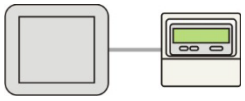
The MitsubishiG50 Driver



The MitsubishiG50 driver interfaces, via an Ethernet network, to a single Mitsubishi AE-200, AG-150, EB-50, or G-50 air conditioning controller. The controller can support up to 50 indoor units, configured in up to 50 logical groups. Available for Commander and ObSys.

This document relates to MitsubishiG50 driver version 1.0 to 1.1

Please read the *Commander Manual* or *ObSys Manual* alongside this document, available from *www.northbt.com*

Contents

Compatibility with the Mitsubishi System

The MitsubishiG50 driver allows North to interface with a Mitsubishi Electric air-conditioning system.

The driver connects via an Ethernet network, to a single Mitsubishi AE-200, AE-50, AG-150, EW-50, EB-50, or G-50 centralised controller (Fig. 1). The controller can support up to 50 indoor units, configured in up to 50 logical groups. Controllers can support more indoor units when using expansion units.

To connect with multiple controllers or expansion units then load a MitsubishiG50 driver for each individual controller. No additional Mitsubishi Procon interface unit is required.

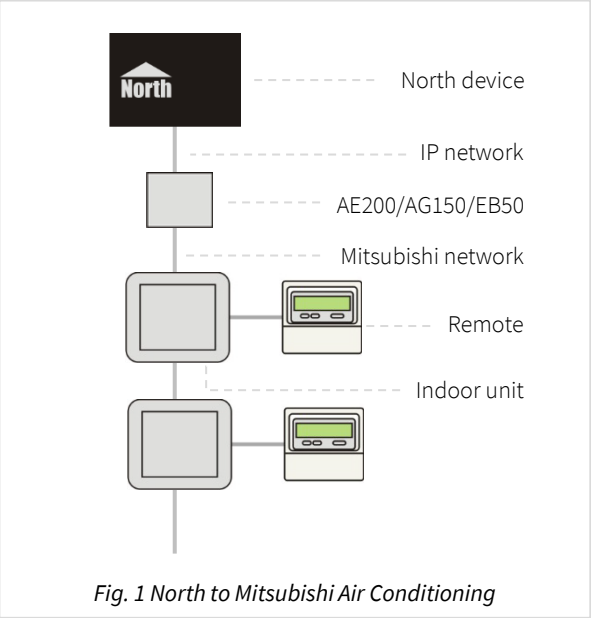


Fig. 1 North to Mitsubishi Air Conditioning

Equipment

Mitsubishi indoor units that are compatible with the driver include:

- M-Net indoor units
- Lossnay units
- K-control indoor units
- A-control indoor units

These include the Mr Slim and City Multi indoor air conditioner units.

Values

Depending on the type of Mitsubishi indoor units connected, each group of units can typically have the following values available:

- On/Off state
- Operating mode
- Temperature
- Air direction
- Fan speed
- Filter dirty
- Return air temperature
- Error state

The Mitsubishi system does not generate alarm event messages. However, the system's malfunction list can be read. This provides the error state of each indoor unit, outdoor unit and controller.

Prerequisites

For AG-150 and G-50 controllers, the *Web Monitoring* option must be enabled. Contact Mitsubishi Electric for assistance in registering the licence for this option. On more recent controllers, this is enabled by default.

For AE-200 or AE-50 controllers, the City Multi VRF dual set-point feature is not currently available in the Mitsubishi protocol. Disable this feature on the AE-200 Advanced Settings menu – set *Old model compatibility* mode to 'On'.

Set the IP address of the Mitsubishi controller. The default IP address is 192.168.1.1.

If you are connecting to a controller via a firewall, then the driver will require access to TCP port 80 on the Mitsubishi controller.

Driver Operation

Reading from the Mitsubishi System

The driver connects to the Mitsubishi controller every two minutes and requests data from the air-conditioning system. This data is processed by the driver to maintain a database of values for each group within the Mitsubishi AC System.

