

ABB Drives

**Installation and
Start-up Guide**

AF 100 Adapter Kit
NAFA-01



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**Installation and
Start-up Guide**

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Safety Instructions

Overview

This chapter states the safety instructions that must be followed when installing and operating the NAFA-01 AF 100 Connection Kit. The material in this chapter must be studied before attempting any work on, or with, the unit.

Warnings and Notes

This manual distinguishes two sorts of safety instructions. Warnings are used to inform of conditions which can, if proper steps are not taken, lead to a serious fault condition, physical injury and death. Notes are used when the reader is required to pay special attention or when there is additional information available on the subject. Notes are less crucial than Warnings, but should not be disregarded.

Warnings Readers are informed of situations that can result in serious physical injury and/or serious damage to equipment with the following symbols:



Dangerous Voltage Warning: warns of situations in which a high voltage can cause physical injury and/or damage equipment. The text next to this symbol describes ways to avoid the danger.



General Warning: warns of situations which can cause physical injury and/or damage equipment by means other than electrical. The text next to this symbol describes ways to avoid the danger.



Electrostatic Discharge Warning: warns of situations in which an electrostatic discharge can damage equipment. The text next to this symbol describes ways to avoid the danger.

Notes Readers are notified of the need for special attention or additional information available on the subject with the following symbols:

CAUTION!

Caution aims to draw special attention to a particular issue.

Note:

Note gives additional information or points out more information available on the subject.

**General Safety
Instructions**



WARNING! All electrical installation and maintenance work on the drive should be carried out by qualified electricians.

The drive and adjoining equipment must be properly earthed.

Do not attempt any work on a powered drive. After switching off the mains, always allow the intermediate circuit capacitors 5 minutes to discharge before working on the frequency converter, the motor or the motor cable. It is good practice to check (with a voltage indicating instrument) that the drive is in fact discharged before beginning work.

The motor cable terminals of the drive are at a dangerously high voltage when mains power is applied, regardless of motor operation.

There can be dangerous voltages inside the drive from external control circuits even when the drive mains power is shut off. Exercise appropriate care when working with the unit. Neglecting these instructions can cause physical injury and death.



WARNING! There are several automatic reset functions in the drive. If selected, they reset the unit and resume operation after a fault. These functions should not be selected if other equipment is not compatible with this kind of operation, or dangerous situations can be caused by such action.

More Warnings and Notes are printed at appropriate instances along the text.

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NAFA-01 AF 100 Adapter Kit Installation and Start-up Guide

Related Publications

- *Advant[®] Fieldbus 100 User's Guide* (English: 3BSE 000 506)*
- *S800 I/O User's Guide* (English: 3BSE 008 878)*
- The drive documentation.

*Issued by and available from ABB Automation Products, Västerås, Sweden.

Terms and Definitions

<i>AdvaBuild (for Windows)</i>	A package of programming tools.
<i>Advant Fieldbus 100 (AF 100)</i>	A twisted pair fieldbus that provides communication between Advant Controllers, I/O stations and higher-level computer systems. Further information is obtainable from the Advant Fieldbus 100 User's Guide (English, 3BSE 000 506; available from ABB Automation Products, Västerås, Sweden).
<i>DDCS</i>	Distributed Drives Communication System; a communication protocol used in fibre optic links in ABB drives.
<i>FCI</i>	A name used in this manual for the CI810 AF 100 Fieldbus Communications Interface.
<i>(S800) I/O Cluster</i>	An extension of the ModuleBus optical link. Consists of a ModuleBus modem (type TB820) with S800 I/O devices.
<i>(S800) I/O Device</i>	A complete I/O device consists of one MTU and one I/O module.
<i>(S800) I/O Module</i>	The active, electronic, and signal conditioning part of an I/O device.
<i>(S800) I/O Station</i>	An I/O station consists of an FCI, 1 to 7 I/O clusters with up to 24 I/O devices.
<i>ModuleBus</i>	An incremental, electrical or optical bus for interconnection of I/O devices.
<i>(S800) MTU</i>	Module Termination Unit; a passive unit onto which an I/O module is mounted. The MTU contains the process I/O terminals and part of Electrical ModuleBus.
<i>S800 I/O</i>	Range of distributed modular I/O units that communicate with Advant Controllers over an AF100 bus.

