [%]

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: 0.1 s
Range: 0.0 – 600.0 s

Gen >Freq Trp [%]

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

Gen <Freq Trp [%]

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

Gen Freq Del [s]

Delay for generator under frequency and over frequency alarm.
Step: 0.1 s
Range: 0.0 – 600.0 s

Programmable delay on alarms

Possibility to set programmable delay on alarms configured for binary input 6 and 7 has been added. If set, it blocks alarms of the respective binary input for the whole time the delay is active. If the reason for the alarm persists after the delay time expired, the alarm is activated. If not, the alarm does not appear. This feature allows the user to perform "filtering" of alarms within a specified period of time. The delay length can be set via the following setpoints:

BI6 Delay [s]

Delay for alarm on binary input nr. 6
Step: 0.1 s
Range: 0 – 360.0 s

BI7 Delay [s]

Delay for alarm on binary input nr. 7
Step: 0.1 s
Range: 0 – 360.0 s

AMF Settings

RetFromIsland [MANUAL, AUTO]

MANUAL: After closing GCB, IA-NT 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: 1 s
Range: 0 – 6000 s

MainsReturnDel   [s]

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

Transfer Del   [s]

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

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

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

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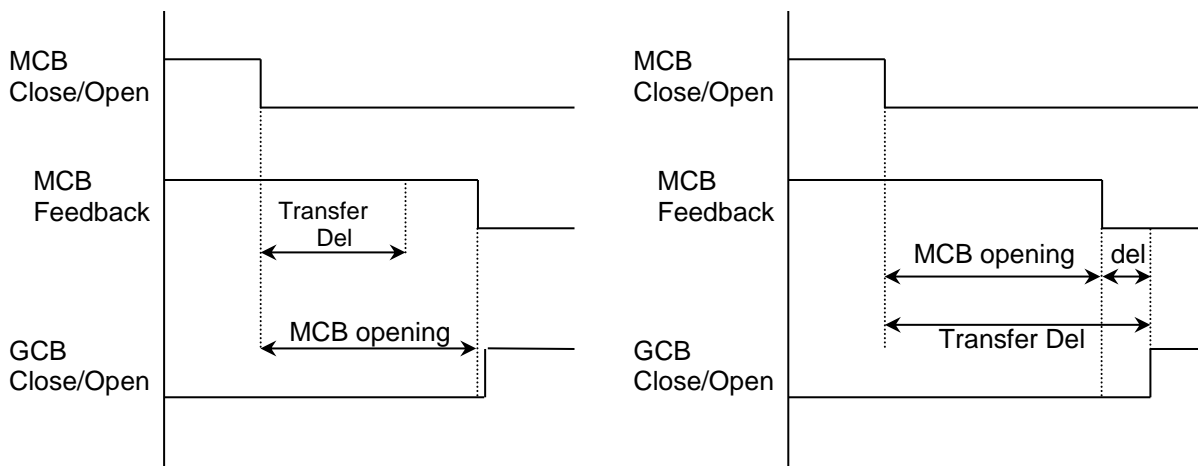
MCB Close Del   [s]

Delay after mains returns to MCB closing, if gen-set is not running(e.g. is in start-up procedure)
Step: 0.1 s
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 under voltage. All three phases are checked. Minimum voltage out of three phases is used.
Step: 1% of nominal voltage
Range: 50% – 150 (Mains >V)%

Mains V Del   [s]

Delay for mains under voltage 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 over frequency. 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 under frequency. All three phases are checked. Minimum out of three is used.
Step: 0.1% of Nominal frequency
Range: 50% – 150.0(Mains >Freq)%

Mains Freq Del   [s]

Delay for mains under frequency and over frequency
Step: 0.1 s
Range: 0 – 60.0 s

MCB Logic   [CLOSE-ON / CLOSE-OFF]

The set point affects 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.
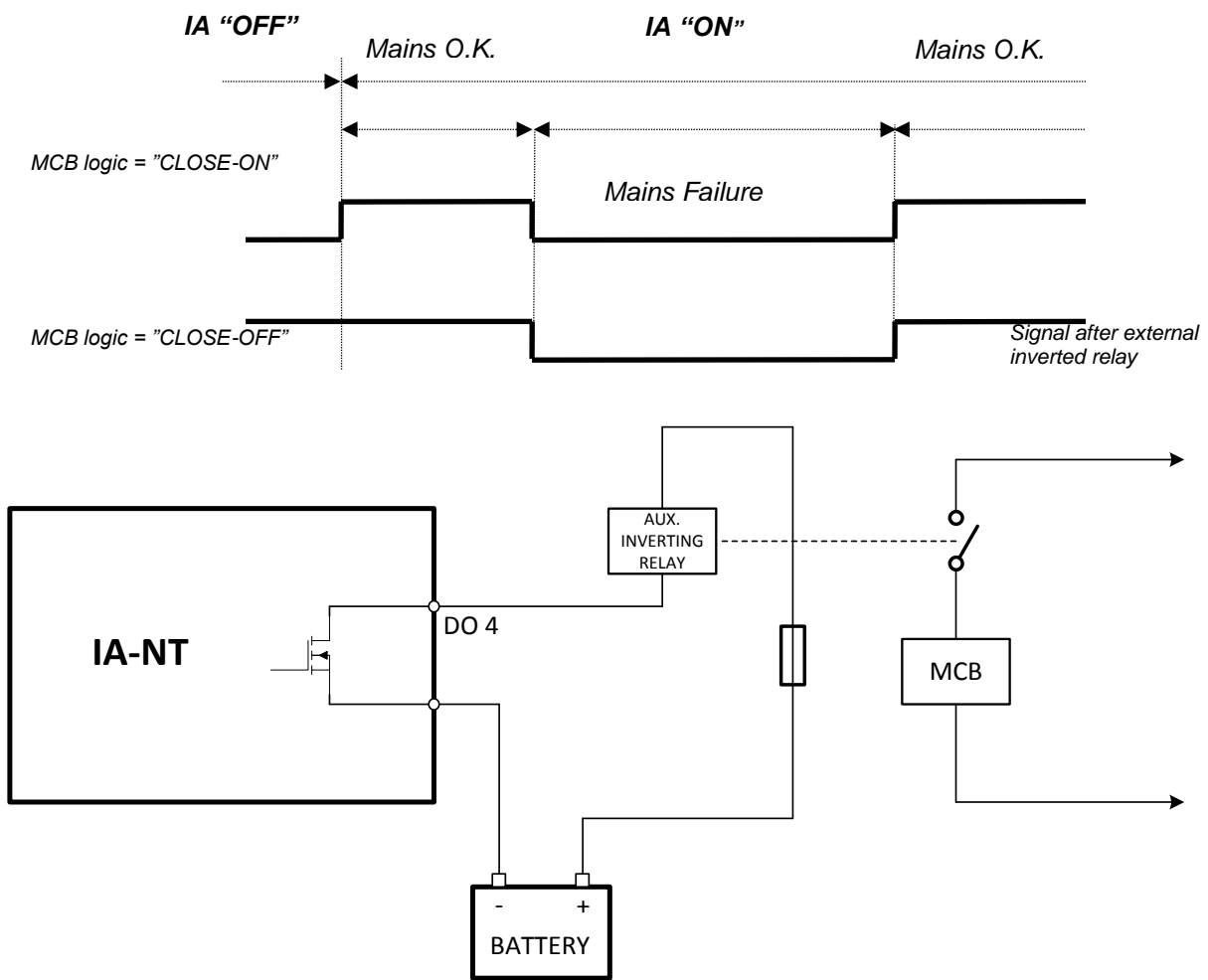
NOTE:
In the case MCB Logic = "CLOSE-OFF" it is necessary to change externally the polarity of the output signal.

ReturnFromTEST   [MANUAL / AUTO]

The set point affects 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* InteliATS^{NT} opens the GCB
    b) After the *Transfer Del* delay InteliATS^{NT} 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 *Transfer Del* delay the controller closes the MCB.

4) The gen-set remains running.
5) To stop the gen-set select a different mode than TEST.

MCB Opens On   [MAINSFAIL / GENRUN]

MAINSFAIL
The command to open the MCB is given immediately after mains fail condition evaluated.

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

NOTE:
This option should be used for MCBs using 230V control and not equipped with the under voltage coil.

GCBFeedbackDel   [s]

After closing binary output GCB close/open this timer starts. After the timer elapses the state of BI: GCB feedback is evaluated.
If the setting of the GCB feedback del setpoint is longer than 60.0 s it means there is NO TIMEOUT.
Step: 0.1 s
Range: 0 – 60.0 s, 60.1 s = NO TIMEOUT.

MCBFeedbackDel   [s]

After closing binary output MCB close/open this timer starts. After the timer elapses the state of BI: MCB feedback is evaluated.
If the setting of the MCB feedback del setpoint is longer than 60.0 s it means there is NO TIMEOUT.
Step: 0.1 s
Range: 0 – 60.0 s, 60.1 s = NO TIMEOUT.

Sync Ctrl

Voltage Window   [%]

This setpoint adjusts maximum allowed difference between generator and mains/bus voltage in respective phases for passive synchronizing:
Step: 1 %
Range: 0 – 30 %
Default: 10 %

Freq Window   [Hz]

This setpoint adjusts maximum allowed difference between generator and mains/bus frequency in respective phases for passive synchronizing:
Step: 0.1 Hz
Range: 0.0 – 2.0 Hz (0.0 – 0.3 Hz for CLOSED transition)
Default: 0.2 Hz

HINT:
This setpoint depends on transition type selected (setpoint *Transition*). If Closed transition takes place *Frequency Window* setpoint values above 0.3 Hz are internally limited to value of 0.3 Hz.

