Compact Controller for Stand-by and Parallel Operating Gen-sets

Inteli New Technology
Mains Supervision Controller

IM-NT-BTB, MCB, MGCB Operator Guide

IM-NT

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Operator Guide

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Table of Contents

General Guidelines

This manual provides general information on how to operate the InteliMains NT controllers and it is intended for everybody who is concerned with operation and maintenance of the controller.

Controller System Description

IM-NT controller is comprehensive mains supervision controller for multiple generating sets operating in parallel to the Mains. The controller automatically connects the group of gen-sets to the Mains.
A modular construction allow upgrades to different levels of complexity in order to provide the best solution for various customer applications.
The key feature of the controller is its easy-to-use operation and installation. Predefined configurations for typical applications are available as well as user-defined configurations for special applications.

Default Applications

For the **IM-NT** controller there are three default applications: BTB, MCB, MGCB.

BTB	**B**us-**T**ie **B**reaker application
MCB	**M**ains **C**ircuit **B**reaker and application
MGCB	**M**aster **G**enerator **C**ircuit **B**reaker application

BTB application
- Controller is between two groups of gen-sets (buses)
- Controls only Bust-tie Breaker (BTB)
- Enables reverse synchronization of one group to another

MCB application
- Controller is between bus (group of gen-sets) and the Mains
- Controls only one Mains Circuit Breaker (MCB)
- Enables reverse synchronization of the gen-sets to the Mains

MGCB application
- Controller is between bus (group of gen-sets) and the Mains
- Controls Mains Circuit Breaker (MCB) and MGCB (Master Generator Circuit Breaker)
- Enables reverse synchronization of the gen-sets to the Mains (over MCB)
- Enables forward synchronization of the gen-sets (over MGCB)

Available Documentation

IM-NT General Manuals

IG/IS-NT Installation Guide.pdf

IG/IS-NT Application Guide.pdf

IM-NT Application Manuals

For each application the appropriate manual is available:

IM-NT-BTB Reference Guide.pdf

IM-NT-MCB-MGCB Reference Guide.pdf

These manuals include these chapters:

- Functions
- Protections and Alarm management
- Controller operation states
- Inputs and Outputs
- Setpoints
- Controller configuration and monitoring

Inteli Troubleshooting Manuals

IGS-NT Troubleshooting Guide.pdf

Includes description of possible troubles during configuration, adjustment and operation of the controller.
Consists of two parts:

- List of troubles and their solution
- “How to” section with recommended procedures in some typical situations

Inteli NT PC Tools Manuals

InteliMonitor.pdf

This manual describes InteliMonitor monitoring PC tool in the following chapters:

- Connection to the controller (Direct, Modem, Internet)
- InteliDDE Server
- Menus description
- Password and access code

GenConfig.pdf

This manual describes GenConfig configuration PC tool in the following chapters:

- Connection to the controller (Direct, Modem, Internet)
- InteliDDE Server
- Menus description
- Controller Configuration Steps (Modules, I/O, Setpoints, Protections, History, User Sensors, Language Translator, PLC Functions, LBI, LAI, Power Formats)

InteliCommunicationGuide.pdf

This manual covers communication topics regarding all types of our controllers. It applies to communication between the controller and superior service or monitoring system but not to communication among the controllers or between the controller and it's peripherals (extension modules, ECU).
It is divided into the following chapters:

- Local connection
- Remote connection
- Modem connection
- Internet connection
- Active call, active SMS, active email
- Modbus connection
- I-LB, IG-IB communication units
- Modem recommendations
- Recommended converters

Conformity Declaration

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.

WARNING – VERY IMPORTANT!!!

For BTB

Every time you want to disconnect the following InteliMains controller terminals:

- Bus voltage measuring and / or
- Binary outputs for BTB control and / or
- BTB feedback

switch InteliMains to MAN mode!

For MCB/MGCB

Every time you want to disconnect the following InteliMains controller terminals:

- Mains voltage measuring and / or
- Binary outputs for MCB control and / or
- MCB feedback

switch InteliMains to MAN mode!

!!! CAUTION !!!

Dangerous Voltage

In no case touch the terminals for voltage and current measurement!
Always properly connect grounding terminals!

Take care when disconnecting In/Im3 terminals when the gen-set is stopped.
For safety connect parallel to controller In/Im3 terminals two anti parallel diodes 10A/100V.

In any case do not disconnect generator CT terminals when the gen-set is loaded.

Adjust Set Points

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

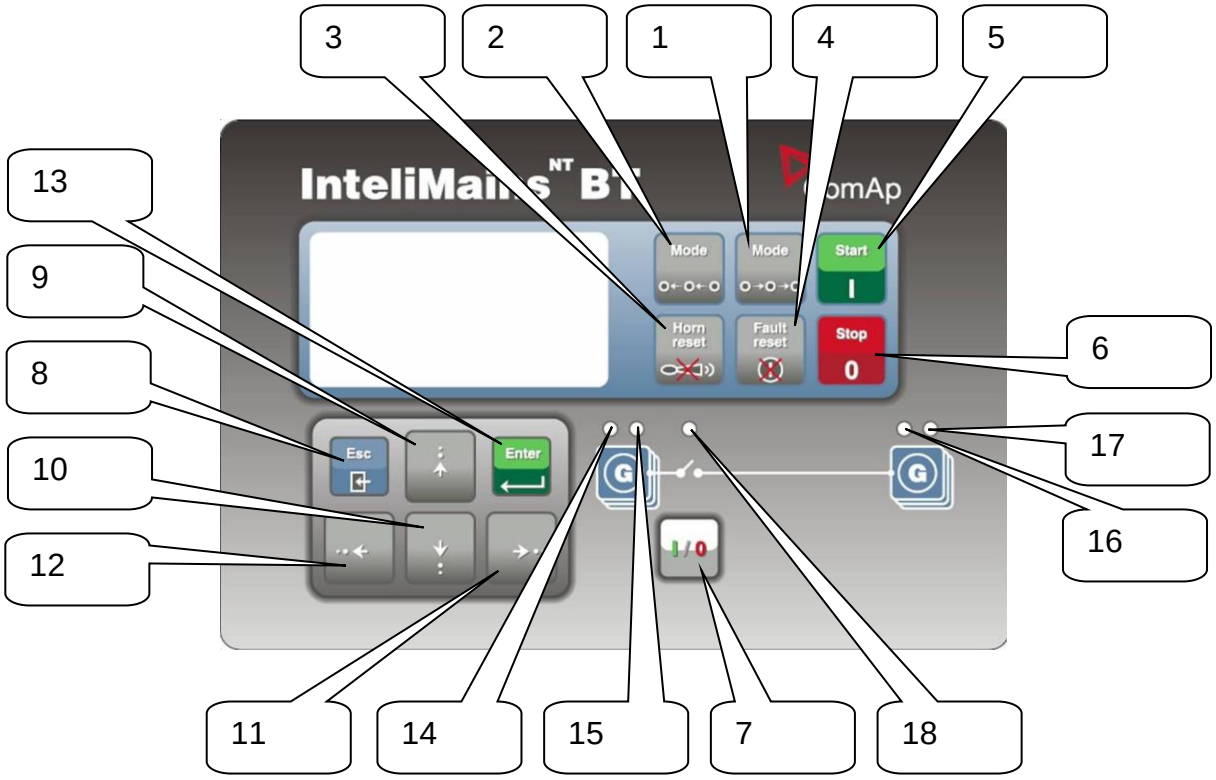
!!! WRONG ADJUSTMENT OF BASIC PARAMETERS CAN DESTROY THE GEN-SET !!!