NAFA-01 AF 100 Adapter Kit

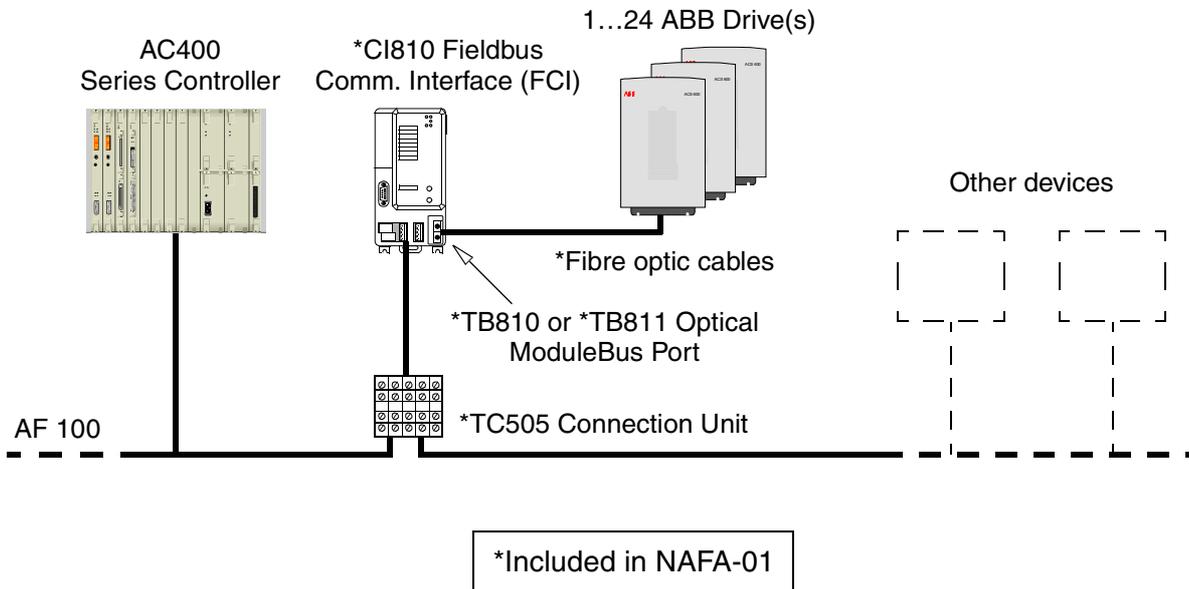
The NAFA-01 AF 100 Adapter Kit contains the components required for connecting ABB drives to a twisted-pair AF 100 bus. The kit consists of the following components:

- CI810 AF 100 Fieldbus Communications Interface (FCI)
- TB810 and TB811 ModuleBus Optical Ports
- TC505 Connection Unit
- 2 pcs 2-metre plastic (POF) fibre optic cables
- this manual.

With the NAFA-01, it is possible to

- Connect up to 24 ABB drives to an AF 100 twisted-pair bus
- Give control commands (such as Start, Stop, Run enable) to the drive(s)
- Feed a motor speed or torque reference to the drive(s)
- Give a process actual value or a process reference to the PID controller of the drive(s)
- Read status information and actual values from the drive(s)
- Reset a drive fault
- Connect S800 I/O modules to an AF 100 bus. For detailed information on the installation and use of S800 modules, see the *S800 I/O User's Guide*.

The following figure presents the connection of ABB drives to an AF 100 bus using the components included in the NAFA-01 kit.



CI810 (FCI) The CI810 AF 100 Fieldbus Communication Interface (hereafter referred to as the FCI) is the main component of the NAFA-01. When connected to the AF 100 bus, the FCI forms an S800 I/O station. For connection of S800 I/O modules or ABB drives, the FCI provides ModuleBus, which is divided into electrical and optical busses. Electrical ModuleBus can be used for connecting up to 12 S800 I/O modules. The Optical ModuleBus link can contain 24 I/O devices (drives or S800 I/O modules) in up to 7 I/O clusters, but **the maximum number of I/O devices on both ModuleBusses combined is 24.**

Note: Drives that are specified in the Advant Controller program using the DRIENG database element – i.e. engineered drives – count as two devices. (Drives using the DRISTD element – i.e. standard drives – are each considered one device.) Thus this rule is applicable:

$$2 \times (\text{NO. OF ENGIN'D DRIVES}) + (\text{NO. OF STD DRIVES}) + (\text{NO. OF S800 I/O DEVICES}) \leq 24$$

