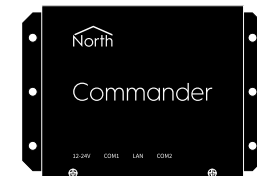




# Commander Tutorial

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This tutorial shows how to use the main features of Commander version 2. It covers Commander's integrate, control, and inform functionality, as well as introducing general North technology such as Zip and the Start Engineering applications.

Work through this tutorial using the North Training Pack, containing: ObSys software, Commander, and Zip modules.

This tutorial relates to the Commander v2.0 (build 17/08/22) base firmware, distributed with the September 2022 release of North ObSys.

## Contents

What is Commander? .....	7
Interface Technology .....	7
Programmable Control .....	7
Information Services .....	7
Commander Hardware .....	8
Power and Connectors .....	8
LEDs .....	8
Battery and Switches .....	9
Installing ObSys, the Engineering Software.....	10
Starting Installation .....	10
ObSys Setup .....	10
ObSys Overview.....	11
ObServer, the Communications Router .....	11
ObView, the Object Viewer .....	11
Basic Commander Settings.....	12
Engineering Commander at a known IP address .....	12
Changing Commander's Label .....	13
Setting Commander's Clock .....	14
Resetting Commander .....	14
ObView Window .....	15
Menu .....	15
Toolbar Area .....	15
Main Area .....	16

Interfacing Commander to other Systems.....	18
Interface Licences within Commander	18
Starting an Interface	19
Stopping an Interface	19
Assembling the Training Pack Zip components	20
Interface Set up	21
The External System	22
What are Objects? .....	23
Value Objects	23
Container Objects	24
Object References	25
Relative References	25
Transferring Values .....	26
Reading from the Source Object	26
Writing to the Destination Object	27
What is Essential Data? .....	28
Pages and Objects	28
Simple Data Storage	29
Data Collection	30
Data Distribution	31
Adjusting Object Values	31
Limiting Adjustments	31
Simply Writing?	32
Setting Commander's LAN Port.....	33
Connecting Commander to your LAN	33
Start Engineering Commander on a LAN	35
Communicating between Commanders	36
BACnet/IP and ModbusTCP	36
Saving your changes to a Backup.....	37
Loading from a Backup.....	38

Time Control.....	40
The Calendar and Today's Day-Type	41
Timers	42
Profilers	43
Introduction to ObVerse Programming.....	44
ObVerse Basics	44
ObVerse Properties	45
Property Purpose and Type	46
ObVerse Modules	47
Module Types	48
Module Inputs	49
Module Outputs	50
Moving an Item	51
Working with Pages and Sheets	52
Adding Comments	52
Saving ObVerse to Disk	53
ObVerse Processors.....	54
Running your ObVerse Strategy in Processor	54
Manually uploading ObVerse Strategy from the Processor	54
Accessing Property Values from Elsewhere	55
Watching ObVerse Run	56
Simple Web Pages .....	58
Controlling Access with the Security .....	59
Security Areas and Levels	60
Enabling Users	61
Specifying Access Security	62
Adding Users	63
Enabling Access Security on Web Pages	64
Access Security in Essential Data	65

Alarms.....	66
Generation and Delivery	67
Alarm History	67
Generating Alarms using Essential Data	68
Generating Alarms from Zip Modules	69
Routing and Filtering	69
Other Alarm Destinations .....	70
Email	70
Printer	70
SMS	70
Other North devices	70
Telnet.....	71
IP Configuration	71
Query/Response	72
Default Configuration.....	73
Commander Hub.....	74
Updating Commander .....	75
Cloud Update	75
TFTP Update	76
Pre-Installed CDMs	77
Zero Interface Licence Drivers	78
Internal Switch Summary .....	79
PROGRAM switch	79
DEFAULTIP Switch	79

# Getting started...

# What is Commander?

Commander is the smallest of North's building controllers, which also includes ObServer. All the controllers contain North's interface technology, block-based programming language, and easy-to-use information services. Commander can work as a stand-alone controller, or alongside other North controllers and display systems, becoming part of a larger control or monitoring solution.

## Interface Technology

Commander includes North's interface technology. Commander can access values from thousands of different systems in a common way, using North drivers. This ability allows Commander to pass data between different systems and enables different sub-systems within a building to be linked together to form a single, coherent system.

## Programmable Control

ObVerse is North's block-based programming language. It is available in all North controllers. Although it is easy to use, it provides real flexibility during engineering, allowing the engineer to incorporate design changes with minimal effort. Date and timer functions are standard, along with feedback control and logic.

## Information Services

Commander supports North's standard protocol, allowing communications with other North products, including powerful engineering tools and display software. Commander also generates and serves standard HTML web pages automatically - these remove the need for graphical design and provide a consistent user display. Commander can also monitor and inform users about alarm conditions, using email or SMS for example.

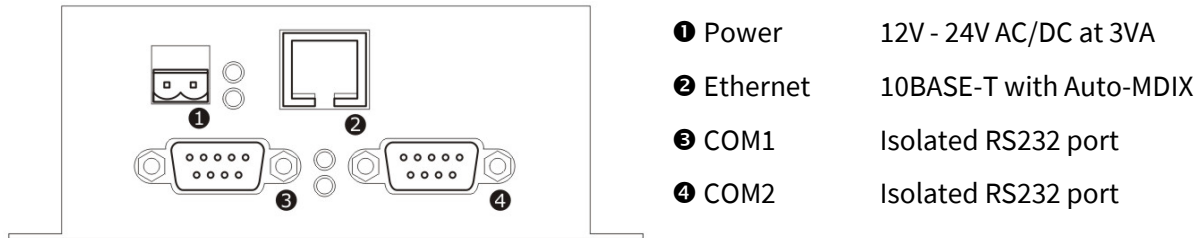
You can also extend information services using, for example, BACnet and Modbus.



# Commander Hardware

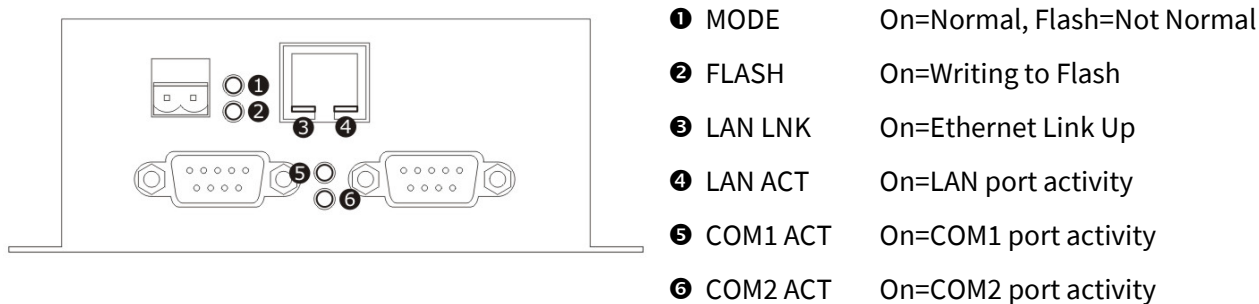
Commander is a two-board device. The upper board contains the main processor, memory, and Ethernet. The lower board contains the power regulation, and the isolated RS232 ports.

## Power and Connectors



Commander runs on any clean voltage supply between 12 and 24 Volts, either AC or DC. Although Commander uses approximately 3VA when running (therefore at 12V it requires approximately 250mA and at 24V it requires approximately 125mA) North recommend you use 6VA supplies.

## LEDs





## Battery and Switches

Remove the lid to access Commander's battery and switches.

The battery supplies power to Commander's memory during power-down, to preserve settings.

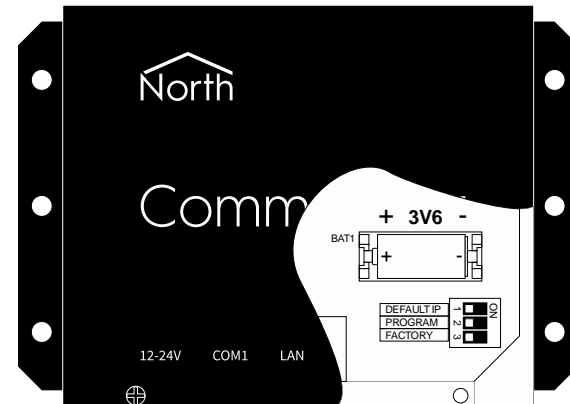
Battery type: **1/2AA 3.6V**

Setting the **DEFAULTIP** switch to ON forces Commander to restart and use its default IP address of 192.168.192.167 instead of its assigned IP address. This is useful if you do not know the normal IP address of Commander. It also enables other areas – for example, TELNET. Setting the switch OFF forces Commander to restart and use its specified IP address.

Setting the **PROGRAM** switch to ON (and restarting) enables programming of new firmware into Commander's flash memory.

The **FACTORY** switch should always be left OFF, unless following North's instruction.

- 📖 To prepare Commander for use, follow these steps:
  - Remove the lid by removing the two screws, and sliding the lid upwards
  - Set the DEFAULTIP switch to ON, to force Commander to a known IP address of 192.168.192.167
  - Apply power, in the range 12-24 VAC or DC – Commander will require approximately 3VA
  - Insert the supplied 3.6V battery into the holder on the upper board
  - Check that the MODE LED is flashing, to show Commander is in Default IP or Program mode.



# Installing ObSys, the Engineering Software

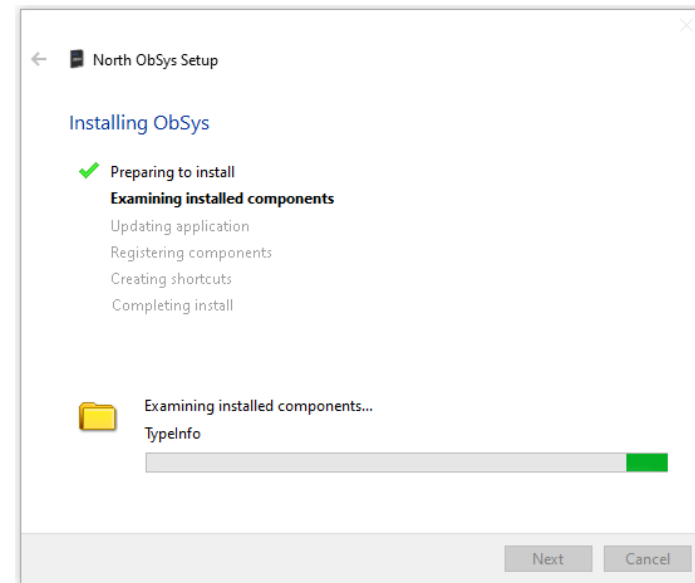
You can engineer all North products using North's ObSys software package. This is a collection of Windows applications, which are installed on a PC - most engineers use a laptop, as ObSys requires little processing power or disk space.

## Starting Installation

If you have ObSys on a CD-ROM or flash drive, just insert it into your PC – the 'autorun' feature will start the installation automatically. If installation does not start automatically, you can run SETUP.EXE manually from the drive. If you have ObSys on a shared network folder, or if you downloaded and unzipped ObSys from the Internet to your own folder, then you must run SETUP.EXE manually from that folder. You may also be able to run the auto extracting SETUP.EXE directly from the Internet.

## ObSys Setup

- 📖 To specify what to install, follow these steps:
  - At the **How do you want to use ObSys?** welcome page, press **To engineer North products.**
  - Read the Licence Agreement: if you are happy to, select **I accept...**, and press **Install.**



# ObSys Overview

ObSys is a package containing several Windows applications. ObServer is the main application. ObView is another important application. Engineering applications needed later also include ObVerse Editor, WebView Editor, and Object Editor.

## ObServer, the Communications Router


ObServer, shortened from Object Server, is the communications router of ObSys. Other XOM-compatible applications can link to, and communicate via, ObServer. ObServer also supports interface drivers, supplied in ObServer Module files, OSM files, and these can communicate via ObServer. ObServer can also link across physical networks to other XOM-compatible products.



## ObView, the Object Viewer

ObView is an application that uses ObServer to communicate. ObView provides a simple way of discovering, showing, and editing values. It also supports more advanced features, such as engineered views, and can support different levels of users with tailored views – but you do not need these when simply engineering other North products.



-  To start engineering using ObView, follow these steps:
  - From Windows **Start**, select **All Programs > North ObSys > Start Engineering**

# Basic Commander Settings

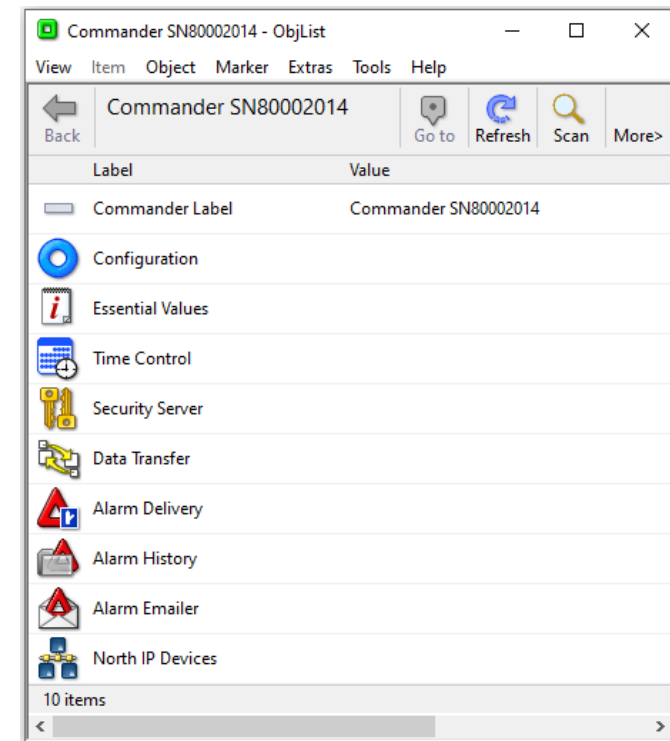
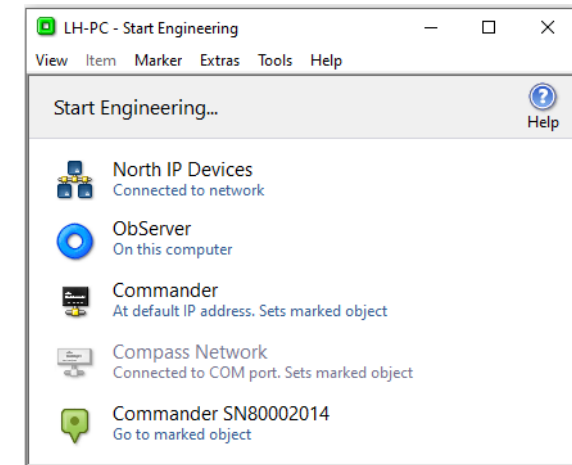
The first things to do, when setting up a Commander, are to set its label and real-time clock.

## Engineering Commander at a known IP address

- 🖥 To set Commander to a known IP address, and start engineering, follow these steps:
  - Connect the PC and Commander directly using Ethernet cable – the Commander can automatically sense the type of cable and cross the wires if necessary
  - Set Commander's **DEFAULTIP** switch to ON. This will force Commander to ignore its specified LAN settings and use the default IP address 192.168.192.167, with a subnet mask 255.255.255.0 instead
  - Set your PC's IP address to a static compatible address, say 192.168.192.1, and its IP mask to 255.255.255.0
  - From Windows **Start**, and select **All Programs > North ObSys > Start Engineering**
  - From Start Engineering, select **Commander at default IP address** – ObView will set Commander as the marked object, and then will display the top-level object in Commander (see note)
  - Left-click on **Configuration** to open it, and ObView will show a list of the last Configuration objects it found – and press **Scan**. Once finished, ObView shows the Configuration objects within this Commander

Press **Back** to go back to the previous view - the top-level objects within Commander. At any time, you may re-run Start Engineering and select Commander (Default IP Address) to get to the top-level of Commander


**Note:** If ObSys finds no objects, ObView cannot communicate with the Commander – perform the actions above again, checking the LAN LNK and LAN ACT LEDs.