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

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

BTB Operator Interface

BTB Pushbuttons and LEDs



Pushbuttons:

1. MODE→ Cycles forward through controller operation modes OFF→MAN→ AUT
2. ←MODE Cycles backward through controller operat. modes OFF←MAN←AUT
3. HORN RESET Deactivates the HORN (AUDIBLE ALARM)
4. FAULT RESET Acknowledges faults and alarms
5. START not used
6. STOP not used
7. BTB ON/OFF Opens and closes (synchronizes) BTB in MAN mode
8. ESC

Where	Function
Measurement screens, Alarm list, History screen, Users/Passwords	Go to Menu screen
Setpoints screen	Go to Menu screen; within setpoint group, go to group list
Setpoint edit	Leave setpoint edit without changes
Language screen	Language screen exit (to menu) without save

9. ↑ Selects the setpoint, selects the screen, selects history record or increases a setpoint value
10. ↓ Selects the setpoint, selects the screen, selects the history record or decreases the setpoint value
11. → Moves the history record displayed columns to the right, 5% increases the

edited setpoint's value (step given by the setpoint range), goes back from Alarm list

12. ← Moves the history record displayed columns to the left, 5% decreases the edited setpoint's value (step given by the setpoint range), view Alarm list from measurement screens
13. ENTER

Where	Function
Menu screen	Goes to the selected display group (Measurement CU, Measurement IO, …)
Setpoints screen	Goes to selected setpoint group
Setpoint edit	Starts setpoint edit / save changes
History screen	Goes to the first column of the first history record
Language screen	Language screen, exit (to menu) and save selection

Pushbuttons' Combinations

The following table determines controller functions when ↑, ↓, ←, →, ENTER and PAGE buttons' combination is pressed:

Where	Pushbutton combination	Function
Measurement screens	ENTER + ↑ ENTER + ↓	Contrast increase Contrast decrease
Info screen	ENTER + ↑ ENTER + ↓	Backlight increase Backlight decrease

LEDs

14. GEN-SET FAILURE: RED LED starts flashing when any failure occurs. After FAULT RESET button is pressed, it goes to steady light (if an alarm is still active) or is off (if no alarm is active).
15. LEFT BUS VOLTAGE: GREEN LED is on, if left bus voltage is present and within limits.
16. RIGHT BUS VOLTAGE: GREEN LED is on, if right bus voltage is present and within limits.
17. GEN-SET FAILURE: RED LED starts flashing when any failure occurs. After FAULT RESET button is pressed, goes to steady light (if an alarm is still active) or is off (if no alarm is active).
18. BTB ON: GREEN LED is on, if BTB feedback is active. Flashes during synchronizing.

How to Select a Controller Mode?

Use MODE→ or ←MODE to select the requested controller operation mode OFF – MAN – AUT. It is not possible to go directly from OFF to AUT.

Screens

There are several screens available:

1. ALARMLIST
2. MEASUREMENT CU
3. MEASUREMENT IO
4. SETPOINTS
5. HISTORY
6. SETPOINTS
7. USERS/PASSWORD
8. LANGUAGE.

Each menu consists of several screens. By pressing the ESC button (repeatedly when necessary) the menu screen is displayed.

How to View the Alarm List?

1. Select the ALARMLIST menu item.
2. Press ENTER or press ← in measurements' screens to go directly to the Alarm list.

How to View Measured Data?

1. Select the MEASUREMENT CU menu item and press ENTER.
2. Use ↑ and ↓ to select the screen with requested data.

How to View IO Values?

1. Select the MEASUREMENT IO menu item and press ENTER.
2. Use ↑ and ↓ to select the screen with requested data.

How to View the History Menu?

1. Select HISTORY menu item and press ENTER.
2. Use ↑ or ↓ to select a requested record.
3. Use → or ← to cycle forward/backward through columns of the record.

How to View and Edit Setpoints?

1. Select SETPOINTS menu item and press ENTER.
2. Use ↑ or ↓ to select requested setpoints group.
3. Press ENTER to confirm.
4. Use ↑ or ↓ to select requested setpoint.
5. Setpoints marked 🔒 are password protected.
6. Press ENTER to edit.
7. Use ↑ or ↓ to modify the setpoint. When ↑ or ↓ is pressed for 2 sec, auto repeat function and speedup is activated. Use ← or → to change the setpoint value by 5% of it's range.
8. Press ENTER to confirm or ESC to leave without change.
9. Press ESC to leave selected setpoints group.

How to Change the Password?

1. Select USERS/PASSWORD menu item and press ENTER.
2. Use ↑ or ↓ to select User.
3. Press ENTER to confirm.
4. Select ChangePassword and press ENTER.
5. Use ↑ or ↓ or ← or → to set new password.
6. Press ENTER to confirm password.

How to Set the Language?

1. Select the LANGUAGE menu item (if not already selected) and press ENTER.
2. Use ↑ or ↓ to select a requested Language.
3. Press ENTER to confirm.

Hint:

If binary inputs *Lang sel int A,B,C* (for IG-NT/EE internal display) or *Lang sel #2 A,B,C* (for IG-Display) are used, it is **not** possible to change languages from Language screen.

Language	0	1	2	3	4	5	6	7
Lang sel xxx A	0	1	0	1	0	1	0	1
Lang sel xxx B	0	0	1	1	0	0	1	1
Lang sel xxx C	0	0	0	0	1	1	1	1

How to Change the Display Contrast?

Press and hold ENTER and use ↑ or ↓ to adjust the best display contrast.

Hint:
Available from the MEASUREMENT screens only.

How to Check the Serial Number and the Software Revision?

Hold down ENTER and press ESC. On the display you can see the controller INFO screen for 10 seconds.

IM-NT-BTB
Controller INFO screen contains: 1. Controller name (see **Basic settings** group) 2. Firmware and release date 3. Controller serial number (8 character number) 4. Application: BTB Using → you can view the INFO2 screen which contains: 5. DispCTRL: Display Software Version 6. IDch: ID string 7. Dngl: connected dongle 8. Serial number: Controller Serial Number 9. Pwd.dec.: Password Decode Number

Hint:
Available from the MEASUREMENT screens only.

How to View Codepages?

Press ↑ button when you are in Info screen to see codapeges.

How to Change the Display Backlight Intensity?

1. Hold down ENTER and then press ESC. On the display you can see Controller INFO screen for 10 seconds.
2. Press and hold ENTER when in INFO screen and use ⇑ or ⇓ to adjust the best display backlight.

Backlight intensity is set for one of the two modes, depending on the activity of configurable binary input *Alt brightness* (IG-NT/EE and modifications). For IG-Display modules, this binary input is located in the Power connector and it's function is fixed (not configurable).

Hint:
Backlight intensity change is available from the MEASUREMENT screens only.

How to Find Active Alarms?

1. Select Alarmlist menu item and press ENTER or press ← in MEASUREMENT IO or in MEASUREMENT CU menu.
   Inverted alarms are still active. Non-inverted alarms are not active, but not yet confirmed.
2. Press FAULT RESET to accept all alarms.
   The asterix mark disappears when an alarm is accepted by FAULT RESET. Non-active alarms immediately disappear from the list. Active alarm list appears on the screen automatically when a new alarm comes up and the Main MEASUREMENT screen was selected.

Hint:
Alarm list does not activate automatically if the display is switched to any other screen than the first one of MEASUREMENT (typically the screen that shows menu selector). The automatic jump to the alarm list screen will not occur if you are listing through the measured values, set points or history!
If setpoint **Engine protect**:*ResetActAlarms* is set to DISABLED, only inactive alarms can be reset.
If an active alarm is present in the alarm list, controller display blinks every 30 seconds.

When to Use BTB ON/OFF Button?

The button is disabled in AUT mode.
In MAN mode it is enabled, but before closing the circuit breaker, bus voltage and frequency must be within limits. The controller has internal protection to avoid the breaker closure without synchronizing.

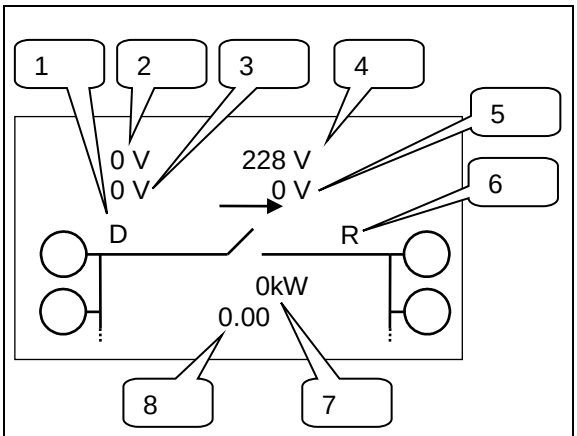
The controller recognizes automatically:

- if there is bus voltage and the gen-set(s) shall be synchronized before closing the BTB
- or if there is no voltage on the bus and the BTB can be closed without synchronizing.