Sync Timeout   [min]

This setpoint adjusts maximum time interval when the system waits for both sources to get synchronized. After that time synchronization timeout alarm is activated and either changeover is interrupted or continues as open delayed transition. See **Transition** setpoint description for more details, please.
Step: 1 min
Range: 1 – 60 min
Default: 1 min

Date/Time

Time Stamp Per   [min]

Time interval for periodic history records. Adjust the setpoint to 0 to disable this function.
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.

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

It is possible to choose out of 6 following Timer functions. Binary output Exerc Timer X is always activated when Timer is active regardless of chosen Timer function. Timer functions require controller running in AUT mode.
No Func: There is no any other function, but binary output Timer1..2 activation.
TEST: When this option is chosen then the Timer output is also internally connected to the Remote TEST binary input.
TEST OnLd: When this option is chosen then the Timer output is also internally connected to the Rem TEST OnLd binary input.
MFail Blk: When this option is chosen then the Timer output is also internally connected to the MainsFailBlock binary input.
Mode OFF: When this option is chosen then the Timer output is also internally connected to the Remote OFF binary input.
Rem Trans: When this option is chosen then the Timer output is also internally connected to the Remote Transfer binary input.

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

Defines TIMER 1 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

SMS/E-Mail

Remote alarm messaging

If a GSM modem and/or InternetBridge-NT 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.

The list of all supported terminals shows the table below:

Terminal	Active alarm sms	Active event sms	Active alarm email	Active event email
IB-Lite	NA	NA	yes	yes
IB-NT	Not supported	Not supported	yes	yes*
IL-NT-GPRS	yes	yes	Not supported	Not supported

*since IB-NT 2.2.0

Controller is capable to detect which communication terminal is connected to the network and send the email/SMS via the active one. InternetBridge-NT is preferred terminal if more possibilities are detected.

NOTE:
An internet module must be available for sending of e-mails. Similarly, a GSM modem is necessary for sending of SMS.

NOTE:
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 IA-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.

NOTE:
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** (Trip) alarm occurs.

NOTE:
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.

<u>NOTE:</u>
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 beginning. **This setpoint can be modified from PC only!**

SMS Language   [1/2]
Select 1 to receive a message in primary controller language or 2 for secondary one.

Function Description

Operating modes

Selection of the operating mode is done through *Mode* buttons on the front panel or by changing of the *Controller mode* setpoint (from the front panel or remotely).

There are following binary inputs that can be used to force one respective operating mode independently on the mode setpoint selection:

- *Remote OFF*
- *Remote MAN*
- *Remote AUT*
- *Remote TEST*
- *Rem TEST OnLd*

If the respective input is active the controller will change mode to the respective position according to the active input. If more inputs are active the mode will be changed according to priorities of the inputs. The priorities match the order in the list above. If all inputs are deactivated the mode will return to the original position given by the setpoint.

OFF

The behavior of the controller in OFF mode depends mainly on setting of the *ActivityAtOff* setpoint.

No activity
Setpoint *ActivityAtOff* = DISABLED.

The controller opens all binary outputs and *Fault reset* is active all the time. Output controlling MCB remains unchanged!

Standard activity
Setpoint *ActivityAtOff* = ENABLED.

The GCB will be opened and the engine will be immediately stopped without unloading and cooling. The MCB is closed permanently (*MCB Opens On* = GENRUN) or is closed or open according to the mains is present or not (*MCB Opens On* = MAINSFAIL). No AMF (Auto Mains Failure - evaluates Mains failure / return) function will be performed. Buttons MCB, GCB, START, STOP including the appropriate binary inputs for external buttons are not active. Output *GenStart/Stop* is not energized.

MAN

The engine can be started and stopped manually using START and STOP buttons (or external buttons wired to appropriate binary inputs) in MAN mode. This will activate/deactivate *GenStart/Stop* binary output which polarity depends on *GenStart Logic* setpoint. When the engine is running, GCB can be closed to a dead bus. Also MCB can be closed and opened manually using the MCB button, regardless the mains is present or not. No autostart is performed. No reaction to the input *Rem Start/Stop*.

NOTE:
The breakers are internally locked to close two voltages against each. The controller will automatically recognize if the breaker can be closed, it means it is never possible to close both breakers together

NOTE:
If some voltage arises on generator bus (e.g. gen-set was started externally - not via IA-NT), generator LED blinks and [Stop], [MCB], [GCB] buttons are inactive. To bring them into operation [Start] button has to be pressed - it will synchronize IA-NT with gen-set state.

CAUTION!
The MCB can be opened manually in MAN mode. Accidental opening the MCB will cause the object (load) will remain without power!!!

AUT

The engine is started and stopped either by the binary input _Rem Start/Stop_ or by the AMF mechanism or by the manual transfer request via _Rem Transfer_ binary input. Buttons MCB, GCB, START, STOP including the appropriate binary inputs for external buttons are not active. The full start sequence up to the moment when the engine is loaded is automatic as well as unloading and stop sequence.

The controller behavior when gen-set is stopped and restarted again whilst the mains failure constantly persists:
- If the problem on the gen-set side appears, all faults messages are auto-quit and no next operation is blocked
- Gen-set Start/Stop signal stays active
- Controller waits for gen-set parameters are OK (means GenReadyToLoad signal is activated or generator voltages are in allowed limits) and then GCB is reclosed
- For ensuring GCB Open/Close output remains off whilst Gen Voltage is OK long enough to rewind the Circuit breaker to the off position use the _Transfer Del_ setpoint

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 _Transfer 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 _Transfer 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 asymmetry (preset delay must elapse)

[2] If during start-up sequence mains returns, then MCB is reclosed with delay *MCB Close Del* (if opened, depending on *MCB Opens On* setpoint) and start-up sequence is interrupted.
[3] If mains fails during stop procedure (cooling) again, stop sequence is interrupted, MCB opened and GCB reclosed with delay *Transfer Del*.

See also chapters: *Circuit breakers timing* and *AMF time chart*.

TEST

The behavior of the controller in TEST mode depends mainly on setting of the *ReturnFromTEST* setpoint.

Automatic return
Setpoint *ReturnFromTEST* = AUTO.

The gen-set will be started when the controller is put to TEST mode and will remain running unloaded. If a mains failure occurs, the MCB will be opened and after *Transfer Del* the GCB will be closed and the gen-set will supply the load. **After mains is recovered, the delay *MainsReturnDel* will count down and if elapses and the mains is still ok, the controller will transfer the load back to the mains and the gen-set will remain running unloaded again until the mode is changed**.

Manual return
Setpoint *ReturnFromTEST* = MANUAL.

The gen-set will be started when the controller is put to TEST mode and will remain running unloaded. If a mains failure occurs, the gen-set will take the load.

The load can be transferred to the gen-set also manually:

- If the MCB button is pressed, the controller will open the MCB, then wait for *Transfer Del* and finally close the GCB.

Once the load is supplied by the gen-set, the gen-set remains supplying it until the controller is switched to other mode.

Test with load
If the binary input *Rem TEST OnLd* is activated, the controller is switched to TEST mode (i.e. the gen-set will be started as described above), but once started the controller will automatically make a switchover, i.e. open MCB, wait for *Transfer Del* and close GCB.
After the binary input *Rem TEST OnLd* has been deactivated, the controller goes back to previous operation mode and it's behavior depends on it. In most cases it will be AUT mode and the controller will either stay supplying the load if the mains is failed, or will transfer the load back to the mains.

Periodic exercises
The output from the *Exerc timer 1* is internally connected to the *Remote TEST* binary input to enable periodic testing of the gen-set.

The controller must have AUT mode selected by mode buttons and other "mode forcing" binary inputs must not be active to ensure proper function of the exercise.

NOTE:
If a Trip or other red alarm comes while the load is supplied from the gen-set and the mains is healthy, the load is switched back to the mains.

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

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.

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

```
                    Mains fail
                    ┌──────────────┐
────────────────────┘              └──────────

                         MCB
                        opened
──────────────────────────┐
                          └──────────────────

              Mains V Del  or  Mains Freq
              ◄────────────► Del  or  Mains VUnb Del

                                    genset start
                                    ┌──────────
────────────────────────────────────┘

                          EmergStart Del
                    ◄──────────────────►
```
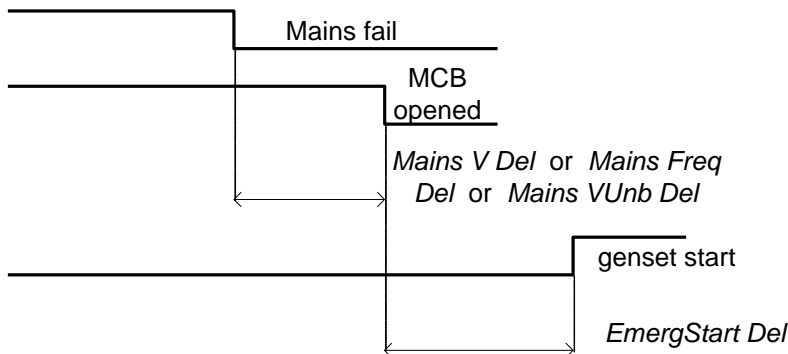
MCB Opens On = GENRUN:

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

```
                 Engine started
              ┌──────────────────────────────
──────────────┘

                                    MCB opened
                          ┌ ─ ─ ┐   ┌──────────
──────────────────────────┘     └───┘
          MinGenStabTime
          ◄──────────►
              MaxGenStartDel
          ◄──────────────────►

                              GCB closed
                              ┌──────────────
──────────────────────────────┘
              Transfer Del
          ◄──────────────►
```
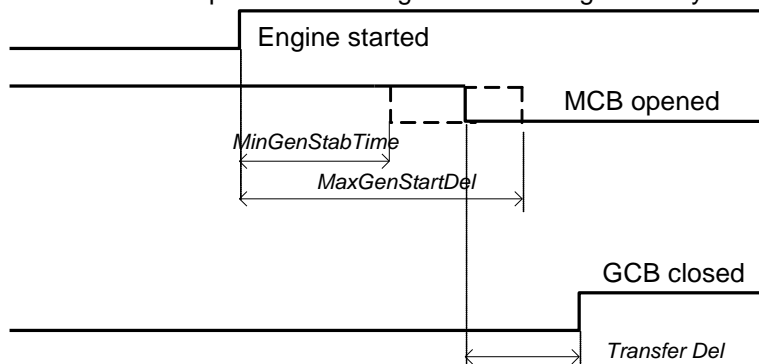
Relation between Mains return and MCB

OFF Mode, GCB and MCB are opened

```
                    Mains return
                    ┌──────────────────────
────────────────────┘

                         MCB closed (only when genset is
                        ┌   not running and GCB  is opened)
──────────────────────────┘
                         MCB Close Del
              ◄──────────────►
```
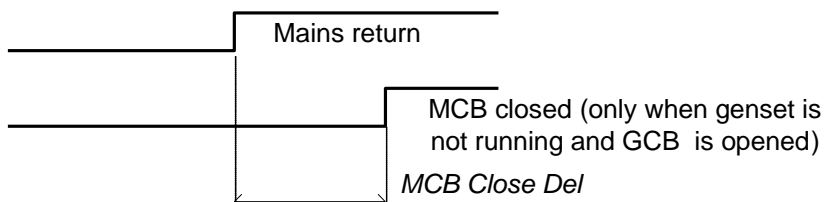
Relation between GCB and MCB

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

```
                              GCB opened
                    _____            _____
                             |          |
                             |_____|
                                         MCB closed
                    _____                 _____
                                        |                |
                             _____|_____|
                             |          |
                             |<-------->|
                             |          |
                                 Transfer Del
```
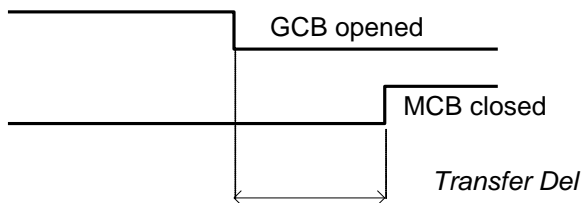
Relation between GCB and MCB (Test mode)

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

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

```
                              MCB opened
                    _____            _____
                             |          |
                             |_____|
                                         GCB closed
                    _____                 _____
                                        |                |
                             _____|_____|
                             |          |
                             |<-------->|
                             |          |
                                 Transfer Del
```
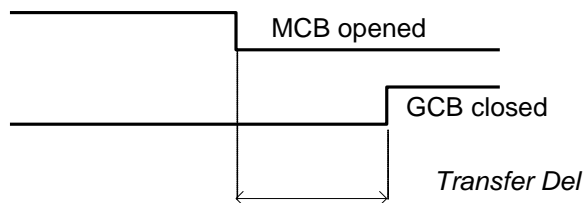
Source evaluation

Source evaluation is same for generator and mains. Setpoints and binary inputs connected with source evaluation are:

- GenProtect setpoint (for generator)
- MainsProtect setpoint (for generator)
- GenReadyToLoad binary input (for mains)
- MainsHealthy binary input (for mains)

State of source can be evaluated in these ways:

- Binary input only
- Measured values only
- Binary input and measured values

Binary input only

In this case the binary input GenReadyToLoad or MainsHealthy has to be configured. After configuration of binary input, related setpoint GenProtect or MainsProtect should be adjust to DISABLED. After that the source will be evaluated only from binary inputs.

Measured values only

In this case the binary input GenReadyToLoad or MainsHealthy can´t be configured. Related setpoint GenProtect or MainsProtect is adjust to valeu ENABLED and its value can´t be changed. Source is evaluated only from measured values (voltage and frequency).

Binary input and measured values

In this case the binary input GenReadyToLoad or MainsHealthy has to be configured After configuration of binary input, related setpoint GenProtect or MainsProtect should be adjust to ENABLED. After that the source will be evaluated from both sources. To evaluate that source is health the values of voltage and frequency have to be in limits and also related binary input has to be in logical one.

Alarm Management

Following alarms are available:
- Warning
- Trip
- Mains failure

Warning (WRN)

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

Possible warnings:

See List of possible events

Trip (TRP)

When the trip alarm comes up, InteliATS[NT] opens outputs GCB CLOSE/OPEN, GENSTART/STOP 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 (AMF)** 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

NOTE:
Mains failure is not written to alarm list!

AMF time chart – genset OK
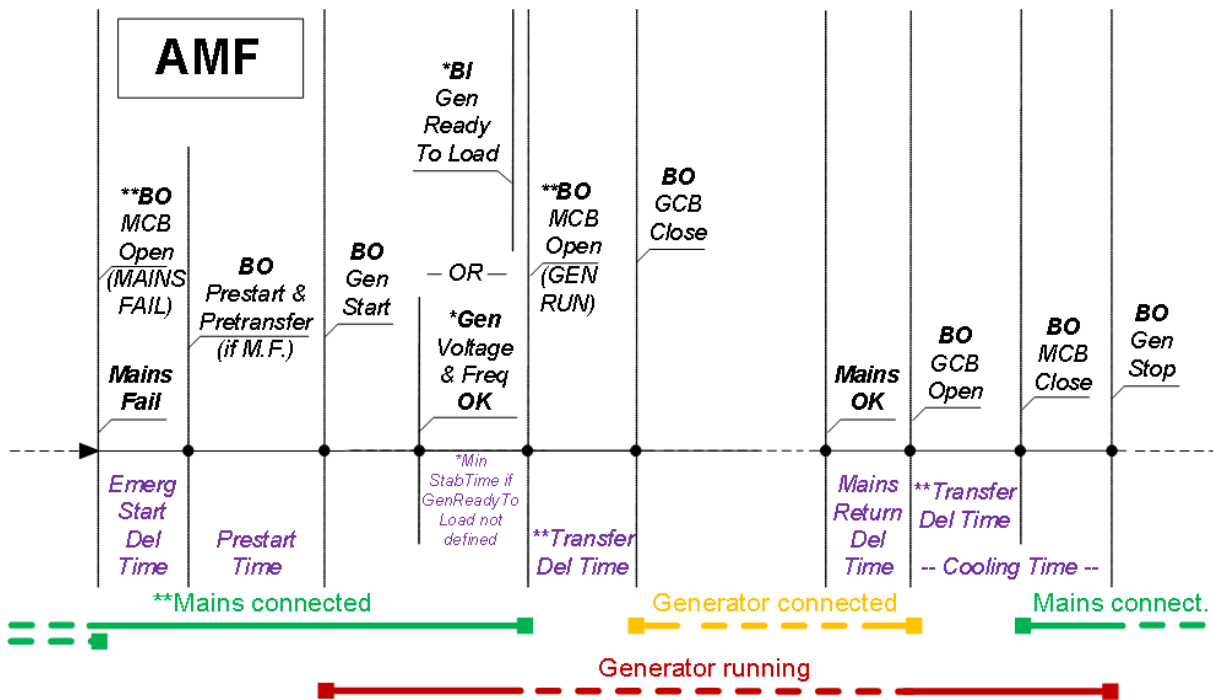
AMF time chart – genset not started properly
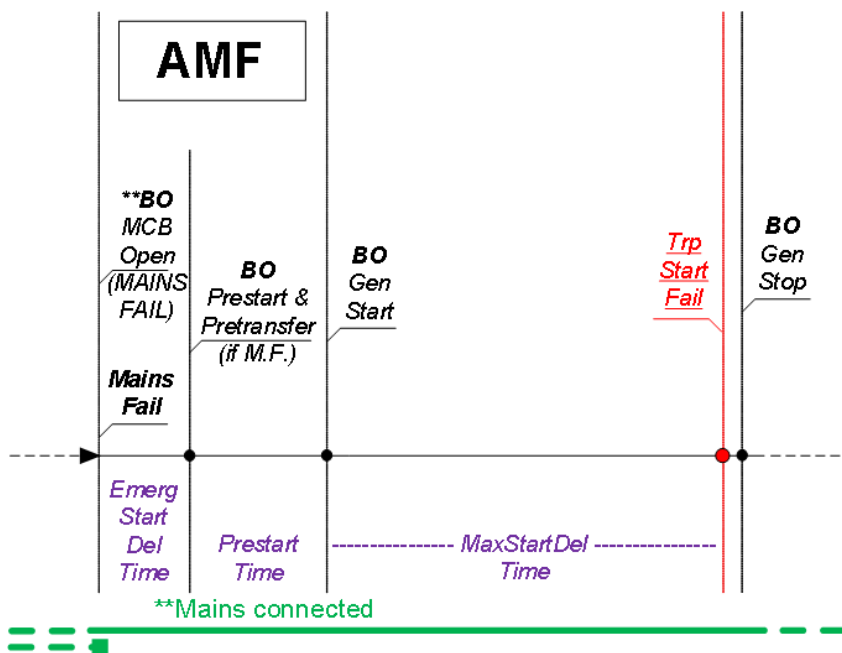
NOTE:
For more details please see the:
*   **AMF Settings:** *Min Stab Time* & *Max Start Del* setpoint description,
**   **AMF Settings:** *MCB Opens On* & *Transfer Del* setpoint description.

Voltage phase sequence detection

InteliATS^{NT} controller detects phase sequence on both generator and mains/bus voltage terminals. These protections are important after controller installation to avoid wrong voltage phases connection. Following alarms can be detected:

Wrong phase sequence

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

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

GCB, MCB fail detection

MCB 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).