## Changing Commander's Label

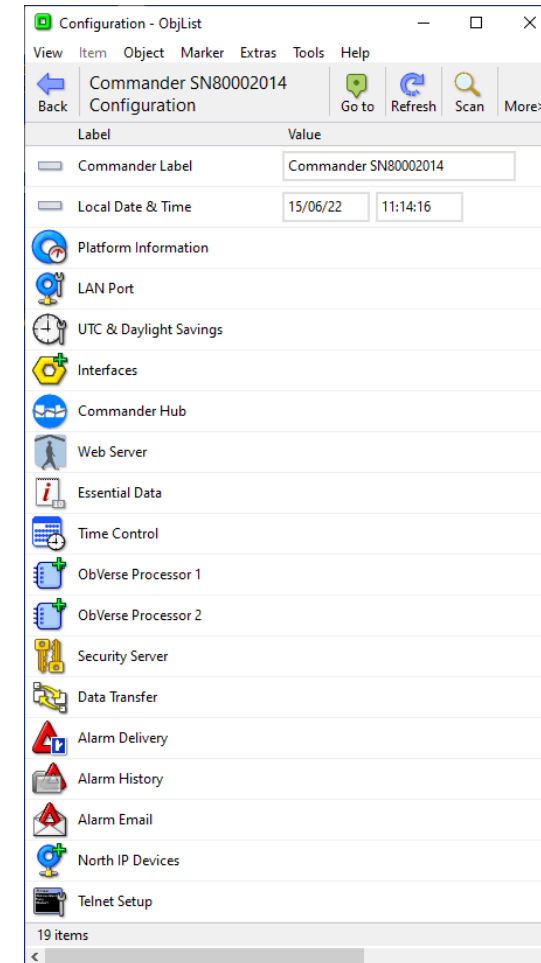
When first supplied by North, Commander's label consists of the word Commander followed by its serial number – for example 'Commander SN80002014'.

From the ObView window that shows the top-level of Commander, you can check the current setting of the Commander Label – although it cannot be changed from this page.

 To set Commander's label, follow these steps:

- From the top-level of Commander, click on **Configuration**
- Move your mouse over the words 'Commander Label' – the mouse is in the shape of a hand – which means the value can be changed
- Click the **Commander Label** object (where the mouse is a hand) and the adjust popup window will appear, showing the current value
- Modify the text in the box, and press **Ok** – Commander will only allow text up to 30 characters in length in this Label
- Press the **Back** button to get back to the top-level of Commander

Notice how some objects have a value to the right of the label. Values that can be viewed, but not adjusted, are shown without a box, values with a box around them can be adjusted - you change the object's value by left-clicking on the box, modifying the value on the popup window, and pressing Ok. Some objects have no value, but instead are container objects (they contain sub-objects). Clicking a container opens that container and clicking on the Back button closes it – we will cover this later.



## Setting Commander's Clock

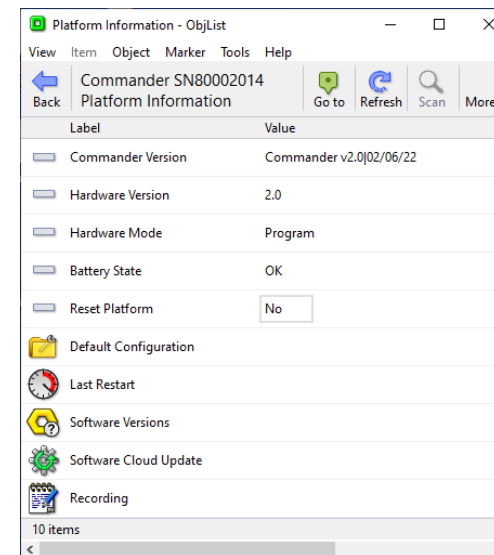
Commander has a battery-backed clock that holds the current time. This is used to time-stamp alarms and logged values; the ObVerse programming language can also use it.

- 📖 To set the local time within Commander, follow these steps:
  - Press **Go to** to go to the Marked Object, Commander, and then click on **Configuration**, and then on each **Local Date & Time** value - an adjust popup window will appear to set the date and time individually. Modify the date and time in the box – notice the format of the date, *dd/mm/yy*. The time format can be *hh:mm* or *hh:mm:ss* – press **Ok** when you are finished adjusting. The new date and time will appear on the window if set correctly.

## Resetting Commander

Some changes have no effect until Commander is reset – there are several ways of doing this: if Commander is near, you can power it off and on; you can change its DEFAULTIP switch; or you can perform a reset using ObView.

- 📖 If you wish to reset Commander using ObView, follow these steps:
  - Press **Go to** to go to the Marked Object – Commander - and then click on **Configuration**, and **Platform Information**. This page shows the version of software in Commander, reset counts, and other information relating to the Commander hardware itself
  - Click on **Reset Platform**, select 'Yes', and press **Ok** – the Commander will reset itself – press **Refresh** to get the page to re-request all the values – you may have to wait until Commander re-establishes Ethernet connections – and notice the Reset Count incremented, and the Last Start Date Time shows the new date and time
  - Press **Go to** to go (back) to the Marked Object, Commander



# ObView Window

We have just used ObView, the Object Viewer, to do some simple editing of Commander. Before we go further, let us take a quick look around the ObView window itself, so you can understand how the main engineering software works.

Objects within the North system are organised in a tree-structure, in a similar way to files and folders on a disk - ObView allows us to navigate over this tree structure, by displaying information about a particular object, including its sub-objects, and allowing us to move up and down the tree.

## Menu

The menu allows access to certain commands and functions to perform on the displayed object - we will learn about these, as we need them.

## Toolbar Area

The toolbar area below the menu shows information about the displayed object and allows the most common actions to be triggered quickly.

**Back** will load the view of the previously opened object (usually of this objects parent.)

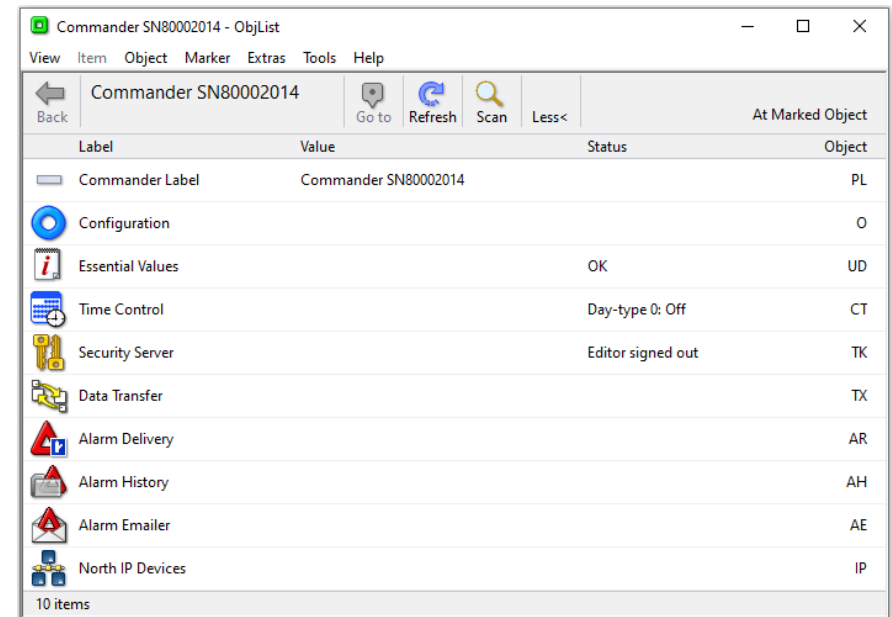
The label area shows the label of the device and the displayed object within that device.

**Go to** will load the view of the Marked Object – in our example, Commander.

**Refresh** will reload the page and re-collect its values and statuses.

**Scan** causes ObView to re-scan the displayed object for sub-objects. ObView enabled the button only on objects that have a variable number of sub-objects.

**Less** decreases the window width – you can still check the status and object references by scrolling the window right and left. **More** increases the window to full width.



## Main Area

The main area of the window contains the list of sub-objects that are within the displayed object.

Each sub-object appears on a single line, starting with an Icon and Label, followed by a Value (if the sub-object has one) or followed by a Status (if the sub-object has one), followed finally by an Object reference.

If there are too many sub-objects to fit on the main area, scroll-bars appear on the right-hand side of the window.

**Left-clicking** on a sub-object causes an action depending on the type of sub-object:

If the object has an adjustable value, with a box surrounding the value, then left-clicking on the adjustable value will allow you to adjust the value – we saw this earlier.

If the sub-object has a non-adjustable value, then left-clicking on the sub-object has no effect.

If the sub-object contains other things, then left-clicking on that container will cause ObView to open the container and display its sub-objects – again we have seen this as we navigate around.

**Right-clicking** on a sub-object shows a popup menu with various actions that can be performed on or with the sub-object:

If the sub-object has a value, then **Copy Value** copies the current value to the clipboard, ready to be pasted elsewhere.

If the sub-object is adjustable, then **Adjust** displays the popup window for adjusting it; **Cut Value** copies the current value and sets the object to zero or blank; **Paste Value** pastes the value in the clipboard to this object; **Delete Value** simply sets the object to zero or blank.

If the sub-object contains other things, then **Open** opens that container, and displays its sub-objects – this is the default action when you left-click on the object.



# Integrating...

# Interfacing Commander to other Systems

One of the roles of Commander is to provide interfacing to third-party systems. It does this using North's interface technology. For each third-party system, North produce a driver – a protocol-converter – that converts the communications language of that system to North's standard language, XOM. North products are based on different hardware platforms, and so North supply drivers in platform-compatible files.

Drivers for Commander come in Commander Module files, or CDM files. Commander comes with popular CDM files pre-installed. It is possible to install other CDM files and to update the CDM files to the latest version – we cover this later in this tutorial.

Although Commander has many pre-installed drivers, it only supports up to four operating interfaces at one time, and each requires a driver.

## Interface Licences within Commander

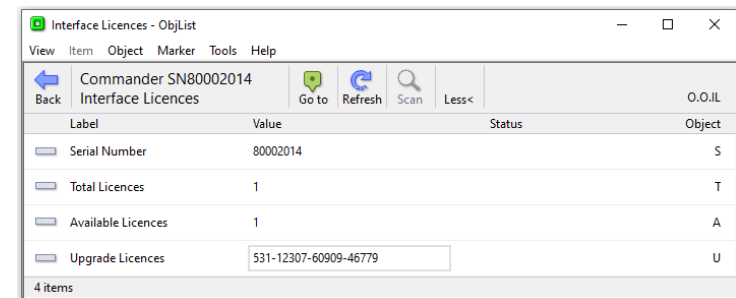
North supply Commanders with a certain number of interface licences (ILs), usually 1. These are used to license the use of drivers.

As Commander starts an interface using a driver, that driver borrows an interface licence from Commander - if Commander does not have any available, the driver will not operate, and the interface will not start.

When an interface is no longer required, and the driver stops, the driver returns the borrowed interface licence to Commander – allowing another driver to borrow it, and therefore allowing you to change the interface as you require.

- 🖥️ To see the current Interface Licence information within Commander, follow these steps:
  - Open **Configuration, Interfaces, Interface Licences**. Each Commander has a unique Serial Number. Total Licences shows the number of licences the Commander has - Available Licences shows how many are still unused

If you wish to increase the interface licences with a Commander, telephone North. North will need details from the Interface Licences page to guide you through adding more.



Label	Value	Status	Object
Serial Number	80002014		S
Total Licences	1		T
Available Licences	1		A
Upgrade Licences	531-12307-60909-46779		U

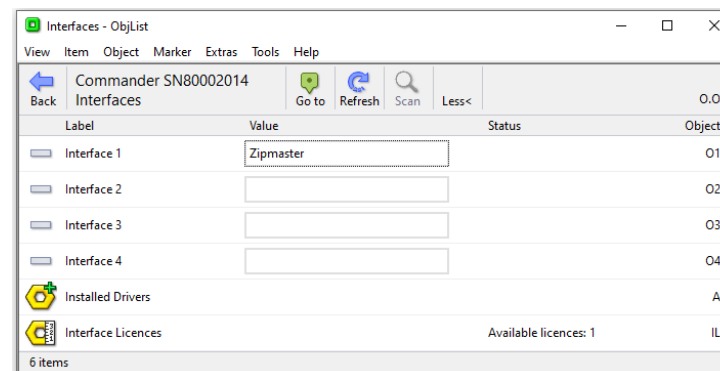
## Starting an Interface

Before you start an interface using a driver, you need to find out whether the driver is installed on the Commander, and then specify that the interface use that driver.

In this documentation, we will set up Interface 1 to use the ZipMaster driver, as we will need this later.

🖥️ To set up Interface 1 to connect to a Zip system, follow these steps:

- Open **Configuration, Interfaces** to view the interfaces currently set up – and the drivers they use – if they are all blank, then there are no interfaces. Open **Installed Drivers** to view a list of drivers currently installed in the Commander
- Scroll up and down and find the **Installed Driver** object that has the value 'ZipMaster'. Copy this value by right-clicking on the object and selecting **Copy Value** from the popup menu. (You can also copy the object's value by clicking to highlight the object, and pressing CTRL+C on the keyboard)
- Press **Back**, then right-click on **Interface 1**, and select **Paste Value** from the popup menu. This will set the value to 'ZipMaster'. (You can also paste to an object's value by clicking to highlight the object, and pressing CTRL+V on the keyboard)



If there are enough available interface licences available, the driver will operate and will appear in the top-level of Commander (you will need to re-scan that level.)

## Stopping an Interface

🖥️ To remove a driver, and therefore stop an interface, follow these steps:

- Open **Configuration, Interfaces**. Right-click on **Interface 1** and select **Cut Value** from the popup menu. This will delete the value and therefore stop the driver.

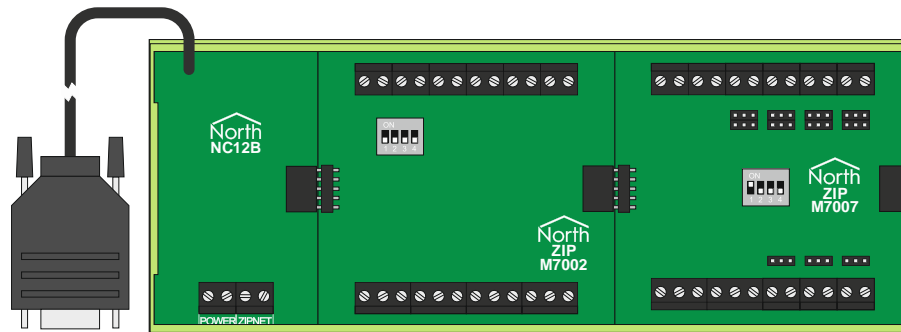
Important Point – if you are following the tutorial, set Interface 1 to 'ZipMaster' to start the ZipMaster driver – we will use it later.

## Assembling the Training Pack Zip components

This tutorial, and others, are written assuming you have access to a set of Zip modules, which allow you to try out certain features of the products. If you are using the Zip components from the Training Pack, they might need assembling.

Zip components typically require connecting, so that a Zip module can share a NetCard's power supply and Zip network. The components are made up of a circuit board with input and output connectors, and green carrier. Each module is supplied with the correct amount of green carrier for the module. Each NetCard is also supplied with two green carrier endcaps.

- 🖨 To assemble the Zip modules in the Training Pack, follow these steps:
  - Remove the components from the NC12B, M7002, and M7007 boxes, and slide the circuit boards from the green carrier
  - Clip together the green carrier, except for one end-cap.
  - Slide into the assembled carrier the NC12B first, then the M7002, then the M7007, ensuring that the 5-pin connection on each module slots into the 5-plug connector of the previous
  - Add the final endcap to hold everything in place. This keeps the circuit boards connected and prevents you touching the underside of any modules when they are in use.
  - With the NC12B on the left, set the address switches of the M7002 to Off-Off-Off-Off (address 0) and the M7007 address switches to On-Off-Off-Off (address 1)



## Interface Set up

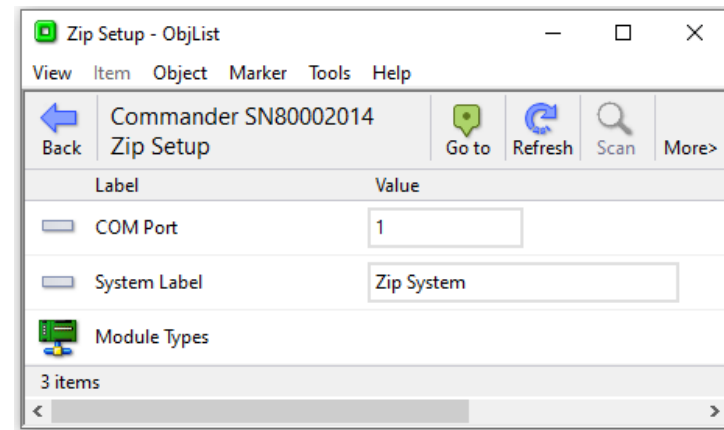
When Commander starts an interface, the interface normally adds two new objects to the top-level of Commander – you will therefore need to **Scan** the top-level.

