Bailey® infi 90®

Instruction

Digital Slave Output Module
(IMDSO04)

Bailey®
Process Control and Automation Solutions from Elsag Bailey Group
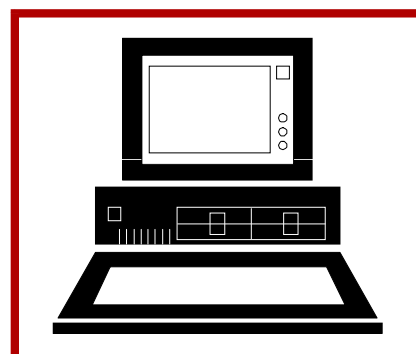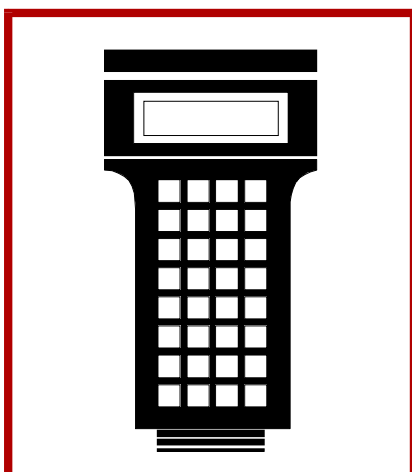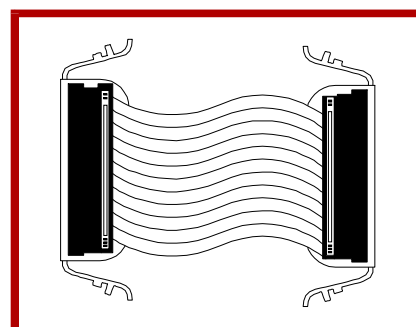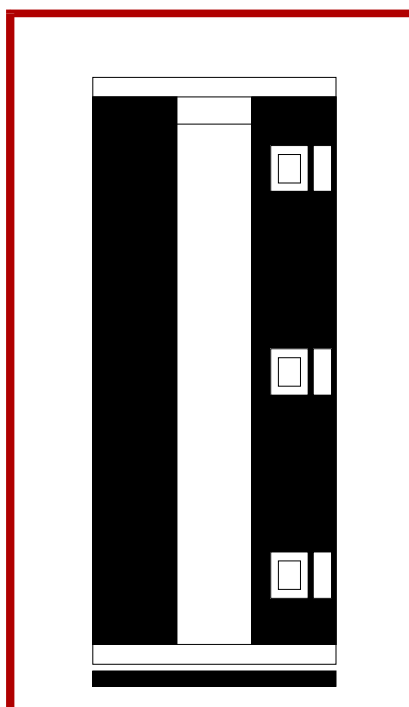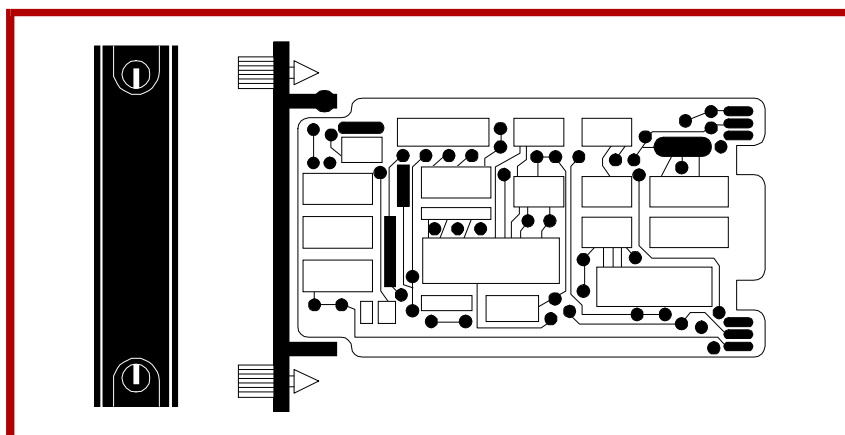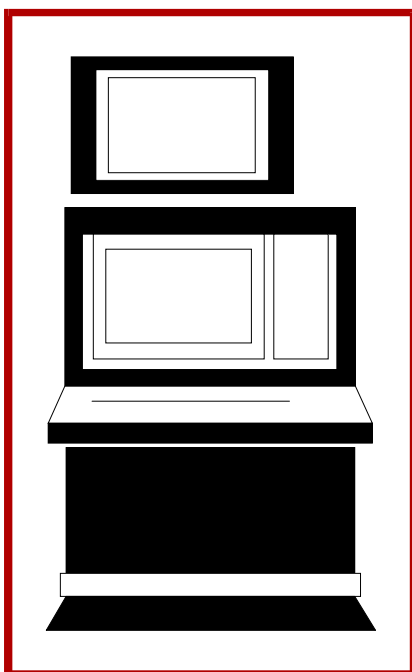
WARNING notices as used in this instruction apply to hazards or unsafe practices that could result in personal injury or death.

CAUTION notices apply to hazards or unsafe practices that could result in property damage.

NOTES highlight procedures and contain information that assists the operator in understanding the information contained in this instruction.

Preface

The Digital Slave Output module (IMDSO04) outputs sixteen separate digital signals from the Infi 90 Process Management System to a process. Master modules use these outputs to control (switch) process field devices.

This instruction explains the slave module features, specifications and operation. It details the procedures to follow to set up and install a Digital Slave Output (DSO) module. It explains troubleshooting, maintenance and module replacement procedures.

The system engineer or technician using the DSO should read and understand this instruction before installing and operating the slave module. In addition, a complete understanding of the Infi 90 system is beneficial to the user.