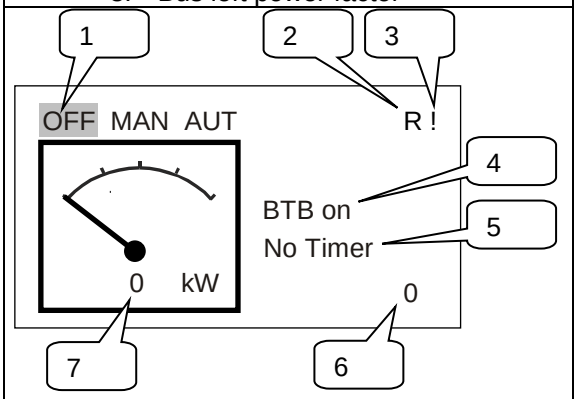
Use this button in MAN mode to close or open the BTB. **Be careful while doing this, because you can disconnect the load from the Mains/gen-set(s)!!!**

BTB Measurement Screens Description

Measurement CU Screen



1. Dead bus
2. Left bus voltage ph-n
3. Left bus voltage ph-ph
4. Right bus voltage ph-n
5. Right bus voltage ph-ph
6. Synchronization enable
7. Import power
8. Bus left power factor



1. Operation mode of the gen-set
2. Signalizes if any remote connection to controller is active
3. Indication of active alarm
4. Application status
5. Timer – event's counting time (e.g. syncronization timeout)
6. Time of timer
7. BusLImport

Bus left (frequency, voltage):

BusL freq – frequency of left bus
BL-Ph-N – left bus voltage phase to neutral
BL-Ph-Ph – left bus voltage phase to phase

Bus right (frequency, voltage):

BusR freq – frequency of right bus
BR-Ph-N – right bus voltage phase to neutral
BR-Ph-Ph – right bus voltage phase to phase

Bus left (current, power, PF):

BusLImport – bus left import power
BusL PF – bus left power factor
BusL Q – bus left reactive power
BTB-curr – BTB current
BusL A – bus left apparent power

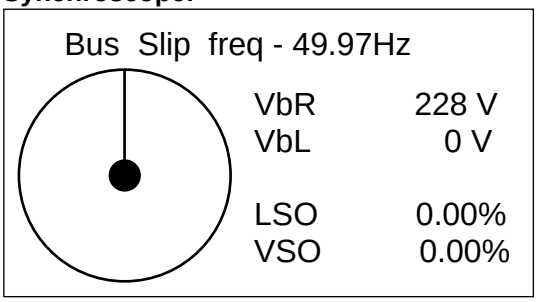
Statistics:

BL kWh – kWhours from left to right bus
BR kWh – kWhours from right to left bus
BL kVAhr – kVAhours from left to right bus
BR kVAhr – kVAhours from right to left bus
Time
Date

PulseCounter 1
PulseCounter 2
PulseCounter 3
PulseCounter 4

TimerAct1-4
TimerAct5-8
TimerAct9-12
TimerAct13-16

Synchroscope:



Legend:
VbR = Right bus voltage
VbL = Left bus voltage
LSO = Load Sharing Output (regulation outputs)
VSO = Var Sharing Output (regulation outputs)

Reg16 (region with up to 16 controllers)
Reg32 (region with up to 32 controllers)

Measurement IO Screen

Assignment of various functions to inputs and outputs depends on configuration. In the table below you can see default configuration.

	BIN BTB feedback not used BTB disable Load res 2 AccessLock int Remote OFF
	NT-BIN 7 NT-BIN 8 NT-BIN 9 NT-BIN 10 NT-BIN 11 NT-BIN 12
	BOUT BTB close/open not used BusL params OK BusR params OK Alarm Horn
	NT-BOUT7 NT-BOUT8 NT-BOUT9 NT-BOUT10 NT-BOUT11 NT-BOUT12

More information about binary inputs, setpoints and I/O modules you can find in IM-NT Reference Guide.

BTB Mode and Function Description

There are three operation modes: **OFF – MAN – AUT** in **BTB** application.
To select the mode use MODE→ or ←MODE buttons.

OFF Mode

All regulations are switched off.
Switching to OFF mode causes opening of BTB regardless of the settings.

MAN Mode

It is possible to close/open BTB manually under supervision of IM-NT controller which doesn't allow to close the breaker if the bus voltages are not in phase.
Pressing BTB ON/OFF button closes/opens BTB if it is allowed by

- setpoints **ProcessControl**:*Synchro enable*, *Mains coupling*, *DeadBusClosing*
- binary input *BTB disable*

AUT Mode

The controller closes automatically BTB if

- bus voltages are within the limits (**Sync ctrl**:*Phase window*, *Voltage window*)

- there is voltage on one of the buses and closing to dead bus is enabled by **ProcessControl**:*DeadBusClosing*
- binary input *BTB disable* is not closed
- it is enabled by setting of **ProcessControl**:*Synchro enable*, *Mains coupling* setpoints

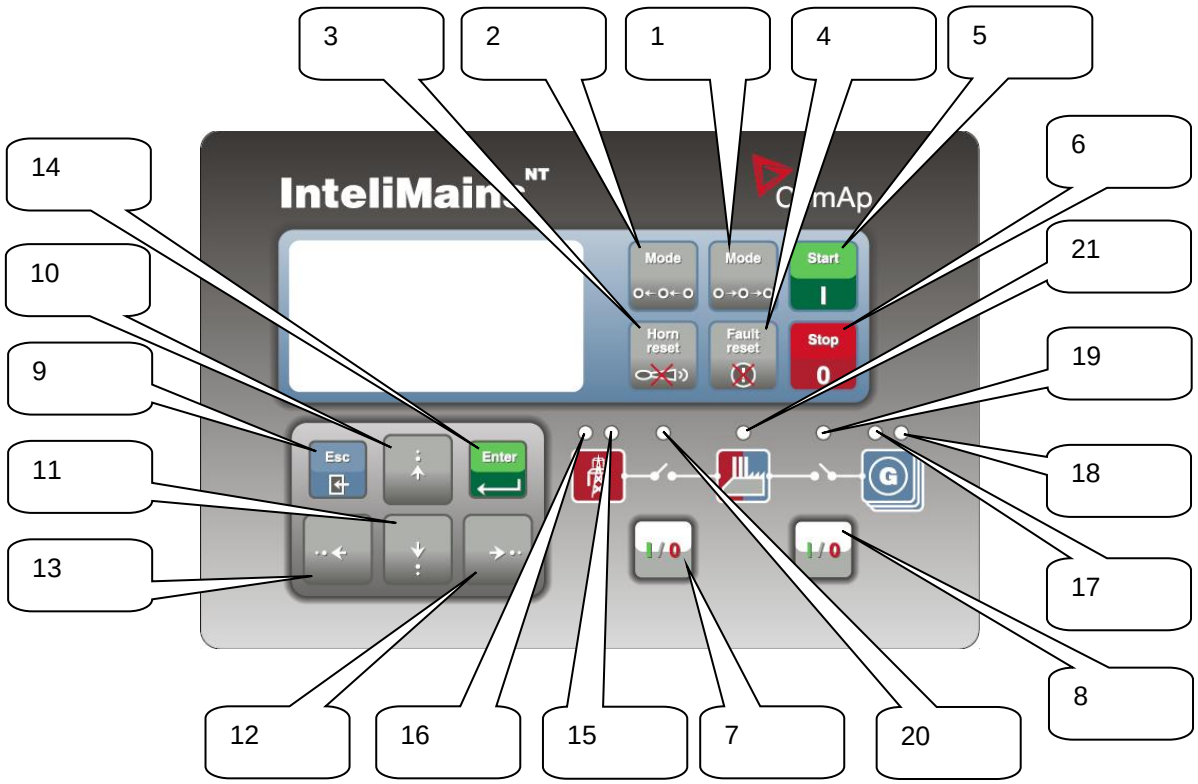
Hint:

It is not possible to close BTB in MAN and AUT mode if there is no voltage on both buses. If voltage on both left and right bus disappears, the BTB is automatically opened.

After the BTB is closed, IM-NT-BTB deactivates all regulation loops that are taken over by the IM-NT-M(G)CB.