When BO GCB Close/Open (MCB Close/Open) opens, there is GCB Delay (0.01 - 60 s) delay for GCB fail and MCB Delay (0.01 - 60 s) for MCB fail detection.
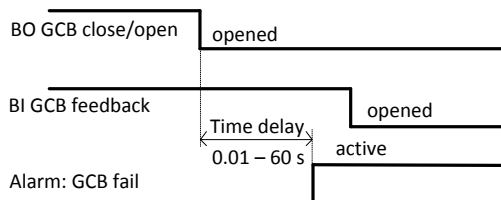
When BO GCB Close/Open (MCB Close/Open) closes, GCB Delay (0.01 - 60 s) delay for GCB fail and MCB Delay (0.01 - 60 s) for MCB fail detection.
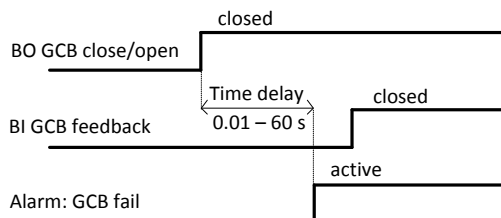
NOTE:
You can solve state of MCB fail by pressing Fault Reset button. You can also disable feedbacks by removing them via LiteEdit.

Gen-set Operation States

Electric state machine

MainsOper	Mains is present, MCB closed
MainsFlt	Mains cut off – immediate state
MainsFlt	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
Trans Del	Forward return break delay. Delay between GCB opening and MCB closing

List of possible events

Events specification	Protection type	Information on binary output available (See list of Binary outputs)	Description
Wrn Batt Volt	WRN	YES	Battery voltage is out of limits given by *Batt Undervolt/Batt OverVolt* setpoints.
Binary input	Configurable	YES	Configurable Warning/Trip alarms on the inputs of IA-NT.
IL-NT-BIO8	Configurable	YES	Configurable Warning/Trp alarms on the inputs of IL-NT-BIO8.
ActCallCH1Fail	WRN	NO	Active call on channel 1 failed.
ActCallCH2Fail	WRN	NO	Active call on channel 2 failed.
Low BackupBatt	WRN	NO	RTC backup battery is flat
Trp BatteryFlat	TRP	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.
Trp Start Fail	TRP	YES	Gen-set start failed.
Wrn Stop Fail	WRN	YES	Gen-set stop failed. The alarm appears if the STOP command fails and the START command was issued before.
Trp Gen Lx >V Trp Gen Lx <V (where x=1,2,3)	TRP TRP	YES	The generator voltage is out of limits given by *Gen <V Trp* and *Gen >V Trp* setpoints.
Trp Gen V Unbal	TRP	YES	The generator voltage is unbalanced more than the value of *Volt Unbal Trp* setpoint.
Trp Gen >, <Freq	TRP	YES	The generator frequency is out of limits given by *Gen >Freq Trp* and *Gen <Freq Trp* setpoints.
Gen CCW Rot	WRN	NO	Genset voltage phases are not wired correctly. MCB closing is prohibited by controller.
Trp Amps Unbal	TRP	NO	The generator current is unbalanced.
Trp Amps IDMT	TRP	NO	Generator current exceeds the limit for IDMT protection given by *Nominal current* and *Amps IDMT Del* setpoints.
Trp Overload	TRP	YES	The load is greater than the value given by *Overload Trp* setpoint.
Trp Short Crct	TRP	YES	Generator current is higher than the value given by *Short Crct Trp* setpoint.
Mains Lx >V	MF	YES	The mains voltage is out of limits given by

Events specification	Protection type	Information on binary output available (See list of [Binary outputs](#))	Description
Mains Lx <V (where x=1,2,3)			*Mains <V* and *Mains >V* setpoints.
Mains V Unbal	MF	YES	The mains voltage is unbalanced more than the value of Mains V*Unbal* setpoint.
Mains >, <Freq	MF	YES	The mains frequency is out of limits given by *Mains >Freq* and *Mains <Freq* setpoints.
Mains CCW Rot	WRN	NO	Mains voltage phases are not wired correctly. MCB closing is prohibited by controller.
EmergencyStop	TRP	NO	If the input *Emergency Stop* is opened Trip is immediately activated.
Total Stop	TRP	NO	If the input *Total Stop* is opened Trip is immediately activated.
GCB Fail	TRP	NO	Failure of generator circuit breaker.
MCB Fail	MF	NO	Failure of mains circuit breaker.
Wrn GeStateNA	WRN	NO	Neither GenerProtect enabled nor BI GenReadyToLoad defined. At least one must be enabled / configured.
Trp GenRd Fail	TRP	NO	Signal BI GenReadyToLoad lost
Wrn Sync TOut	WRN	NO	Maximum time interval given by *Sync Timeout* when the system waits for both sources to get synchronized is exceeeded. Warningis activated and either changeover is interrupted or continues as open delayed transition.
Wrn Shunt Trip	WRN	YES	GCB and MCB are closed together >300ms.
ParamFail	NONE	NO	Wrong checksum of parameters. Happens typically after downloading new firmware or changing of the parameter. The controller stays in INIT mode. Check all parameters and write at least one new parameter.
xCB Disabled	WRN	NO	LBI MCB or GCB is activated.

NOTE:
Events Trp Gen Lx <V, Trp Gen <Freq, Trp Gen V Unbal, Trp Amps Unbal are confirmed automatically. Fault Reset it's not necessary to activate after the cause of the event disappeared.

History file

InteliATS[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.

NOTE:
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
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
Vm1	Mains voltage L1
Vm2	Mains voltage L2
Vm3	Mains voltage L3
Mfrq	Mains frequency
UBat	Battery voltage
BIN	Binary inputs IA-NT
BOUT	Binary outputs IA-NT
BIOE*	Binary inputs/outputs plug-in module (when IL-NT-BIO8 module is configured)

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

Init Screens

InteliATS^{NT} controller holds information about serial number, uploaded firmware version and others. These information are displayed on so called "Init Screens". It is possible to call this screen from any measurement screen by pressing ENTER and PAGE buttons concurrently and then only PAGE button separately.

Init screens consist of:

Customer Logo screen

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

Firmware Init screen

This screen consists information about type of controller, controller manufacturer ComAp, uploaded firmware branch, used application and version of firmware.

Language screen

InteliATS^{NT} controller offers configurable language support. On this screen is possible to switch between languages configured in controller.

User Interface screen

InteliATS^{NT} controller enables to choose the user interface as customer prefers. There are two choices available: USER or ENGINEER interface.

USER interface is meant 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 displays 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 which are available. This mode is default.

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

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

Remote Control and Data Logging

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

Direct cable connection

An external communication module is necessary to enable direct cable connection to a PC. The module is plugged into the slot located on the rear side of the controller. Find more information about installation of the modules in a separate chapter.
A RS232, USB or RS485 interface can be used for direct cable connection to a PC. The setpoint COM1 Mode or COM2 Mode (according to the interface used) must be set to DIRECT position for this kind of connection.
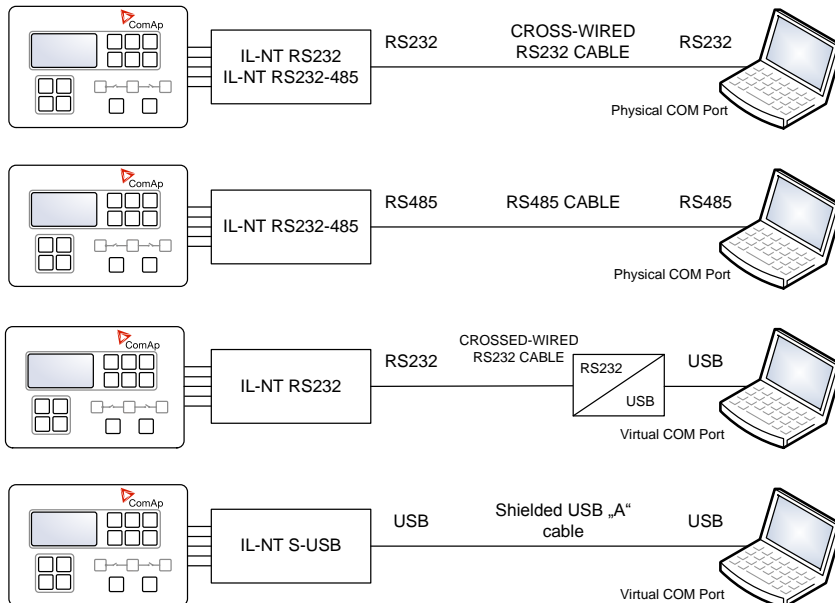
DIRECT CABLE CONNECTION TYPES

The following modules are available for direct connection to a PC:

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

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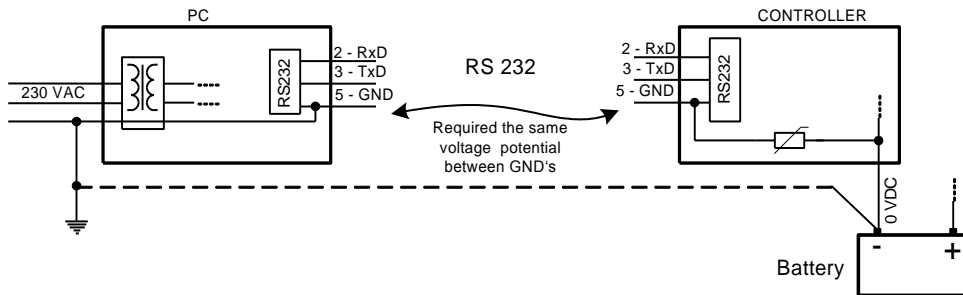
Modem connection