On reading an object from the Mitsubishi AC System, the driver responds immediately with the value from its database.

Adjusting a Value in the Mitsubishi System

On adjusting a value, the driver updates it's database and queues values to be sent to Mitsubishi.

Once no further adjustments have been made for 15 seconds, or the queue is full, then the driver connects to the Mitsubishi controller and sends the queued values.

As adjustments to the Mitsubishi system can take several seconds to process, allow time for the value to update in the controller.

We recommend that object writes to the Mitsubishi system are set to change-of-value. If a background write is required, a rate in the order of hours should be set.

Using the Driver

On ObSys and Commander, the MitsubishiG50 driver is pre-installed. On all of these North devices, you can use the driver to create an interface to Mitsubishi. Once started, you will need to set up the driver before it can communicate with the Mitsubishi system.

Starting the Interface

To start an interface using the MitsubishiG50 driver, follow these steps:

- → **Start Engineering** your North device using ObSys
- → Navigate to **Configuration, Interfaces,** and set an unused **Interface** to 'MitsubishiG50' to start the particular interface
- → Navigate to the top-level of your North device and re-scan it

The driver setup object (Mc), labelled **Mitsubishi Setup**, should now be available. If this object is not available, check an interface licence is available and the driver is installed.

Setting up the Driver

To set up the driver, follow these steps:

- → Navigate to the **Mitsubishi Setup** object (Mc). For example, if you started interface 1 with the driver earlier, then the object reference will be 'M1'
- → Set the **G50 IP Address** object (IA) to the IP address you configured the Mitsubishi controller with earlier

Checking Communications

You can check that the interface is communicating by reading the **Device Communicating** object (DS). A value of 'yes' indicates the driver has connected to, and is communicating with, the Mitsubishi controller.

Adjustments to the Mitsubishi system can take several seconds to process, so allow time for the value to update in the controller (see *Driver Operation* above).

Object Specifications

Once an interface is started, one or more extra objects become available within the top-level object of the device. As with all North objects, each of these extra objects may contain sub-objects, (and each of these may contain sub-objects, and so on) – the whole object structure being a multi-layer hierarchy. It is possible to navigate around the objects using the ObSys Engineering Software.

Each object is specified below, along with its sub-objects.

Example Object Reference

An example of a reference to an object in the same device: the Mitsubishi AC System object (S1) contains Group 1 (G1), which contains a label object (L). Therefore, the object reference will be 'S1.G1.L'.

An example of a reference to an object in a different device: the IP network object (IP) contains Default Commander object (CDIP), which contains the object above (S1.G1.L) – therefore the complete object reference is 'IP.CDIP.S1. G1.L'.

Device Top-Level Objects

When an interface is started using the MitsubishiG50 driver, the objects below become available within the top-level object of the device. For example, if Interface 1 is started, then the object with references 'M1' and 'S1' become available.

Description	Reference	Type
Mitsubishi Setup Set up the MitsubushiG50 driver, started on interface *c* (*c* is the interface number)	M*c*	Fixed Container: On the Commander platform this will be *[CDM v20\MitsubishiG50 v11]* On the ObSys platform this will be *[OSM v20\MitsubishiG50 v11]*
Mitsubishi AC System Access Mitsubishi system connected to interface *c* (*c* is the interface number)	S*c*	Variable Container: *[MitsubishiG50 v11]*

MitsubishiG50 Driver Setup

Object Type: *[OSM v20\MitsubishiG50 v11]*
Object Type: *[CDM v20\MitsubishiG50 v11]*
Object Type: *[OSM v20\MitsubishiG50 v10]*
Object Type: *[CDM v20\MitsubishiG50 v10]*

The MitsubishiG50 driver contains the following objects:

Description	Reference	Type
Module Label Label displayed when scanning the driver setup object	PL	Obj\Text; Max. 20 chars; Adjustable
Device Label Label displayed when scanning the system	DL	Obj\Text; Max. 20 chars; Adjustable
G50 IP Address IP address of the remote Mitsubishi AE-200 or EB-50 controller	IA	Obj\IP; Adjustable
Expansion Controller Address of expansion controller, If fitted. If no controller is fitted, use '0'. The driver can only communicate with units from a single controller. Not available in driver version 1.0	EC	Obj\Num: 0, 1…3; Adjustable
Device Communicating	DS	Obj\NoYes
Reset Driver This will clear the drivers database of groups, indoor units, and alarms and then re-initialize communications with the controller	RST	Obj\NoYes; Adjustable
Debug Enable This will store additional debug information in the record file. Use this option only when instructed by North Support	DE	Obj\NoYes; Adjustable

Mitsubishi AC System

Object Type: *[MitsubishiG50 v11]*
Object Type: *[MitsubishiG50 v10]*

The Mitsubishi system contains objects to access the configured Groups (G*x*) and the Malfunction List (ML).

A group could contain a single indoor unit, or multiple units of the same type. Scan the object to find the groups available.

Description	Reference	Type
Group x The group number, *x,* is in the range 1…50	G*x*	Fixed Container, one of the following: M-Net units *[MitsubishiG50 v11\MNet]* K-control units *[MitsubishiG50 v11\K]* A-control *[MitsubishiG50 v11\A]* Lossnay *[MitsubishiG50 v11\Lossnay]* Lossnay with interlocked OA processing unit *[MitsubishiG50 v11\LossnayOA]* Heat-pump boiler (heating only or heating/cooling) *[MitsubishiG50 v11\Boiler]* Unknown type *[MitsubishiG50 v11\Other]*
Malfunction List	ML	Fixed Container: *[MitsubishiG50 v11\Alarms]*

Mitsubishi M-Net Units

Object Type: *[MitsubishiG50 v11\MNet]*
Object Type: *[MitsubishiG50 v10\MNet]*

A group of Mitsubishi M-Net type units contain the following objects.

Where multiple M-Net indoor units are grouped together, only the lowest address in the group reports the Return Air Temperature (RT).

Adjustments to the Mitsubishi system can take several seconds to process, see *Driver Operation*.

Description	Reference	Type
Label Group name configured for Web pages	L	Obj\Text; Max. 20 chars
Model	T	Obj\Enum Values: 0=Not registered, 1=Indoor (M-NET), 2=Indoor (K-control), 3=Indoor (A-control), 4=Lossnay, 5=Boiler, 6=Lossnay OA, 7=Other
On/Off Status	S	Obj\OffOn; Adjustable In addition, value '3' = test run mode (read only)
Mode	M	Obj\ENum: 0…4; Adjustable Values: 0=Auto, 1=Cool, 2=Dry, 3=Fan, 4=Heat
Extended Mode Provides additional information on the current mode when set to Auto	ME	Obj\ENum: 0…6 Values: 0=Auto, 1=Cool, 2=Dry, 3=Fan, 4=Heat, 5=Auto (Cool), 6=Auto (Heat)
Temperature Set Point (°C)	ST	Obj\Num; Range: 17…30; Adjustable
Return Air Temperature (°C)	RT	Obj\Float
Air Direction	AD	Obj\ENum: 0…6; Adjustable Values: 0=Horizontal, 1=Diagonal 1, 2= Diagonal 2, 3=Vertical, 4=Swing, 5=Auto, 6=Diagonal 0 (The number of available air directions depends on the model)
Fan Speed	FS	Obj\ENum: 0…4; Adjustable Values: 0=Auto, 1=Low, 2=Medium Low, 3=Medium High, 4=High. (The number of available fan speeds depends on the model)
Filter Dirty To clear the filter dirty fault, write 'No'(0) to this object	F	Obj\NoYes; Adjustable
Error Detected	E	Obj\NoYes
Local Remote Control – Inhibit On/Off	RC.F0	Obj\NoYes; Adjustable
Local Remote Control – Inhibit Mode	RC.F1	Obj\NoYes; Adjustable
Local Remote Control – Inhibit Setpoint	RC.F2	Obj\NoYes; Adjustable
Local Remote Control – Inhibit Filter Reset	RC.F3	Obj\NoYes; Adjustable
Address list This value contains a comma separated list of values of connected indoor units within group	IA	Obj\Text
Error list This value contains a comma separated list of values of units within group	IE	Obj\Text

