symphony™

Instruction
Harmony Series

Hydraulic Servo Termination Unit
NTHS03

ABB

Preface

The NTHS03 Hydraulic Servo Termination Unit is a Harmony rack I/O device that is part of the Symphony Enterprise Management and Control System. It provides a signal path between an IMHSS03 Hydraulic Servo module and hydraulic servo valve, I/H converter, or linear variable differential transformer.

This instruction explains the NTHS03 termination unit specifications and operation. It details the procedures necessary to complete setup, installation, maintenance, repair, and replacement of the termination unit.

NOTE: The NTHS03 termination unit is fully compatible with existing INFI 90® OPEN Strategic Enterprise Management Systems.

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Electrical Shock Hazard During Maintenance
Disconnect power or take precautions to insure that contact with energized parts is avoided when servicing.

SPECIFIC WARNINGS

Verify the main power, field power, and power entry panel circuit breakers/switches are turned off before starting installation, retrofit, upgrade, or wiring procedures. Failure to do so could result in severe or fatal shock. Do not turn the power on until the installation, retrofit, upgrade, or wiring procedures are complete. (p. 2-6)

Never clean electrical parts or components with live power present. Doing so exposes you to an electrical shock hazard. (p. 3-3)

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Safety Summary (continued)

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Support Services

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Introduction

Section 1

Overview

The NTHS03 Hydraulic Servo Termination Unit is a Harmony rack I/O device that is part of the Symphony Enterprise Management and Control System. It provides a signal path between an IMHSS03 Hydraulic Servo Module and a hydraulic servo valve, I/H converter, or linear variable differential transformer. The IMHSS03 module is a position control module through which a rack controller can control a hydraulic actuator via a servo valve. By regulating the current to the servo valve, it initiates a change in actuator position. A linear variable differential transformer (LVDT) provides actuator feedback to the IMHSS03 module via the NTHS03 termination unit. Typical uses for this hardware are positioning steam turbine throttle and control valves, gas turbine fuel valves, inlet guide vanes, and nozzle angle.

Figure 1-1 shows the Harmony rack I/O architecture. A Harmony area controller and the Harmony rack controllers can use the rack I/O module and termination units for I/O interface.

Intended User

Personnel installing, operating, or maintaining the NTHS03 termination unit should read this instruction before performing any installation, operation, or maintenance procedures. Installation requires an engineer or technician with experience handling electronic circuitry. Those working with the NTHS03 termination unit should have experience working with and know the precautions to take around AC/DC power. A knowledge of the Symphony system, electronic principles, analog control tuning experience, turbine startup, plant operating procedures, hydraulic actuators, servo valves, and I/H converters is also required.

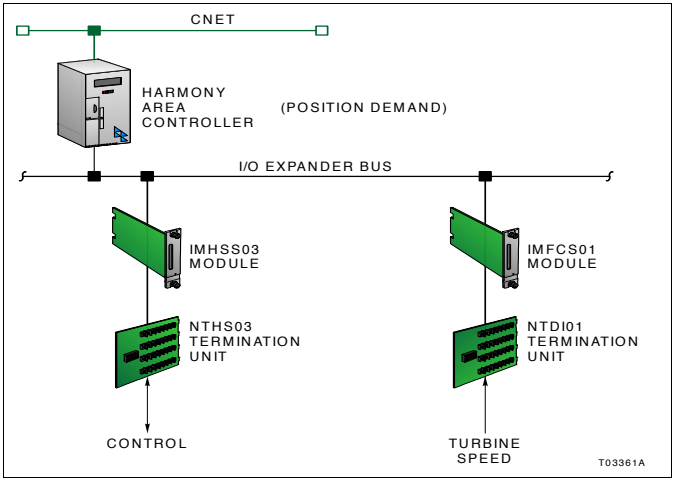


Figure 1-1. Harmony Rack I/O Architecture

Description

The NTHS03 termination unit is a seven-by-seven inch square printed circuit board. The board contains:

- Four dipshunt sockets.
- Three terminal strips.
- One fuse holder.
- Two cable sockets.
- 24 VDC Faston connector.
- DC common Faston connector.
- One fuse (24 VDC power).
- Four jumpers.