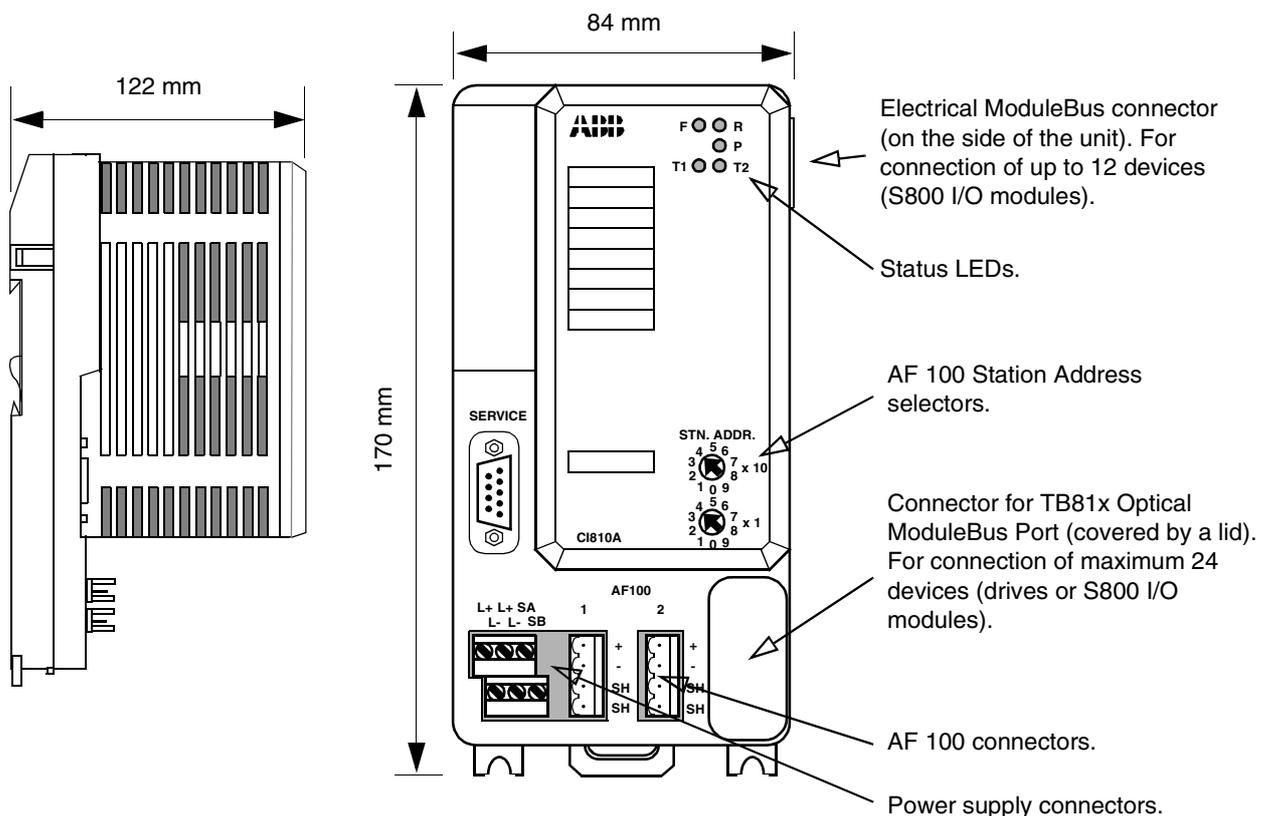


Figure 1 The CI810 (FCI).

Status LEDs

LED	Colour	Description
F (Fault)	Red	Module fault. This LED will also light at module start-up and is turned off after a successful self-test.
R (Run)	Green	Operational state.
P (Power OK)	Green	Internal power OK.
T1 (Traffic 1)	Yellow	Data traffic on AF 100 cable 1.
T2 (Traffic 2)	Yellow	Data traffic on AF 100 cable 2.

TB810/TB811 Optical ModuleBus Port

The FCI requires a TB81x optical port to provide a fibre optic connection. The maximum communication speeds of the TB810 and TB811 are 10 Mbit/s and 5 Mbit/s respectively.

Note: The communication speed on the fibre optic link is always 4 Mbit/s regardless of which optical port type is used.