Mitsubishi K-Control Units

Object Type: *[MitsubishiG50 v11\K]*
Object Type: *[MitsubishiG50 v10\K]*

A group of Mitsubishi K-control type units contain the following objects.

Adjustments to the Mitsubishi system can take several seconds to process, see *Driver Operation*.

Description	Reference	Type
Label Group name configured for Web pages	L	Obj\Text; Max. 20 chars
Model	T	Obj\Enum Values: 0=Not registered, 1=Indoor (M-NET), 2=Indoor (K-control), 3=Indoor (A-control), 4=Lossnay, 5=Boiler, 6=Lossnay OA, 7=Other
On/Off Status	S	Obj\OffOn; Adjustable In addition, value '3' = test run mode (read only)
Mode	M	Obj\ENum: 0…4; Adjustable Values: 0=Auto, 1=Cool, 2=Dry, 3=Fan, 4=Heat
Extended Mode Provides additional information on the current mode when set to Auto	ME	Obj\ENum: 0…6 Values: 0=Auto, 1=Cool, 2=Dry, 3=Fan, 4=Heat, 5=Auto (Cool), 6=Auto (Heat)
Temperature Set Point (°C)	ST	Obj\Num: 17…30; Adjustable
Return Air Temperature (°C)	RT	Obj\Float
Air Direction	AD	Obj\ENum: 0…6; Adjustable Values: 0=Horizontal, 1=Diagonal 1, 2= Diagonal 2, 3=Vertical, 4=Swing, 5=Auto, 6=Diagonal 0 (The number of available air directions depends on the model)
Fan Speed	FS	Obj\ENum: 0…4; Adjustable Values: 0=Auto, 1=Low, 2=Medium Low, 3=Medium High, 4=High. (The number of available fan speeds depends on the model)
Error Detected	E	Obj\NoYes
Local Remote Control – Inhibit On/Off, Mode, Setpoint	RC	Obj\NoYes; Adjustable
Address list This value contains a comma separated list of values of connected indoor units within group	IA	Obj\Text
Error list This value contains a comma separated list of values of units within group	IE	Obj\Text

Mitsubishi A-Control Units

Object Type: *[MitsubishiG50 v11\A]*
Object Type: *[MitsubishiG50 v10\A]*

A group of Mitsubishi A-control type units contain the following objects.

Adjustments to the Mitsubishi system can take several seconds to process, see *Driver Operation*.