The first object that the interface adds is the Setup object, which has a yellow hexagonal nut icon (see the icon to the right). This is where values relating to the driver's operation are – things like RS232 port numbers, baud rates, and system labels. The second object added to the top-level of Commander represents the system that can be accessed using the driver.



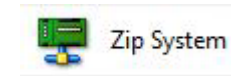
Different drivers have different setup values, which, because of their diversity, are not documented here.

- 🖥 To configure the interface for the Training Pack Zip, follow these steps:
  - Open **Zip Setup**, (you may need to Scan the top-level object if you have just added the interface) to view the Zip setup objects
  - Set **COM Port** to '1', to tell the driver to use COM1 on the Commander
  - Connect 12VDC to the NC12B's power connector on the assembled Training Pack Zip modules - the NC12B's POWEROK led should light, and the M7002 and M7007 OK LEDs should flash
  - Use the cable to connect the NC12B to the Commander's COM1 port - the OK LED of each Zip module should glow solidly to indicate that it has a link with the ZipMaster

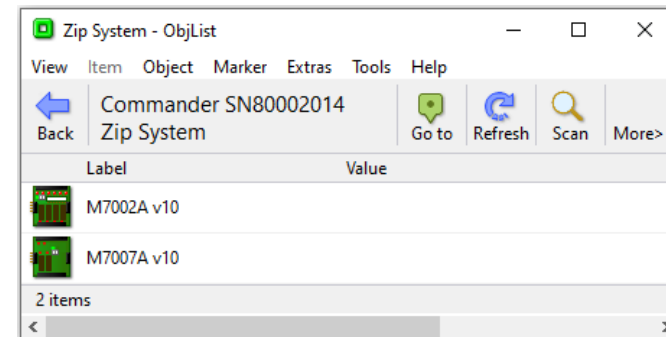


## The External System

The second new object that is added to the top-level of Commander when an interface starts, represents the external system that can be accessed using the driver. It is usually shown with icon that looks like that system (see the Zip System icon to the right). This is where objects relating to the system are located – devices, values, controllers, sensors, etc. The objects within each system are different, so they cannot be documented here.



- 🖥️ To view the Zip modules, follow these steps:
  - Open **Zip System** to view the system's object – you may need to **Scan** to see any Zip modules on the network



# What are Objects?

Before we navigate down into the objects within an external system, let us examine these things we call objects. There are two main groups, or classes, of objects – value objects and container objects.

## Value Objects

We have seen value objects (objects that have a value) before. Some are read-only, and just provide information, like sensor values; some are adjustable, like set points and labels.

Within North's extensible object model (XOM), each value object also has a type – which indicates the type of value it holds. For example, the type could indicate that the value can only hold whole numbers. Below is a list of the main object types and the values they can hold.

Value Type	Values	Format	Examples
Number	Whole numbers, positive or negative	ddd	1, 50
Float	Numbers with a decimal point	ddd.ddd	12.5, -2.0, 5239.2345
NoYes	A digital state – No or Yes	d Where 0=No, 1=Yes	0, 1
OffOn	A digital state – Off or On	d where 0=Off, 1=On	0, 1
Text	A text value, up to a certain defined length	cccccc...ccc (up to max chars)	"Some Text"
Date	A calendar date	dd/mm/yy	12/01/11, 25/12/07
DateTime	A moment in time	dd/mm/yy hh:mm:ss	25/12/11 15:00:00
Enum	An enumerated value, where a number represents something else	ddd Where 0=aaa, 1=bbb, 2=ccc	4
Obj	An object reference	cccccc (0-30 chars)	S1.C1.V
Times	A list of on-off times	hh:mm-hh:mm, hh:mm-hh:mm	07:30-12:00, 12:30-17:00
Profile	A list of value change points	hh:mm=v, hh:mm=v, ...	07:30=21, 17:00=12
Ip	An IPv4 address	ddd.ddd.ddd.ddd	192.168.0.4

As examples, the Commander's label is a Text object, and the Commander's clock is a DateTime object.

Each object type has extra parameters that define type-specific things – for example, text objects have a maximum length parameter; number objects have a high value parameter – but we will cover this later.

## Container Objects

Container objects are objects that contain sub-objects. We use containers to group things together or repeat things. Again, each has a type, but there is no simple list as there are hundreds of container object types – however you do not need to know or remember them.

You have already seen and used container objects – the top-level of Commander is a container object; the Configuration object is a container object; the Platform Information object is a container object.

Container objects split into two main types: fixed and variable.

**Fixed container objects** always contain the same sub-objects. Fixed container objects never need scanning to discover what sub-objects they contain. It is possible to backup data from an object and restore it to another object of the same type because they always contain the same sub-objects. It is also possible to generate object-specific views that can be re-used, and object-specific processes. In summary:

- Always contain the same sub-objects, wherever they are
- Do not need scanning
- Backups can be re-used elsewhere, as the sub-objects are the same

**Variable container objects** contain sub-objects that are site-specific. There is no predefined list of sub-objects for each object - each site is usually different. The sub-objects may ‘stabilise’ over time, or they may change regularly. The top-level object of Commander is a variable container object, and when you change the interfaces within Commander, you change the top-level’s sub-objects – adding an interface normally adds two sub-objects. You can scan variable container objects to discover the sub-objects they contain. In summary:

- Different sites have different sub-objects
- Need scanning when you first see them, and when their contents have changed
- Backups cannot be used elsewhere, as the number of objects changes

Within any container object, each sub-object must have a unique identifier, to allow us to refer to that sub-object – we call this its sub-object reference, and it is normally a few characters of text.



## Object References

When a task in a device needs to read the value of an object, say to calculate something, we need to be able to specify which object it should read. We call this ‘referencing an object’, and we call the identifier of the object its ‘reference’.

Object references are made up of the unique sub-object references, which are appended, (using a period, or full-stop, to separate the parts,) depending on the route from the task to the object.

For example: Consider a route through Commander, with its sub-object **Configuration** (sub-object reference O); its sub-object **Platform Information** (sub-object reference PI); its sub-object **Last Restart** (sub-object reference LR); its sub-object **Reset Count** (sub-object reference RC). The complete reference for the Reset Count within Commander is **O.PI.LR.RC** - if a task within Commander needs to find the count of resets, it would read the value of the object O.PI.LR.RC

Notice how the reference describes the route to the object – go to these sub-objects, read this sub-object.

## Relative References

This concept of the route to the object being held in the reference makes the references extendable. When another device needs to read the count of resets within a Commander, it needs a reference that describes both the route to the Commander and the route to the object within that Commander. All North products that support IP networks have a sub-object called the **IP Network** (IP), which in turn has sub-objects that represent known IP addresses (say CDIP could represent IP address 192.168.192.167). This would make the object reference to the count of resets **IP.CDIP.O.PI.RC**



To see different object references, follow these steps:

- **Start Engineering** Commander at its default IP address: ObView puts the object reference of the current object just above the word ‘Object’ in the column title bar, and sub-object references below it.
- Open **Configuration, Platform Information, Last Restart** to see the objects within - the object reference to this object has become O.PI.LR
- Right-click on **Reset Count**, and select **Copy Object Reference** from the popup menu – the object reference (O.PI.RC) has been copied to the clipboard
- Run Windows Notepad, right-click in the main text area, and select **Paste** from the popup menu – and the object reference appears in the document

# Transferring Values


All North products support the concept of a transfer – a task that can transfer the value from one object to another. These transfers form the most basic integration between systems.

Commander has 500 transfers built-in. You can use each to transfer values from any object to any other object. The source we read the value from, and the destination we write the value to, can be internal to Commander, or in one of the external systems connected to Commander – and we specify these using object references. Be careful - if you try to transfer a time-type object to a no-yes-type object, the result might not be what you were expecting!

## Reading from the Source Object

Transfers happen in two parts – reading the value, then writing it if necessary.

The first part of a transfer is the reading of the source object. As well as specifying the reference of the source object, we need to specify how often we want to read it.

-  To set up Transfer 1 to read from Zip modules on Interface 1, follow these steps:
  - **Start Engineering** Commander using your ObSys
  - Open **Data Transfer** (to view the 500 transfers,) then **Transfer 1**
  - Set **Source Object** to 'S1.M0.DI1.S' – System one, Module zero, Digital input one, State. If this successfully reads, the **Value** will change to 0 or 1, representing the open or closed contact; if the **Source Read Fails** rises, then the transfer cannot read the object, and something is wrong<sup>1</sup>
  - Leave the **Source Read Rate** as 'ASAP'. The transfer reads the object as fast as possible – try changing the state of the input and watch the Value change.

Although the default rate is ASAP (as soon as possible), choose the read rate carefully, as some older systems may struggle to perform if they are being constantly read from. Consider also: if you have 100 reads within transfers, and each read takes 1 second (due to slow communications say), it will take 100 seconds to read them all!

**Note:** If the transfer source reading fails, check the Source Object reference is correct, and the communications route to the object is working.

## Writing to the Destination Object

The second part of a transfer is the writing of the value to the destination.

Every time the transfer reads the value, it compares the new value against the current value it holds. If the value has changed, the transfer writes the new value to the destination object. If the value has not changed, there is usually no need to re-write it.

Some systems, however, can forget values if they lose power, and so they may need a periodic re-write of the value, to correct the loss of memory after a power fail.

Similarly, some integration designs require a periodic re-write of a value to reset a temporary local adjustment.

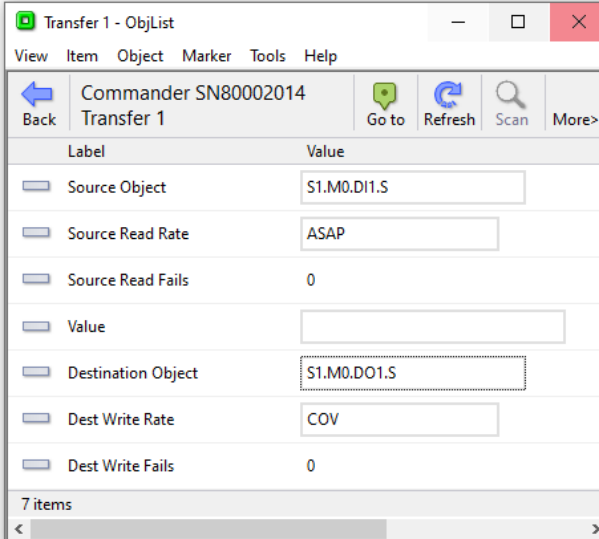
The **Destination Object** specifies where to write the value. The **Dest Write Rate** allows you to specify the periodic rewrite rate – however if you set it to ‘COV’ (change of value) the write will only happen when the value changes (or on power-up of Commander).

🖥 To set up Transfer 1 to write a value to the Zip modules on Interface 1, follow these steps:

→ Set **Dest Write Object** to ‘S1.M0.DO1.S’ – System one, Module zero, Digital output one, State – if the object reference is correct, and communications route to the destinations is working, the Value will be written to the relay - therefore the relay will follow the state of the digital input 1.

Remember that the destination write occurs whenever the value changes, the read rate will dictate how fast the destination responds to source changes.

The Zip system remembers states and values through power-cycles, and therefore you can leave the **Write Dest Rate** as COV, unless some other task is causing temporary adjustments that need resetting.



The screenshot shows a software window titled "Transfer 1 - ObjList". It has a menu bar with "View", "Item", "Object", "Marker", "Tools", and "Help". Below the menu bar, there's a header area with "Commander SN80002014" and "Transfer 1". To the right of the header are buttons: "Back", "Go to", "Refresh", "Scan", and "More>". The main area is a table with two columns: "Label" and "Value".

Label	Value
Source Object	S1.M0.DI1.S
Source Read Rate	ASAP
Source Read Fails	0
Value	
Destination Object	S1.M0.DO1.S
Dest Write Rate	COV
Dest Write Fails	0

At the bottom, it says "7 items" and has a scrollbar.

# What is Essential Data?

Essential Data is the name of Commander's value database and can perform useful tasks.

Although it is not necessary to collect values into a database within Commander before they are used, there are benefits:

- A value can be collected once, to save other tasks each collecting it individually
- Once collected, a value is immediately available from the database, rather than a task or user having to wait for slow communications
- Associated values, such as labels and limits, can be assigned in a consistent way

If it is used, Essential Data provides data for a wide range of other services, which may be used:

- Essential Data can hold a value and read or write it elsewhere
- Essential Data can check whether a value is within an acceptable range, and generate alarm messages if necessary
- Essential Data can build historic logs of the value
- Essential Data values are uploaded to Commander Hub, part of North's cloud services
- Commander can automatically make Essential Data available on web pages
- Some drivers make Essential Data available on other protocols – BACnet/IP, Modbus, Zip

## Pages and Objects

Essential Data stores data in a two-layer structure that consists of pages and objects.

Commander's Essential Data has pages. Each page has a label, which could refer to a location, say 'Living Room', or function, for example 'Heating'. If a page has no label set up, other tasks cannot access it.

Each page has objects. Each object has a label, value type, a value, and access rights, alongside other properties. If an object has no label, other tasks cannot access it.

When Commander shows Essential Data as a web page, this page/object structure provides hierarchy. However, the page/object structure has little effect on data collection.

## Simple Data Storage

Commander can use Essential Data for simply storing values. This needs the least set-up – just a label, a value type, and the actual value. As an example, an engineer could write ObVerse strategy to read a heating setpoint from an Essential Data object.

- 🖥 To set-up a simple Essential Data page, follow these steps:
  - Open **Configuration, Essential Data** – to see some general information, along with the list of pages to edit
  - Open **Page 1**, to see the settings for Page 1, along with a list of objects within Page 1
  - Set the page's **Label** to 'Zip Input 2'
- 🖥 To then set up simple value storage, follow these steps:
  - Open **Object 1**, to see the setting for object 1 on page 1
  - Set **Label** to 'Count', **Type** to 'Number', and **Current Value** to '20' – the Value Last Updated date/time object changes, to reflect when the value was set

We have now created storage for a value within Essential Data. The engineer can always change the value within the Configuration section, as we have just done – but this is only really for engineering the pages and objects – other tasks should access the values from the top-level of Commander.

- 🖥 To see which pages and objects are available within Essential Data, follow these steps:
  - Press **Go to** to get to the top-level of Commander
  - Open **Essential Values** – this is the 'public' side of the database, and by default, has this friendlier label that appears on the web pages
  - You may need to **Scan** the list of pages you have created
  - Open **Zip Input 2** to view the objects within the page - if necessary, **Scan** the list of objects – in this example, a single 'Count' from above

Label	Value
Label	Count
Type	Number
Adjustable	No
Units	
Access Security	0
Type ENum Alternatives	
Type Float Dps/Time periods	0
Value High Limit	0.0000
Value Low Limit	0.0000
Current Value	20
Value Last Updated	20/07/20 15:04:18
Value Alarm State Delay	None
Value Alarm State	OK
Value Alarm Enable/Priority	0
Remote Action	None
Remote Object	
Remote Rate	ASAP/COV
Remote Fails	0
Data Log Enable/Rate	Disable

## Data Collection

Using Essential Data purely as data storage is a contrived example. However, data collection is probably the most important use, and it builds on data storage.

Rather than just storing a value, an Essential Data object can be set up to collect its value periodically from another remote object – which could be within Commander, from one of its interfaces, or from another North device.

- 🖥 To add an Essential Data object with data collection, follow these steps:
- Open **Configuration, Essential Data**
  - Open the page and object that will be modified for data collection – we will use the **Zip Input 2** page, and the **Count** object
  - Set **Remote Object** to 'S1.M0.DI2.C' – i.e. the count of the times the digital input changes from 0 to 1
  - Set **Remote Rate** to '1 minute' – we will have the data collected every minute
  - Set **Remote Action** to 'Read' – we will read the remote object – and the Current Value should change to the correct count of the digital inputs.
  - Connect a simple switch between the **C** and **I** terminals of DI2 of the Zip M7002, and open and close the switch a few times to cause the digital input's count to rise. Press **Refresh** to see the Current Value change.