There are four versions of the DSO module; this manual discusses one. Refer to Product Instruction I-E96-310 for information on the IMDSO01/02/03.

List of Effective Pages

Total number of pages in this instruction is 37, consisting of the following:

Page No.	Change Date
Preface	Original
List of Effective Pages	Original
iii through vii	Original
1-1 through 1-6	Original
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3-1 through 3-6	Original
4-1 through 4-2	Original
5-1 through 5-4	Original
6-1	Original
7-1	Original
8-1	Original
A-1 through A-3	Original
B-1	Original

When an update is received, insert the latest changed pages and dispose of the superseded pages.

> **NOTE:** On an update page, the changed text or table is indicated by a vertical bar in the outer margin of the page adjacent to the changed area. A changed figure is indicated by a vertical bar in the outer margin next to the figure caption. The date the update was prepared will appear beside the page number.

Safety Summary

GENERAL WARNINGS	**Equipment Environment** All components, whether in transportation, operation or storage must be in a noncorrosive environment. **Electrical Shock Hazard During Maintenance** Disconnect power or take precautions to ensure that contact with energized parts is avoided when servicing. **Special Handling** This module uses Electrostatic Sensitive Devices (ESD).

SPECIFIC WARNING	Disconnect power before installing dipshunts for slave modules on the MMU backplane (slave expander bus). Failure to do so could result in severe or fatal shock. (p. 3-4, 5-3)

SPECIFIC CAUTIONS	Disable the digital output signals before removing the module to prevent damage to the edge connector (P3) pins. (p. 3-4, 5-2, 7-1)

Sommaire de Sécurité

<table>
<tr>
<td>AVERTISSEMENT D'ORDRE GENERAL</td>
<td>Environment de l'equipement
Nes pas soumettre les composantes a une atmosphere corrosive lors du transport, de l'entreposage ou de l'utilisation.

Risques de chocs electriques lor de l'entretien
S'assurer de debrancher l'alimentation ou de prende les precautions necessaires a eviter tout contact avec des composants sours tension lors de l'entretien.

Precautions de Manutention
Ce module contient des composantes sensibles aux decharges electro-statiques.</td>
</tr>
</table>

<table>
<tr>
<td>ADVERTISSEMENT D'ORDRE SPECIFIQUE</td>
<td>Couper l'alimentation avant d'installer les dipshunts sur la plaque arriere du chassis de montage de modules (MMU). Toute negligence a cet egard constitue un risque de choc pouvant entrainer des blessures graves, voire moretiles. (p. 3-4, 5-3)</td>
</tr>
</table>

<table>
<tr>
<td>ATTENTION D'ORDRE SPECIFIQUE</td>
<td>Invalider les signaux de sortie numerique avant de retirer le module afin d'eviter d'endommager les broches du connecteur plat. (p. 3-4, 5-2, 7-1)</td>
</tr>
</table>

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SECTION 1 - INTRODUCTION

There are four versions of the Digital Slave Output (DSO) module; this instruction discusses the IMDSO04. The difference between this version and the IMDSO01/02/03 is in the output circuitry and switching capabilities. Refer to Product Instruction I-E96-310 for information on the IMDSO01/02/03.

The Digital Slave Output module (IMDSO04) outputs sixteen digital signals from the Infi 90 system to control a process. It is an interface between the process and the Infi 90 Process Management System. The signals provide digital switching (ON or OFF) for field devices. Master modules perform the control functions; slave modules provide the I/O.

This manual explains the purpose, operation and maintenance of the slave module. It addresses handling precautions and installation procedures. Figure 1-1 illustrates the Infi 90 communication levels and the position of the Digital Slave Output (DSO) module within these levels.

INTENDED USER

System engineers and technicians should read this manual before installing and operating the DSO module. A module **SHOULD NOT** be put into operation until this instruction is read and understood. You can refer to the Table of Contents to find specific information after the module is operating.

MODULE DESCRIPTION

The DSO consists of a single printed circuit board (PCB) that occupies one slot in a Module Mounting Unit (MMU). It outputs sixteen separate digital signals through solid state circuits on the PCB. Twelve outputs are isolated from each other; the remaining two pairs share common positive output lines.

Two captive screws on the faceplate secure the module to the MMU. A front panel LED indicates the module operating status. Sixteen front panel LEDs (group A and group B) display the module output states (ON or OFF).