As all optical components on a fibre optic link must be of the same type for the light intensity and receiver sensitivity levels to match, choose the appropriate TB81x Optical ModuleBus Port to be used according to the optical component type used in the drive to be connected.

Plastic (POF) cables – such as those included in the NAFA-01 kit – can be used with both 5 Mbit/s and 10 Mbit/s optical components. Hard Clad Silica (HCS) cables can be used with 10 Mbit/s components only.

The recommended cable lengths are as follows:

Cable Type	Optical Port Type	
	TB811	TB810
POF	2...10 m	2...30 m
HCS	–	2...200 m

Status LEDs

The TB81x has two LEDs, labelled *Tx* and *Rx*, that indicate data being transmitted and received respectively.

TC505 Connection Unit When connecting the FCI to the AF 100 bus, the incoming and outgoing cables can either be connected directly to the AF 100 terminals of the module, or a TC505 Connection Unit can be used.

The TC505 is typically used when the I/O station is installed in a cabinet. The TC505 has no internal capacitive decoupling between the shield and earth, and is intended for use within a cabinet which itself has a separate capacitive coupling.

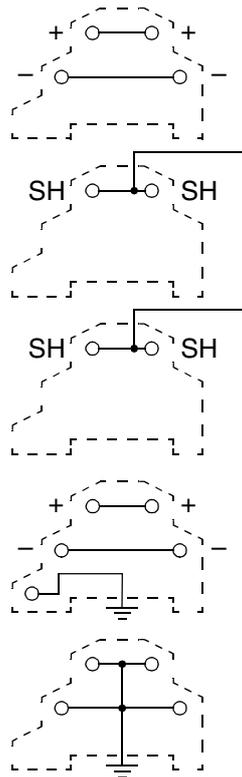


Figure 2 TC505 internal connections.

- Compatibility** The NAFA-01 can be used in conjunction with the following ABB drives:
- ACS 400
 - ACS 600 with Standard, System, Motion Control, Pump and Fan Control, or Crane Application Program
 - DCS 400
 - DCS 500
 - DCS 600.

Warranty and Liability Information See the drive documentation for warranty information.

Installation and Configuration



WARNING! Before installation, switch off the drive power supply. Wait five minutes to ensure that the capacitor bank of the drive is discharged. Switch off all dangerous voltages connected from external control circuits to the inputs and outputs of the drive.

Follow the installation instructions given in the *S800 I/O User's Guide*.

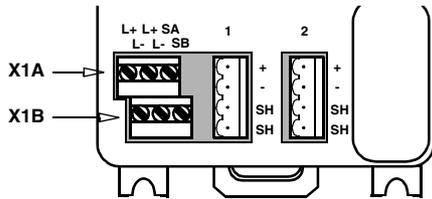
The FCI and the TC505 can be installed on a horizontal or vertical DIN mounting rail.

The earth of the FCI module is connected to the mounting rail by means of an earthing tab. The mounting rail onto which the option module is to be mounted must be earthed to a noiseless earth. If the rail is not mounted on a properly earthed base, a separate earthing conductor must be used. The conductor must be made of minimum 6 mm² stranded wire and kept as short as possible.

The FCI is cooled by natural convection. Ensure that the ventilation slots on the module are not blocked. Avoid placing the module directly above heat-generating components.

Power Supply Connection

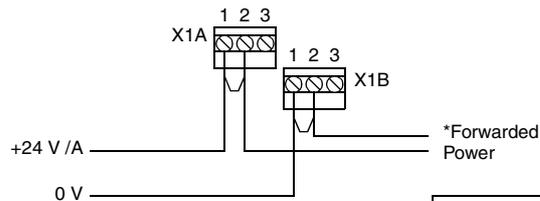
The power supply terminal headers accept wire sizes from 0.2 to 2.5 mm² (24 to 14 AWG). The terminal designations are as follows:



X1A	Designation	Description
1	L+	+24 V (in)
2	L+	+24 V (out)
3	SA	Redundant power supply monitor input

X1B	Designation	Description
1	L-	0 V (in)
2	L-	0 V (out)
3	SA	Redundant power supply monitor input