The Remote Rate requires a little thought. Although in an ideal world we would collect the data constantly, this can cause communications bottlenecks both within Commander, and on systems connected to Commander. So, before setting the Remote Rate, consider:

- How fast the value might change - outside air temperatures change quite slowly
- How fast the data will be seen from within the Essential Data – for example, the web pages may only refresh every minute
- How many other values are collected from the same external system - if there are 100 values being collected, and the external system communications are slow and only allow one read per second, then it will take 100 seconds, or approximately 2 minutes, to collect all the values

Label	Value
Label	Count
Type	Number
Adjustable	No
Units	
Access Security	0
Type ENUM Alternatives	
Type Float Dps/Time periods	0
Value High Limit	0.0000
Value Low Limit	0.0000
Current Value	20
Value Last Updated	20/07/20 15:04:18
Value Alarm State Delay	None
Value Alarm State	OK
Value Alarm Enable/Priority	0
Remote Action	Read
Remote Object	S1.M0.DI2.C
Remote Rate	1 min
Remote Fails	1
Data Log Enable/Rate	Disable

Data Log

## Data Distribution

As well as collecting data, the engineer can use Essential Data to distribute data – i.e. writing values from Essential Data to other objects.

## Adjusting Object Values


Normally Essential Data spends its time reading a remote object, and perhaps showing it to a user.

Sometimes, however, we need to allow the user to change the value, and have Essential Data write the value back to the remote object. This is the normal operation of Essential Data – if the object is adjustable.

When the Remote Action is set to ‘Read’ and the object is made adjustable, Essential Data spends most of the time reading the remote value. When the user adjusts the value within Essential Data, Essential Data attempts to write the new value to the remote object, before going back to reading it. If the write succeeds, the next read will collect the new value. However, if the write fails for whatever reason (value not allowed, or communications are too busy), Essential Data just goes back to reading it.

## Limiting Adjustments

When adjusting values, it would be useful to limit the range that the user can set the value to. You do this with the Value High Limit and Value Low Limit objects.

-  To put an adjustable, limited value into Essential Data, follow these steps:
  - Open **Configuration, Essential Data**
  - Open **Page 2**, and adjust the page’s **Label** to ‘Test Changes’
  - Open **Object 1**, and adjust the object’s **Label** to ‘Limited’
  - Set **Value Type** to ‘Number’, **Adjustable** to ‘Yes’, and **Value High Limit** to ‘10’

If the high and low limits are both set to zero, then limits are not checked when the user makes adjustments.

The web server allows users to adjust Essential Data, and it is safer to put limits on these adjustments, than leave them unchecked.

## Simply Writing?

Sometimes we just need to write a value to an object – when the user changes it, we write it. Essential Data supports this with its Remote Action set to ‘write’. In this mode, Essential Data never reads the remote object. You can decide whether to write the value only when it changes, or when it changes and periodically after the change. As we said previously during Transfers, this periodic writing can be useful.

 To put Essential Data in control of a relay, follow these steps:

→ Open **Configuration, Essential Data, Test Changes, Object 2**

→ Set **Label** to ‘Relay’, **Type** to ‘OffOn’, and **Adjustable** to ‘Yes’

→ Set **Remote Object** to ‘S1.M0.DO3.S’, **Remote Rate** to ‘1 minute’, and **Remote Action** to ‘Write’. Every minute (or whenever something adjusts this Essential Value), the value will be written to the State of DO3 on M0 – i.e. the third relay on the Zip M7002 in the Training Pack.

You can adjust the value from the top-level of Commander, by navigating to Essential Values – remember you may need to scan and refresh as the number of pages and objects has changed.

If you set the Remote Rate to ASAP, the value will be written only when it is changed – be careful that the remote object cannot be modified from elsewhere, or things will get very confusing!

Summary of the Essential Data set-up so far in the tutorial:

Page	Object	Use	Adjustable
1	1	Zip Input 2 - Count	No
2	1	Test Changes - Limited	Yes
2	2	Test Changes - Relay	Yes



## Setting Commander's LAN Port

Up to this point, all engineering within this tutorial has been done with your PC directly connected to Commander, effectively creating their own 'mini-LAN' – with Commander at its default IP address. However, Commanders normally sit on a LAN, and provide information to users or other devices on that LAN.

Commander supports three methods of addressing on the LAN Port: Default, Static, or Dynamic.


**Default IP Addressing** forces the IP address to 192.168.192.167 with subnet mask of 255.255.255.0 – this is useful for quick engineering, or if the Commander's IP address has been forgotten.

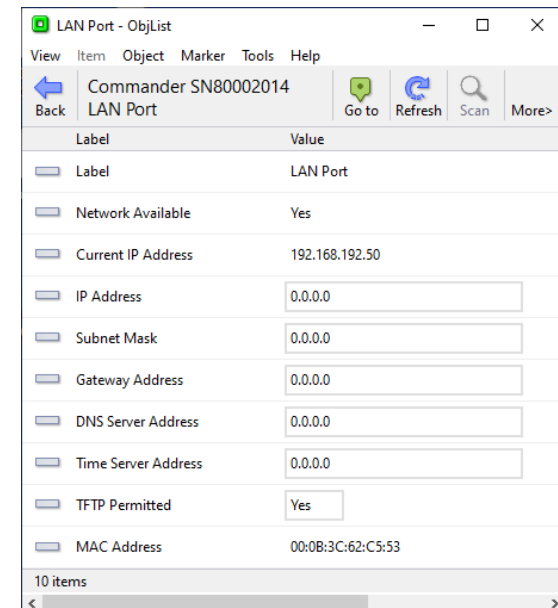
**Static IP Addressing** instructs Commander to use the specified IP address and subnet mask – you can also tell it DNS and NTP server addresses. This is the most useful way, as users and other devices may need to know exactly where Commander is.

**Dynamic IP Addressing** instructs Commander to request its IP address and subnet mask from the LAN's DHCP server – the server normally also supplies DNS and NTP server addresses. Dynamic addressing is simpler than static addressing, but the IP address given by the DHCP server to Commander may change after a period.


## Connecting Commander to your LAN

First, you need to set the Commander IP addressing to match your LAN - either to use dynamic addressing, or to use a static IP address. Then you need to disconnect the Commander from your PC and connect it to the LAN.

-  To set the Commander LAN Port to use dynamic addressing, follow these steps:
  - **Go to** the top-level of Commander; open **Configuration, LAN Port** to view the current settings. The Current IP Address is the address that Commander is using right now – 192.168.192.167 is the default IP address. The **IP Address** object holds the address that you wish the Commander to be – set it to '0.0.0.0' to tell Commander to use DHCP to get its IP settings.
  - Change the Commander's DEFAULTIP to OFF – it will now restart and use DHCP to get an IP address
  - Connect the Commander to your LAN switch, hub, or router, using Cat5 cable



Label	Value
Label	LAN Port
Network Available	Yes
Current IP Address	192.168.192.50
IP Address	0.0.0.0
Subnet Mask	0.0.0.0
Gateway Address	0.0.0.0
DNS Server Address	0.0.0.0
Time Server Address	0.0.0.0
TFTP Permitted	Yes
MAC Address	00:0B:3C:62:C5:53

-  To set the Commander LAN Port to a static IP address, follow these steps:
- **Go to** the top-level of Commander, open **Configuration, LAN Port** to view the current settings
  - Set **IP Address** to a known IP address on your LAN, and set the **Subnet Mask** for your LAN – in this document, we will use 192.168.2.150 and 255.255.255.0 – you may need to ask your network administrator
  - If you know the **Gateway Address** to enable access to other networks, **DNS server address** to resolve domain names to IP addresses, and/or **NTP Server address** to access accurate world time, then change them – they can be on the local network, or if you have a Gateway Address set, they can be on an external network – again, you may need to ask your network administrator
  - Power down the Commander, and connect it to your LAN router using cable – Commander can automatically sense the type of cable and cross the wires if necessary
  - Change the Commander's DEFAULTIP switch to OFF – it will now restart using the IP address you specified
  - Connect the Commander to your LAN switch, hub, or router, using Cat5 cable


Once you have connected Commander to your LAN, you will also need to prepare your PC for working on the LAN (setting its IP address, etc.) before you connect your PC to the LAN.

The ObView window that you used to set the Commander's new IP address will no longer get values from Commander because it is talking to the Commander at the old IP address – so **Close** the ObView window, ready to Start Engineering again later.

In the next part of the tutorial, we will work with the Commander over your LAN – so if you cannot communicate with the Commander, and you need to check any of these changes, remember to go back and set Commander to its default IP address to find what went wrong!

## Start Engineering Commander on a LAN


Once you have connected Commander and your PC onto the same LAN, you can engineer Commander across that LAN.

-  To start engineering Commander across your LAN, follow these steps:
  - From Windows **Start**, select **All Programs > North ObSys > Start Engineering**
  - From the **Start Engineering** page, select **North IP Devices Connected to network**, and then open the Commander to engineer. ObView will display a list of the last objects it found in a device at that address. You may need to press **Scan** to see the contents of the Commander.
  - Set the Marker to this object, by selecting **Marker, Set** from the menu. This sets the Marked Object to the new address of the Commander.
  - Open **Configuration** to see the current date - remember, you may need to **Scan**.

It is always useful to have a recognisable label within the Commander you are looking for on a network of North products.

## Communicating between Commanders

Once a Commander is on a LAN, it can communicate across the network with other Commanders – transferring values, or sending alarms, for example. However, you must first set up Commander's IP Alias table with the IP addresses and optional security-key – an alias is just a short sub-object reference for the device, rather than always having to use its IP address.

-  To tell Commander to find other North devices on the IP network, follow these steps:
  - Open **Configuration, North IP Devices**
  - Set **Autofill List** to 'Scan now' – Commander will find other North products on the LAN, and then press **Refresh** – each will have been given a reference automatically. You can change this if you wish (keep the reference short) or disable Commander talking to a device by deleting its reference
  - **Go to** the top-level of Commander, and open **North IP Devices**
  - You may need to **Scan** to see the devices at the IP addresses– you should see ObSys Engineering software running on your PC


You can now navigate down these devices – the first time you access them you may need to scan and refresh to see the objects they contain. The power of XOM means you may use any of the objects you find in transfers, or other tasks within Commander.

## BACnet/IP and ModbusTCP

Some North drivers expose the Essential Data to other systems – making it easy to set Commander as a server.

Two examples of these types of driver are BACnet/IP and ModbusTCP. You must start the interface as any other, but once set up it will work automatically, making the Essential Data available to other systems.

You need to refer to the document about the driver to learn how to set up and use it.

-  To view the documentation for the BACnet/IP driver, follow these steps:
  - From Windows **Start**, select **All Programs > North ObSys > Product Documents**
  - Click on the **Search** tab; in the **search for** box, type 'BACnet' and press **Search** – the window shows a list of documents that it has found containing the word 'BACnet' in the title
  - Double-click on **BACnetIP Driver**, and the document appears.

# Saving your changes to a Backup

Before we leave this section of the Tutorial, we should cover saving the changes you have made to a Commander.

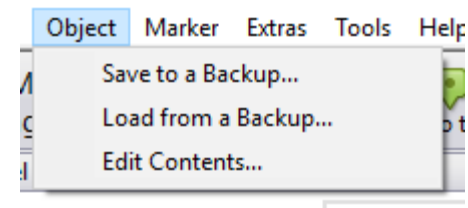
Whenever you change the setup of a Commander (or any other equipment for that matter), you should save your changes. This is good engineering practice.

The Engineering Software can back up any object. It only backs up objects that can be written – any read-only objects are not saved.

Backup files, with the file extension ‘.obs’, are text files, and as such can be viewed and edited.

💻 To save the settings within a Commander to a backup file, follow these steps:

- Navigate to the top of the Commander
- From the menu, select **Object, Save to a backup...**
- Select the folder into which the backup is to be stored – by default, the selection is the folder for the specific Commander within North’s TypeInfo folder:  
C:\ProgramData\North Building Technologies\ObSys\TypeInfo\DefaultSite\IP\<IP Alias>
- Press **Save** to start the backup process.



💻 To save any object to a backup file, follow these steps:

- Navigate to the object you wish to back-up, for example, **Configuration, Essential Data, Page 1**
- From the menu, select **Object, Save to a backup...**
- Select the folder, (you may change the default file name if you wish), and press **Save**.

Note: when saving a backup, the backup application, ObSave, will only backup items it knows about – for example, if you have not scanned a Zip network, ObSave will not save it.

See the later section ‘Default Configuration’ about saving your work to flash memory within Commander.

## Loading from a Backup

Once saved, backup files can be loaded into the original Commander, or anywhere else that has the same object structure (like another Commander). Object backups can also be loaded into other objects of the same structure.

For example, a backup from an Essential Data Page in ObSys can be loaded into an Essential Data Page within Commander.



To Restore an object, follow these steps:

- Navigate to the object you wish to restore with the same object type as the original backup. For example,  
**Configuration, Essential Data, Page 8**
- From the menu, select **Object, Load from a backup...**
- Select the folder and '.obs' file, and press **Open** – the loading starts.

Remember, when loading a backup, the loaded data may change Commander's operation – for example, if the IP Address is set, Commander will operate at that new IP address.

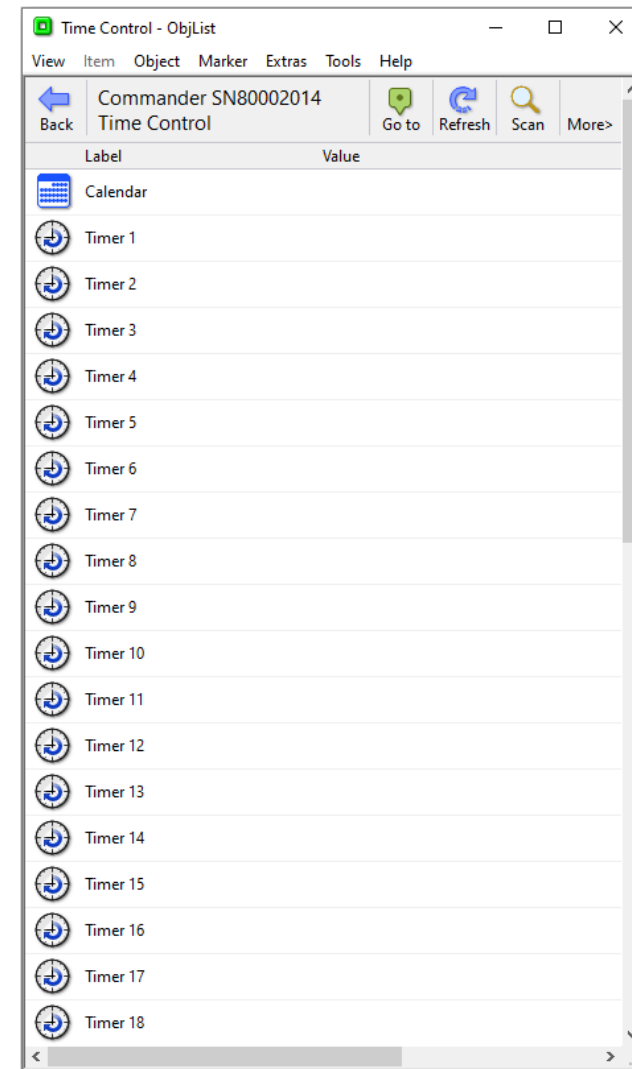
# Controlling...

# Time Control

Timers and profilers allow users to control when things happen in the day, and when they do not. You can save energy and keep the occupants happy. Commander supports timed control with its Calendar, along with its Timer and Profiler tasks.

Commander's single calendar determines today's day-type, and its twenty timers and profilers use today's day-type to determine which of their values to set based on time periods.

Commander supports ten different day-types: Commander uses one of them as day-type 'off', leaving you nine to define and use yourself. They are numbered 0 (off) and 1 – 9.





## The Calendar and Today's Day-Type

The Commander's calendar determines today's day-type. It does this either by requesting it from some other calendar in a different North device, or by calculating the day-type itself.

If you have a 'master' calendar elsewhere on the system, Commander's Calendar can request the day-type from that master – you need to specify the object reference of the master calendar's day-type.