The slave module has three connection points for external signals and power (P1, P2 and P3). P1 connects to logic power (+5 VDC) that drives the module circuits (refer to Table 5-2). P2 connects it to the slave expander bus to communicate with a master module (refer to Table 5-3). The digital signals are output through connector P3 using a cable connected to a
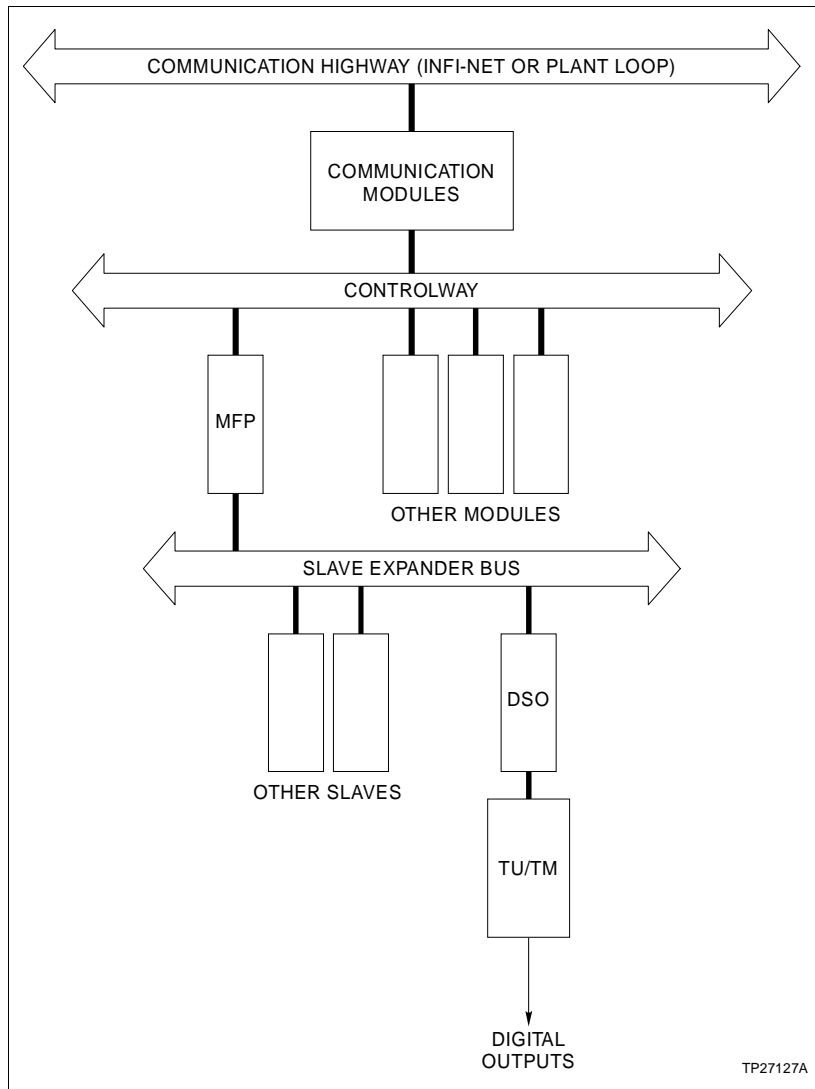
Figure 1-1. Infi 90 Communication Levels

Termination Unit (TU) or Termination Module (TM) (refer to Table 5-4). The terminal blocks (physical connection points) for field wiring are on the TU/TM.

FEATURES

The modular design of the DSO, as with all Infi 90 modules, allows for flexibility when you are creating a process management strategy. It outputs sixteen separate digital signals to the process. Open collector transistors in the output circuits can sink up to 250 mA to a 24 VDC load.

The front panel LEDs provide a visual indication of the module status to aid in system test and diagnosis. You can remove or install a DSO module without powering the system down.

INSTRUCTION CONTENT

This manual consists of eight sections. *Introduction* is an overview of the DSO module: Features, description and specifications. *Description and Operation* explains the module operation and output circuitry. *Installation* describes precautions to observe when handling DSO modules, and setup procedures required before module operation. This section discusses switch settings and installation procedures. *Operating Procedures* explains the front panel indicators and start-up of the slave module. *Troubleshooting* describes the error indications and corrective actions to take. *Maintenance* has a maintenance schedule for the slave module. *Repair/Replacement Procedures* details the procedures to replace a slave module. *Support Services* provides replacement part ordering information. It explains other areas of support that Bailey Controls provides.

HOW TO USE THIS MANUAL

Read this manual through in sequence. It is important to become familiar with the entire contents of this manual before using the DSO module. The manual is organized in sections to enable you to find specific information quickly.

1. Read and do the steps in Section 3.

2. Read Section 4 before powering up the module.

3. Refer to Section 5 if a problem occurs.

4. Refer to Section 6 for scheduled maintenance requirements.

5. Use Section 8 when ordering replacement parts.

REFERENCE DOCUMENTS

Document Number	Document
I-E96-201	Multi-Function Processor (IMMFP01)
I-E96-202	Multi-Function Processor (IMMFP02)
I-E96-209	Logic Master Module (IMLMM02)
I-E93-911	Termination Unit Manual
I-E96-100	Operator Interface Station
I-E93-916	Engineering Work Station
I-E92-501-2	Configuration and Tuning Terminal
I-E93-900-20	Function Code Application Manual

GLOSSARY OF TERMS AND ABBREVIATIONS

Term	Definition
CTT	Configuration and Tuning Terminal; hand held module that provides a local means for system configuration, tuning and diagnostics.
Configuration	A control strategy with function blocks.
Controlway	A redundant peer-to-peer communication path for point data transfer between intelligent modules within a process control unit.
Digital	A discrete signal having only two states: on or off.
Dipshunt	Dual in-line package with shorting bars.
Dipswitch	A dual in-line package that contains single pole switches.
EWS	Engineering Work Station; an integrated hardware and software personal computer system for configuring and monitoring Infi 90 modules.
Function Code	An algorithm which defines specific functions. These functions are linked together to form the control strategy.
LED	Light Emitting Diode; the module front panel indicator that shows status and error messages.
LSB	Least Significant Bit; the bit of a binary number that carries the least numerical weight.
Latch Register	A temporary storage buffer that latches onto a piece of data until instructed to move it elsewhere.
Master Module	One of a series of controller modules designed to direct field processes through a slave module. The multi-function processor is an example.
MFP	Multi-Function Processor Module; a multiple-loop controller with data acquisition and information processing capabilities.
MMU	Module Mounting Unit (IEMMU01/02); a card cage that provides electrical and communication support for Infi 90 modules.
MSB	Most Significant Bit; the bit of a binary number that carries the most numerical weight.
OIS	Operator Interface Station; integrated operator console with data acquisition and reporting capabilities. It provides a window into the process for flexible control and monitoring.
PCU	Process Control Unit; rack type industrial cabinet that contains master, slave and communication modules, and their communication paths.
Slave Expander Bus	Parallel address/data bus between the master module and the slave.
TM	Termination Module; provides input/output connection between plant equipment and the Infi 90 process modules. The termination module slides into a slot in the termination mounting unit.
TU	Termination Unit; provides input/output connection between plant equipment and the Infi 90 process modules. The termination unit is a flat circuit board for panel mounting.