A PC can be connected to the controller also remotely via modems. Either an analog, GSM or ISDN modem must be connected to the RS232 interface and the setpoint *COM1 Mode* must be set to MODEM.
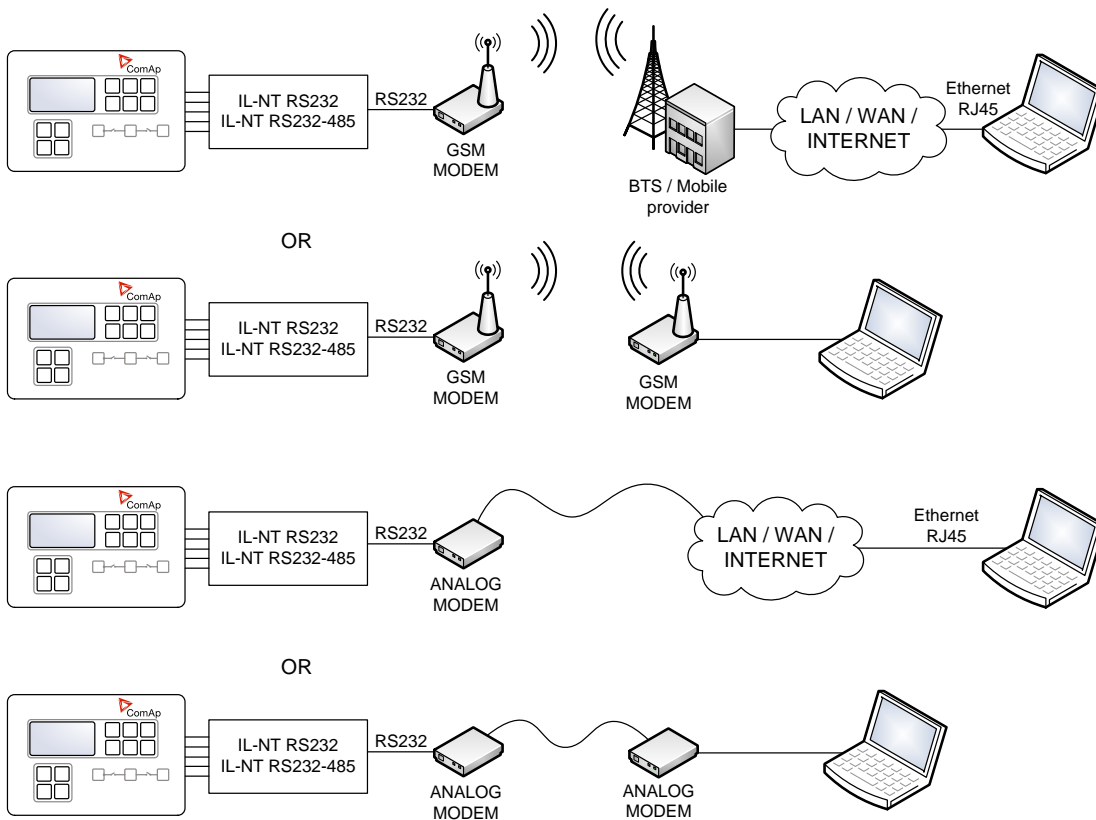
MODEM CONNECTION TYPES

The following modules can be used for a modem connection to a PC:

1. IL-NT RS232
2. IL-NT RS232-485

The RS232 interface uses COM1 port of the controller.
If you have trouble with modem communication, an additional initialization string may be required. This may be due to, for example, a national telephone network-specific feature. Use the setpoint *ModemIniString* to add the necessary AT commands which will be sent to the modem during the initialization. See the documentation of the modem for details.

NOTE:
Use the same kind of modem (e.g. analog, GSM or ISDN) as used on the controller also on the PC side.

Recommended GSM modems

- Siemens/Cinterion M20, TC35, TC35i, ES75, MC39 (baud rate 9600 bps)
- Wavecom M1200/WMOD2 (baud rate 9600 bps)
- Wavecom Maestro 20
- Wavecom Fastrack M1306B (Fastrack M1206B is **not** recommended)
- Falcom A2D

Modem setup procedure

Analog modems obviously do not require any setup. The only case in which setup could be necessary is if the modem has been bought in a country with a telephony system different than the target country where the modem will be used.
GSM modems need to be set up prior to using them with the controller. Use the *gm_setup* program (installed together with LiteEdit) to perform initial setup of the modem. See the latest *Inteli Communication Guide* (available on the ComAp web site) for details. The setup must be done while a SIM card is inserted.

NOTE:
It is always recommended to use modems bought in and approved for the target country.

Internet connection

A PC can be connected to the controller also remotely via Ethernet (internet, intranet). An appropriate Ethernet communication module must be used.

Use a plug-in communication module IB-Lite or IL-NT-GPRS to connect to the IA-NT controller via the internet. The setpoint *COM1 Mode* must be set to the DIRECT position.
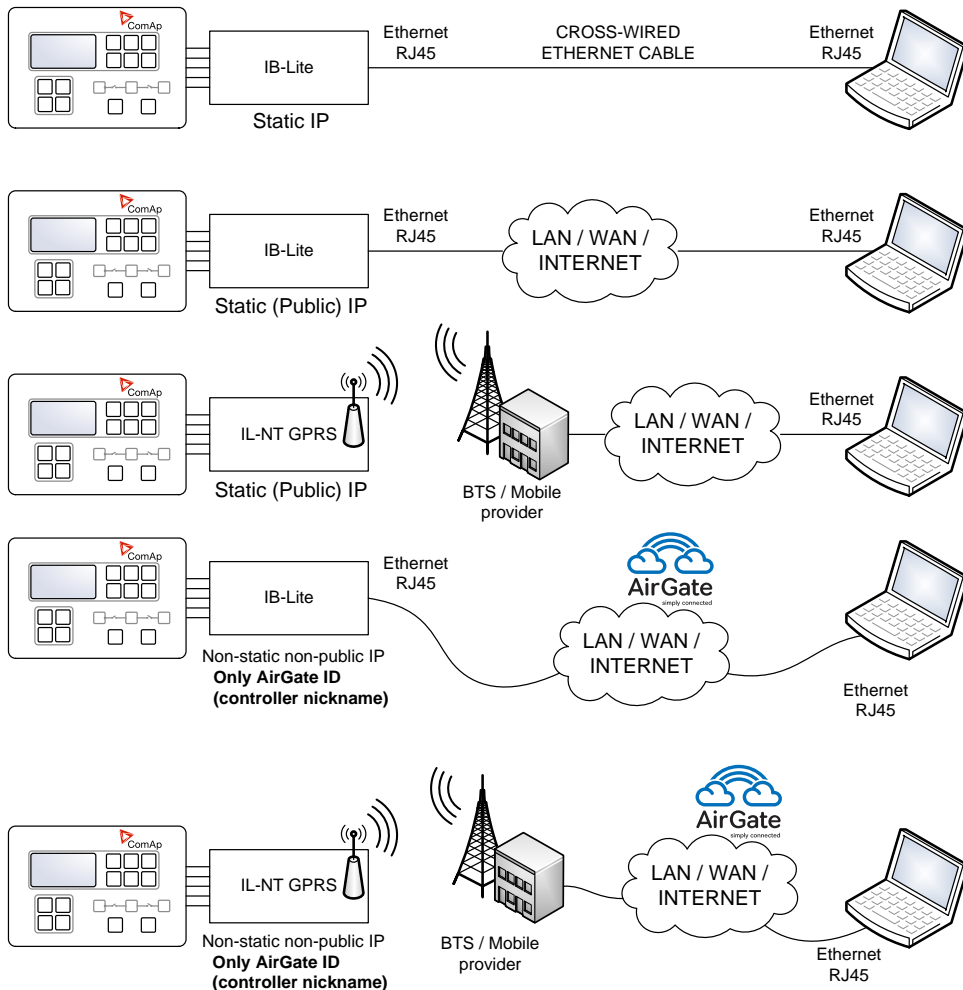
INTERNET CONNECTION FOR SINGLE CONTROLLER

Using a web browser

The IB-Lite module with firmware version 1.1 and above makes it possible to use any web browser for basic monitoring and adjustment of the controller. Direct your web browser to the IP address of the module, e.g. http://192.168.1.254 and then enter the access code.

IB-Lite

HINT:
Setting the module up requires a certain familiarity with network administration. Ask your IT specialist for assistance.

The default settings of the module are IP = 192.168.1.254, Netmask = 255.255.255.0 and Gateway = 192.168.1.1. The default password for service webpages is "comap" (or "0").
To restore the default settings, close the "restore default setting" jumper located on the module before switching the controller on and remove it few seconds after the controller has been switched on.

HINT:
The default settings can be changed directly from the controller panel by pressing the "Page" button and using ▼, ▲ and "Enter" to get to the "Comms Settings" menu (THIS APPLIES TO FIRMWARE VERSIONS 1.3 AND HIGHER).

Configuration

1. Plug the module into the controller and power the controller on.
2. Connect the module into your Ethernet network. If the default address does not match local network parameters (i.e. the network segment does not use the IP range 192.168.1.xxx or the IP 192.168.1.254 is occupied), connect the module directly to your PC using a cross-wired cable. See details in the Installation chapter.
3. If you are connected directly, you have to change temporarily the IP address and subnet mask of your PC Ethernet connection. Use the following settings: DHCP disabled, IP from the range 192.168.1.1 – 192.168.1.253 and subnet mask 255.255.255.0. After the IB-Lite setup is finished, restore your PC setting back to the original values.
4. Start a web browser and direct it to `http://192.168.1.254/sp_config.htm`.
5. After a successful login the configuration page will be displayed.
6. It is recommended to change the user name and password and keep the new values confidential.
7. Consult your IT specialist for proper IP settings.
8. Consult your e-mail provider for proper e-mail settings. Note that also most public SMTP servers require authentication and e-mails must be sent from an existing address.
9. If you want to enable access only for clients with a specified IP address, tick the checkbox "Trusted clients" and fill-in the allowed IP addresses.