If you are calculating the day-type in Commander, it works in the following way: The calendar determines whether today's date is an exception date – if so that exception day-type is used – otherwise the day-type based on the day-of-week is used.

The calendar re-calculates the day-type every minute, based on the day-types and the exception dates.

- 📖 To set up a standard week within the calendar, follow these steps:
  - **Go to** the top-level of Commander, and open **Time Control** – you may need to press **Scan** to see the calendar and timers
  - Open **Calendar**. You can now see the objects that make up the calendar, including the day-type labels, the day-of-week day-types, and the exception dates and day-types
  - Adjust **Day-type 1 Label** to 'Workday'
  - For each of the weekdays Monday to Friday, adjust the Day-type to '1' (Workday). This means that weekdays are all workdays, unless the date is an exception date
  - You can see the Current Day-Type near the top of the object list, along with a Current Day-Type Label

This object list view of the calendar is good for engineering – imagine the power of ObVerse strategy modifying the day-types for the week ahead perhaps.

The screenshot shows the 'Calendar - ObjList' window for Commander SN80002014. The window has a menu bar (View, Item, Object, Marker, Extras, Tools, Help) and a toolbar with buttons for Back, Go to, Refresh, Scan, and More>. The main area is a table with two columns: 'Label' and 'Value'. The table contains the following entries:

Label	Value
Source object	
Source read rate	ASAP
Source fail count	0
Day-type 0 label	Off
Day-type 1 label	Workday
Day-type 2 label	
Day-type 3 label	
Day-type 4 label	
Day-type 5 label	
Day-type 6 label	
Day-type 7 label	
Day-type 8 label	
Day-type 9 label	
Current day-type	0
Current day-type label	Off
Monday day-type	0
Tuesday day-type	0
Wednesday day-type	0
Thursday day-type	0
Friday day-type	0
Saturday day-type	0
Sunday day-type	0
Exceptions used	0

## Timers

Commander uses timers to control off/on processes. Each timer produces an off or on state, which can be accessed by other tasks.

Each timer has on-off times for each of the possible day-types and uses those on-off times on days that have that day-type. The timer re-calculates the state of the timer every minute.

🖥️ To set a timer, follow these steps:

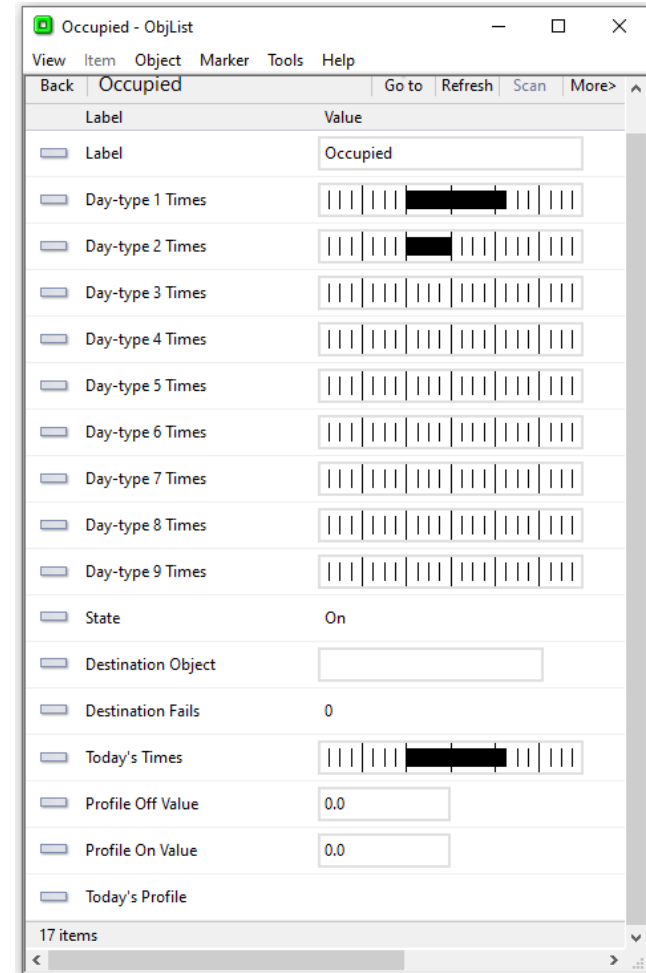
- Open **Time Control, Timer 1** to see the times, label, etc.
- Adjust **Label** to 'Occupied'
- Adjust **Day-type 1 Times**, and change the **Period 1 - Start** value to '8:00' – either type in the box, or click-and-drag the slider – then the **End** value to '17:00'
- Repeat the last step with **Day-type 2 Times**, putting in '8:00' to '12:00' – we will use this as a half day

Notice the State object near the bottom of the object list, and the Today's Times – which is useful for transferring to other things that have an 'on-off times' object.

🖥️ To send the state to another object, follow these steps:

- Adjust the timer's **Destination Object** to the object reference 'S1.M0.DO2.S' (The second relay output of the Training Pack)
- After the next on/off time change, the relay turns on or off depending on the timer state – if the object reference is wrong, the Destination Fails count will rise

This object list view of timers is good for engineering. However, the user can view and adjust the Timers and on-off times using the web pages.



## Profilers

Commander uses profilers to control analogue values over time. Each profiler produces a value, which can be accessed by other tasks.

Each profiler has a list of change-points for each of the possible day-types and uses those change-points on days that have that day-type. Every minute, the profiler checks whether the current time matches a change-point time, and if so, sets the value to that of the change-point.

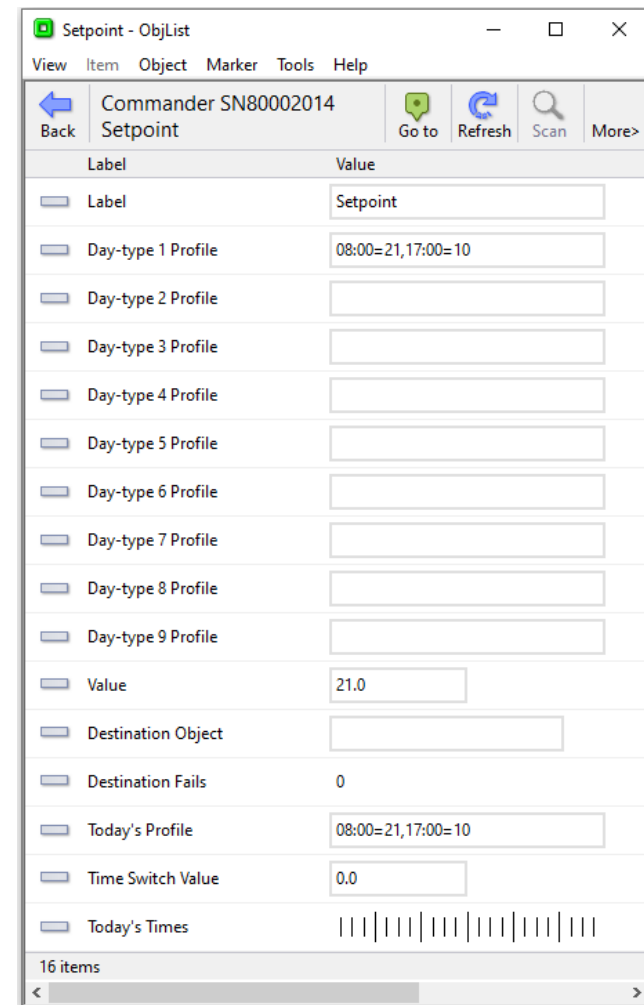
- 🖥 To set a profiler, follow these steps:
  - Open **Time Control, Profiler 1** to see the profiles, labels, etc.
  - Adjust **Label** to 'Setpoint'
  - Adjust **Day-type 1 Profile**, and change the value to '8:00=21,17:00=10'
  - Repeat the last step with **Day-type 2 Profile**, putting in '8:00=21,12:00=10' – we will use this as a half day

The Value object will change only when the current time matches the time in a change-point. If the Destination Object is specified, then when the value changes it will be written to the object.

- 🖥 To make a temporary value change, follow these steps:
  - Change the **Value** object to '19'. The Value will remain at 19 until the next change-point.

Notice the Today's Profile object near the bottom of the object list which is useful for transferring to other things that have a 'time-value profile' object.

This object list view of profilers is good for engineering. However, the user can view and adjust the profiles using the web pages.



The screenshot shows a web application window titled 'Setpoint - ObjList'. It has a menu bar with 'View', 'Item', 'Object', 'Marker', 'Tools', and 'Help'. Below the menu is a toolbar with buttons for 'Back', 'Go to', 'Refresh', 'Scan', and 'More>'. The main content area is a table with two columns: 'Label' and 'Value'. The table contains the following rows:

Label	Value
Label	Setpoint
Day-type 1 Profile	08:00=21,17:00=10
Day-type 2 Profile	
Day-type 3 Profile	
Day-type 4 Profile	
Day-type 5 Profile	
Day-type 6 Profile	
Day-type 7 Profile	
Day-type 8 Profile	
Day-type 9 Profile	
Value	21.0
Destination Object	
Destination Fails	0
Today's Profile	08:00=21,17:00=10
Time Switch Value	0.0
Today's Times	

At the bottom of the table, it says '16 items' and there is a scrollbar.

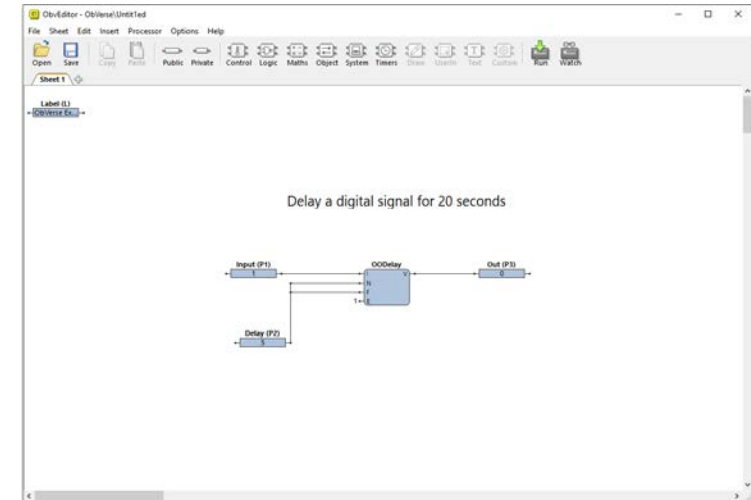
# Introduction to ObVerse Programming

Sometimes you need to do more than simply transfer a value from one object to another – you need to calculate something, delay something, or perform more complex functions on a value. North provides this flexibility with ObVerse, a cause-and-effect programming language.

ObVerse consists of a range of modules. The engineer selects modules and links them together to perform a desired strategy.

ObVerse strategy runs in an ObVerse processor within a device. Commander has two ObVerse standard processors, and whenever Commander is powered-on, these processors run their ObVerse strategy continuously.

You can create and edit ObVerse strategy using North's ObvEditor application, installed as part of the ObSys software. ObvEditor provides drag-and-drop graphical editing of ObVerse, uploading and downloading of ObVerse strategy, and run-time monitoring of the strategy within the processor.



## ObVerse Basics

ObVerse strategy is made up from properties, modules, and comments.

ObVerse properties are value objects as we have met before. They are containers for storing data values and carry a value from one module to another or between the processor and other tasks in the system.

ObVerse modules are used to perform an operation on one or more input values and calculate a value. Properties are linked to the inputs and outputs to store these input and output values.

Comments in ObVerse are short pieces of text used to explain ObVerse strategy and make it easier for others to understand.

The image above shows ObVerse strategy that takes a digital value and adds a delay to it: it has three properties (the narrow blue items with sharp corners), a module (the blue item with rounded corners), and a comment in heavier text.

- 📖 To start the ObVerse Editor, follow these steps:
  - Open **Configuration, ObVerse Processor 1**.
  - Open **ObVerse** to run the ObVerse Editor - this will also associate the editor and the processor. When the editor starts, it shows pre-defined ObVerse strategy – which contains an input property called Label.

## ObVerse Properties

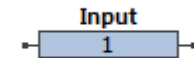
An ObVerse property is a value object and holds a value. When you add a property, you are adding value storage. You choose the object's reference within the ObVerse strategy, the type of value it holds, and whether the property is public (other processes and tasks can access it) or private (its value is only accessible by other modules within the process). If the property is public you can also specify a label, and an initial value – the value of the property after initially downloaded, but before other tasks write to it. If the property is private the label and initial value are not configurable.

The public property shown to the right has been labelled 'Input' and has an initial value 1.

The property is drawn as a rectangle, with the initial value shown inside. If the property is public, its label is shown above the property. A 'tooltip' will show the property's reference and type of value it holds. The short lines on either side of the property show what connects to (and therefore uses), the property's value - a left-hand line may be connected to the single module that calculates and sets the value in the property; a right-hand line may be connected to one or modules that use the value. In most cases the property will first be shown red meaning it is not connected to anything (and therefore has an error.)

All ObVerse strategy should have a Label property (L) – a text input property – it is automatically used as a title for the main ObVerse processor object that appears within the top-level of Commander.

- 📖 To set the label of our example ObVerse strategy, follow these steps:
  - Hover the cursor over the **Label property** to display the tooltip for the property - this shows it's reference and the type of value associated
  - Double-click on the Label property, and set its **Initial value** to 'ObVerse Example'



- 🖥️ To add a public property to our example ObVerse strategy, follow these steps:
- In the editor window, select **Public** on the toolbar. Select **NoYes** as the type of value needed, and the cursor will change to show a property...
  - Click in the editor window (wherever you would like the property to be placed), and the Property Details window appears. Set the **Reference** to 'I1', **Initial value** to '0' and the **Label** to 'Input', then click **OK**. The initial value of the property is now shown in the property itself. If you have made a mistake double-click the property again to edit its details.

## Property Purpose and Type

When you create a property, you must select the purpose of each property you create:

Purpose	Use
Public	Public property values allow other tasks to read and write to their values – within ObVerse the properties have connectors on both the left and right hand side
Private	Private property values cannot be seen by other tasks - they can only be seen within this ObVerse. Commonly used to store a value between modules, they always create their own reference and label

Each property you create holds a particular type of value – an Off/On value perhaps, or a Text label:

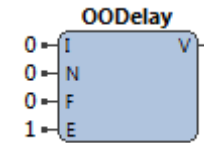
Type	Holds
NoYes	Binary state: 0 or 1, where 0 means No, 1 means Yes
OffOn	Binary state: 0 or 1, where 0 means Off, 1 means On
Num	Whole numbers (no decimals)
Float	Floating point numbers with decimal points
Obj	Object References
Enum	Enumerated values 0 to n, where you determine the meaning of each
Text	Any text string up to 30 characters
DateTime	Date and time
Times	List of on-off times
Profile	List of time-value pairs

## ObVerse Modules

An ObVerse module takes inputs, performs an action, and produces outputs – and you can connect these inputs and outputs to the properties you have created. Modules come in a variety of functions, including control, logic, maths, timers, object access – the list goes on!

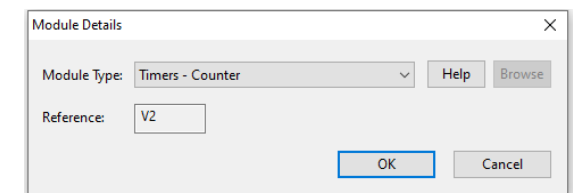
Modules have their inputs connected on the left-hand side, and the outputs on the right. It therefore makes sense that you place your ObVerse strategy inputs on the left-hand side of the page, and its outputs on the right-hand side – calculations will therefore occur naturally from left to right.

The module shown to the right is an On-Off-Delay module – which delays a digital signal when it turns on and off. It takes four inputs (I, N, F, and E) and calculates one output (V). It has its own label above, OODelay.



- 📖 To add a module to the ObVerse strategy, follow these steps:
  - Select the function of the module you would like to add from the toolbar, in this example we will add a Counter module so click the **Timers** button.
  - There are several modules which come under the Timers category - select **Counter**. The cursor will now change to the shape of a module...
  - Click in the editor window to the right of the property we have just added, and the Counter module will now be added to the window

- 📖 To see what a module does, follow these steps:
  - Double-click a module on the ObVerse page, in this case we will double-click the **Counter** module itself and select **Help** – and the *ObVerse Manual* will open showing the help for the Counter module
    - you can see from the help that the Counter module takes three inputs, and calculates two outputs
    - a count of 0-to-1 changes on the I input, and a count of seconds that the I input is set to On
  - **Close** the documentation when finished, and **Cancel** the Module Details window



- 📖 To add two properties ready for the module's outputs, follow these steps:
  - Click the **Public** button on the toolbar then select **Num** from the sub-menu
  - The cursor will now change to a property... click in the editor window somewhere to the right of the Counter module we have just added

- The Purpose, Data Type and Reference have already been filled in for us by the editor; change the Reference to 'O1' and **Label** to 'Starts' and click **OK**
- Repeat the process to add another **Public Num** property, setting the **Reference** to 'O2' and **Label** to 'Seconds'.