SPECIFICATIONS

Power Requirements	
Voltage	+5 VDC ($\pm$ 5%)
Current Consumption	135 mA (typical) 200 mA (maximum)
Dissipation (logic only)	750 mW (typical) 1.2 W (maximum)
Outputs	
Load Voltage	24 VDC
Load Current (maximum)	250 mA
Off Leakage Current (maximum)	10 µA @ 70°C (158°F)
On Voltage Drop (maximum)	2.4 V @ 70°C (158°F)
Current Consumption	150 mA (typical), 250 mA (maximum)
Isolation	
300 V rms between output and logic circuitry and output to output. CSA approved for 300 V isolation.	
Surge Withstanding Capability	
Meets ANSI/IEEE C37.90A-1974 "Guide for Surge Withstanding Capability Test".	
Mounting	
Occupies one slot in a standard Infi 90 module mounting unit.	
Environmental	
Ambient Temperature	0° to 70°C (32° to 158°F)
Relative Humidity	0 to 95% up to 55°C (131°F) (non-condensing) 0 to 45% at 70°C (158°F) (non-condensing)
Atmospheric Pressure	Sea level to 3 km (1.86 miles)
Air Quality	Non-corrosive
Certification	
CSA certified as process control equipment in an ordinary (non-hazardous) location .	

SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE

NOMENCLATURE

The following modules and equipment can be used with a DSO:

Nomenclature	Hardware
IMMFP01/02	Multi-Function Processor Module
IMLMM02	Logic Master Module
NIDI01	Termination Module, Digital Inputs
NTDI02	Termination Unit, Digital Inputs
NKTM01	Cable, Termination Module
NKTU02	Cable, Termination Module
NKTU01	Cable, Termination Unit

SECTION 2 - DESCRIPTION AND OPERATION

INTRODUCTION

This section explains the output circuitry, control logic, data, logic power and connections for the Digital Slave Output (DSO) module. The DSO is a digital signal interface between a Multi-Function Processor (MFP), Multi-Function Controller (MFC) or Logic Master Module (LMM) and process field devices. The master module communicates with its slave module on a 12-line slave expander bus shown in Figure 1-1. Each slave on the bus has a unique address set by its slave address dipswitch (S1).

DIGITAL OUTPUTS

Digital signals have two states, ON or OFF. The DSO module digital outputs switch voltages of 24 VDC at 250 mA. This voltage energizes (turns on) and de-energizes (turns off) a field device.

MODULE BLOCK DIAGRAM

The DSO consists of registers, buffers and interface circuits. They control the digital output switching, and transmit slave operating status back to a master module. Open collector transistors provide the switching functions. Optocouplers isolate the module circuits from the process.

The DSO has two sets of circuits to control its sixteen outputs. One controls group A outputs; the other controls group B outputs. Both receive their data from a single slave expander bus interface. Figure 2-1 is a block diagram of the DSO module. It illustrates signal flow through the module. Figure 2-2 shows the digital output circuit.

Digital Output Circuits

Sixteen open collector transistors in the digital output block function as digital switches. Optocouplers for each output provide isolation between the module circuits and the process field device. All outputs are normally de-energized (OFF) until a signal from the data selector block causes them to energize (ON). The output circuits provide 300 volts isolation between output and logic circuits, and other output channels.

NOTE: Due to the number of pins on the P3 connector, twelve outputs are separate while the remaining two pairs share output terminals. The positive (+) sides of outputs 7 and 8 are tied together for each group (refer to Table 5-4). They are not isolated from each other, but are isolated from the module circuitry.
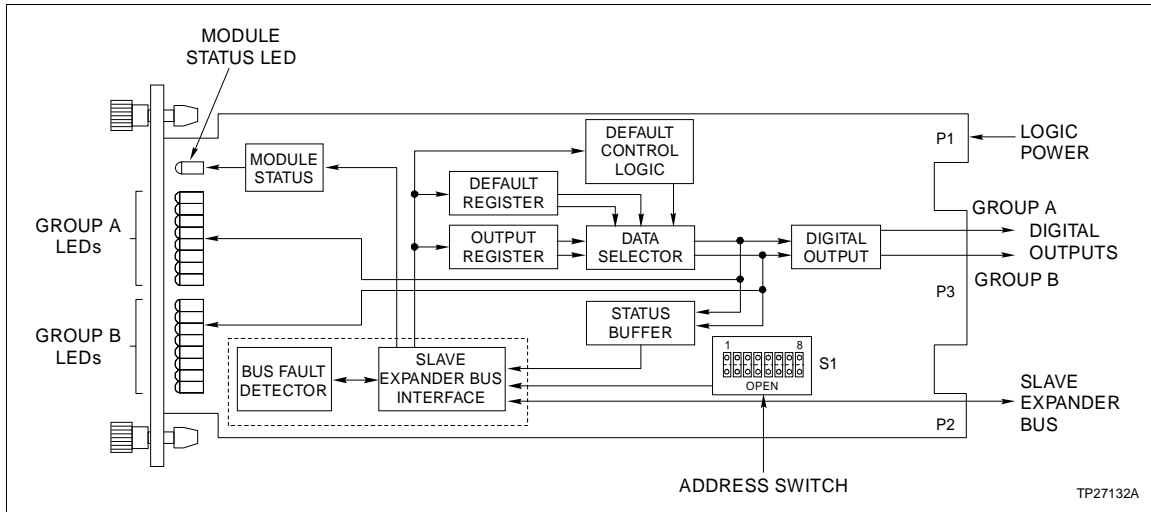
Figure 2-1. Digital Slave Output Module Block Diagram
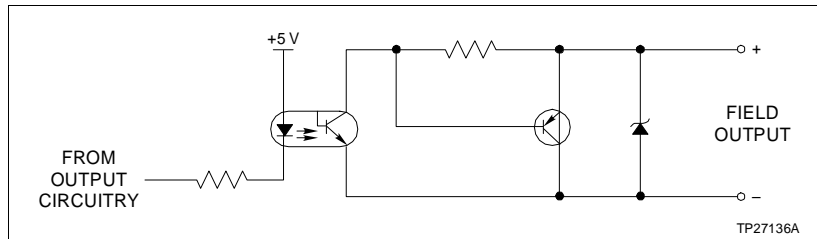
Figure 2-2. Digital Output Circuit