MGCB Operator Interface

MGCB Pushbuttons and LEDs



Pushbuttons:

1. MODE→ — Cycles forward through controller operation modes OFF→MAN→AUT→TEST
2. ←MODE — Cycles backward through controller operation modes OFF←MAN←AUT←TEST
3. HORN RESET — Deactivates the HORN (AUDIBLE ALARM)
4. FAULT RESET — Acknowledges faults and alarms
5. START — Opens binary output *Sys start/stop* (causes start of the gen-set group)
6. STOP — Closes binary output *Sys start/stop* (causes stop of the gen-set group)
7. MCB ON/OFF — Opens and closes (synchronizes) the Mains circuit breaker in MAN Mode
8. MGCB ON/OFF — Opens and closes (synchronizes) the MGCB in MAN Mode
9. ESC

Where	Function
Measurement screens, Alarm list, History screen, Users/Passwords	Go to Menu screen
Setpoints screen	Go to Menu screen; within setpoint group, go to group list
Setpoint edit	Leave setpoint edit without changes
Language screen	Language screen exit (to menu) without save

10. ↑ Selects the setpoint, selects the screen, selects history record or increases a setpoint value
11. ↓ Selects the setpoint, selects the screen, selects the history record or decreases the setpoint value
12. → Moves the history record displayed columns to the right, 5% increases the edited setpoint's value (step given by the setpoint range), goes back from Alarm list
13. ← Moves the history record displayed columns to the left, 5% decreases the edited setpoint's value (step given by the setpoint range), view Alarm list from measurement screens
14. ENTER

Where	Function
Menu screen	Goes to the selected display group (Measurement CU, Measurement IO, etc.)
Setpoints screen	Goes to selected setpoint group
Setpoint edit	Starts setpoint edit / save changes
History screen	Goes to the first column of the first history record
Language screen	Language screen, exit (to menu) and save selection

Pushbuttons' Combinations

The following table determines controller functions when ↑, ↓, ←, →, ENTER and PAGE buttons' combination is pressed:

Where	Pushbutton combination	Function
Measurement screens	ENTER + ↑ ENTER + ↓	Contrast increase Contrast decrease
Info screen	ENTER + ↑ ENTER + ↓	Backlight increase Backlight decrease

LEDs

15. MAINS VOLTAGE: GREEN LED is on, if voltage on the mains terminals is present.
16. MAINS FAILURE: RED LED starts flashing when the mains failure occurs and gen-set does not run, goes to steady light when the gen-set starts and goes off when the mains restores.
17. BUS VOLTAGE: GREEN LED is on, if bus voltage is present and within limits.
18. GEN-SET FAILURE: RED LED starts flashing when any failure occurs. After FAULT RESET button is pressed, goes to steady light (if an alarm is still active) or is off (if no alarm is active).
19. MGCB ON: GREEN LED is on, if MGCB feedback is active. Flashes during forward synchronizing.
20. MCB ON: GREEN LED is on, if MCB feedback is active. Flashes during reverse synchronizing (synchronizing of the loaded gen-set back to the restored mains).
21. LOAD – GREEN LED is on, if bus voltage is present.

How to Select a Gen-set Mode?

Use MODE→ or ←MODE to select the requested gen-set operation mode OFF – MAN – AUT – TEST. It is not possible to go directly from OFF to TEST.

Screens

There are several screens available:

1. ALARMLIST
2. MEASUREMENT CU
3. MEASUREMENT IO

4. HISTORY
5. SETPOINTS
6. USERS/PASSWORD
7. LANGUAGES

Each menu consists of several screens. By pressing the ESC button (repeatedly when necessary) the menu screen is displayed.

How to View the Alarm List?

1. Select the ALARMLIST menu item.
2. Press ENTER or press ← in measurements' screens to go directly to the Alarm list.

How to View Measured Data?

1. Select the MEASUREMENT CU menu item and press ENTER.
2. Use ↑ and ↓ to select the screen with requested data.

How to View IO Values?

1. Select the MEASUREMENT IO menu item and press ENTER.
2. Use ↑ and ↓ to select the screen with requested data.

How to View the History Menu?

1. Select HISTORY menu item and press ENTER.
2. Use ↑ or ↓ to select a requested record.
3. Use → or ← to cycle forward/backward through columns of the record.

How to View and Edit Setpoints?

1. Select SETPOINTS menu item and press ENTER.
2. Use ↑ or ↓ to select requested setpoints group.
3. Press ENTER to confirm.
4. Use ↑ or ↓ to select requested setpoint.
5. Setpoints marked 🔒 are password protected.
6. Press ENTER to edit.
7. Use ↑ or ↓ to modify the setpoint. When ↑ or ↓ is pressed for 2 sec, auto repeat function and speedup is activated. Use ← or → to change the setpoint value by 5% of it's range.
8. Press ENTER to confirm or ESC to leave without change.
9. Press ESC to leave selected setpoints group.

How to Change the Password?

1. Select USERS/PASSWORD menu item and press ENTER.
2. Use ↑ or ↓ to select User.
3. Press ENTER to confirm.
4. Select ChangePassword and press ENTER.
5. Use ↑ or ↓ or ← or → to set new password.
6. Press ENTER to confirm password.

How to Set the Language?

1. Select the LANGUAGE menu item (if not already selected) and press ENTER.
2. Use ↑ or ↓ to select a requested Language.
3. Press ENTER to confirm.

Hint:

If binary inputs *Lang sel int A,B,C* (for IG-NT/EE internal display) or *Lang sel #2 A,B,C* (for IG-Display) are used, it is **not** possible to change languages from Language screen.

Language	0	1	2	3	4	5	6	7

Lang sel xxx A	0	1	0	1	0	1	0	1
Lang sel xxx B	0	0	1	1	0	0	1	1
Lang sel xxx C	0	0	0	0	1	1	1	1

How to Change the Display Contrast?

Press and hold ENTER and use ⇑ or ⇓ to adjust the best display contrast.

Hint:

Available from the MEASUREMENT screens only.

How to Check the Serial Number and the Software Revision?

Hold down ENTER and press ESC. On the display you can see the controller INFO screen for 10 seconds.

IM-NT-MGCB
Controller INFO screen contains: 1. Controller name (see **Basic settings** group) 2. Firmware and release date 3. Controller serial number (8 character number) 4. Application: MGCB Using → you can view the INFO2 screen which contains: 5. DispCTRL: Display Software Version 6. IDch: ID string 7. Dgnl: connected dongle 8. Serial number: Controller Serial Number 9. Pwd.dec.: Password Decode Number

Hint:

Available from the MEASUREMENT screens only.

How to View Codepages?

Press ⇑ button when you are in Info screen to see codepages.

How to Change the Display Backlight Intensity?

1. Hold down ENTER and then press ESC. On the display you can see Controller INFO screen for 10 seconds.
2. Press and hold ENTER when in INFO screen and use ⇑ or ⇓ to adjust the best display backlight.

Backlight intensity is set for one of the two modes, depending on the activity of configurable binary input *Alt brightness* (IG-NT/EE and modifications). For IG-Display module, this binary input is located in the Power connector and it's function is fixed (not configurable).

Hint:

Backlight intensity change is available from the MEASUREMENT screens only.

How to Find Active Alarms?

1. Select Alarmlist menu item and press ENTER or press ← in MEASUREMENT IO or in MEASUREMENT CU menu.
   Inverted alarms are still active. Non-inverted alarms are not active, but not yet confirmed.
2. Press FAULT RESET to accept all alarms.

The asterix mark disappears when an alarm is accepted by FAULT RESET. Non-active alarms immediately disappear from the list. Active alarm list appears on the screen automatically when a new alarm comes up and the Main MEASUREMENT screen was selected.

Hint:

Alarm list does not activate automatically if the display is switched to any other screen than the first one of MEASUREMENT (typically the screen that shows menu selector on the upper). The automatic jump to the alarm list screen will not occur if you are listing through the measured values, set points or history!
If setpoint **Engine protect**:*ResetActAlarms* is set to DISABLED, only inactive alarms can be reset.
If an active alarm is present in the alarm list, controller display blinks every 30 seconds.

When to Use MCB ON/OFF Button?

The button is disabled in AUT mode.
In MAN and TEST modes it is enabled, but before closing of the circuit beaker, bus voltage and frequency must be within limits. The controller has internal protection to avoid the breaker closure without synchronizing.
Use the MCB button in MAN or TEST mode to close or open the MCB. **Be careful while doing this, because you can disconnect the load from gen-sets!!!**

The controller recognizes automatically:

- if there is mains / bus voltage and the gen-set(s) shall be synchronized before closing the GCB
- or if there is no voltage on the bus and the MCB can be closed without synchronizing

When to Use MGCB ON/OFF Button?