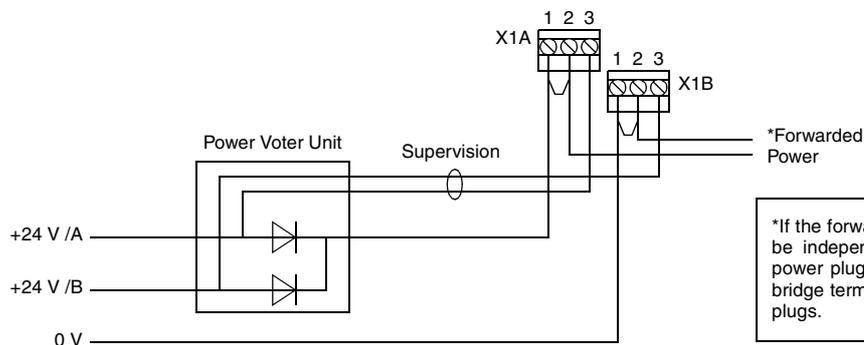
Non-redundant Connection



*If the forwarded power needs to be independent of whether the power plugs are inserted or not, bridge terminals 1 and 2 on both plugs.

Redundant Connection

With this connection, the FCI can be used for monitoring both power supplies.



*If the forwarded power needs to be independent of whether the power plugs are inserted or not, bridge terminals 1 and 2 on both plugs.

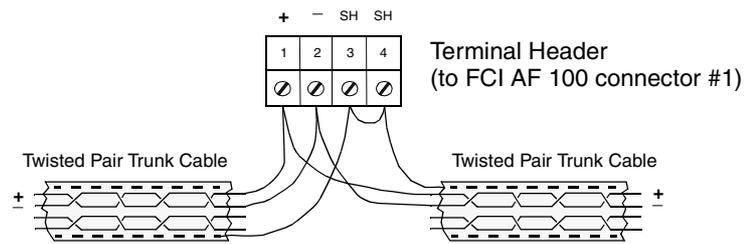
AF 100 Bus Connection

The AF 100 bus cables can be connected to the CI810 either directly or through the TC505 Connection Unit. Diagrams are presented below for both cases.

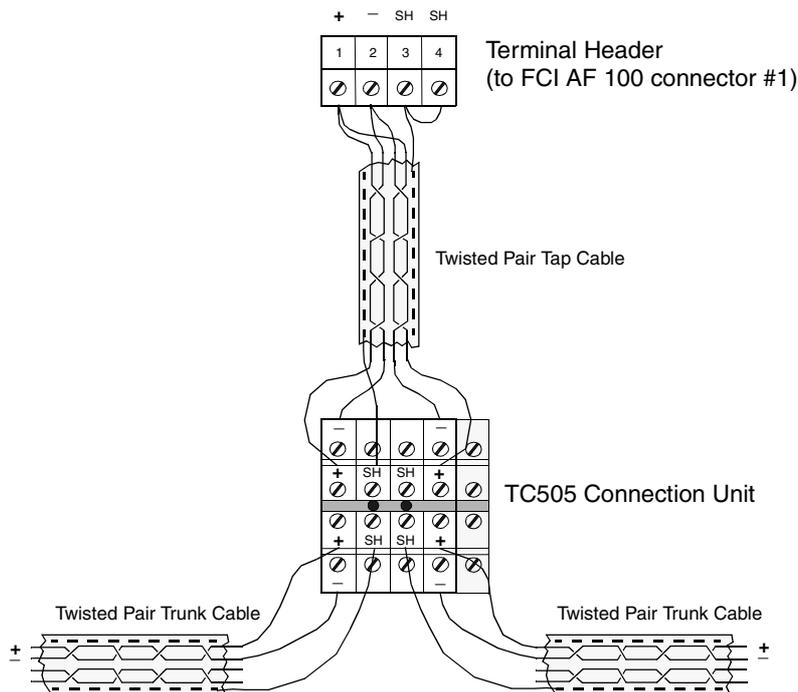
The diagrams illustrate non-redundant cabling for single bus cable only. For instructions on redundant connection of two bus cables, refer to the *Advant Fieldbus 100 User's Guide*.

Arrange the bus cables as far away from power cables as possible. Avoid parallel runs. Use bushings at cable entries.

Direct bus connection (without the TC505 Connection Unit)



Wiring using the TC505 Connection Unit



FCI Address Setting

The address selectors on the FCI are used to define an individual address for the module on the AF 100 bus segment. The setting must be in the range of 1 to 79.