The data selector block drives the output circuits and lights the front panel output status LEDs. It uses data from the output register or default register to do this. During normal operation, it selects the output register data.

Output Control Logic

An output register holds the data that controls the outputs. The slave expander bus interface writes master module data to this register. This data, sent to the data selector, determines the output states (ON or OFF).

Default data from the master module is sent to the default register. The master module configuration sets the default values (Function Code (FC) 128). The default register is reset to logic zeros during power up to drive the outputs to a de-energized state. FC 128 in the master module configuration selects the output values used to drive the output circuits in the event of a master module failure (*time-out*). If FC 128 is not defined, the outputs will go to a de-energized state during a *time-out*. Refer to the ***BUS FAULT TIMER*** in this section for further explanation of *time-out*.

The default control logic block is a one bit latch register. It sends a signal to the data selector block to select either the default register data or the output register data during a *time-out* (indicating a master module error). This signal is dependent on the master module configuration (FC 83 specification 2). The bus fault detector in the slave expander bus interface checks for a *time-out* condition. During a *time-out*, the data selector block normally selects the default register data. If a *hold* option is selected in FC 83, the default control logic circuits send a logic 1 to override the data selector. It causes the data selector to drive the outputs with the output register data instead of default data to maintain the outputs at their current values (*hold*).

Status Logic

The status buffer block provides module status information to the master module. This information is output states, and module identification and status. The master module reads this data through the slave expander bus interface. Refer to **MODULE DATA** in this section for an explanation of the data.

OUTPUT CIRCUIT CONNECTIONS

The output signals connect to the 30-pin card edge connector P3 of the DSO using a termination cable from a TU/TM. Proper polarity wiring of field signals is necessary for the output circuits to function properly.

SLAVE EXPANDER BUS

The Infi 90 slave expander bus is a high speed synchronous parallel bus. It provides a communication path between master modules and slave modules. The master module provides the control functions and the slave module provides the I/O functions. The P2 card edge connector of the slave and master module connect to the bus.

The slave expander bus is twelve parallel signal lines located on the Module Mounting Unit (MMU) backplane. A 12-position dipshunt placed in a connection socket on the MMU backplane connects the bus between the master and slave modules. Cable assemblies can extend the bus to six MMUs.

A master module and its slaves form an individual subsystem within a Process Control Unit (PCU). The slave expander bus between master/slave subsystems must be separated. Leaving a dipshunt socket empty or not connecting the MMUs with cables separates them.

UNIVERSAL SLAVE EXPANDER BUS INTERFACE

The DSO uses a custom gate array to perform the slave expander bus interface function. All the control logic and communication protocol are built into an integrated circuit (IC). This IC provides the following functions:

- Address comparison and detection.

- Function code latching and decoding.

- Read strobe generation.

- Data line filtering of bus signals.

- On-board bus drivers.

MODULE DATA

FC 83 in the master module configuration accesses the DSO on the slave expander bus. It also allows the master module to automatically read status data from the slave module, and write output data to it. The slave address in FC 83 must be the same as the address set on the slave address dipswitch (S1).

Status Data

Status data consists of three separate 8-bit bytes read by the master module. The first and second bytes contain readback data that reflects the state of group A and group B outputs. Each bit of this data corresponds to the digital output state (ON or OFF).

The third byte is the module identification and module status. Slave module identification is in the four most significant bits (MSB). It identifies the slave module to the master module. It also verifies the slave expander bus communication integrity and the master module configuration. Slave module status is the least significant bit (LSB). During initialization, the master module writes data to the output register and default register, and forces this bit to a logic 1. A reset or *time-out* (bus fault error) resets it to a logic 0. Default data is normally written only during master module start-up. The master module reads the module status bit to test for a change in the state of the module. It uses this bit as a signal to rewrite data to the module to ensure that proper default values are in the default register.

Output Data

Output data is two 8-bit bytes sent to the output registers. Each byte corresponds to group A and group B outputs. Each bit of data represents one output. The bit value reflects the state of the output. Logic 1 turns a field device ON; logic 0 turns it OFF.

Default Data

Default data is two 8-bit bytes sent to the default registers. It is set by the master module configuration (FC 128). The function of this data is the same as the output data but is used only when a *time-out* occurs.

LOGIC POWER

Logic power (+5 VDC) drives the DSO circuits. It connects through the top 12-pin card edge connector (P1) shown in Figure 2-1.

BUS FAULT TIMER

The bus fault timer is a one-shot timer that is reset by the slave expander bus clock; the master module generates the bus clock. If the clock stops (indicating a master module error or failure), the bus fault timer *times out* in 10 milliseconds. This causes the digital outputs to change to their default values. A red front panel status LED indicates a bus fault (*time-out*).

STATUS LED INDICATOR

A front panel module status LED indicator shows the operating state of the DSO. Circuits on the DSO determine the module status and light the LED accordingly. Section 4 explains the indications and Section 5 explains corrective actions to take.