Mounting Hardware

Harmony termination units mount in standard ABB Automation enclosures (CAB-01, CAB-04, CAB-12). An NFTP01 Field Termination Panel is used for termination unit mounting (Fig. 1-2). The panel attaches to the side rails in standard 438-millimeter (19-inch) enclosures.

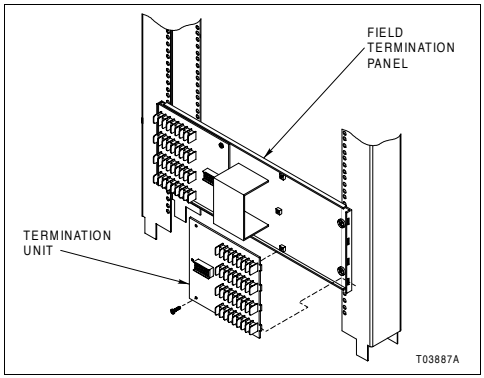


Figure 1-2. Mounting Hardware

Instruction Content

This instruction contains the following sections:

Introduction — Provides an overview of the NTHS03 termination unit.

Installation — Explains the physical installation, wiring and cable requirements, dipshunt settings and handling of the termination unit.

Maintenance — Contains a maintenance schedule.

Repair and Replacement — Explains how to replace the fuses and termination unit.

How to Use this Instruction

Read this instruction in sequence. It is important to become familiar with the entire contents of this instruction before using the module. Refer to a specific section for information as needed.

1. Perform the steps in the installation section.

2. Refer to the maintenance section for scheduled maintenance requirements.

3. Refer to the repair and replacement procedures to replace a termination unit.

Document Conventions

The ? in the nomenclature or in a part number indicates a variable for that position (e.g., IMMFP1?).

Reference Documents

Table 1-1 lists ABB Automation instructions for equipment that is referenced in this instruction.

Table 1-1. Reference Documents

Number	Document
WBPEEUI200502??	Module Mounting Unit (IEMMU11, IEMMU12, IEMMU21, IEMMU22)
WBPEEUI200505??	Site Planning Guidelines
WBPEEUI240771??	IMHSS03 Hydraulic Servo Module

Related Nomenclature

Table 1-2 lists nomenclature related to the NTHS03 termination unit.

Table 1-2. Related Nomenclature

Nomenclature	Description
IEMMU11, EMMU12, IEMMU21, IEMMU22	Module mounting unit
IMHSS03	Hydraulic servo module
NFTP01	Field termination panel
NKHS03	Termination cable (PVC)
NKHS13	Termination cable (non-PVC)

Specifications

Refer to Table 1-3 for NTHS03 termination unit specifications.

Table 1-3. NTHS03 Termination Unit Specifications

Property	Characteristic/Value
Inputs	
LVDT secondary 2-position	4 analog total, 2 LVDT secondary (each with 2 secondaries) 24 V_{PP}, ±7 VDC common mode, 10 kΩ differential input impedance
Digital	3 optically isolated (250 VDC) contact inputs (raise, lower, and trip bias) State / Voltage (VDC) / Current On / 18 minimum / 2.8 mA nominal forward[1] Off / 11 maximum (run-off voltage) / 10 μA maximum leakage **NOTE:** 1. When V_{IN} = 24 VDC nominal.
Outputs	
LVDT supply primary excitation	2 analog: LVDT primary 1 and 2 Operating frequency: 400 Hz to 15 kHz LVDT Excitation Voltage (V_{PP}) / Minimum LVDT Impedance (Ω) 2.1 / 15.0 2.6 / 18.0 3.6 / 24.0 4.5 / 30.0 5.4 / 36.0 6.0 / 40.0 7.7 / 51.3 9.0 / 60.0 13.5 / 90.0 18.0 / 120.0
Servo valve coil	4 analog: 2 redundant (selectable) with servo output protection. Shorting or opening 1 output does not affect the other output. Output Current (mA) / Maximum Coil Impedance (Ω) ± 8 / 750 ± 16 / 375 ± 24 / 250 ± 32 / 187 ± 40 / 150 ± 48 / 125 ± 56 / 107 ± 64 / 93