## Module Types

Here is a list of some of the modules supported by Commander's ObVerse standard processors. For a complete list, and to find out how a module is used, refer to the *ObVerse Manual: Standard Processor* document.

### Maths

Add  
Subtract  
Multiply  
Divide  
Modulus-Remainder  
Multiple-Add  
Average  
Minimum  
Maximum  
Byte-To-Bits  
Bits-To-Byte  
Num-To-Bit/Bit-To-Num  
Random  
Rescale  
Smooth  
Square-Root  
Linearize  
Usage-Over-Period

### Logic

Logical-And  
Logical-Or  
Logical-Inverse  
Equal  
Gate  
Greater  
Less  
Logical-Exclusive-Or  
Multiple-Logical-And  
Multiple-Logical-Or  
Select

### Object

Alarm  
Object-Read  
Object-Write

### System

System-Information

### Control

Feedback  
Hysteresis  
Lead-Lag  
Optimum-Start-Stop  
Proportional-Integral-Derivative  
Raise-Lower

### Timers


Counter  
Date-Pulse  
Delay  
Latch  
On-Off-Delay  
Pulser  
Times-State  
Profile-Value




## Module Inputs

Each module input – the lines on the left side of the module - may be used in one of several ways: as a constant value; connected to a property; or connected one of the device's Essential Values.


If you want the input to remain constant throughout the process, you can set the input to a constant value – the module will always see the input as the value you specify. When you first insert a module, all its inputs are set to pre-determined constants.

 To view the label of a module input, follow these steps:

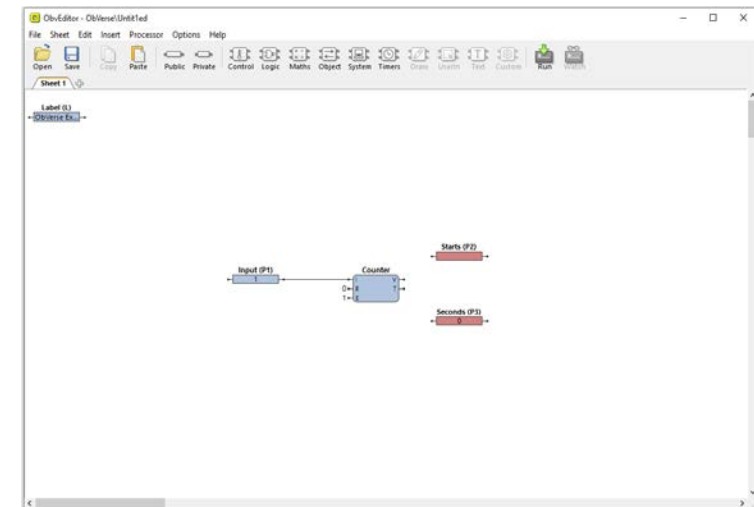
- Move the cursor over the module input, on our example the R input of the Counter module, and a tooltip will show the label of the R input, Reset, and the current constant value, 0

 To change the constant value of a module input, follow these steps:

- Move the cursor over the module input, on our example the R input of the Counter module, to see the full label of the R input, Reset, and the current constant value, 0
- Double-click on the **module input**, to see the value adjustment window
- Change the value to that required, in our case '0', and press **OK**

 To connect a module input to a property, follow these steps:

- Move the cursor over the **module input**, on our example the I input of the Counter module, to see the full label of the I input, Input, and the current constant, 0
- Click-and-drag the cursor to the property, in our case the Input (I1) property we created earlier – the connecting line will appear, and then is drawn thicker when the link becomes valid. The connecting line will remain, showing the link has been made



Module inputs can only connect to property outputs. They cannot be connected to property inputs or other modules directly. If you try to connect two modules, the editor will automatically place a private property between the modules you wish to connect. This property can be edited further if you wish.

You can also connect module inputs to properties by right-clicking on the module input, and from the popup-menu, select **Connect to Public** or **Connect to Private** – the list of input or output properties appears, and you select the one you want.

Each module input can only connect to one property – otherwise it is not clear which value it would use at which time. However, several different module inputs can connect to a single property and use the value.

If you connect a module input to a property of the wrong type, then the module will attempt to convert between the two types – for example, if a number input is connected to a text property, the ObVerse processor will try to extract a numeric value from the start of the text.

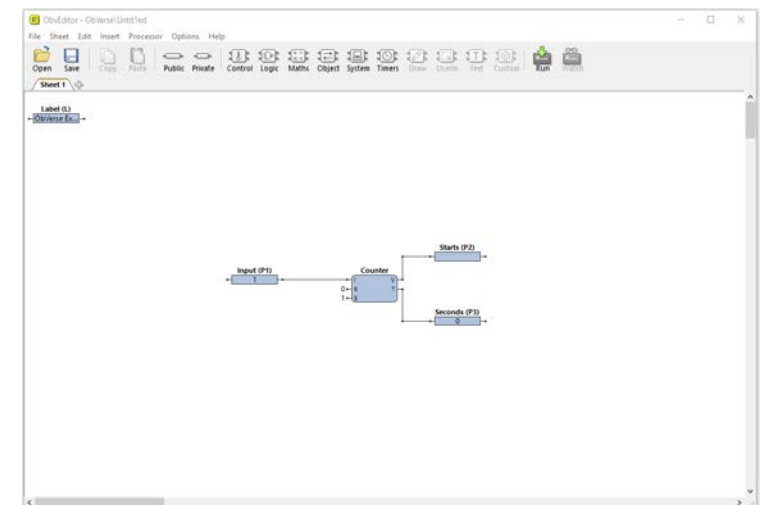
## Module Outputs

A module's purpose is to calculate its outputs, which are available via the connectors on the right-hand side of the module. The outputs from the module usually connect to properties – where the module puts the actual values. If you do not need a particular output value, you do not connect it to a property.

- 🖥 To view the label of a module output, follow these steps:
  - Move the cursor over the module output, in our example the V of the Counter module, to see the full label of the V output, Count, appear in the tooltip
- 🖥 To connect a module output to a property, follow these steps:
  - Move the cursor over the module output, on our example the V output of the Counter module
  - Click-and-drag the cursor to the property, in our case the Starts (O1) property – the connecting line will appear and go thicker when the cursor drags over a valid link – and release it. The connecting line will remain, showing the link is in place

Module outputs can only connect to properties, and not to other module inputs. If you try to connect a module output directly to a module input the editor will place a private property between them in the same way as described earlier.

You can also connect module outputs to properties by right-clicking on the module output, selecting **Connect to Public** or **Connect to Private** from the popup-menu, and when the list of output properties appears, selecting the property.



Each module output can only connect to one property.

If you connect a module output to a property of the wrong type, then the module will attempt to convert between the two types – for example, if a number output is connected to a NoYes property, the ObVerse processor will attempt to convert – by checking if the number is zero (i.e. No) or non-zero (i.e. Yes).

## Moving an Item

Once your ObVerse strategy is laid out, the next task is to tidy it up - and leave it in a state that you would wish to find it! By click-and-dragging on the shaded area of a property or a module, you can move the item to wherever you wish on the page – or even onto another page or sheet (see below).



To move a module, follow these steps:

- Click-and-drag the shaded area of the Counter module, and position it so that the connecting line from the Input property to the module is straight – then release the mouse-button



To move several items at once, follow these steps:

- Click-and-drag a bounding rectangle around the two output properties O1 and O2 to select them – they will both have thick surrounding lines to show they are selected
- Click-and-drag the shaded area of one of the selected properties to move both together – release when you have the items where you want them

## Working with Pages and Sheets

ObVerse strategy can be created over a number of pages, sheets or a combination of both. Pages and sheets aid the organisation of large amounts of ObVerse.

Click and drag the editor window scroll bars and you will see dotted lines spaced over the entire window space – these show boundaries between A4 landscape pages. Connection lines between modules and properties over different pages will be shown as long as the input lies to the right of an output.

The Sheet tabs in the top-left hand corner of the editor window show which sheets are currently available, the highlighted tab shows which sheet is currently being edited in the main window. Modules and properties can be connected between sheets in the same way as between pages, although the connections are displayed differently: When a connection is made between a module and a property over different sheets the reference of the connected module or property will be shown on the input or output.

- 📄 To add another sheet to the editor window, follow these steps:
  - Click on the '+' icon next to the latest sheet tab, the next numbered sheet will now be added

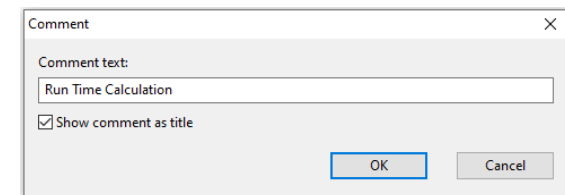
## Adding Comments

Adding comments to ObVerse strategy makes it easier for others (or even yourself) to see what you were trying to do with the ObVerse.

ObVerse comments come in two sizes, regular and title.

- 📄 To add a comment to our ObVerse strategy, follow these steps:
  - Right-click on the screen above the module, and select **Insert Comment...** from the popup menu
  - In the **Comment Text**, enter the comment 'Run Time Calculation', select **Show as title**, and press **OK** – the comment appears in bold text

Again, you can move the comment by click-and-dragging it to where you wish.



## Saving ObVerse to Disk

After changing ObVerse strategy, you can save a copy to disk, for backup purposes.

 To save the current ObVerse strategy, follow these steps:

- From the editor menu, select **File > Save** or click the disk button on the toolbar
- If you have never given the ObVerse strategy a filename, Save will ask you to specify one. For the **File name**, enter 'ObVerse Example' and click **Save**

The ObVerse will be saved to disk in the 'TypeInfo\ObVerse' folder within the ObSys Application Data folder.

The folder in which the ObVerse file is saved is related to the ObVerse type that is reported by the ObVerse when it is scanned – and is shown in the title bar of the editor window. If the window title bar of the editor shows `xxxx\yyyy`, then the ObVerse file will be stored in 'TypeInfo\xxxx\yyyy.obv' within the ObSys Application Data folder.

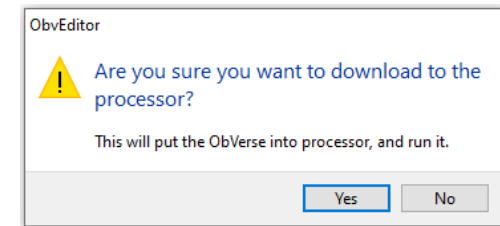
# ObVerse Processors

Now you have written your first chunk of ObVerse strategy, you need to practice running and watching, and see the way other tasks within Commander can access the properties within the ObVerse processor.

## Running your ObVerse Strategy in Processor

While you are editing ObVerse strategy, the ObVerse processor continues to run the strategy already in it (even if it has none). You need to put the new strategy in the processor to allow it to run.

- 🖥️ To put the new ObVerse strategy into the processor and set it running, follow these steps:
  - On the editor toolbar, select **Run**. When asked 'Are you sure...', click **Yes**
  - If the file needs saving, you will be asked 'Do you want to save', press **Yes** – after the file has been saved it will be put in the processor and will run automatically



When the editor puts strategy into the processor, it sends it an item at a time, and so you might see a downloaded item count. This depends on the size of the strategy, and the speed of the link between the editor and the processor.

## Manually uploading ObVerse Strategy from the Processor

After you have downloaded and tested the strategy, the editor may be closed. Remember that the ObVerse strategy was stored in two places – a file on the PC and in the ObVerse Processor.

When an ObVerse processor object is selected in Commander, the editor window opens and automatically displays the strategy which is running in the processor. This is worth bearing in mind if you lose the original ObVerse file, or you need to see the running strategy within a processor.

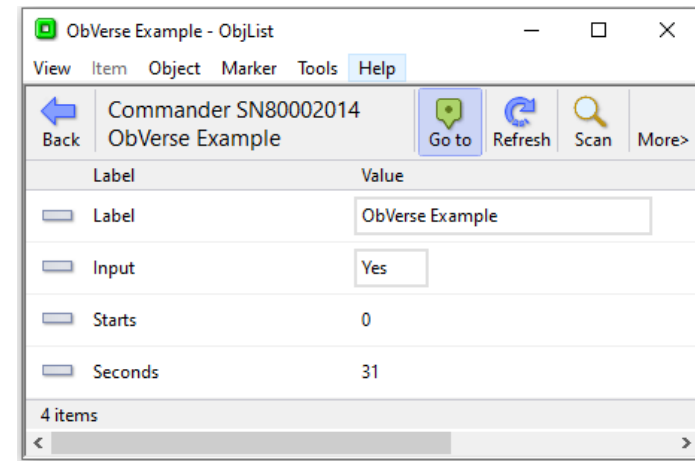
- 🖥️ To manually upload the ObVerse strategy currently running in the processor:
  - From the editor window, select **Processor** from the dropdown menu then click **Get ObVerse** to display the last strategy which was downloaded into the processor.

## Accessing Property Values from Elsewhere

Once the ObVerse strategy is running, the public properties (not the private properties) become available within Commander as value objects. The ObVerse processor itself appears as a container object in the top-level of Commander, and the input and output properties appear within that container object.

Other tasks within Commander can read from and write to the public properties - for example, transfers.

- 📖 To modify an input property using ObView, follow these steps:
  - Navigate to the top level of Commander
  - You may need to **Scan** to see the new ObVerse Example objects added by the ObVerse processor
  - Open **ObVerse Example** – again you may need to **Scan** to see its sub-objects
  - Set **Input** by clicking the object's value and selecting 'Yes' – the property is changed, and the ObVerse strategy continues counting seconds – ObView will normally refresh the values every 5 minutes, so you will need to press **Refresh** to see the values changing more regularly

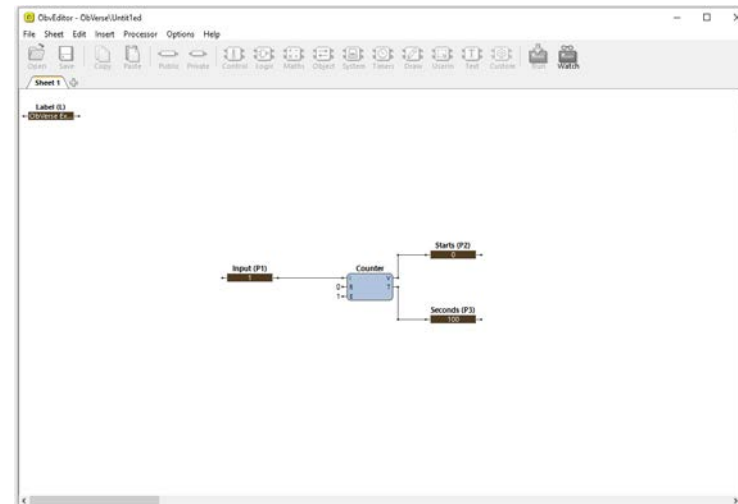


## Watching ObVerse Run

After downloading the ObVerse strategy, you can use the editor to watch what is happening in your ObVerse processor - the editor shows the live data from each property. When watching, it is only possible to adjust property values; objects cannot be moved, added, or deleted. Be careful adjusting output and private property values as they will normally be overwritten when modules recalculate.

- 🖥️ To start Watching, follow these steps:
  - From the editor window, select the **Watch** button on the toolbar
- 🖥️ To see a current value, if the value is too large, follow these steps:
  - **Move** the cursor over the property, and the tooltip will show the full Current Value
- 🖥️ To change an property value, follow these steps:
  - Double-click on the property, and the Value dialog box appears.
  - When asked 'Are you sure...' select **Yes**
  - Change the value to '1', and press **Ok** – the value changes, and the editor shows how that value affects the strategy - in our case the Starts property increases, and the Seconds counter starts to rise
- 🖥️ To stop Watching, follow these steps:
  - From the editor window, click **Watch** on the toolbar a second time

**Note:** Watching ObVerse strategy running within a processor can put stress on the communications path between the editor and the processor, and so should be used only when necessary.