SECTION 3 - INSTALLATION

INTRODUCTION

This section explains what you must do before you put the Digital Slave Output module (IMDSO04) into operation. ***DO NOT PROCEED*** with operation until you read, understand and do the steps in the order in which they appear.

> **NOTE:** Refer to Product Instruction I-E93-911 for termination device wiring instructions.

SPECIAL HANDLING

> **NOTE:** Always use Bailey's Field Static Kit (P/N 1948385A2 - consists of wrist strap, ground cord assembly, alligator clip) when working with modules. The kit is designed to connect a technician and the static dissipative work surface to the same ground point to prevent damage to the modules by electrostatic discharge.

The Digital Slave Output (DSO) module uses electrostatic sensitive devices. Follow Steps 1 through 4 when handling:

1. Keep the module in its special anti-static bag until you are ready to install it in the system. Save the bag for future use.

2. Ground the anti-static bag before opening.

3. Verify that all devices connected to the module are properly grounded before using them.

4. Avoid touching the circuitry when handling the module.

UNPACKING AND INSPECTION

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

2. Notify the nearest Bailey Controls 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

You must set the address dipswitch (S1) ***BEFORE*** installing or operating the DSO module. Its respective Termination Unit (TU) or Termination Module (TM) must be configured to output the digital signals from the DSO to the field devices.

> **NOTE:** Due to the number of pins on the P3 connector, twelve outputs are separate while the remaining two pairs share output terminals. The positive (+) side of point 7 and 8 are tied together for each group (refer to Table 5-4).

Slave Address Selection Switch (S1)

The DSO can have one of 64 addresses (address 0 to 63) on the slave expander bus. This address uniquely identifies the slave to the master module and must be the same as the address set in the master module configuration (Function Code (FC) 83 specification 1).

The address is set by the eight position address dipswitch (S1) shown in Figure 3-1. The six right switch positions (3 through 8) of S1 set the six bit DSO address. Positions 1 and 2 are not used and must remain in the closed position (see Figure 3-2). Table 3-1 is a binary address conversion table for setting S1.
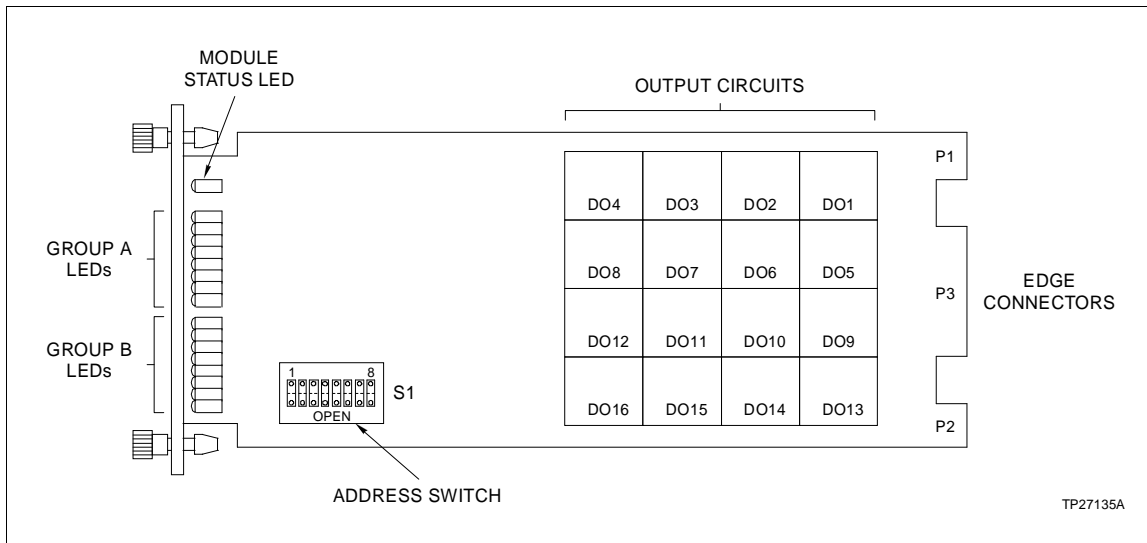
Figure 3-1. Digital Slave Output Module
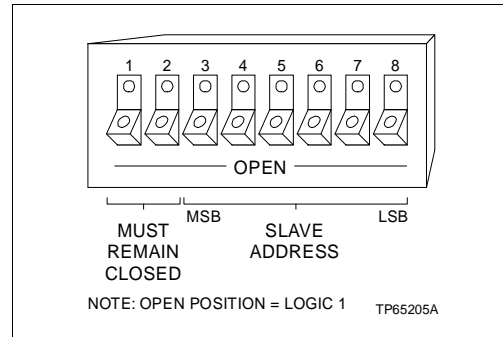
Figure 3-2. Address Select Switch (S1)

Table 3-1. Address Switch Settings (S1)