HINT:
See also the latest *LiteEdit Reference Guide* (available on the ComAp web site) for more information about IB-Lite setup.

Firmware upgrade

1. Follow steps 1–3 of the configuration procedure above.
2. Start a web browser and direct it to `http://192.168.1.254/sp_fw_upld.htm`.
3. After a successful login the configuration page will be displayed.
4. Press the button "Browse" and select the appropriate firmware file.
5. Press "Upload new firmware" button. After the firmware upload is finished, the module will restart.

HINT:
Interrupting the upload will NOT cause any damage. Just repeat the upload again.

IL-NT-GPRS

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

POWER SUPPLY
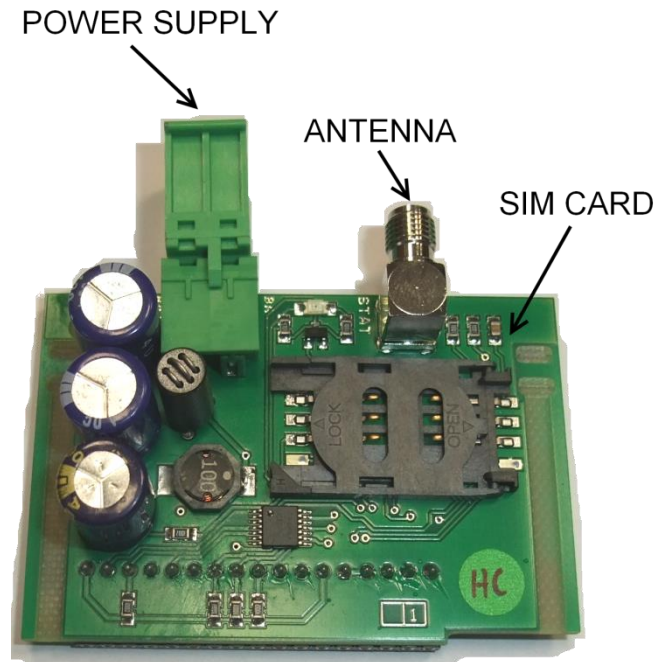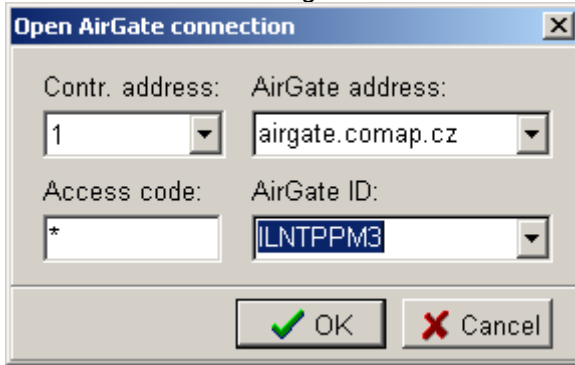
ANTENNA

SIM CARD

1. You will need one of supported ComAp controllers (IL-NT/IC-NT/ID-Lite/IA-NT), IL-NT-GPRS, antenna, SIM card with GPRS service and optionally IL-NT-RS232 or IL-NT-S-USB module.
2. Contact SIM card operator for getting GPRS APN (APN = Access Point Name) name, username and password. Example: APN Name = internet.t-mobile.cz, UserName = [blank], Password = [blank].
3. Make sure SIM card does not require PIN code. If it does, it is possible to disable it in any common network unlocked mobile telephone.
4. Power up the ComAp controller.
5. Enter correct APN Name, APN UserName and APN UserPass in controller's setpoint group Comms Settings. Set COM1 Mode = DIRECT. Comms settings as every setpoint group are accessible by PAGE button from any measurement screen on controller. Setpoints can be set on controller's front panel keyboard or by LiteEdit 4.5 and higher.
6. Switch off ComAp controller.
7. Place the SIM card into slot on IL-NT-GPRS card, plug in the IL-NT-GPRS card into communication slot on back side of ComAp controller.
8. Connect the antenna to designated SMA connector.
9. Connect power supply to IL-NT-GPRS module. It supports 8-36V DC voltage.
10. Power up the system.
11. Wait for approx 2 - 4 minutes for first connection of the system to AirGate. AirGate will generate automatically the AirGate ID value. Then navigate to last of measurement screens where you will find signal strength bar and AirGate ID identifier.
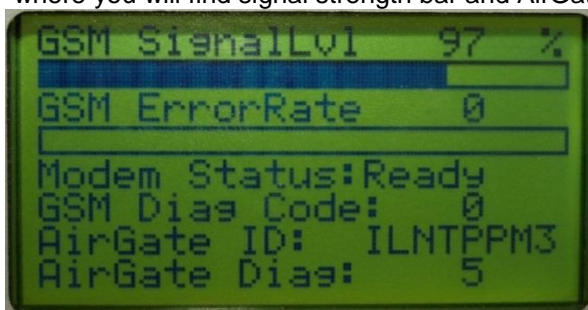
Once this AirGate ID is displayed, connection via AirGate was successful. This value will be needed for LiteEdit or WebSupervisor connection. Kindly make a note for future reference.

![ComAp logo]

AirGate Connection dialog in LiteEdit:

Add new gen-set dialog in WebSupervisor:

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

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

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

HINT:
To reduce the data traffic over GPRS network you can set in setpoint group „Comms Settings"
the parameter „AirGate IP" = 80.95.108.26. This will save significant data amount needed for translation of Airgate server IP address. In case of changing the server IP address this settings has to be updated or returned to default „airgate.comap.cz".

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

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

Table of Diagnostic Codes:

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

- AirGate Diag – Diagnostic Code for AirGate connection

Table of Diagnostic Codes:

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

AirGate

AirGate *technology for easy plug-and-play wireless communication is incorporated into the product. An ordinary SIM card with GPRS service is suitable for this system. This overcomes problems with the necessity for a special SIM card (fixed and public IP), firewalls and difficult communication settings.*
http://www.comap.cz/news-room/news-and-events/detail/AirGate
http://www.comap.cz/news-room/news-and-events/detail/The-Rainbow-rises-for-remotemonitoring-
applications/
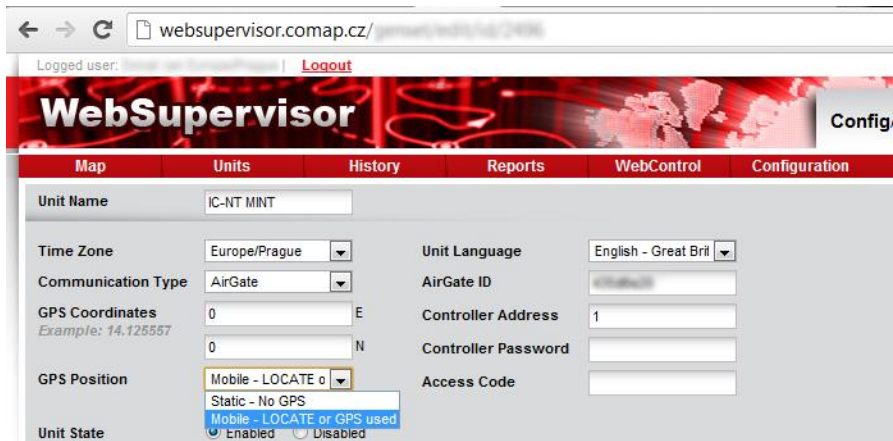
Locate

The controller supports the LOCATE technology for GSM localization using an IL-NT-GPRS communication module. It is possible to view the localization in WebSupervisor.

Modbus protocol

The selection of the function of serial port is done via the setpoint *COMx Mode* in *Basic settings*

- 57600 bps, 8 data bits, 1 stop bit, no parity
- Transfer mode RTU
- Function 3 (Read Multiply Registers)
- Function 6 (Write Single Register)
- Function 16 (Write Multiply Registers)
- The response to an incoming message is sent with minimum 4.096 ms delay after message reception

The complete description of Modbus communication protocol can be found in *Modbus Protocol Reference Guide PI-MBUS-300* and *Open Modbus Specification Release 1.0*. Both documents are available on the web.

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.**

NOTE:
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.

HINT:
Do not write setpoints repeatedly (e.g. power control from a PLC by repeated writing of baseload setpoint via Modbus) The setpoints are stored in EEPROM memory, which can be overwritten up to 10^5 times without risk of damage or data loss, but it may become damaged, when the allowed number of writing cycles is exceeded!