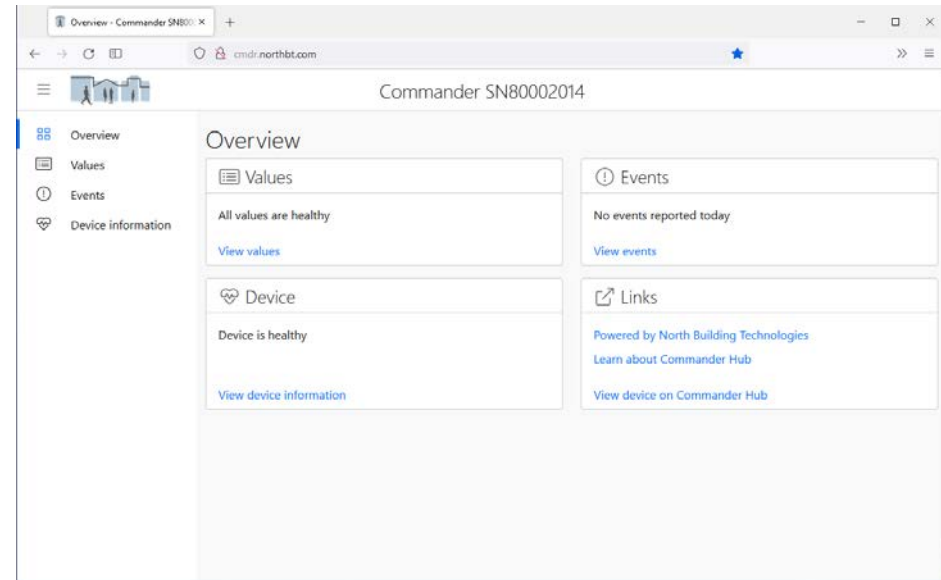


Informing...

# Simple Web Pages

Once Commander is on a LAN, its built-in web server (if enabled) automatically becomes available to others on the LAN. Commander will serve the Essential Data pages and objects, showing the values it last received, which users can adjust.

- 🖥 To view Commander's web pages, follow these steps:
  - Start your preferred web-browser on your engineering PC
    - this must be on the same network if you have been engineering
  - In the **address bar**, enter the IP address of the Commander - in this tutorial we set the Commander to '192.168.2.150' - and press **Enter**, and the Commander's web page appears



The website is arranged into the areas Overview – showing summary information; Values – to view and adjust values from Essential Data; Events – from Alarm History (we will cover this later in the tutorial); and Device information.

Commander builds simple responsive html pages, and so you can use any modern browser, including those on mobile devices.

It is possible to enable and disable certain web pages – this needs knowledge of Commander's security features.

# Controlling Access with the Security

Once Commander is on a LAN, you must start to consider security – to control who can and who cannot view and modify values.

North products (including Commander and ObSys) use security databases to authenticate users; remote ‘areas’ ask a particular security database for information about a user when that user requires access.

Imagine a virtual ‘door’. It works as follows:

- When a user wishes to enter an ‘area’, he/she presents ID (and optional password) to the ‘door’
- The door encrypts the credentials, passes them to the security database, asking for the user’s privileges
- The Security Server returns the user’s name and current privilege levels
- The door decides whether the user can enter the area, and ‘opens’ if the user is allowed

Rather than just one privilege level, security databases hold privilege levels in eight different areas for each user – you must tell the door which area it controls access to, and what the minimum privilege level the user must have in that area before he can pass. This means that a user can have lots of privilege in one area, and yet only a little in another.

Commander’s security database is called **Security Server**, and by default it has no users or groups set up.

## Security Areas and Levels

Within each security system there are eight security areas. Security areas could be actual areas in a building, but are normally functional areas: for example, 'environmental control' and 'North engineering' areas would allow a user to have different privileges in controlling set points and engineering Commanders.

There can be many doors on a system. Each lock controls access to some functionality, and the engineer assigns each door to one of the eight areas. The engineer also assigns the minimum privilege level needed within that area - zero means no privileges required - seven is the highest security.

The engineer gives each user a privilege level in each of the eight areas. The level is in the range zero to seven, seven being the most powerful. When a user wishes to pass a door, his/her privilege level in the door's area is checked against the minimum required for that area – and then either allowed to pass or rejected.

The engineer must decide the use of the eight areas. The engineer must also decide the power of the privilege levels. Most systems use only a few levels per area: 0=None, 1=Guest, 2=User, 7=Administrator.

As an example, imagine a door into a secure room. The secure room is in area 1. The door needs a user to have a minimum privilege level of 6 in area 1 before it will open. The door has a card-reader that checks users with a security database before unlocking the door. User A has privilege level 7 in area 1 – she can open the door. User B has privilege level 5 in area 1 – he cannot open the door. User C has privilege level 1 in area 1 – she cannot open the door.

The example continues: on the same Commander, a temperature set point can be viewed by all, but users need a minimum privilege level of 2 in area 1 to adjust – therefore Users A and B can adjust the set point, but User C cannot.

## Enabling Users

As well as holding the user's own privilege level in each of eight areas, the security database holds the user's name, and whether the user is enabled – if disabled, the user will never be validated.

Each user can also be given start and end dates – if these are set up, the security database disables the user automatically if today's date is not within the range specified.

You may make a user a member of up to three groups. Each group has an enable object, along with group privilege levels for the eight areas. The privilege levels for the user will now be an amalgamation of any groups he is a member of, along with his own privilege levels.

Each user has a UserID (or card number) and a Password – together these form a coded token. It is the coded token that is passed around a system – the password is never seen.

Whenever an item checks a coded token with the security database, the database remembers the date and time of the successful validation – this allows you to see when the user was last validated.

The screenshot shows a window titled 'User 1 - ObjList' with a menu bar (View, Item, Object, Marker, Tools, Help) and a toolbar (Back, Go to, Refresh, Scan, More>). The main area displays a list of user attributes and their values:

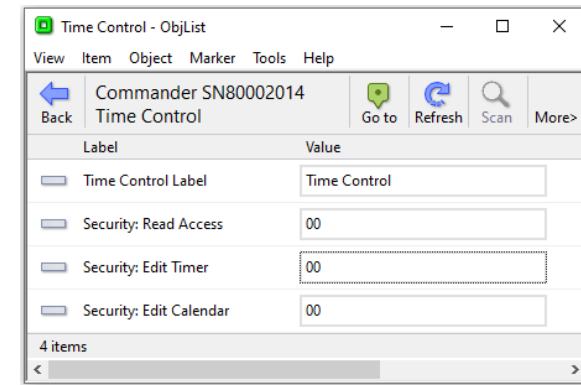
Label	Value
Name	Administrator
Enabled	Yes
User ID/Card	admin
Password	*****
Token	*****
Group 1	0
Group 2	0
Group 3	0
Privilege Level in Area 1	7
Privilege Level in Area 2	7
Privilege Level in Area 3	7
Privilege Level in Area 4	7
Privilege Level in Area 5	7
Privilege Level in Area 6	7
Privilege Level in Area 7	7
Privilege Level in Area 8	7
Valid Start Date	00/01/80
Valid End Date	00/01/80
Last Validation Date	00/01/80

At the bottom, it indicates '19 items' and shows a scroll bar.

## Specifying Access Security

Once you have added users to the database, the only thing left is to assign the area and minimum privilege level to control access to the protected features.

An item that supports security will have one or more Access Security objects, each of which has a two-digit value. Each object controls the access to a feature - such as seeing the value, or adjusting the value, or viewing the page. The two-digit value is made up of the area digit (1-8), followed by the minimum privilege level (1-7) - for example, if the minimum privilege level is 6 in area 2, then the two-digit value is 26. If the value is 00, then no security checks are made.



The screenshot shows a software window titled "Time Control - ObjList". It has a menu bar with "View", "Item", "Object", "Marker", "Tools", and "Help". Below the menu bar is a toolbar with buttons: "Back", "Go to", "Refresh", "Scan", and "More>". The main area displays the "Commander SN80002014" and "Time Control" object. It contains a table with two columns: "Label" and "Value".

Label	Value
Time Control Label	Time Control
Security: Read Access	00
Security: Edit Timer	00
Security: Edit Calendar	00

At the bottom, it indicates "4 items" and has a scroll bar.


## Adding Users

Each security database has extra security to protect against any ‘back-door’ ObView access – called the Editor Password. You must enter this single password into the Editor Sign In object before any major changes can be made to the user information. Once signed in, you can change the Editor Password to something more memorable.

By default, the Editor Password is blank. We recommend you change this!

 To enable Editor Access, follow these steps:

- **Go to** the top level of Commander, and open **Security Server**
- Set **Editor Sign In** to the current Editor Password – the default setting for this is blank! You can check editing is allowed – the **Editor Access Allowed** object will show ‘Yes’

 To add a low-level user, follow these steps:

- Check the **Editor Access Allowed** object reads ‘Yes’, and open a free **User** entry – we will use **User 2**
- Set **Name** to ‘Basic User’, **Enable** to ‘Yes’, **UserID** to ‘BU’, and **Password** to a memorable phrase
- Set **Privilege Level in Area 3** to ‘7’ – this is the one area where this user has power

 To add a medium-level user, follow these steps:



- Check that the **Editor Access Allowed** object reads ‘Yes’, and navigate to a free **User** entry – we will use **User 3**
- Set **Name** to ‘Medium User’, **Enable** to ‘Yes’, **UserID** to ‘MU’, and **Password** to a memorable phrase
- Set **Privilege Level in Area 1** to ‘7’, and **Privilege Level in Area 2** to ‘7’
- Set **Privilege Level in Area 3** to ‘4’ – this is the one area where this user has only medium power

Summary of User and Privileges set  
up so far in the tutorial:

User	Area1	Area2	Area3	Area4	Area7	Area6	Area7	Area8
BU	0	0	7	0	0	0	0	0
MU	7	7	4	0	0	0	0	0

## Enabling Access Security on Web Pages

Now you have some users, you can enable Web Server access security, which will force the web server to request the UserID and password from the user (done within the user's browser).



-  To enable general security on Commander's web server, follow these steps:
  - Navigate to **Configuration, Web Server, Security**
  - Set **Require User Sign-in** to 'Yes'. This means a User's details are checked against the local Security Server when accessing values on the local Web Server.
  - Test by using your browser to view the Commander's web page – you should need to sign in now – use the username 'MU' with password set earlier.
  
-  To sign out of Commander and get your browser to forget the UserID it is remembering, follow these steps:
  - On the web page in the browser, select the user icon at the top right of the page, this will navigate to the Profile page and show the Change password and the Sign out options
  - Select **Sign Out**, which ends your session

You should now be able to sign in as either 'BU' (basic user) or 'MU' (medium level user).



## Access Security in Essential Data

You can control who can view Essential Data pages within their browser, and control who can adjust each adjustable object.

-  To set the viewing Access Security on an Essential Data page, follow these steps:
  - Open **Configuration, Essential Data**, and then the page – we will use **Zip Input 2**
  - Set **Access Security** to '31' – this means that our example users 'BU' and 'MU' can view the page
-  To set the adjusting Access Security on an Essential Data object, follow these steps:
  - Open the required object – we will use **Test Changes**, object **Limited** – an adjustable value we set up early
  - Set **Access Security** to '35' – this means that our example user 'BU', who has level 7 in area 3 can adjust the value, but user 'MU' who has level 4 in area 3 cannot adjust the value

Once Essential Data pages have Access Security set, the web server builds the left-hand menu for the current user – not showing pages that the user cannot access with his/her privileges.

Summary of Web Server access set-up so far in the tutorial:

Action	Access Level	User 'BU'	User 'MU'
View Calendar	11	No	Yes
Edit Calendar	14	No	Yes
View Page 1	31	Yes	Yes
Adjust Page 2 Object 1	35	Yes	No

# Alarms

Normally, when a user or task wishes to know the value of an object, say a digital input, they can read it. This method works well when the values are needed only occasionally.

There are times, however, when instead of a user monitoring a value, it is better that the object tells the user when it changes. North call these object-to-user messages ‘alarms’.

Within any North system, alarms have the same basic format, made up of six pieces of information:

- System Name – the system name assigned by the engineer
- Point Name – the unique point name within the System
- Condition – the condition or state that the Point is now at
- Priority – the importance of the alarm message – this is set by the engineer, or by the system
- Date – the date that the Point went to the Condition
- Time – the time that the Point went to the Condition

When alarms are sent between object and user, they are sent in text form, with the | separating the different parts.

The System Name relates to the system that sent the alarm. It could be a Commander Label if the Commander generated the alarm. It could be a system label of an interface running within Commander, say a fire alarm system.

The Point Name is normally generated by the system, although the engineer might be able to specify some point names.

The Condition informs the user of the new condition the Point is in. Each time the condition changes, an alarm is sent.

The Priority is a single digit, in the range 1 (the highest priority), to 9 (the lowest), and is sometimes specified by the engineer.

Although particular priorities have no official meanings, the table (shown right) shows how they are generally used.

Priority	Meaning	Default Colour
1	Life-critical – someone may get injured	Red
2	Property-critical – something may be destroyed	Orange
3	Important – needs some action	Yellow
4 to 9	Information only	Blue/Grey

The Date and Time refer to the instant the condition occurred (if the time was known – some objects do not know the actual time).

## Generation and Delivery

Alarms must travel from the object that generated them to the user. The easy part is the generation. The most complex part is the display part because each user wants the messages delivered in a different way, to different places.

Commander can help with the generation. If the external systems cannot send alarms, Essential Data has some features which can generate alarms itself.

Commander delivers all alarms, including those generated by Essential Data, in the same way.

By default, all alarms are sent to the Alarm Delivery task, which will deliver them onwards, perhaps based on priority and/or content, to several destinations.

One destination, which is set up by default, is the Alarm History. The engineer can set up other destinations in other places, including in other Commanders and ObSys software, emails messages, SMS, and printers.

## Alarm History

Commander has an Alarm History, to which the Alarm Delivery module sends alarms. The Alarm History is a rolling record of the last 100 or so alarms. This provides a simple way of testing alarms, as well as a record.



To view the alarm history using a web browser, follow these steps:


- Open the Commander's **web page** in your browser. The top page may show the last few alarms that have occurred recently
- Select **Alarms** from the menu on the left
- Select the order that the server sorts the alarms using the **Change Order** drop-down box
- Press **Clear List** to wipe all alarms from the history

Alarms that are put into the Alarm History are also sent to Commander Hub, if enabled within the Commander.


## Generating Alarms using Essential Data

Some external systems connected to Commander send alarms or events. Fire Alarm systems, originally designed to print alarms, have made alarm sending the main part of the link to North. Other systems based more on values and states, like Modbus, never send alarms.

Essential Data can generate alarms on behalf of any system that cannot send its own alarm messages. As seen before, Essential Data is set up to read the values of external systems; by setting up a value high and low limits, Essential Data can also monitor the value being read, and work out when the value is 'out-of-limits'.

 To set up an Essential Data object to generate alarms, follow these steps:

- Open **Configuration, Essential Data, Page 1, Object 2**
- Set **Label** to 'Closed', **Type** to 'NoYes', and **Current Value** to '0'
- Set **Value Low Limit** to '0', and **Value High Limit** to '0.5' – when the value is 0 it is ok, when it is 1 it goes out-of-limits
- Set **Remote Object** to 'S1.M0.DI2.S' – i.e. the state of the digital input
- Set **Remote Rate** to '5 seconds' – the state will be collected every 5 seconds
- Set **Remote Action** to 'Read' – the object will be read – and the Current Value should change to the correct state
- Switch the digital input and leave for 5 seconds. The Value Alarm State will change to reflect whether the Current Value is within limits – but no actual alarm is sent because the Alarm Priority is 0

 To set the Alarm Priority, and therefore enable sending of alarms, follow these steps:

- Set **Alarm Enable/Priority** to '3' – this is a non-critical alarm
- Switch the digital input, to change the Value Alarm State, and cause the alarm to be sent to the Alarm Delivery, which delivers the alarm to the Alarm History,
- On the web browser, view the Commander's Alarms page to see the alarm

## Generating Alarms from Zip Modules

Using a Zip system as an example external system, you can see how alarms from Zip work. The ZipMaster driver checks communications with the Zip modules and can generate alarms when a module stops replying to requests.