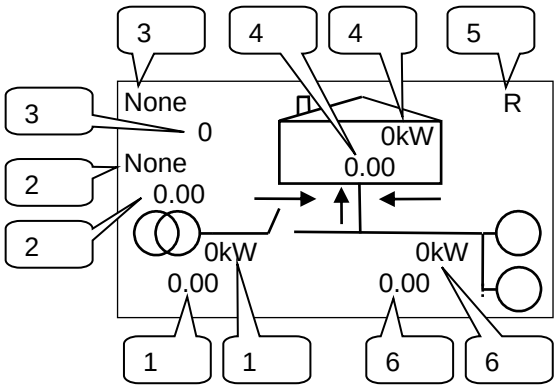
The button is disabled in AUT mode.
The controller has internal protection to avoid the breaker closure without synchronizing. Use this button in MAN or TEST mode to close or open the MGCB. **Be careful while doing this, because you can disconnect the load from the mains!!!**

The controller recognizes automatically:

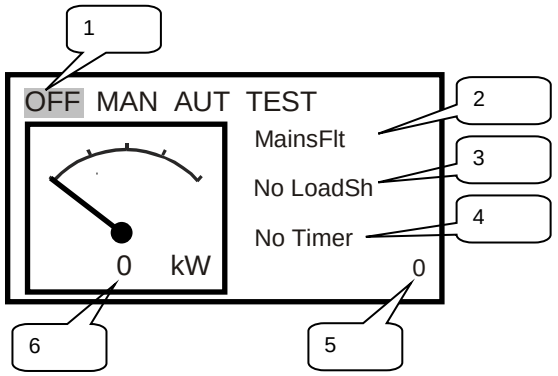
- if there is mains / bus voltage and the gen-set(s) shall be synchronized before closing the MGCB
- or if there is no voltage on the bus and the MGCB can be closed without synchronizing

MGCB Measurement Screens Description

Measurement CU Screen



1. Mains: actual value of active power and power factor
2. Actual power factor control mode and required value
3. Actual power control mode and required value
4. Load: actual value of active power and power factor
5. “R” is signalizing if any remote connection to controller is active. If “!” is shown, it indicates an active alarm.
6. Gen-set(s): actual value of active power and power factor



1. Operation mode of the gen-set
2. Application status
3. Load Shedding status
4. Timer – event’s counting time (e.g. syncronization timeout)
5. Time of timer
6. Active power

Mains (power, PF)

MainsImport – active power imported from Mains
Mains PF – Mains power factor
Mains Q – Mains reactive power

M-Ph-N – Mains voltage phase to neutral

Mains (voltage, current)

M-Ph-Ph – Mains voltage phase to phase
M-curr – Mains current

Objects (power, PF)

Object P – object active power
Object PF – object power factor
Object Q – object reactive power
B-Ph-N – bus voltage phase to neutral

B-Ph-Ph – bus voltage phase to phase

TotRunPact – active power of gen-set group
TotRun PF – power factor of gen-set group
TotRun Q – reactive power of gen-set group
Mains freq – Mains frequency
Bus freq – bus frequency
MaxVectorS – maximum vector shift

Mains power:

MainsImport – active power imported from Mains
Mains PF – Mains power factor
Mains Q – Mains reactive power
Mains A – Mains current

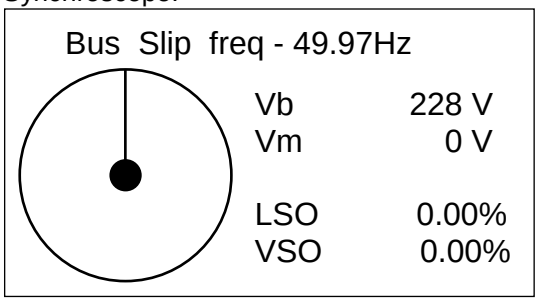
Statistics:

M kWh I – Mains kWhours import
M kWh E – Mains kWhours export
M kVAhr I – Mains kVAhours import
M kVAhr E – Mains kVAhours export
Sum MWh – sum of MWhours of gen-set group
Sum MVAhr – sum of MVAhours of gen-set group
Time
Date

PulseCounter 1
PulseCounter 2
PulseCounter 3
PulseCounter 4

TimerAct1-4
TimerAct5-8
TimerAct9-12
TimerAct13-16

Synchroscope:



Legend:
Vb = bus voltage
Vm = Mains voltage
LSO = Load Sharing Output (regulation outputs)
VSO = Var Sharing Output (regulation outputs)

Power management:

TotAvlbPnom – sum of nominal power of all gen-sets available for power management
TotRunPnom – sum of nominal power of loaded gen-sets in power management
TotRunPact – Sum of active power
Act Reserve – Actual load reserve
Reg16 (region with up to 16 controllers)
Reg32 (region with up to 32 controllers)

Measurement IO Screen

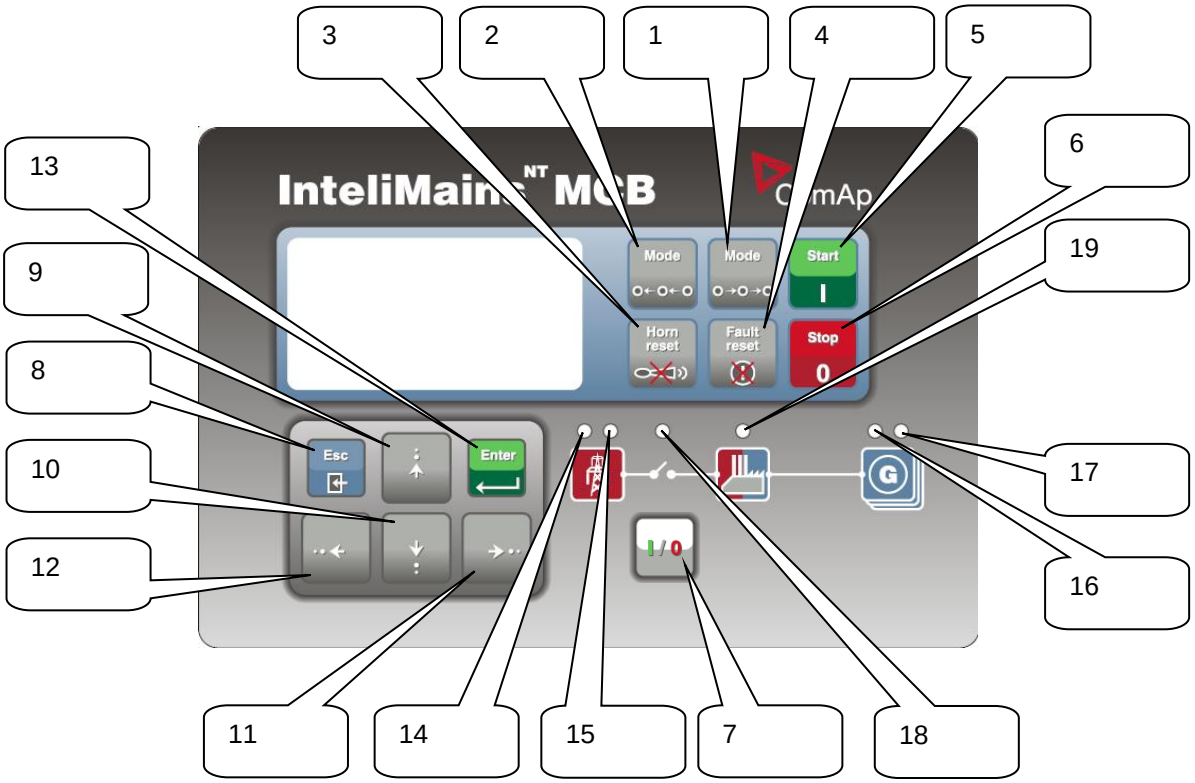
Assignment of various functions to inputs and outputs depends on configuration. In the table below you can see default configuration.

	BIN MCB feedback MGCB feedback MCB disable Load res 2 AccessLock int Remote OFF
	NT-BIN 7 NT-BIN 8 NT-BIN 9 NT-BIN 10 NT-BIN 11 NT-BIN 12
	BOUT MCB close/open MGCB close/open MainsParams OK Bus params OK Alarm Horn
	NT-BOUT7 NT-BOUT8 NT-BOUT9 NT-BOUT10 NT-BOUT11 NT-BOUT12

More information about binary inputs, setpoints and I/O modules you can find in IM-NT Reference Guide.