Drive Connection The FCI is connected to the drive (or branching unit) with a pair of fibre optic cables. For fibre optic connection, the FCI requires a TB81x Optical ModuleBus Port fitted.

- Use the flat of a screwdriver to remove the protective lid at the lower right-hand part of the FCI base.
- Insert the TB81x into the bay until the retaining clips click into place.

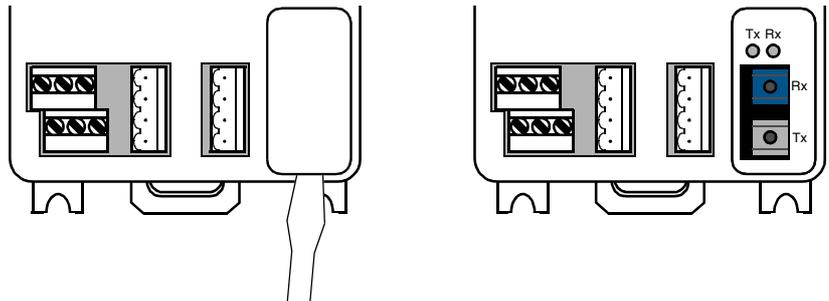


Figure 3 (Left) Removing the protective lid of the TB81x bay. (Right) TB81x Optical ModuleBus Port inserted.

- Route the fibre optic cables from the TB81x Optical ModuleBus Port to the drive. Consult the drive documentation as to the corresponding terminals inside the drive. Observe the connector colour coding: blue connectors should go to blue receivers, grey (or black) connectors to grey transmitters.

Multiple (up to 24) drives can be connected in a ring. A star topology can be achieved using DDCS Branching Units; consult your local ABB representative for information.

Handle fibre optic cables with care. When unplugging optic cables, always grab the connector, not the cable itself. Do not touch the ends of the fibres with bare hands as the fibre is extremely sensitive to dirt. The maximum long term tensile load for the fibre optic cables is 1 N. The minimum short term bend radius is 25 mm. Use grommets at cable entries.

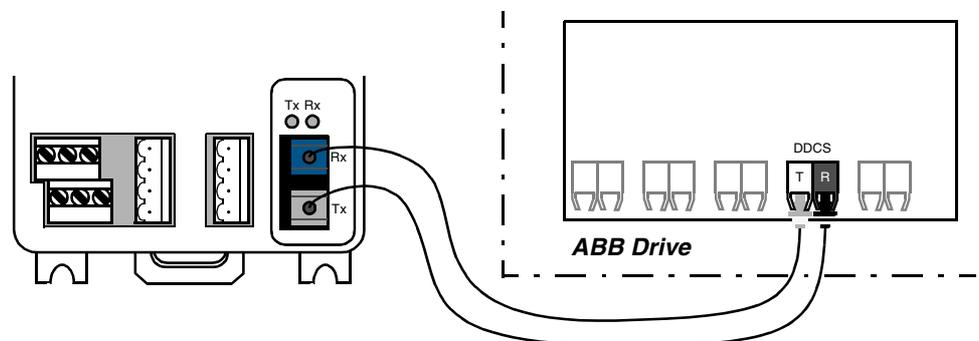


Figure 4 Fibre optic link connecting the FCI to the drive.

Drive Configuration After the components of the NAFA-01 kit have been installed according to the above instructions, the drive must be prepared for communication with the FCI and the Advant Controller.

Activation of Communication The detailed procedure of activating the communication between the drive and the NAFA-01 is dependent on the drive type. Normally, a parameter must be adjusted to activate the communication; see the drive documentation.

Communication Speed Set the communication speed on the drive to 4 Mbit/s.

Note: The communication speed on the fibre optic link is always 4 Mbit/s regardless of which type of optical port is used.

DDCS Node Address All devices on the Optical ModuleBus must have a distinctive address (device number). Allowable addresses are shown in the table below.

If there are S800 I/O clusters on the link, they reserve all 12 addresses allocated for that cluster, regardless of how many I/O devices the cluster contains. A drive can use any address from the remaining free cluster address ranges. See Figure 5.

Cluster	Address Range
1	101 to 112
2	201 to 212
3	301 to 312
4	401 to 412
5	501 to 512
6	601 to 612
7	701 to 712

The drive has a parameter for setting the node address. See the drive manuals for more information.