Addr	MSB					LSB	Addr	MSB					LSB
	3	4	5	6	7	8		3	4	5	6	7	8
0	0	0	0	0	0	0	32	1	0	0	0	0	0
1	0	0	0	0	0	1	33	1	0	0	0	0	1
2	0	0	0	0	1	0	34	1	0	0	0	1	0
3	0	0	0	0	1	1	35	1	0	0	0	1	1
4	0	0	0	1	0	0	36	1	0	0	1	0	0
5	0	0	0	1	0	1	37	1	0	0	1	0	1
6	0	0	0	1	1	0	38	1	0	0	1	1	0
7	0	0	0	1	1	1	39	1	0	0	1	1	1
8	0	0	1	0	0	0	40	1	0	1	0	0	0
9	0	0	1	0	0	1	41	1	0	1	0	0	1
10	0	0	1	0	1	0	42	1	0	1	0	1	0
11	0	0	1	0	1	1	43	1	0	1	0	1	1
12	0	0	1	1	0	0	44	1	0	1	1	0	0
13	0	0	1	1	0	1	45	1	0	1	1	0	1
14	0	0	1	1	1	0	46	1	0	1	1	1	0
15	0	0	1	1	1	1	47	1	0	1	1	1	1
16	0	1	0	0	0	0	48	1	1	0	0	0	0
17	0	1	0	0	0	1	49	1	1	0	0	0	1
18	0	1	0	0	1	0	50	1	1	0	0	1	0
19	0	1	0	0	1	1	51	1	1	0	0	1	1
20	0	1	0	1	0	0	52	1	1	0	1	0	0
21	0	1	0	1	0	1	53	1	1	0	1	0	1
22	0	1	0	1	1	0	54	1	1	0	1	1	0
23	0	1	0	1	1	1	55	1	1	0	1	1	1
24	0	1	1	0	0	0	56	1	1	1	0	0	0
25	0	1	1	0	0	1	57	1	1	1	0	0	1
26	0	1	1	0	1	0	58	1	1	1	0	1	0
27	0	1	1	0	1	1	59	1	1	1	0	1	1
28	0	1	1	1	0	0	60	1	1	1	1	0	0
29	0	1	1	1	0	1	61	1	1	1	1	0	1
30	0	1	1	1	1	0	62	1	1	1	1	1	0
31	0	1	1	1	1	1	63	1	1	1	1	1	1

1= OPEN ; 0=CLOSED

Termination Unit/Module Configuration

A TU/TM connects the field device wiring to the Infi 90 system. The terminal blocks (connection points) are located on the TU/TM. You must configure the TU/TM to output the DSO signals that are sent to the process field device. Proper polarity wiring of field signals is necessary for the output circuits to function properly. Refer to the appendices to determine the configuration for your application.

Physical Installation

NOTE: Section 3 provides instructions pertaining to the physical installation of the slave only. For complete cable and TU/TM information, refer to Termination Unit Manual I-E93-911.

The DSO module inserts into a standard Infi 90 Module Mounting Unit (MMU) and occupies one slot. To install:

1. Verify the slot assignment of the module.

WARNING	**Disconnect power before installing dipshunts for slave modules on the MMU backplane (slave expander bus). Failure to do so could result in severe or fatal shock.**
AVERTISSEMENT	**Couper l'alimentation avant d'installer les dipshunts sur la plaque arriere du chassis de montage de modules (MMU). Toute negligence a cet egard constitue un risque de choc pouvant entrainer des blessures graves, voire moretiles.**

2. Verify that a dipshunt is in the slave expander bus socket on the MMU backplane between the slave and master module.

3. Connect the hooded end of the termination cable from the TU/TM to the MMU backplane. To do this, insert the connector into the backplane slot in the same slot as the one assigned to the slave module. The latches should snap securely into place.

4. Align the module with the plastic guide rails in the MMU; gently slide the module in until the front panel is flush with the top and bottom of the MMU frame.

CAUTION	**Disable the digital output signals before removing the module to prevent damage to the edge connector (P3) pins.**
ATTENTION	**Invalider les signaux de sortie numerique avant de retirer le module afin d'eviter d'endommager les broches du connecteur plat (P3).**

5. Push and turn the two captive retaining screws on the module faceplate one half turn to the latched position. It is latched when the slots on the screws are vertical and the open ends face the center of the module. (To remove the module, turn the module retaining screws to the unlatched position and gently slide it out).

WIRING CONNECTIONS AND CABLING

The DSO has three card edge connectors to supply logic power, establish slave expander bus communication and provide digital outputs (P1, P2, P3 respectively).

Wiring

Installing the module in the MMU connects the slave module to the logic power (+5 VDC), necessary to drive the circuitry, at P1. It also connects P2 to the slave expander bus for communication with the master module. P1 and P2 connection require no additional wiring or cabling.

> **NOTE:** You must install a dipshunt on the backplane of the MMU to connect the slave expander bus between the slave module and master module. Locate the modules so the bus can connect the modules or they will not communicate.

Cable Connections

The IMDSO04 uses either a NTDI01 or NIDI01 for termination. See Figure 3-3 to determine the cables to use with the TU/TM you are using.

FUSING

The DSO does not have any on board fusing requirements.

PRE-OPERATING ADJUSTMENTS

You do not have to make any adjustments to the DSO prior to operating.
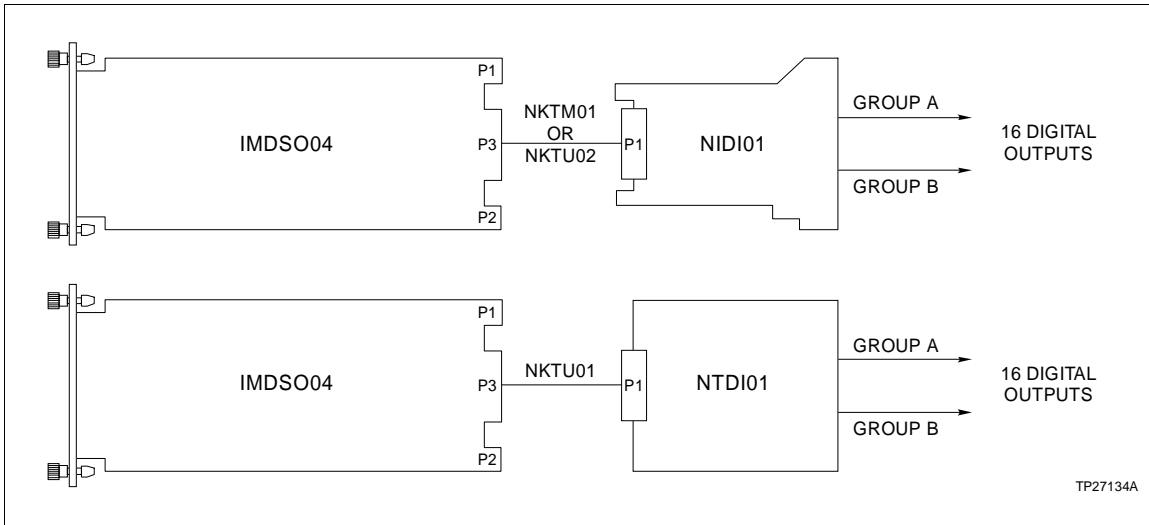
Figure 3-3. IMDSO04 Cable Connections and Termination