MCB Operator Interface

MCB Pushbuttons and LEDs



Pushbuttons:

1. MODE→ — Cycles forward through controller operation modes OFF→MAN→AUT→TEST
2. ←MODE — Cycles backward through controller operation modes OFF←MAN←AUT←TEST
3. HORN RESET — Deactivates the HORN (AUDIBLE ALARM)
4. FAULT RESET — Acknowledges faults and alarms
5. START — Opens binary output *Sys start/stop* (causes start of the gen-set group)
6. STOP — Closes binary output *Sys start/stop* (causes stop of the gen-set group)
7. MCB ON/OFF — Opens and closes (synchronizes) the Mains circuit breaker in MAN Mode
8. ESC

Where	Function
Measurement screens, Alarm list, History screen, Users/Passwords	Go to Menu screen
Setpoints screen	Go to Menu screen; within setpoint group, go to group list
Setpoint edit	Leave setpoint edit without changes
Language screen	Language screen exit (to menu) without save

9. ⇑ — Selects the setpoint, selects the screen, selects history record or increases

a setpoint value

10. ⇓ Selects the setpoint, selects the screen, selects the history record or decreases the setpoint value
11. → Moves the history record displayed columns to the right, 5% increases the edited setpoint's value (step given by the setpoint range), goes back from Alarm list
12. ← Moves the history record displayed columns to the left, 5% decreases the edited setpoint's value (step given by the setpoint range), view Alarm list from measurement screens
13. ENTER

Where	Function
Menu screen	Goes to the selected display group (Measurement CU, Measurement IO, etc.)
Setpoints screen	Goes to selected setpoint group
Setpoint edit	Starts setpoint edit / save changes
History screen	Goes to the first column of the first history record
Language screen	Language screen, exit (to menu) and save selection

Pushbuttons' Combinations

The following table determines controller functions when ⇑, ⇓, ←, →, ENTER and PAGE buttons' combination is pressed:

Where	Pushbutton combination	Function
Measurement screens	ENTER + ⇑ ENTER + ⇓	Contrast increase Contrast decrease
Info screen	ENTER + ⇑ ENTER + ⇓	Backlight increase Backlight decrease

LEDs

14. MAINS FAILURE: RED LED starts flashing when the mains failure occurs and the gen-set does not run, goes to steady light when the gen-set starts and goes off when the mains restores.
15. MAINS VOLTAGE PRESENT: GREEN LED is on, if voltage on the mains terminals is present and within limit.
16. GEN BUS VOLTAGE PRESENT: GREEN LED is on, if bus voltage is present and within limits.
17. GEN-SET FAILURE: RED LED starts flashing when any failure occurs. After FAULT RESET button is pressed, goes to steady light (if an alarm is still active) or is off (if no alarm is active).
18. MCB ON: GREEN LED is on, if MCB feedback is active. Flashes during reverse synchronizing (synchronizing of the loaded gen-set back to the restored mains).
19. Bus – GREEN LED is on if bus voltage is present and within limits.

How to Select a Gen-set Mode?

Use MODE→ or ←MODE to select the requested gen-set operation mode OFF – MAN – AUT – TEST. It is not possible to go directly from OFF to TEST.

Screens

There are several screens available:

1. ALARMLIST
2. MEASUREMENT CU
3. MEASUREMENT IO
4. HISTORY
5. SETPOINTS
6. USERS/PASSWORD

Each menu consists of several screens. By pressing the ESC button (repeatedly when necessary) the menu screen is displayed.

How to View the Alarm List?

1. Select the ALARMLIST menu item.
2. Press ENTER or press ← in measurements' screens to go directly to the Alarm list.

How to View Measured Data?

1. Select the MEASUREMENT CU menu item and press ENTER.
2. Use ↑ and ↓ to select the screen with requested data.

How to View IO Values?

1. Select the MEASUREMENT IO menu item and press ENTER.
2. Use ↑ and ↓ to select the screen with requested data.

How to View the History Menu?

1. Select HISTORY menu item and press ENTER.
2. Use ↑ or ↓ to select a requested record.
3. Use → or ← to cycle forward/backward through columns of the record.

How to View and Edit Setpoints?

1. Select SETPOINTS menu item and press ENTER.
2. Use ↑ or ↓ to select requested setpoints group.
3. Press ENTER to confirm.
4. Use ↑ or ↓ to select requested setpoint.
5. Setpoints marked 🔒 are password protected.
6. Press ENTER to edit.
7. Use ↑ or ↓ to modify the setpoint. When ↑ or ↓ is pressed for 2 sec, auto repeat function and speedup is activated. Use ← or → to change the setpoint value by 5% of it's range.
8. Press ENTER to confirm or ESC to leave without change.
9. Press ESC to leave selected setpoints group.

How to Change the Password?

1. Select USERS/PASSWORD menu item and press ENTER.
2. Use ↑ or ↓ to select User.
3. Press ENTER to confirm.
4. Select ChangePassword and press ENTER.
5. Use ↑ or ↓ or ← or → to set new password.
6. Press ENTER to confirm password.

How to Set the Language?

1. Select the LANGUAGE menu item (if not already selected) and press ENTER.
2. Use ↑ or ↓ to select a requested Language.
3. Press ENTER to confirm.

Hint:

If binary inputs *Lang sel int A,B,C* (for IG-NT/EE internal display) or *Lang sel #2 A,B,C* (for IG-Display and) are used, it is **not** possible to change languages from Language screen.

Language	0	1	2	3	4	5	6	7
Lang sel xxx A	0	1	0	1	0	1	0	1
Lang sel xxx B	0	0	1	1	0	0	1	1

Lang sel xxx C	0	0	0	0	1	1	1	1

How to Change the Display Contrast?

Press and hold ENTER and use ⇑ or ⇓ to adjust the best display contrast.

Hint:

Available from the MEASUREMENT screens only.

How to Check the Serial Number and the Software Revision?

Hold down ENTER and press ESC. On the display you can see the controller INFO screen for 10 seconds.

IM-NT-MCB
Controller INFO screen contains: 10. Controller name (see **Basic settings** group) 11. Firmware and release date 12. Controller serial number (8 character number) 13. Application: MCB Using → you can view the INFO2 screen which contains: 14. DispCTRL: Display Software Version 15. IDch: ID string 16. Dgnl: connected dongle 17. Serial number: Controller Serial Number 18. Pwd.dec.: Password Decode Number

Hint:

Available from the MEASUREMENT screens only.

How to View Codepages?

Press ⇑ button when you are in Info screen to see codapeges.

How to Change the Display Backlight Intensity?

1. Hold down ENTER and then press ESC. On the display you can see Controller INFO screen for 10 seconds.
2. Press and hold ENTER when in INFO screen and use ⇑ or ⇓ to adjust the best display backlight.

Backlight intensity is set for one of the two modes, depending on the activity of configurable binary input *Alt brightness* (IG-NT/EE and modifications). For IG-Display module, this binary input is located in the Power connector and it's function is fixed (not configurable).

Hint:

Backlight intensity change is available from the MEASUREMENT screens only.

How to Find Active Alarms?

1. Select Alarmlist menu item and press ENTER or press ← in MEASUREMENT IO or in MEASUREMENT CU menu.
   Inverted alarms are still active. Non-inverted alarms are not active, but not yet confirmed.
2. Press FAULT RESET to accept all alarms.
   The asterix mark disappears when an alarm is accepted by FAULT RESET. Non-active alarms immediately disappear from the list. Active alarm list appears on the screen automatically when a new alarm comes up and the Main MEASUREMENT screen was selected.

Hint:

Alarm list does not activate automatically if the display is switched to any other screen than the first one of MEASUREMENT (typically the screen that shows menu selector on the upper). The automatic

jump to the alarm list screen will not occur if you are listing through the measured values, set points or history!
If setpoint **Engine protect**:*ResetActAlarms* is set to DISABLED, only inactive alarms can be reset.
If an active alarm is present in the alarm list, controller display blinks every 30 seconds.

When to Use MCB ON/OFF Button?