Description	Reference	Type
Label Group name configured for Web pages	L	Obj\Text; Max. 20 chars
Model	T	Obj\Enum Values: 0=Not registered, 1=Indoor (M-NET), 2=Indoor (K-control), 3=Indoor (A-control), 4=Lossnay, 5=Boiler, 6=Lossnay OA, 7=Other
On/Off Status	S	Obj\OffOn; Adjustable In addition, value '3' = test run mode (read only)
Mode	M	Obj\ENum; Adjustable Values: 0=Auto, 1=Cool, 2=Dry, 3=Fan, 4=Heat
Extended Mode Provides additional information on the current mode when set to Auto	ME	Obj\ENum: 0…6 Values: 0=Auto, 1=Cool, 2=Dry, 3=Fan, 4=Heat, 5=Auto (Cool), 6=Auto (Heat)
Temperature Set Point (°C)	ST	Obj\Num: 17…30 °C; Adjustable
Return Air Temperature (°C)	RT	Obj\Float
Air Direction	AD	Obj\ENum: 0…6; Adjustable Values: 0=Horizontal, 1=Diagonal 1, 2= Diagonal 2, 3=Vertical, 4=Swing, 5=Auto, 6=Diagonal 0 (The number of available air directions depends on the model)
Fan Speed	FS	Obj\ENum: 0…4; Adjustable Values: 0=Auto, 1=Low, 2=Medium Low, 3=Medium High, 4=High. (The number of available fan speeds depends on the model)
Filter Dirty To clear the filter dirty fault, write 'No'(0) to this object	F	Obj\NoYes; Adjustable To clear the filter dirty fault, write 'No'(0) to this object
Error Detected	E	Obj\NoYes
Local Remote Control – Inhibit On/Off	RC.F0	Obj\NoYes; Adjustable
Local Remote Control – Inhibit Mode	RC.F1	Obj\NoYes; Adjustable
Local Remote Control – Inhibit Setpoint	RC.F2	Obj\NoYes; Adjustable
Local Remote Control – Inhibit Filter Reset	RC.F3	Obj\NoYes; Adjustable
Address list This value contains a comma separated list of values of connected indoor units within group	IA	Obj\Text
Error list This value contains a comma separated list of values of units within group	IE	Obj\Text

Mitsubishi Lossnay Units

Object Type: *[MitsubishiG50 v11\Lossnay]*
Object Type: *[MitsubishiG50 v10\Lossnay]*

A group of Mitsubishi Lossnay heat-recovery type units contain the following objects.

Adjustments to the Mitsubishi system can take several seconds to process, see *Driver Operation*.

Description	Reference	Type
Label Group name configured for Web pages	L	Obj\Text; Max. 20 chars
Model	T	Obj\Enum Values: 0=Not registered, 1=Indoor (M-NET), 2=Indoor (K-control), 3=Indoor (A-control), 4=Lossnay, 5=Boiler, 6=Lossnay OA, 7=Other
On/Off Status	S	Obj\OffOn; Adjustable In addition, value '3' = test run mode (read only)
Mode	M	Obj\ENum; Adjustable Values: 7=Auto, 8=Heat Recovery, 9=Bypass
Fan Speed	FS	Obj\ENum: 0…4; Adjustable Values: 0=Auto, 1=Low, 2=Medium Low, 3=Medium High, 4=High (The number of available fan speeds depends on the model)
Filter Dirty To clear the filter dirty fault, write 'No'(0) to this object	F	Obj\NoYes; Adjustable To clear the filter dirty fault, write 'No'(0) to this object
Error Detected	E	Obj\NoYes
Local Remote Control – Inhibit On/Off	RC.F0	Obj\NoYes; Adjustable
Local Remote Control – Inhibit Filter Reset	RC.F3	Obj\NoYes; Adjustable
Address list This value contains a comma separated list of values of connected indoor units within group	IA	Obj\Text
Error list This value contains a comma separated list of values of units within group	IE	Obj\Text

Mitsubishi Lossnay/OA Units

Object Type: *[MitsubishiG50 v11\LossnayOA]*
Object Type: *[MitsubishiG50 v10\LossnayOA]*

A group of Mitsubishi combined Lossnay and OA processing units contain the following objects.

Adjustments to the Mitsubishi system can take several seconds to process, see *Driver Operation*.