Communication object list (exported from default IA-NT-PWR archive)

Setpoints of IA-NT PWR:

Name	Firmware ver.	Application	Date	App. ver.	Ser. num.	Filename	
IA-NT-PWR	IA-NT-2.4 R:27.04.2015	PWR	27.04.2015	2.4	12345678	IA-NT-PWR-2.4.AIL	

Group	Name	Value	Dimens.	Password	Com. obj.	Lo limit	Hi limit	Data type
Basic Settings	ControllerName	IA-NT-PWR		No	8637			Short string
Basic Settings	Nominal Power	200	kW	No	8276	1	5000	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	/1	No	9579	0,1	500	Unsigned 16
Basic Settings	Vm PT Ratio	1	/1	No	9580	0,1	500	Unsigned 16
Basic Settings	NomVolts Ph-N	231	V	No	8277	80	20000	Unsigned 16
Basic Settings	NomVolts Ph-Ph	400	V	No	11657	138	35000	Unsigned 16
Basic Settings	Nominal Freq	50	Hz	No	8278	45	65	Unsigned 16
Basic Settings	ActivityAtOFF	ENABLED		No	11620			String list
Basic Settings	ControllerMode	OFF		No	8315			String list
Basic Settings	GenStart Logic	CLOSE-ON		No	9100			String list
Basic Settings	Batt Undervolt	18	V	No	8387	8	40	Integer 16
Basic Settings	Batt Overvolt	36	V	No	9587	18	40	Integer 16
Basic Settings	Batt Volt Del	5	s	No	8383	0	600	Unsigned 16
Basic Settings	ConnectionType	3Ph4Wire		No	11628			String list
Basic Settings	CT Location	GenSet		No	11625			String list
Basic Settings	Transition	OPEN		No	12969			String list
Basic Settings	GCB Delay	0,05	s	No	9836	0,01	60	Unsigned 16
Basic Settings	MCB Delay	0,05	s	No	9056	0,01	60	Unsigned 16
Comms Settings	ControllerAddr	1		Yes	24537	1	32	Unsigned 8
Comms Settings	COM1 Mode	DIRECT		Yes	24522			String list
Comms Settings	COM2 Mode	DIRECT		Yes	24451			String list
Comms Settings	ModbusComSpeed	9600	bps	Yes	24477			String list
Comms Settings	IBLite IP Addr	192.168.1.254		No	24376			Short string
Comms Settings	IBLite NetMask	255.255.255.0		No	24375			Short string
Comms Settings	IBLite GateIP	192.168.1.1		No	24373			Short string
Comms Settings	IBLite DHCP	ENABLED		No	24259			String list
Comms Settings	ComAp Port	23		No	24374	0	65535	Unsigned 16
Comms Settings	APN Name			No	24363			Long string
Comms Settings	APN User Name			No	24361			Long string
Comms Settings	APN User Pass			No	24360			Short string
Comms Settings	AirGate	ENABLED		No	24365			String list
Comms Settings	AirGate IP	airgate.comap.cz		No	24364			Long string
Comms Settings	SMTP User Name			No	24370			Long string
Comms Settings	SMTP User Pass			No	24369			Short string
Comms Settings	SMTP Server IP			No	24368			Long string
Comms Settings	Contr MailBox			No	24367			Long string
Comms Settings	Time Zone	GMT+1:00		No	24366			String list
Comms Settings	DNS IP Address	8.8.8.8		No	24362			Short string
Engine Params	Prestart Time	0	s	No	8394	0	600	Unsigned 16
Engine Params	Cooling Time	0	s	No	8258	0	3600	Unsigned 16
Engine Params	Max Start Del	20	s	No	10914	1	601	Unsigned 16
Engine Params	Min Stab Time	3	s	No	8259	0	300	Unsigned 16
Engine Params	Stop Time	60	s	No	9815	1	3601	Unsigned 16
Engine Params	PowerSwitch ON	100	kW	No	11658	0	32000	Integer 16
Engine Params	PowerSwitchOFF	50	kW	No	11659	0	32000	Integer 16
Gener Protect	GenerProtect	ENABLED		No	11030			String list

Gener Protect	Overload Trp	120	%	No	8280	0	200	Unsigned 16
Gener Protect	Overload Del	5	s	No	8281	0	600	Unsigned 16
Gener Protect	Short Crct Trp	250	%	No	8282	100	500	Unsigned 16
Gener Protect	Short Crct Del	0	s	No	9991	0	10	Unsigned 16
Gener Protect	Amps IDMT Del	4	s	No	8283	1	60	Unsigned 16
Gener Protect	Amps Unbal Trp	50	%	No	8284	1	200	Unsigned 16
Gener Protect	Amps Unbal Del	5	s	No	8285	0	600	Unsigned 16
Gener Protect	Gen >V Trp	110	%	No	8291	70	200	Unsigned 16
Gener Protect	Gen <V Trp	70	%	No	8293	0	110	Unsigned 16
Gener Protect	Gen V Del	3	s	No	8292	0	600	Unsigned 16
Gener Protect	Volt Unbal Trp	10	%	No	8288	1	200	Unsigned 16
Gener Protect	Volt Unbal Del	3	s	No	8289	0	600	Unsigned 16
Gener Protect	Gen >Freq Trp	110	%	No	8296	85	200	Unsigned 16
Gener Protect	Gen <Freq Trp	85	%	No	8298	0	110	Unsigned 16
Gener Protect	Gen Freq Del	3	s	No	8297	0	600	Unsigned 16
Gener Protect	BI6 Delay	1	s	No	10131	0	600	Unsigned 16
Gener Protect	BI7 Delay	1	s	No	10132	0	600	Unsigned 16
AMF Settings	RetFromIsland	AUTO		No	9590			String list
AMF Settings	EmergStart Del	5	s	No	8301	0	6000	Unsigned 16
AMF Settings	MainsReturnDel	20	s	No	8302	1	3600	Unsigned 16
AMF Settings	Transfer Del	1	s	No	8303	0	600	Unsigned 16
AMF Settings	MCB Close Del	1	s	No	8389	0	60	Unsigned 16
AMF Settings	Mains >V	110	%	No	8305	60	150	Unsigned 16
AMF Settings	Mains <V	60	%	No	8307	50	110	Unsigned 16
AMF Settings	Mains V Del	2	s	No	8306	0	600	Unsigned 16
AMF Settings	Mains V Unbal	10	%	No	8446	1	150	Unsigned 16
AMF Settings	Mains VUnb Del	2	s	No	8447	0	60	Unsigned 16
AMF Settings	Mains >Freq	102	%	No	8310	98	150	Unsigned 16
AMF Settings	Mains <Freq	98	%	No	8312	50	102	Unsigned 16
AMF Settings	Mains Freq Del	0,5	s	No	8311	0	60	Unsigned 16
AMF Settings	MCB Logic	CLOSE-OFF		No	8444			String list
AMF Settings	ReturnFromTEST	MANUAL		No	8618			String list
AMF Settings	MCB Opens On	GENRUN		No	9850			String list
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	Timer1Function	No Func		No	11660			String list
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	Timer2Function	No Func		No	11661			String list
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
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 IA-NT PWR:

Name	Firmware ver.	Application	Date	App. ver.	Ser. num.	Filename
IA-NT-PWR	IA-NT-2.4 R:27.04.2015	PWR	27.04.2015	2.4	12345678	IA-NT-PWR-2.4.AIL

Group	Name	Value	Dimension	Com. obj.	Data type	
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 Freq	50	Hz	8210	Unsigned 16	
Load	Load A L1	41	A	8198	Unsigned 16	
Load	Load A L2	41	A	8199	Unsigned 16	
Load	Load A L3	41	A	8200	Unsigned 16	
Load	Load kW	150	kW	8202	Integer 16	
Load	Load kW L1	50	kW	8524	Integer 16	
Load	Load kW L2	50	kW	8525	Integer 16	
Load	Load kW L3	50	kW	8526	Integer 16	
Load	Load kVAr	15	kVAr	8203	Integer 16	
Load	Load kVAr L1	5	kVAr	8527	Integer 16	
Load	Load kVAr L2	5	kVAr	8528	Integer 16	
Load	Load kVAr L3	5	kVAr	8529	Integer 16	
Load	Load kVA	153	kVA	8565	Integer 16	
Load	Load kVA L1	51	kVA	8530	Integer 16	
Load	Load kVA L2	51	kVA	8531	Integer 16	
Load	Load kVA L3	51	kVA	8532	Integer 16	
Load	Load PF	1		8204	Integer 8	
Load	Load Char	R		8395	Char	
Load	Load PF L1	1		8533	Integer 8	
Load	Load Char L1	R		8626	Char	
Load	Load PF L2	1		8534	Integer 8	
Load	Load Char L2	R		8627	Char	
Load	Load PF L3	1		8535	Integer 8	
Load	Load Char L3	R		8628	Char	
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	Hz	8211	Unsigned 16	
Controller I/O	Battery Volts	24,3	V	8213	Integer 16	
Controller I/O	Bin Inputs	[1111001]		8235	Binary 16	
Controller I/O	Bin Outputs	[1111000]		8239	Binary 16	
Controller I/O	IL-NT-BIO8	[xxxxxxxx]		11635	Binary 8	
Controller I/O	GSM SignalLvl	0	%	11895	Unsigned 16	
Controller I/O	GSM ErrorRate	0		12199	Unsigned 8	
Controller I/O	GSM Diag Code:	0		11270	Unsigned 8	
Controller I/O	AirGate Diag:	0		11271	Unsigned 8	
Controller I/O	AirGate ID:	No Connection		12385	Long string	
Controller I/O	Modem Status:	No Connection		12485	Short string	
Statistics	Genset kWh	0		8205	Integer 32	
Statistics	Genset kVArh	0		8539	Integer 32	
Statistics	Mains kWh	0		11025	Integer 32	
Statistics	Mains kVArh	0		11026	Integer 32	
Statistics	Num Starts	0		8207	Unsigned 16	
Statistics	Num BadStarts	0		11195	Unsigned 32	

IA Info	Breaker State	Basic Settings		8455	Unsigned 16
IA Info	Timer Text	Basic Settings		8954	Unsigned 16
IA Info	Timer Value	0	s	8955	Unsigned 16
IA Info	FW Version	24		8393	Unsigned 8
IA Info	Application	19		8480	Unsigned 8
IA Info	FW Branch	10		8707	Unsigned 8
IA Info	PasswordDecode	0		9090	Unsigned 32
IA Info	DiagData	0		10050	Unsigned 32
Date/Time	Time	#####		24554	Time
Date/Time	Date	#####		24553	Date

IL-NT-RD Remote display software

This chapter describes Remote display software IL-NT-RD, which is designed as an remote signaling and control software for InteliATS^{NT}, InteliLite^{NT} and InteliDrive Lite controllers. **It is the optional software which is possible to upload into controller instead of standard controller's firmware.**

General description

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

Warning!