Table 1-3. NTHS03 Termination Unit Specifications *(continued)*

Property	Characteristic/Value
Outputs *(continued)* I/H converter	1 analog Output Current (mA) — Maximum Impedance (Ω) 4 - 20 — 300 20 - 160 — 15
Position panel meter	1 analog (scaled feedback output) Output Current (mA) — Maximum Impedance (Ω) 4 - 20 — 300
Unscaled position feedback	1 analog Output Current (mA) — Maximum Impedance (Ω) 2 — 5000
Test mode	1 analog Output Current (mA) — Maximum Impedance (Ω) 1 — 5000
Digital	1 independent, optically isolated (250 VDC), open collector output (hard manual) State — Voltage (VDC) — Current On — 2.4 — 250 mA Off — 24 — 10 μA
Cable insulation PVC (UL rating PLTC) Non-PVC (UL rating PLTC)	 80°C (176°F) at 300 V 90°C (194°F) at 300 V
Mounting	Mounts on the field termination panel.
Surge Protection	Meets IEEE-472-1974 Surge Withstand Capability Test
Environmental Ambient temperature Relative humidity Altitude Air quality	 0° to 70°C (32° to 158°F) 5% to 95% up to 55°C (131°F) (noncondensing) 5% to 45% at 70°C (158°F) (noncondensing) Pollution degree: I Sea level to 3 km (1.86 mi) Noncorrosive
Cooling requirements	No cooling is required when used in ABB Automation cabinets and operated within environmental limits.

Table 1-3. NTHS03 Termination Unit Specifications *(continued)*

Property	Characteristic/Value
Certifications	
Canadian Standards Association (CSA)	Certified for use as process control equipment in an ordinary (nonhazardous) location.
Factory Mutual (FM)	Approved as nonincendive equipment for use in Class I; Division 2; Groups A,B,C,D; hazardous locations.

SPECIFICATIONS ARE SUBJECT TO CHANGE WITHOUT NOTICE

Installation

Section 2

Introduction

This section explains NTHS03 termination unit installation. Do ***not*** proceed with operation until the steps are read, understood, and performed in the order in which they appear.

Special Handling

Observe these steps when handling electronic circuitry:

1. ***Use Static Shielding Bag.*** Keep an assembly in its static shielding bag until ready to install it in the system. Save the bag for future use.

2. ***Ground Bags before Opening.*** Before opening a bag containing an assembly with static sensitive devices, touch it to the equipment housing or ground to equalize charges.

3. ***Avoid Touching Circuitry.*** Handle assemblies by the edges; avoid touching the circuitry.

4. ***Avoid Partial Connection of Semiconductors.*** Verify that all devices connected to the module are properly grounded before using them.

5. ***Ground Test Equipment.***

6. ***Use an Antistatic Field Service Vacuum.*** Remove dust from assemblies if necessary.

7. ***Use a Grounded Wrist Strap.*** Use the ABB Automation field static kit (part number 1948385A1 - consisting of two wrist straps, ground cord assembly, alligator clip, and static dissipative work surface) when working with modules. The kit grounds a technician and the static dissipative work surface to the same ground point to prevent damage to the circuitry by electrostatic discharge. Connect the wrist strap to the appropriate grounding plug on the power supply or to an unpainted portion of the enclosure with the alligator clip. The wrist strap must be effectively connected to the earth grounding electrode system through the AC safety ground.

8. ***Do Not Use Lead Pencils to Set Switches.*** To avoid contamination of switch contacts that can result in unnecessary circuit board malfunction, do not use a lead pencil to set a switch.

Unpacking and Inspection

1. Examine the hardware immediately to verify it has not been damaged in transit.

2. Notify the nearest ABB sales office of any such damage.

3. File a claim for any damage with the transportation company that handled the shipment.

4. Use the original packing material and container to store the hardware.

5. Store the hardware in an environment of good air quality, free from temperature and moisture extremes.

Setup/Physical Installation

Set the dipshunts and install the jumpers and fuse ***before*** installing or operating the NTHS03 termination unit. Figure 2-1 shows the layout of the termination unit.

Dipshunt Configuration

There are four dipshunts on the termination unit. Figure 2-1 shows the locations of the dipshunts. Dipshunts XU01 through XU04 are set according to how the I/O signals are powered. Table 2-1 lists the dipshunt settings. Configure a dipshunt by either cutting straps or leaving straps uncut in certain sequences. Cut the dipshunt straps using a standard shunt cutting tool. Always cut straps completely. Install the configured dipshunt into the desired socket on the termination unit. To install a dipshunt, align the end of the dipshunt identified with the silver dot to the end of the socket having an identification mark and push the dipshunt into the socket. Be careful not to bend any pins during insertion.