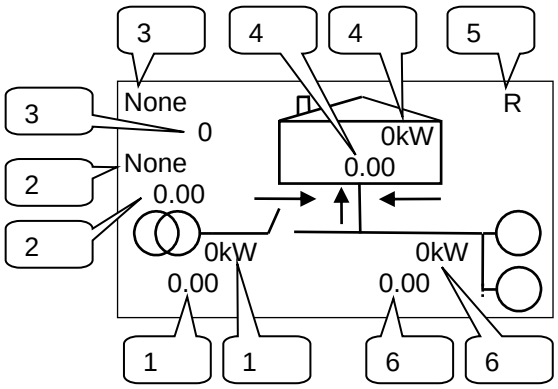
The button is disabled in AUT mode.
In MAN and TEST modes it is enabled, but before closing of the circuit beaker, generator voltage and frequency must be within limits. The controller has internal protection to avoid the breaker closure without synchronizing.

The controller recognizes automatically:

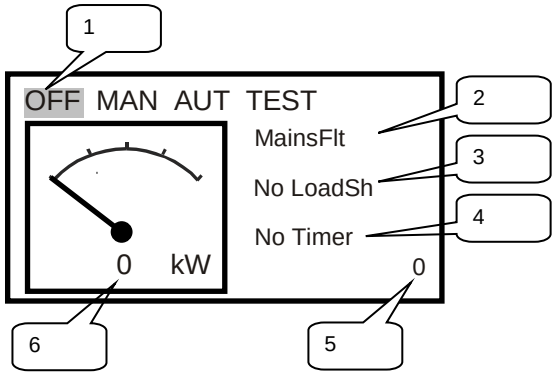
- if there is mains / bus voltage and the gen-set shall be synchronized before closing the MCB
- or if there is no voltage on the bus and the MCB can be closed without synchronizing.

MCB Measurement Screens Description

Measurement CU Screen



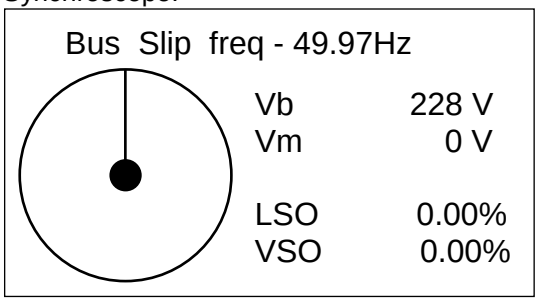
1. Mains: actual value of active power and power factor
2. Actual power factor control mode and required value
3. Actual power control mode and required value
4. Load: actual value of active power and power factor
5. “R” is signalizing if any remote connection to controller is active. If “!” is shown, it indicates an active alarm.
6. Gen-set(s): actual value of active power and power factor



1. Operation mode of the gen-set
2. Application status
3. Load Shedding status
4. Timer – event’s counting time (e.g. syncronization timeout)
5. Time of timer
6. Active power

Mains (power, PF)

MainsImport – active power imported from
Mains PF – Mains power factor
Mains Q – Mains reactive power

M-Ph-N – Mains voltage phase to neutral
Mains (voltage, current) M-Ph-Ph – Mains voltage phase to phase M-curr – Mains current
Objects (power, PF) Object P – object active power Object PF – object power factor Object Q – object reactive power B-Ph-N – bus voltage phase to neutral
B-Ph-Ph – bus voltage phase to phase
TotRunPact – active power of gen-set group TotRun PF – power factor of gen-set group TotRun Q – reactive power of gen-set group Mains freq – Mains frequency Bus freq – bus frequency MaxVectorS – maximum vector shift
Mains power: MainsImport – active power imported from Mains Mains PF – Mains power factor Mains Q – Mains reactive power Mains A – Mains current
Statistics: M kWh I – Mains kWhours import M kWh E – Mains kWhours export M kVAhr I – Mains kVAhours import M kVAhr E – Mains kVAhours export Sum MWh – sum of MWhours of gen-set group Sum MVAhr – sum of MVAhours of gen-set group Time Date
PulseCounter 1 PulseCounter 2 PulseCounter 3 PulseCounter 4
TimerAct1-4 TimerAct5-8 TimerAct9-12 TimerAct13-16
Synchroscope:    Legend: Vb = bus voltage Vm = Mains voltage LSO = Load Sharing Output (regulation outputs) VSO = Var Sharing Output (regulation

outputs)
Power management: TotAvlbPnom – sum of nominal power of all gen-sets available for power management TotRunPnom – sum of nominal power of loaded gen-sets in power management TotRunPact – Sum of active power Act Reserve – Actual load reserve Reg16 (region with up to 16 controllers) Reg32 (region with up to 32 controllers)

Measurement IO Screen

Assignment of various functions to inputs and outputs depends on configuration. In the table below you can see default configuration.

	BIN MCB feedback not used MCB disable Load res 2 AccessLock int Remote OFF
	NT-BIN 7 NT-BIN 8 NT-BIN 9 NT-BIN 10 NT-BIN 11 NT-BIN 12
	BOUT MCB close/open not used MainsParams OK Bus params OK Alarm Horn
	NT-BOUT7 NT-BOUT8 NT-BOUT9 NT-BOUT10 NT-BOUT11 NT-BOUT12

More information about binary inputs, outputs and setpoints you can find in IM-NT Reference Guide.

MCB/MGCB Mode and Function Description

There are four gen-set operation modes: **OFF – MAN – AUT – TEST** in **MCB** and **MGCB** application. To select the mode use MODE→ or ←MODE buttons.

OFF Mode

InteliMains NT has no influence at gen-set group.
If mains voltage is within limits and no mains alarm is active, MCB is closed after **AMF settings**:*MCB close del* if **AMF settings**:*MCB opens on* = MAINS FAIL. If **AMF settings**:*MCB opens on* = GEN RUNNING, MCB stays closed all the time, regardless of the mains condition.
MCB application - if the controller is switched to OFF mode while the gen-sets are running and there is voltage on the bus, MCB is not closed before bus voltage disappears.
MGCB application – if the controller is switched to OFF mode while the gen-sets are running and there is voltage on the bus, MGCB is opened and after **AMF settings**:*FwRet break* MCB is closed (if there is Mains voltage).
Binary output *Sys start/stop* is not active.

MAN Mode

It is possible to close/open breakers manually under supervision of IM-NT controller which doesn't allow to close simultaneously breakers without synchronizing (e.g. MCB and MGCB).

If the Mains fails, controller opens MCB if **AMF settings**:*MCB opens on* = MAINS FAIL. After the Mains returns, MCB stays opened. Otherwise MCB is controlled manually by pressing MCB ON/OFF button or closing *MCBButton* binary input.
MGCB application – if the Mains fails, group of gen-sets is started and there is voltage on the bus, MGCB can be closed anytime by pressing MGCB ON/OFF button.
Pressing of Start/Stop buttons closes/opens binary output *Sys start/stop*, i.e. cause start/stop of the gen-set group.

AUT Mode

Controller performs automatically sequences after Mains failure, closing/opening MCB and MGCB, Peak shaving function, closing of *Sys start/stop* binary output.
MCB is opened according to setpoint **AMF settings**:*MCB opens on* after Mains failure or after the gen-sets are running.
MGCB is closed after the start of gen-set group as soon as an appropriate load reserve is achieved (*Syst res OK* binary output closed).
Controller reacts on binary input *Rem start/stop* – if this input is closed, controller activates binary output *Sys start/stop* in order to start gen-set group. In MGCB application MGCB can be closed before the output activation (see also setpoint **ProcessControl**:*MGCBparalClose*).