Note: For ABB drives, the actual setting for the node address parameter is calculated by multiplying the hundreds by 16, then adding the tens and ones to the result. For example, address 201 is set at the drive node address parameter as $2 \times 16 + 1 = 33$.

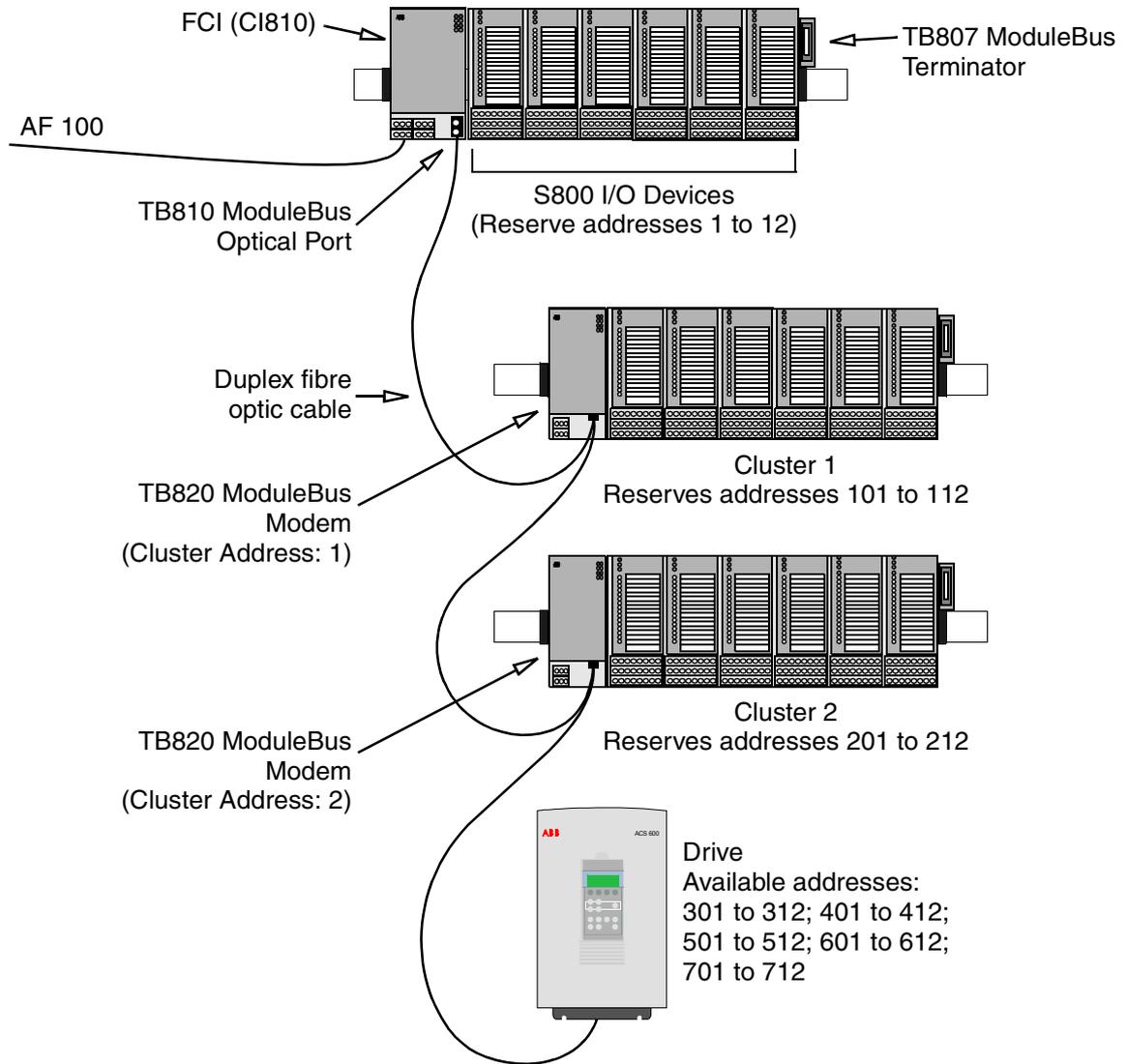


Figure 5 An example of device addressing on an Optical ModuleBus link.

Advant Controller Configuration

Please refer to the *S800 I/O User's Guide* and the documentation of the Advant Controller for information on configuring the Advant system for communication with the NAFA-01.



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