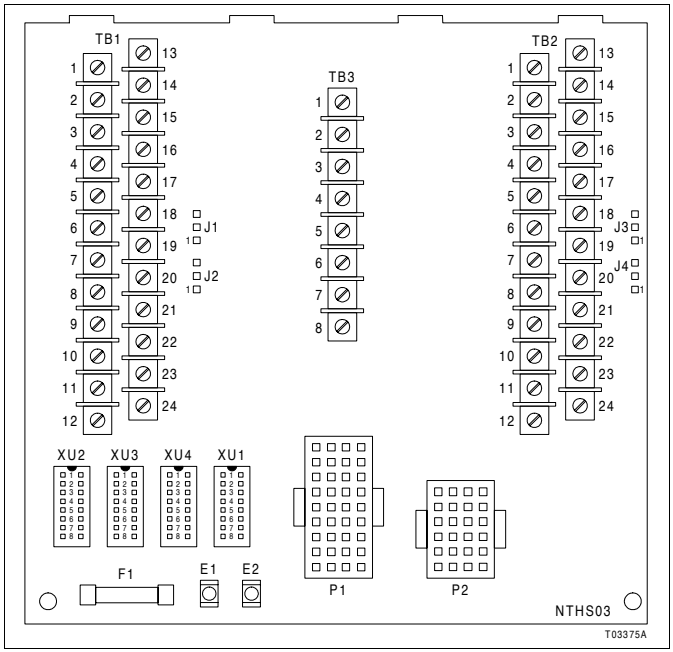
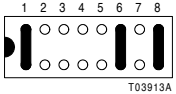
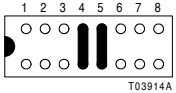


Figure 2-1. Termination Unit Layout

Table 2-1. Dipshunt Settings

Dipshunt	I/O Signal	System Power Setting	External Power Setting
XU1	Hard manual		
XU2	Lower contact		
XU3	Raise contact		
XU4	Trip bias		

Jumper Configuration

There are four jumpers on the termination unit. Jumpers J1 through J4 select system or external power for the linear variable differential transformer (LVDT). Table 2-2 lists the jumper setting.

Table 2-2. Jumper Settings

Jumper	Power Source	Setting
J1 - J4	System (IMHSS03 module)	1 - 2
J1 - J4	External	2 - 3

Fuse Installation

ABB Automation ships a 3 ampere (slo blo)/250 volt fuse (ABB Automation P/N 1948182?33001) with every NTHS03 termination unit. Verify the fuse is correctly installed in fuse holder F1.

Termination Unit Installation

The termination unit is ready for installation when the dip-shunts are properly configured and installed, the jumpers are properly installed, and the fuse is in place. The termination unit mounts on a standard NFTP01 panel as shown in Figure 1-2.

Mounting

To mount the NTHS03 termination unit to the field termination panel:

1. Remove the safety shield.

2. Insert the tabs of the circuit board into the proper slots of the termination panel standoff as shown in Figure 2-2 and slide the circuit board into position.

3. Secure the termination unit circuit board to the field termination panel with two No. 10 thread-forming screws (Fig. 2-2).