- 🖥️ To set up a Zip Module communications alarm, follow these steps:
  - **Go to** the top level of Commander, and open **Zip System, M7002A v10 (M0), Module Information**
  - Set **Alarm Priority** to '2' – module alarm messages, including communication alarms, are now enabled
  - Disconnect the RS232 cable from the Zip NC12B – the modules will flash to indicate 'loss of comms', and the alarm will be generated, and be delivered to the alarm history – you can see this on the Alarms web page.

## Routing and Filtering

By default, Commander delivers all alarms to one destination – the alarm history.

You can use Alarm Delivery to filter alarms based on the alarm priority or contents: Alarm Delivery will only pass alarms that meet your criteria; these are sent onwards to the destination.

- 🖥️ To send only alarms with priority 1 to 3 to the Alarm History, follow these steps:
  - **Go to** the top level of Commander, and open **Alarm Delivery, Destination 1**
  - Set **High Priority** to '1', and **Low Priority** to '3'
- 🖥️ To send only alarms that contain the word 'Zip' to the Alarm History, follow these steps:
  - Set **Comparison Method** to 'Contains', and **Comparison String 1** to 'Zip' – remember that the comparison string is case-sensitive

Label	Value
Label	All to History
Enable	Yes
Destination Object	AH.ALARM
Add Device Label	No
Fail State	No
High Priority	1
Low Priority	9
Comparison Method	Begins with
Comparison String 1	Zip
Comparison String 2	
Comparison String 3	
Any Group	No

12 items

## Other Alarm Destinations

Below are listed other possible alarm destinations – this document only describes them, as they require additional equipment or knowledge that you might not have to hand.

### Email

North's AlmEmail driver is standard within Commander. Once set up with the IP address of an SMTP server, alarms can be sent to one of several groups of people using either standard or HTML emails. If users have their corporate emails sent to mobile devices, then alarms will be passed to remote engineers.

### Printer

North's Printer driver supports alarm printing to a **serial printer** – this type of printer will print single lines, rather than the whole page printers, and therefore can provide not only a way of seeing alarms as they occur, but also a paper record of all alarms.

The Printer driver supports the ESC/P Epson colour printer codes.

### SMS

North's GsmSms driver connects to a SIM-enabled GSM modem. GSM users are added to the driver setup, and alarms can then be sent to any of the users, or to an 'on-call' user. The alarm then arrives at the users GSM phone as a text message.

The GsmSms driver also supports bi-directional communications using text messages, allowing a user to both request current information, as well as change certain objects.

### Other North devices



ObSys supports **Alarm Store**, where alarms are held waiting user silencing and acknowledgement. Both also support alarm translation, and re-prioritisation. North's **Alarm Manager** application can be used to view alarms from several Alarm Stores, and provide a very easy-to-use, powerful interface.

# Telnet

Sometimes it is necessary to talk to Commander without using web pages – Commander has a Telnet server that you can enable. It can provide simple text-based access to any object values within, or outside, Commander. By default, Telnet is disabled, but you can enable Telnet, and give it a ‘user name’, to act as a simple password.


When Commander’s DEFAULTIP [was previously PROGRAM] switch is set ON, Telnet is always enabled, with a user name of PROGRAM.

Commander supports several services within the Telnet session – Query/Response, and IP-Configuration.

-  To enable Telnet client on Windows Vista and later, follow these steps:
  - From Windows **Control Panel**, select **Programs** (or Programs and Features in Vista) then **Turn Windows features on or off**
  - Select the check box next to **Telnet Client** to enable it, then click **OK**
-  To enable Commander’s Telnet service, follow these steps:
  - Open **Configuration, Telnet Setup**
  - Set **User** to ‘TTEST’ – up to 7 letters only
  - Set **Telnet Enabled** to ‘Yes’

## IP Configuration

The Telnet client application runs within the Windows Command Prompt window. TELNET.EXE takes one parameter – the IP address of the Telnet server.

-  To connect to Commander’s IP Configuration telnet service, follow these steps:
  - Within Command Prompt window, type the command line:  
`telnet 192.168.2.150`
  - At the User: prompt, type ‘TTEST’, and press ENTER
  - At the Service: prompt, type ‘ipc’, and press ENTER – Commander responds with the current IP configuration

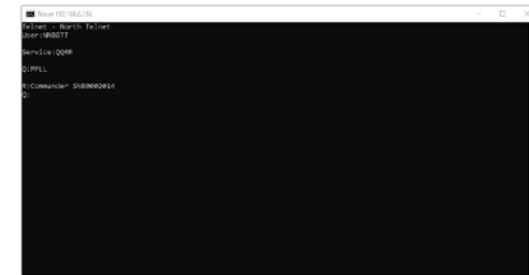
- At the Service prompt, press ENTER – this means you have no more service requirements – and Commander closes the telnet session

## Query/Response

Commander's Telnet server supports a simple query/response protocol. You can use this manually or it can be used from an external device.

 To view the use the Query/Response service, follow these steps:

- Within Command Prompt window, type the command line:  
`telnet 192.168.2.150`
- At the User: prompt, type 'TTEST', and press ENTER
- At the Service: prompt, type 'qr', and press ENTER – this enters the Query-Response service
- At the query prompt Q: type 'PL' and press ENTER – this asks for the value of the Commander object PL – the Commander responds 'R:<value>', and a new query prompt
- At the prompt, type 'O.PI.RC' and press Enter – this asks for Configuration-Platform Information – Reset Count. Commander sends the response with the current Reset Count
- At the prompt, type 'O.PI.RC=0' and press enter – this asks for the same value to be adjusted to 0
- At the prompt, type 'O.PI.RC' and press Enter – to see the new value
- At the prompt, press ENTER – this states that you have no more queries to make
- At the Service prompt, press ENTER – this states you have no more service requirements – and Commander closes the telnet session



```
cmd [C:\Users\user> telnet 192.168.2.150
telnet -> Start Telnet
User: TTEST
Service: qr
Q: PL
R: 5180002010
Q:
R:
Service:
User:
cmd [C:\Users\user>
```

Notice that you can both read and adjust values.





# Default Configuration

Commander's firmware and CDMs are held in permanent memory – flash memory. This is updated when CDMs are updated.

Commander's configuration is held in battery-backed memory - if the battery expires (or is removed) when the external power is removed, the configuration is lost.

To counter this loss, it is possible to save the current configuration to permanent memory. Once saved, whenever the configuration in battery-backed memory is lost, it is reloaded from the default configuration in permanent memory.

-  To save the current configuration as the default configuration, follow these steps:
  - Change the internal PROGRAM switch to ON
  - Re-power Commander – the MODE LED will flash, to show Commander is in Program mode
  - Using ObView, open **Configuration, Platform Information, Default Configuration**.
  - Set **Save Configuration As** to 'DF1' to cause the configuration to be written to permanent memory.  
Commander will light the FLASH LED and save the configuration (which takes 20-30 seconds), then restart.  
Once online, **Saved Configuration** shows the label 'DF1'
-  To reset the Default Configuration to factory settings (ie. blank settings), follow these steps:
  - Set the **Save Configuration As** to 'blank' (case sensitive) – this again takes 20-30 seconds, after which time the **Saved Configuration** shows an empty value (").

# Commander Hub


Introduced with Commander version dated 25/08/21, Commander Hub is part of North's cloud services.

When the link is enabled in Commander, all Essential Data values and Alarm History messages are sent to Commander Hub (assuming a connection to the Internet is available).

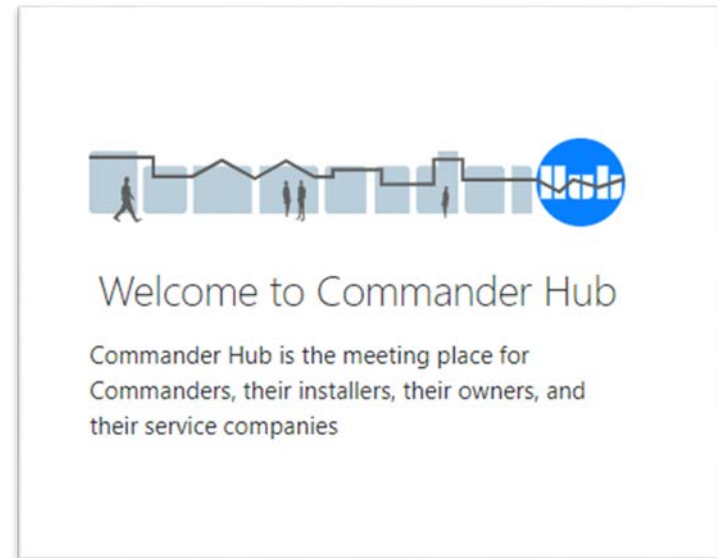
By enabling the link to Commander Hub, you agree to have read and understand the [Terms of Use](#) and [Privacy Policy](#) for Commander Hub.

 To enable a link from your Commander to Commander Hub, follow these steps:

- Using ObView, open **Configuration, Commander Hub**
- Set **Enable Link** to 'Yes'
- Wait for **Registration Code** to update, this may take up to 15 minutes after you have enabled the link
- You will need the **Serial Number** and **Registration Code** to add the device to My Hub.

 To add your Commander to My Hub, follow these steps:

- Visit [www.cmdrhub.com](http://www.cmdrhub.com)
- If you do not already have an account, you will need to register
- From the My Hub page, select **Options, Add device** and complete the serial number and registration code.



# Updating Commander

When supplied, the Commander hardware contains the main system firmware, along with several popular North drivers. North provide other less-used drivers in separate CDM files, but you need to install these drivers before you can use them. North also update the drivers and CDM files, and you may need to install these.

You can set Commander to update its firmware from North's cloud-services if it has Internet access (and therefore not in DEFAULTIP mode), or install from a PC using TFTP.

Before updating Commander's firmware, the Commander must be in PROGRAM mode. We also recommend taking a complete backup of the Commander's configuration before updating.


## Cloud Update

If Commander has Internet access, it can be instructed to check and update its firmware to the latest released version available from North's cloud-based servers.

Two different update options are available: the quickest is 'in use only', and this updates the system firmware and drivers currently in use; the 'factory' option updates all the factory-installed software.

To add a driver that has not been previously installed, add the driver name to an available Interface before updating the 'in use' firmware.

## Updating Commander's Firmware

-  To update Commander using North's cloud service, follow these steps:
  - Power Commander OFF, and change the internal switch PROGRAM to ON, and re-power Commander and it will start working in Program mode – the MODE LED will flash, to show Commander is in Program mode
  - Using ObView, open **Configuration, Platform Information, Software Cloud Update**
  - Set **Check & Update Software** to either 'In use only' or 'All factory installed' to have Commander update the firmware. DO NOT REMOVE THE POWER during this operation.
  - The **Progress** object shows how the update is progressing. The Commander may reset itself several times during this time, and you may have to press 'Refresh' to see the latest progress. Once finished, the Check & Update Software object returns to 'Off', and the Progress value shows how many files were updated.

## TFTP Update

If Commander cannot update itself, because it is in DEFAULTIP mode or has no Internet connection, Commander supports the Trivial File Transfer Protocol (TFTP).

### What is TFTP?

TFTP is one of the standard IP protocols. TFTP requires a client (your PC) and a server (Commander).



To enable TFTP client on Windows, follow these steps:

- From Windows **Control Panel**, select **Programs** then **Turn Windows features on or off**
- Select the check box next to **TFTP Client** to enable it, then click **OK**

The TFTP client is a Windows command line utility, with the following format:

```
TFTP -i <serverIPaddr> put "<filename>"
```

where <serverIPaddr> is the actual IP address of the Commander, and <filename> is the file name to transfer.


### Locating the CDM Files

North distributes drivers for Commander in CDM files – these files are made to work in certain areas of Commander's memory – called banks. You can only load one CDM file per bank, so you must choose which CDM to load in each bank.

ObSys setup installs CDM files within the CDMs folder of the ObSys Program Files folder – for example "C:\Program Files (x86)\North Building Technologies\ObSys\CDMs".

### Installing or Updating a CDM

Commander only opens its TFTP server port when Program mode is physically enabled using the PROGRAM switch – this means that normally Commander cannot be modified accidentally or maliciously.

-  To load a CDM to Commander using your TFTP client, follow these steps:
- Power Commander OFF, and change the internal switch PROGRAM to ON, and re-power Commander and it will start working in Program mode – it will enable its TFTP server – the MODE LED will flash, to show Commander is in Program mode
  - On your PC, run the Command window, cmd.exe
  - At the command prompt, type the following to change to the CDMs folder:  
`CD "\\Program Files (x86)\North Building Technologies\ObSys\CDMs"`
  - Type the TFTP command to send the file, for example:  
`TFTP -i 192.168.2.150 put "Bank7 ZitonzP v11 141215.cdm"`
  - Once Commander has received and checked the file, Commander will write the CDM to flash memory (showing its FLASHWRITE LED), and when complete, will restart, and the MODE LED will flash to show it is in Program mode again
  - Close your Command window, then power Commander OFF, and change the internal PROGRAM switch to OFF, and re-power Commander, and it will start working in RUN mode – it will disable its TFTP server

## Updating the Main Commander System Firmware

If you need to update the main Commander firmware itself, download three files: 'CmdrBase.bin' and 'CmdrExt.bin', and 'Bank 1 All-North.cdm'.

You load these files individually using TFTP in the same way as the CDM files.

## Pre-Installed CDMs

Below is a list of the factory installed CDMs installed in Commander. Some CDMs contain several drivers. This list is subject to change.

Bank	CDM
1	ZipMaster, Compass, plus system modules
2	Modbus
3	TrendIQ
4	BACnetIP
9	AlmEmail, GSMSMS, SNMPTrap, TextOut, Printer
10	Galaxy

Bank	CDM
12	APC, GeistPDU, PowerOne
17	ExtraData
18	DataSync, JSONData, JSONNotify, MQTT, SG
19	AlmSet, DeviceCheck, StateCheck, CsvRead, XmlRead
20	Advanced4000, ColtOPV, Morley, Notifier, Protec, ZitonZP
21	DALI, Helvar, iLight, LutronQS, Luxmate, PhilipsLM
22	Carel, Daikin, MitsubishiG50, PanasonicVRF, CCNDP2, MitsCity
23	EIB, KNXIP, LonSLTA, Mbus
24	DraytonWiser, EnOcean, HeatmiserNeo, LegrandMyHome
25	Meaco, Hue, Kentec, KentecTaktis

## Zero Interface Licence Drivers

Most drivers for interfacing to other external systems need an Interface Licence (IL) to before they will start. However, the following drivers require **zero** Interface Licences:

ZipMaster	Compass	Modbus	BACnetIP	GSMSMS
JSONData	SnmpTrap	SG	DeviceCheck	AlmSet

# Internal Switch Summary

## PROGRAM switch

When the internal PROGRAM switch is set ON, and Commander re-powered, the Commander enters Program mode, where the following happens:

- Commander enables the TFTP service, allowing you to download new/updated CDMs and base code
- Saving the Commander's current configuration as the Default Configuration becomes possible
- Commander can Software Cloud Update, if triggered
- Interface Licences can be added
- If the Web server is enabled and within five minutes after power-up, then changing network settings and Commander Hub link are enabled.

## DEFAULTIP Switch

When the internal DEFAULTIP switch is set ON, Commander automatically restarts and enters Default-IP mode, where the following happens:

- Commander operates with a static IP address of 192.168.192.167, and network mask of 255.255.255.0
- Within Commander's North IP Devices, the Local Encryption Key is disabled. This enables an engineer to access the Commander without knowledge of this security setting (as long as they have physical access to the Commander). When the DEFAULTIP switch is turned off, the Local Encryption Key is again required for access.
- Commander enables the Telnet service, with a user 'PROGRAM', allows access to both 'qr' service and 'ipc' service
- Commander enables the Web Server, no sign-in is required (regardless of security), allowing access to all web pages, and adjustment of any adjustable values
- Changing network settings and Commander Hub link on the Web server is enabled.

## Next Steps

In this tutorial you have learnt about North's controller, Commander. You have powered-on Commander and used ObSys software to configure it. Following the steps, you have also configured the range of integration and control features available.

Next, learn more about North's Zip input-output system by following the steps in the *Zip Tutorial*.

If you require help, contact support on 01273 694422 or visit [www.northbt.com/support](http://www.northbt.com/support)





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