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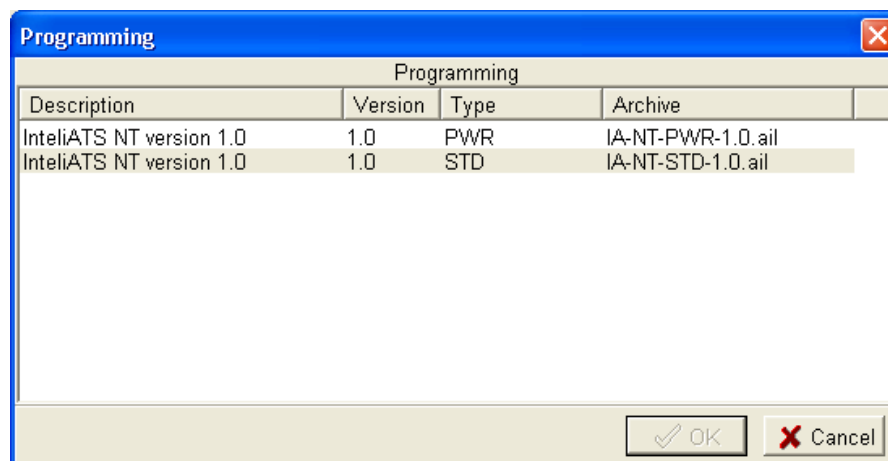
IL-NT-RD Software installation

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

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

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

Description	Version	Type	Archive	
InteliATS NT version 1.0	1.0	PWR	IA-NT-PWR-1.0.ail	
InteliATS NT version 1.0	1.0	STD	IA-NT-STD-1.0.ail	

- Press "OK" button to program the firmware to the controller.

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

CAUTION!
Check the statistic values after firmware upgrade. Readjust the values if necessary.

IL-NT-RD Wiring

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

Connection process

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

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

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

Controller type selection

IL-NT-RD automatically detects controller type.

Troubles with connection

There are few reasons why remote display can not connect with master controller:
1. Not supported type of controller connected (E.g. IGS-NT, ID-DCU, IC-NT, IGS-CU, etc.)
2. Not supported firmware in master controller
3. Configuration table error in master controller
4. Wrong settings of setpoint COMx Mode in master controller
5. Wrong connection, wiring, communication fail

Direct RS232 connection

HW module: IL-NT-RS232

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

Up to 2 meters: Recommended to use our standard AT-LINK cable.

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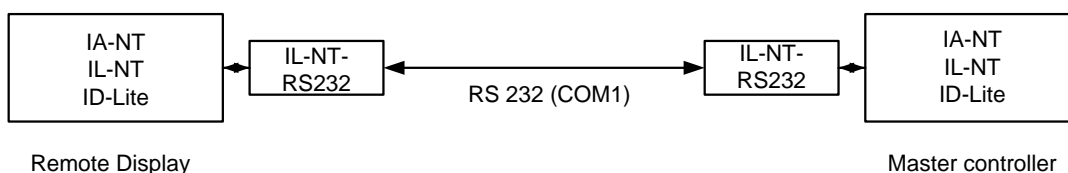
Up to 10 meters: Recommended to use standard Null-modem cable for local connection between controller and remote display, although the three wires (TxD, RxD, GND) RS 232 connection is enough for direct communication:

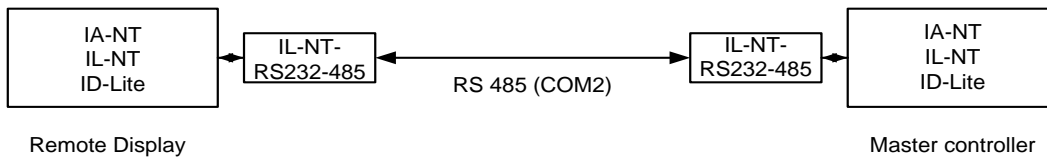| IA-NT/IL-NT/ID-Lite connector (D-SUB9 female)	IL-NT-RD connector (D-SUB9 female)
RxD 2	3 TxD
TxD 3	2 RxD
GND 5	5 GND

Remote RS485 and/or direct RS232 connection

HW module: IL-NT-RS232-485
Up to 1000 meters (only with RS485):
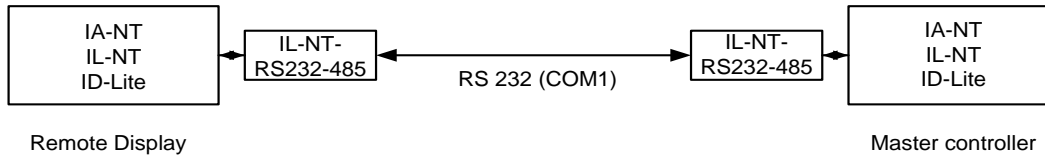
OR

OR
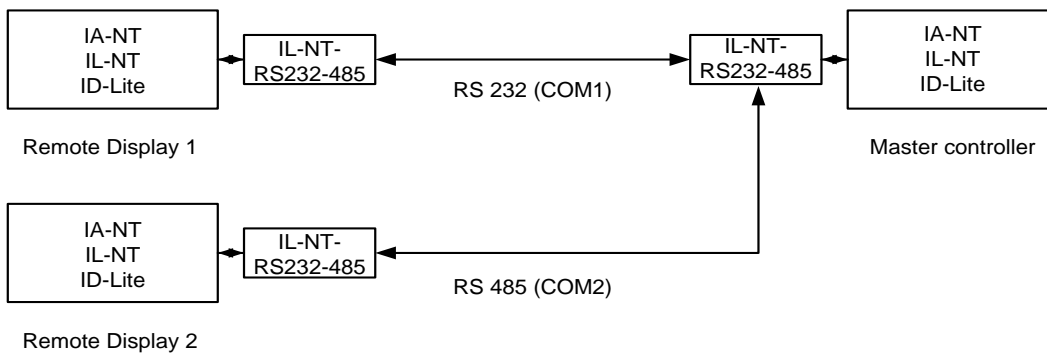
Case 1) RS232 / Master controller settings:
    ControllerAddr = 1..32
    COM1 Mode = DIRECT

Case 2) RS485 / Master controller settings:
    ControllerAddr = 1..32
    COM2 Mode = DIRECT

Case 3) RS232 + RS485 / Master controller settings:
    ControllerAddr = 1..32
    COM1 Mode = DIRECT
    COM2 Mode = DIRECT

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

Alternative connection using external RS232-RS422/485 converter:

Recommend external converter:
ADVANTECH – ADAM 4520: RS232 to RS422/485 converter, DIN rail, automatic RS485 bus supervision, no external data flow control signals, galvanic isolated, baud rate 38400 or 56000 bps.

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

Function description

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

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

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

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

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

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

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

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

SW compatibility

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

- All InteliATS^{NT} standard software from ver. 1.0
- All InteliLite^{NT} standard software from ver. 1.1
- All ID-Lite standard software from ver. 1.0
- Chosen InteliATS^{NT}, InteliLite^{NT} and ID-Lite customer branches

Some of the future InteliATS^{NT}, InteliLite^{NT}, ID-Lite versions may require upgrade of the IL-NT-RD software.

Maintenance

Backup battery replacement

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

For battery replacement 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

Inputs/Outputs overview

Model	BIN	BOUT	COM1	COM2	Gen. Voltage	Mains Voltage	Gen. Current
IA-NT PWR	7	7	Y*	Y*	Y	Y	Y

NOTE:
* With optional plug-in module
Y – Available
N – Not available

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

NOTE:
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 IA-NT	-20..+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 61000-6-3:2006, EN 61000-6-3:2006
	EN 61000-6-1:2005, EN 61000-6-2:1999
Vibration	2 – 25 Hz, ±1.6 mm
	25 – 100 Hz, a = 4 g
Shocks	a = 500 m/s^2

EMC environment conditions classification according to standard 60947-6-1: Type A (industrial equipment)

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	50 A / 1s
Max. continuous current	10 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)
Impulse voltage (Uimp)	4 kV

Binary inputs and outputs

Binary inputs

Not electrically separated

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

Not electrically separated

Number of outputs	7
Maximum current	0.5 A
Maximum switching voltage	36 VDC

IL-NT RS232 interface (optional card)

Plugs into IA-NT controller COMMUNICATION MODULE port.

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

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

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

IL-NT RS232-485 interface (optional card)

Plugs into IA-NT controller COMMUNICATION MODULE port.

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

IL-NT S-USB interface (optional card)

Plugs into IA-NT controller COMMUNICATION MODULE port.

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

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

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

IB-Lite interface (optional card)

Plugs into IA-NT controller COMMUNICATION MODULE port.

Interface to Ethernet	RJ45 (10baseT)
Operating temperature	-30..+70°C
Storage temperature	-30..+70°C

IL-NT-GPRS interface (optional card)

Plugs into IA-NT controller COMMUNICATION MODULE port.

SIM Card Type	Standard size (1FF)
Antenna Connector	SMA Female

IL-NT AOUT8 interface (optional card)

Plugs into IA-NT controller EXTENSION MODULE port.

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

IL-NT BIO8 extension module (optional card)

Technical details:

IL-NT BIO8 plugs into the controller's EXTENSION MODULE port.
8 dedicated pins of the plug-in card's terminal can be configured as binary inputs or outputs.

Binary inputs

Number of inputs	8
Input resistance	4.7 kΩ
Input range	0–36 VDC
Voltage level for close contact indication (Logical 1)	< 0.8 VDC
Voltage level for open contact indication (Logical 0)	> 2 VDC
Max voltage level for open contact indication	8–36 VDC

Binary open collector outputs

Number of outputs	8
Maximum current per pin	0.5 A
Maximum switching common current	2 A
Maximum switching voltage	36 VDC

HINT:
Binary inputs are not galvanically isolated.