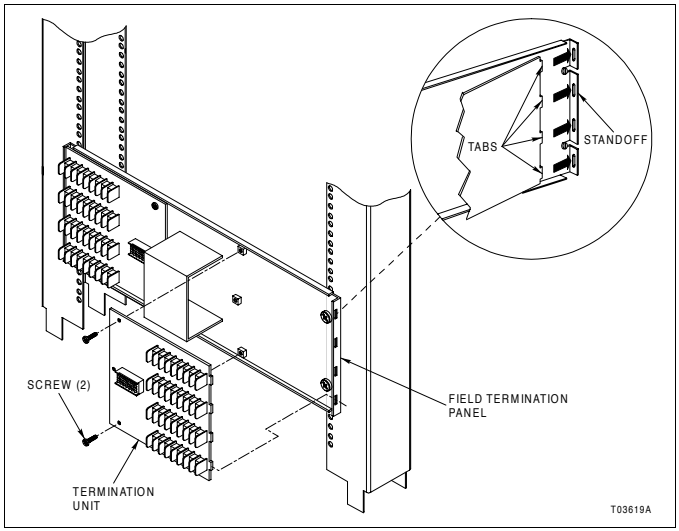


Figure 2-2. Termination Unit Installation

Cable Connection

After mounting the termination unit to the field termination panel, install the termination cable. Table 2-3 lists the cables, their applications, connector assignments and maximum length restrictions. Figure 2-3 shows a diagram of cable connections to the I/O module and termination unit.

Table 2-3. Cable Applications

Nomenclature/Description	Application	NTDO02 Connector	Max. Length m (ft)
NKHS03 (PVC) NKHS13 (non-PVC) termination cable	NTHS03 to IMHSS03 module	P1 and P2	Variable

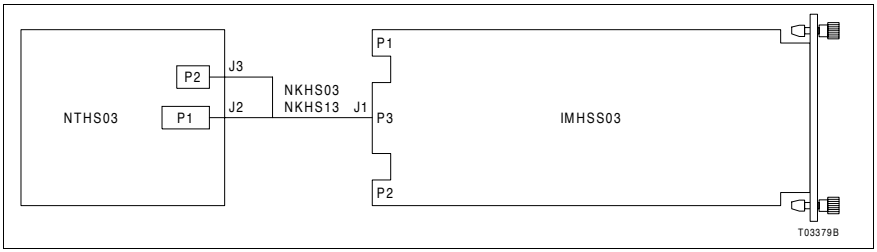


Figure 2-3. Cable Connections

To install the termination unit cable:

CAUTION	**Remove a module from its assigned slot before installing or removing a cable assigned to that slot. Failure to do so could result in damage to the module.**

1. Install the J1 connector of the NKHS03 or NKHS13 termination unit cable in the module mounting unit backplane slot assigned to the IMDSS03 module.

2. Insert the J2 connector of the cable into P1 of the termination unit.

3. Insert the J3 connector of the cable into P2 of the termination unit.

Power Wiring

There are two terminals that provide power and ground connections. Refer to Figure 2-1 for terminal locations. Terminal E1 is the 24 VDC power connection. Terminal E2 is the I/O common connection. To connect the power wiring:

WARNING	**Verify the main power, field power, and power entry panel circuit breakers/switches are turned off before starting installation, retrofit, upgrade, or wiring procedures. Failure to do so could result in severe or fatal shock. Do not turn the power on until the installation, retrofit, upgrade, or wiring procedures are complete.**

1. Attach a 14 AWG wire from the 24 VDC power distribution source to the E1 terminal on the termination unit.

2. Attach a 14 AWG wire from the I/O common to the E2 terminal of the termination unit.

Terminal Block Wiring

Refer to Figure 2-4 for terminal block assignments and terminal polarity. Field wiring requirements will depend on the application. Refer to the ***Site Planning Guidelines*** instruction for specific information on field wiring installation requirements (i.e., spacing, isolation, etc.). Connect the wiring from the terminals to the output devices.

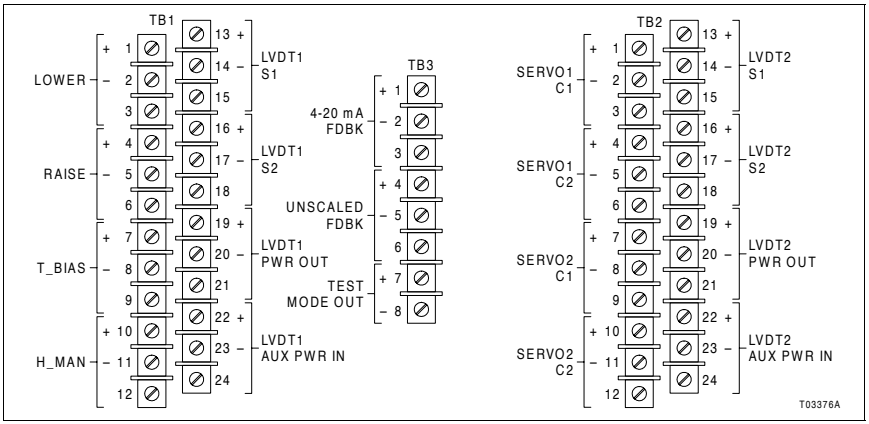


Figure 2-4. Terminal Assignments

Installation Complete

The termination unit is ready for operation when:

1. The fuse is installed.

2. The jumpers are installed.

3. The dipshunts are installed.

4. The termination unit is installed on the field termination panel.

5. The cables are connected.

6. Power wiring is connected and applied to the termination unit.

7. Terminal block wiring is connected to the termination unit and field device.

8. The safety shield is installed.

Maintenance

Section 3

Introduction

The reliability of any stand-alone product or control system is affected by the maintenance of the equipment. ABB Automation recommends that all equipment receive preventive maintenance which will keep the equipment operating at an optimum level.

This section presents procedures that the customer should be able to perform on site. These preventive maintenance procedures should be used as a guideline to assist in establishing good preventive maintenance practices.

Personnel performing preventive maintenance should meet the following qualifications.

- Maintenance personnel should be qualified electrical technicians or engineers that know the proper use of test equipment.
- Maintenance personnel should be familiar with the module mounting unit and field termination panel, have experience working with process control systems, and know what precautions to take when working on live AC and/or DC systems.

Preventive Maintenance Schedule

Table 3-1 is the preventive maintenance schedule for the NTHS03 termination unit. The table lists the preventive maintenance tasks in groups according to their specified maintenance interval. Tasks that require further explanation are covered under ***Preventive Maintenance Procedures***.

NOTE: The preventive maintenance schedule is for general purposes only. Your application may require special attention.

Table 3-1. Preventive Maintenance Schedule

Task	Frequency
Check cabinet air filters. Clean or replace them as necessary. Check the air filter more frequently in excessively dirty environments.	3 months
Check cabinet and termination unit for dust. Clean as necessary using an antistatic vacuum.	
Check all termination unit signal, power and ground connections within the cabinet. Verify that they are secure. Refer to procedure.	
Check termination unit circuit board, giving special attention to power contacts and edge connectors. Clean as necessary. Refer to procedure.	12 months
Complete all tasks in this table.	Shutdown

Equipment and Tools Required

Tools and equipment required for maintenance procedures are:

- Antistatic vacuum.
- Screwdriver (medium length).
- Isopropyl alcohol (99.5 percent electronic grade).
- Distilled water.
- Compressed air.
- Foam-tipped swabs.
- Lint-free cloths.
- Nonabrasive eraser.

Preventive Maintenance Procedures

This section covers tasks from Table 3-1 that require specific instructions or further explanation.

- Cleaning printed circuit boards and edge connectors.
- Checking signal, power, and ground connections.

Printed Circuit Board Cleaning

WARNING	**Never clean electrical parts or components with live power present. Doing so exposes you to an electrical shock hazard.** **Wear eye protection whenever working with cleaning solvents. When removing solvents from printed circuit boards using compressed air, injury to the eyes could result from splashing solvent as it is removed from the printed circuit board.**

There are several circuit board cleaning procedures in this section. These procedures cover circuit board cleaning and washing, cleaning edge connectors and circuit board laminate between edge connectors. Use the procedures that meet the needs of each circuit board. Remove all dust, dirt, oil, corrosion or any other contaminant from the circuit board.

Perform all cleaning and handling of the printed circuit boards at static safe work stations. Always observe the steps under ***Special Handling*** in Section 2 when handling printed circuit boards.

General Cleaning and Washing

If the printed circuit board needs minor cleaning, remove dust and residue from the printed circuit board surface using clean, dry, filtered compressed air or an antistatic field service vacuum cleaner.

To wash the printed circuit board:

1. Clean the printed circuit board by spraying or wiping it with isopropyl alcohol (99.5% electronic grade). Use a foam-tipped swab to wipe the circuit board.

2. Remove excess solvent by using compressed air to blow it free of the circuit board.

Edge Connector Cleaning

1. Use a solvent mixture of 80% isopropyl alcohol (99.5% electronic grade) and 20% distilled water.

2. Soak a lint-free cloth with the solvent mixture.

3. Work the cloth back and forth parallel to the edge connector contacts.

4. Repeat with a clean cloth that is soaked with the solvent mixture.

5. Dry the edge connector contact area by wiping with a clean lint-free cloth.

To clean tarnished or deeply stained edge connector contacts:

1. Use a nonabrasive eraser or equivalent to remove tarnish or stains. Fiberglass or nylon burnishing brushes may also be used.