Description	Reference	Type
Label Group name configured for Web pages	L	Obj\Text; Max. 20 chars
Model	T	Obj\Enum Values: 0=Not registered, 1=Indoor (M-NET), 2=Indoor (K-control), 3=Indoor (A-control), 4=Lossnay, 5=Boiler, 6=Lossnay OA, 7=Other
On/Off Status	S	Obj\OffOn; Adjustable In addition, value '3' = test run mode (read only)
Mode	M	Obj\ENum: 1…9; Adjustable Values: 1=Cool, 2=Dry, 3=Fan, 4=Heat, 7=Auto, 8=Heat recovery, 9=Bypass
Extended Mode Provides additional information on the current mode when set to Auto	ME	Obj\ENum: 1…9 Values: 1=Cool, 2=Dry, 3=Fan, 4=Heat, 5=Auto (Cool), 6=Auto (Heat), 7=Auto, 8=Heat recovery, 9=Bypass
Temperature Set Point (°C)	ST	Obj\Num: 17…30 °C; Adjustable
Return Air Temperature (°C)	RT	Obj\Float: 0…99 °C
Air Direction	AD	Obj\ENum: 0…6; Adjustable Values: 0=Horizontal, 1=Diagonal 1, 2= Diagonal 2, 3=Vertical, 4=Swing, 5=Auto, 6=Diagonal 0 (The number of available air directions depends on the model)
Fan Speed	FS	Obj\ENum: 0…4; Adjustable Values: 0=Auto, 1=Low, 2=Medium Low, 3=Medium High, 4=High (The number of available fan speeds depends on the model)
Filter Dirty To clear the filter dirty fault, write 'No'(0) to this object	F	Obj\NoYes; Adjustable
Error Detected	E	Obj\NoYes
Local Remote Control – Inhibit On/Off	RC.F0	Obj\NoYes; Adjustable
Local Remote Control – Inhibit Mode	RC.F1	Obj\NoYes; Adjustable
Local Remote Control – Inhibit Setpoint	RC.F2	Obj\NoYes; Adjustable
Local Remote Control – Inhibit Filter Reset	RC.F3	Obj\NoYes; Adjustable
Address list This value contains a comma separated list of values of connected indoor units within group	IA	Obj\Text
Error list This value contains a comma separated list of values of units within group	IE	Obj\Text

Mitsubishi Heat-Pump Boiler Units

Object Type: *[MitsubishiG50 v11\Boiler]*
Object Type: *[MitsubishiG50 v10\Boiler]*

A group of Mitsubishi heat-pump boiler units contain the following objects.

Adjustments to the Mitsubishi system can take several seconds to process, see *Driver Operation*.

Description	Reference	Type
Label Group name configured for Web pages	L	Obj\Text; Max. 20 chars
Model	T	Obj\Enum Values: 0=Not registered, 1=Indoor (M-NET), 2=Indoor (K-control), 3=Indoor (A-control), 4=Lossnay, 5=Boiler, 6=Lossnay OA, 7=Other
On/Off Status	S	Obj\OffOn; Adjustable In addition, value '3' = test run mode (read only)
Mode	M	Obj\ENum: 0…4; Adjustable Values: 0=Heating, 1=Eco-Heating, 2=Hot Water, 3=Anti-Freeze, 4=Cooling
Temperature Set Point (°C)	ST	Obj\Num: 10…90°C; Adjustable See note 1 below
Water Temperature (°C)	RT	Obj\Float
Check Water Sign	W	Obj\NoYes
Error Detected	E	Obj\NoYes
Local Remote Control – Inhibit On/Off	RC.F0	Obj\NoYes; Adjustable
Local Remote Control – Inhibit Mode	RC.F1	Obj\NoYes; Adjustable
Local Remote Control – Inhibit Setpoint	RC.F2	Obj\NoYes; Adjustable
Local Remote Control – Inhibit Water Reset	RC.F4	Obj\NoYes; Adjustable
Address list This value contains a comma separated list of values of connected indoor units within group	IA	Obj\Text
Error list This value contains a comma separated list of values of units within group	IE	Obj\Text

Notes

1. For heating only type boilers (Air to water booster unit), the following setpoints are supported:

Warm water mode:	30-50°C
Warm water mode (eco):	30-45°C
Hot water mode:	30-70°C
Anti-freeze mode:	10-45°C
Cooling mode:	mode not supported

   For heating and cooling boilers (Air to water HEX unit), the following setpoints are supported:

Warm water mode:	30-45°C
Warm water mode (eco):	30-45°C
Hot water mode:	mode not supported
Anti-freeze mode:	10-45°C
Cooling mode:	10-30°C

Unrecognised Mitsubishi Units

Object Type: *[MitsubishiG50 v11\Other]*
Object Type: *[MitsubishiG50 v10\Other]*

If Mitsubishi unit type is unrecognised, it contains the following objects:

Description	Reference	Type
Label Group name configured for Web pages	L	Obj\Text; Max. 20 chars
Model Type	TL	Obj\Text; Max. 4 chars
Address list This value contains a comma separated list of values of connected indoor units within group	IA	Obj\Text
Error list This value contains a comma separated list of values of units within group	IE	Obj\Text

Mitsubishi Malfunction List

Object Type: *[MitsubishiG50 v11\Alarms]*
Object Type: *[MitsubishiG50 v10\Alarms]*

The Mitsubishi malfunction list contains the error state for all connected Mitsubishi Electric indoor unit, outdoor unit, remote controller and system controller addresses.

Description	Reference	Type
Address x Malfunction alarms for address *x*. The address number , *x*, has the following use: Indoor Unit 1…50 1…50 Outdoor Unit 1…50 51…100 Remote Controller 1…100 101…200 System Controller 0…50 0, 201…250	A*x*	Fixed container: *[MitsubishiG50 v10\Alarms\Address]*

Mitsubishi Alarms for an Address

Object Type: *[MitsubishiG50 v11\Alarms\Address]*
Object Type: *[MitsubishiG50 v10\Alarms\Address]*

Each Mitsubishi alarm address reports its state, error code, model type, group number and group label. However, this is dependent on the address type.

The error state is also available from the MitsubishiG50 Group object.

Description	Reference	Type
Error Detected	E	Obj\NoYes
Error Code	EC	Obj\Text; Max. 4 chars The value 8000 indicates no error. Contact Mitsubishi Electric for the latest error code list.
Model Type	T	Obj\Text; Max. 4 chars See note 1 for list of model types available.
Group Number	G	Obj\Num: 0, 1…50 The Group Number is not available on outdoor units and system controllers.
Group Label	GL	Obj\Text; Max. 20 chars The Group Label is not available on outdoor units and system controllers.

Notes

1. Model Type abbreviation. These include:

Model Type	Meaning
IC	Indoor unit (M-Net)
KIC	Indoor unit (K-control)
AIC	Indoor unit (A-control)
LC	Lossnay
FU	Lossnay OA
BU	Heat-pump boiler
AU	Heat-pump boiler with cooling
OC	Outdoor unit
OCi	Outdoor unit (Ice-Y)
OS	Outdoor unit (Sub)
BC	BC controller
BS	BC controller (Sub)
IU	Outdoor unit (Ice-Y Sub)
RC	Outdoor unit (Ice-Y Sub)
TR	G-50
SC	Other system controller
KA	K transmission converter
NONE	No unit at address

Driver Versions

Version	Build Date	Details
1.0	28/5/2012	Released for Commander platform.
1.1	1/10/2014	Added support for Mitsubishi expansion controller
1.1	6/5/2015	Added support for AE-200 controllers
1.1	15/12/2016	Improved refresh of object write
1.1	15/5/2017	Added 'test run' value to group on/off status object (S) Optimized TCP receive Force read of values after multiple writes to system
1.1	14/8/2017	Improved connection when powering-up both the North device and Mitsubishi system together. Added support for fan speed 'auto' state. Added support for air direction 'auto' and 'diagonal 0' states. Changed Error Code to a text object type

Next Steps…

If you require help, contact support on 01273 694422 or visit *www.northbt.com/support*

North Building Technologies Ltd
+44 (0) 1273 694422
support@northbt.com
www.northbt.com

Author: JF
Checked by: BS

Document issued 30/08/2023.