TEST Mode

MCB application
Test on load – automatic start of the gen-sets (activation of binary output Sys start/stop), load takeover and opening of MCB; if the Mains fails during test, load is transferred to the gen-sets

MGCB application
Engine Start Only – start of the gen/sets and their synchronization on generator bus; after pressing MGCB ON/OFF button, it is synchronized and load is transferred to gen-sets; after pressing MCB ON/OFF button MCB is opened and MGCB stays closed, gen-sets running in Island
Test on load – MGCB is closed, gen-sets synchronized to the bus, load transferred to gen-sets and MCB opened
Return to Mains is influenced by setpoint **AMF settings**:*ReturnTo mains*:
DISABLED – after the Mains return, load remains on the gen-sets
ENABLED – after the Mains return, synchronizes MCB, transfers load to the Mains, MGCB opens and gen-sets keep running unloaded

Overview of controller reactions in AUT mode when start command is issued (e.g. binary input *Rem start/stop* is closed) with influence of some setpoints from **ProcessControl** group:

State description	**IslandEnable**	**ParallelEnable**	**RevSyncEnable**	**SynchroEnable**
Mains OK or Mains fail Start is blocked				
				ON
			ON	
			ON	ON
Mains OK: possible paralel operation after gen-set controllers have synchronized; MGCB application - only forward synchronization of MGCB (i.e. not if **ProcessControl**:*MGCBparalClose* = NO); MCB application – after Mains fail opens MCB and stops gen-sets Mains fail: Start is blocked		ON		
Mains OK: possible paralel operation after gen-set controllers have synchronized; MGCB application – both **ProcessControl**:*MGCBparalClose* = YES/NO possible MCB application – after Mains fail opens MCB and stops gen-sets Mains fail: Start is blocked		ON		ON

State description	IslandEnable	ParallelEnable	RevSyncEnable	SynchroEnable
mains OK: possible paralel operation after gen-set controllers have synchronized; MGCB application - only forward synchronization of MGCB (i.e. not if **ProcessControl**:*MGCBparalClose* = NO); MCB application – after Mains fail opens MCB and stops gen-sets Mains fail: Start is blocked		ON	ON	
Mains OK: possible paralel operation after gen-set controllers have synchronized; MGCB application – both **ProcessControl**:*MGCBparalClose* = YES/NO possible MCB application – after Mains fail opens MCB and stops gen-sets Mains fail: Start is blocked		ON	ON	ON
Mains OK: Start is blocked	ON			
Mains fail: Starts and goes to Island operation (if **ProcessControl**:*MFStart enable* = YES)	ON			ON
	ON		ON	
MCB application – after Mains return opens Sys start/stop output and after last GCB is opened waits **AMF Settings**:*FwRet break* to closing MCB (paralel operation is not enabled) MGCB application – after Mains returns opens MGCB and Sys start/stop output and waits **AMF Settings**:*FwRet break* efore closing MCB (paralel operation is not enabled)	ON		ON	ON
Mains OK: possible paralel operation after gen-set controllers have synchronized; MGCB application - only forward synchronization of MGCB(i.e. not if **ProcessControl**:*MGCBparalClose* = NO); if **ProcessControl**:*Synchro enable* is ON then *MGCBparalClose* is not important Mains fail: Starts and goes to Island operation (if **ProcessControl**:*MFStart enable* = YES) MCB application – after Mains return opens Sys start/stop output and after last GCB is opened waits **AMF Settings**:*FwRet break* to closing MCB (there is no way to get in paralel operation) MGCB application – after Mains returns opens MGCB and Sys start/stop output and waits **AMF Settings**:*FwRet break* before closing MCB (there is no way to get in paralel operation)	ON	ON		
	ON	ON		ON
Mains OK: possible paralel operation after gen-set controllers have synchronized; MGCB application - only forward synchronization of MGCB(i.e. not if **ProcessControl**:*MGCBparalClose* = NO); if **ProcessControl**:*Synchro enable* is ON then *MGCBparalClose* is not important Mains fail: Starts and goes to Island operation (if **ProcessControl**:*MFStart enable* = YES) MCB application – after Mains return synchronizes MCB; after MCB is closed opens Sys start/stop output (which causes unloading of all gen-sets and their stop) MGCB application – after Mains returns MCB is synchronized and after it is closed *Sys start/stop* is opened; after gen-set power falls under **Sync/Load ctrl**:*MGCB open leve* (or **Sync/Load ctrl**:*MGCB open del* elapses) MGCB is opened	ON	ON	ON	
	ON	ON	ON	ON

Hint:

RevSynsEnable = **ProcessControl**:*Synchro enable* = REVERSE.
SynchroEnable = **ProcessControl**:*Synchro enable* = FORWARD/BOTH (MGCB application only).

List of Abbreviations

AMF	Auto Mains Failure (controller starts automatically on mains failure)
AI	Analog Input
AO	Analog Output
ATS	Automatic Transfer Switch (switches the load to actually supplied bus (by mains or generators)
AVR	Automatic Voltage Regulator
BI	Binary Input
BO	Binary Output
BOR	Breaker open with fault reset
BOC	Breaker Open & Cool-down - protection type (see the Reference Guide for details)
BTB	Bus-Tie Breaker
CAN1	CAN bus for extension modules connection (e.g. IGS-PTM, IS-BIN8/16, IS-AIN8, I-AOUT8, I-CB, IGL-RA15)
CAN2	CAN bus for intercontroller communication (in multiple applications) and monitoring (connection of I-LB, IG-IB)
COX	Application for Complex Systems where actions are taken by a PLC and the controller only follows the orders - needs an external driver (cox)
ESF	Engine Specific File
FMI	Failure Mode Identifier
GC	Graphical Characters - option for additional support of one "graphical" language
GCB	Generator Circuit Breaker
CHP	Combined Heat & Power - cogeneration application, usually with gas engine
I-AOUT8	Extension module with 8 AO
I-CB	Communication Bridge - interfaces IS, IG/IS-NT, ID controllers and non-standard engine ECU
IG-AVRi	IG Automatic Voltage Regulator interface
IG-EE	InteliGen for Electronic Engines (HW optimized for connection to an engine equipped with ECU)
IG-EEC	InteliGen EE controller with extended communication possibilities + switchable sensing ranges of AC voltages and currents
IG-IB	IG Internet Bridge - for internet/ethernet communication
IGL-RA15	Indication panel with LEDs signalizing state of 15 BO
IG-NT	InteliGen New Technology gen-set controller
IG-NTC	InteliGen NT controller with extended communication possibilities + switchable sensing ranges of AC voltages and currents
IGS-NT-LSM+PMS	Dongle for IG-XX and IS-NT to enable Load Sharing control loops and PMS
IGS-PTM	Extension module with 8 BI/BO, 4 AI and 1 AO
I-LB	Local Bridge – for direct and modem monitoring and control of multiple gen-sets
IM-NT	InteliMains New Technology - Mains supervision controller; the same controller in a different SW configuration can work as a bus-tie synchronizer
I-RB	Relay Board
IS-AIN8	Extension module with 8 AI.
IS-BIN8/16	Extension module with 8 BO and 16 BI.
IS-NT	InteliSys New technology gen-set controller
IS-NT-BB	InteliSys New Technology Basic Box (without display)

KWP2000	Key Word Protocol of Scania S6 unit (for engine diagnostics)
LS	Load Sharing - analog load sharing line to interconnect the gen-sets on the site (for isolated parallel or mains parallel of multiple gen-sets); IG/IS-NT controllers use digital Load Sharing via CAN2 bus
LSM	Load Sharing Module
LSO	Load Sharing Output
LT	Option for Low Temperature modification (display equipped with heating foil)
MCB	Mains Circuit Breaker
MGCB	Master Generator Circuit Breaker (sometimes used with multiple gen-sets in island parallel or mains parallel operation)
MINT	Multiple application with INTernal control loops - for multiple gen-sets in island parallel or mains parallel operation; Load Sharing and VAr Sharing controlled internally; PMS available
MP	Mains Protection
NPU	Mains protection relay (voltage, frequency, vector shift protections)
OC	Occurrence Count (number of fault occurrances transmitted in diagnostic frame from ECU)
OfL	Off load - protection type (see application manual for details)
PGN	Parameter Group Number (refer to SAE J1939-71)
PMS	Power Management System - ensures optimization of running gen-sets on the site with multiple gen-sets; based on kW/kVA spinning reserve or on relative (%) load; no-master system ensures high reliability
SHAIN	Shared (virtual) Analog INput module
SHAOUT	Shared (virtual) Analog OUTput module
SHBIN	SHared (virtual) Binary INput module
SHBOUT	SHared (virtual) Binary OUTput module
SPI	Single Parallel Island application - for single gen-sets in parallel with mains or in island operation; suitable for CHP application; no MCB control
SPM	Single Prime Mover application - for single gen-sets without mains
SPN	Suspect Parameter Number (refer to SAE J1939-71)
SPtM	Single Parallel to Mains application - for single gen-sets in parallel with mains or in island operation, with AMF support; both MCB and GCB controlled
SSB	Single Stand-By application - for single gen-sets with mains and break transfer gen-set to mains
VPIO	Virtual periphery I/O module – internal “SW wires” linking binary outputs to inputs
VS	VAr Sharing - ensures VAr sharing between the gen-sets on the site via CAN bus (for isolated parallel or mains parallel of multiple gen-sets)
VSO	Var Sharing Output