2. Minimize electrostatic discharge by using the 80/20 isopropyl alcohol/water solution during burnishing.

3. Do not use excessive force while burnishing. Use only enough force to shine the contact surface. Inspect the edge connector after cleaning to assure no loss of contact surface.

4. Wipe clean with a lint-free cloth.

Checking Connections

NOTE: Power to the cabinet should be off while performing this preventive maintenance task.

WARNING	**There are exposed AC and DC connections inside the cabinet. These exposed electrical connections present a shock hazard that can cause injury or death.** **If input or output circuits are a shock hazard after disconnecting system power at the power entry panel, then the door of the cabinet containing these externally powered circuits must be marked with a warning stating that multiple power sources exist.**

Check all signal wiring, power and ground connections within the cabinet to verify their integrity. When checking connections, always turn a screw, nut or other fastening device in the direction to tighten only. If the connection is loose, it will be tightened. If the connection is tight, the tightening action will

verify that it is secure. There must not be any motion done to loosen the connection.

1. Verify that all power connections within the cabinet are secure.

2. Verify that all wiring connections to the termination unit are secure.

Repair and Replacement

Section 4

Introduction

This section explains the repair and replacement procedures for an NTHS03 termination unit.

Fuse Replacement

If the fuse opens, replace it with a fuse having an equivalent rating. Table 4-1 describes the fuse and lists the ABB Automation part numbers. To replace the fuse:

1. Turn off power to the cabinet.
2. Remove the safety shield.
3. Remove the blown fuse from its holder.
4. Replace the blown fuse with an equivalent fuse.
5. Install the safety shield.
6. Turn on power to the cabinet.

Table 4-1. Parts List

Part Number	Description
1946715?8	Dipshunt
1946984?1	Jumper
1948182?33001	Fuse, 3 A, 250 V (slo blo)
NFWAB17010	0.19-16 (no. 10) x 5/8 in. Phillips-head thread forming screw

Termination Unit Replacement

If it is determined that the termination unit is faulty, replace it with a new one. ***Do not*** try to repair the unit; replacing components may affect the unit performance and certification.

When replacing a termination unit, observe the special handling guidelines listed in Section 2.

NOTE: Turn off power to the field devices before removing the cables from the termination unit.

CAUTION	**Remove a module from its assigned slot before installing or removing a cable assigned to that slot. Failure to do so could result in damage to the module.**

Follow Steps 1 through 17 to replace the termination unit.

1. Turn off power to the cabinet and remove the safety shield.

2. Disconnect the 24 VDC and I/O common wiring from the E1 and E2 Faston connectors of the termination unit. Mark the wires according to their terminal assignment as they are removed.

3. If the termination unit is connected to an I/O module, pull the I/O module out of its cable connection on the module mounting unit backplane.

4. If there is a termination cable connected, disconnect it from the P1 and P2 connectors on the termination unit.

5. Turn off power to the field devices. Disconnect I/O wiring from the terminal blocks. Mark the wires according to their terminal assignment.

6. When all cables and wires are removed from the termination unit, remove the two mounting screws and remove the termination unit from the field termination panel.

7. Verify that the dipshunts on the replacement termination unit are the same as the dipshunt settings on the faulty termination unit.

8. Verify that the fuse is installed on the replacement termination unit.

9. Verify that the jumpers are installed on the replacement termination unit.

10. Secure the replacement termination unit circuit board to the field termination panel with the two mounting screws.

11. Connect the termination unit cables to their assigned connector on the termination unit.

12. Connect the I/O wiring to the terminal strips.

13. Connect the 24 VDC and common wiring to the E1 and E2 Faston connectors of the termination unit.

14. Push on the faceplate of the I/O module to fully insert it into its module mounting unit slot. The I/O modules should be seated in the termination unit cable at the rear of the module mounting unit when fully inserted.

15. After all cables and wiring have been replaced, install the safety shield and return power to the field devices.

16. Return power to the cabinet.

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