SECTION 4 - OPERATING PROCEDURES

This section explains the front panel indicators and start-up procedures for the Digital Slave Output module (IMDSO04).

STATUS INDICATORS

The Digital Slave Output (DSO) module has a front panel module status LED indicator to aid in system test and diagnosis. Sixteen front panel indicators display the output states (ON or OFF). The location of the indicators is shown in Figure 4-1.
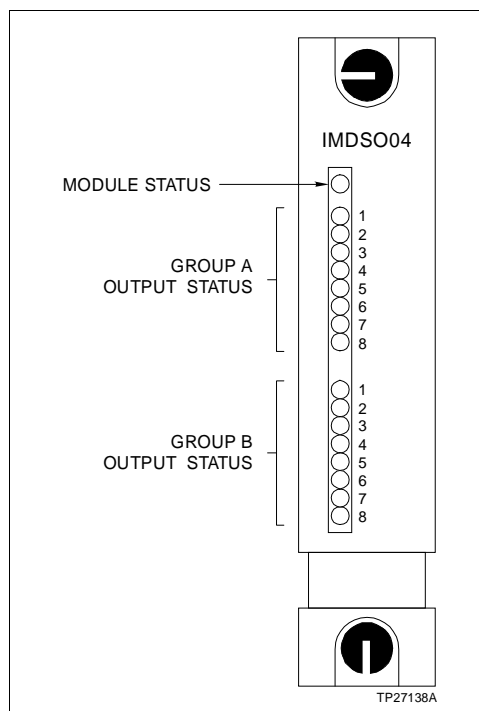
Figure 4-1. IMDSI02 Front Panel

Module Status Indicator

Table 4-1 explains the three states of the module status LED indicator (refer to Section 5 to determine corrective actions).

Output Status Indicators

There are sixteen front panel indicators (group A and group B) to display the output states. Each indicator represents one digital output. A red LED indicates an energized (ON) output; a blank LED indicates a non-energized (OFF) output.

INTRODUCTION

Table 4-1. IMDSO04 Front Panel

LED	Indication
Solid Green	Enabled and communicating with master module
Off	No power or not enabled
Solid Red	Bus fault timer error (*time-out*)

START-UP PROCEDURES

The master module controls the start-up of the DSO module; it is fully automatic. Function Code (FC) 83 in the master module configuration enables the DSO. Specification 1 (FC 83) is the slave module address. It must be the same as the address set on the address dipswitch (S1). The front panel LED (solid green) verifies that the module is enabled and communicating.

SECTION 5 - TROUBLESHOOTING

This section explains the error indications and corrective actions for the Digital Slave Output (DSO) module.

ERROR INDICATIONS AND CORRECTIVE ACTION

You can obtain the status of the DSO through an Infi 90 operator interface (e.g., Operator Interface Station, Engineering Work Station, Configuration and Tuning Terminal) or the front panel status LED indicators.

> **NOTE:** If you look at the DSO front panel output status LED indicators and none are lit, this may indicate a faulty DSO (an output must be energized to light an LED). Check the master module for bad quality on its output blocks.

Module Status LED

The front panel status LED has three states to indicate normal operation and error conditions. Table 5-1 lists DSO status LED states, error indications, probable causes and corrective actions.

> **NOTE:** If the corrective actions in Table 5-1 do not correct a problem with the DSO module, replace it.

Table 5-1. Status LED Indications and Corrective Actions

LED State	Indication	Probable Cause	Corrective Action
Solid Green	Slave module operating normally and communicating with master module	Normal operation	No action required
Off	Slave module not enabled	Address set on S1 not the same as address in master module configuration FC 83 spec 1	Change address on S1 to correspond with FC 83 spec 1 OR Change address in FC 83 spec 1 to correspond with S1
		Dipshunt not properly installed between master module and slave module	Verify dipshunt is installed properly (no bent pins) in slave expander bus socket on MMU backplane between master and slave module
		Master module configuration is not correct	Verify FC 83 is in master module configuration

Table 5-1. Status LED Indications and Corrective Actions (continued)

LED State	Indication	Probable Cause	Corrective Action
Off (continued)	No power to slave module	Module not completely inserted in MMU	Verify module is completely inserted in MMU: faceplate flush with MMU and captive retaining screws latched
Red	Bus fault timer error (*time-out*)	Slave expander bus clock failure	Check master module for proper operation
		Dipshunt not installed between master and slave module	Verify dipshunt is installed in the slave expander bus socket on the MMU backplane between master and slave module

Master Module Errors

The master module performs status checks on the DSO. An error will appear in the report function of an operator interface. Refer to the Product Instruction for the operator interface you are using for an explanation of these reports.

Function Code (FC) 83 output block N in the master module configuration is the DSO status flag (logic 0=good; logic 1=bad). You can use an operator interface to monitor this block. If the status flag is a logic 1, check the front panel module status LEDs and the operator interface report function to determine corrective actions.

> **NOTE:** If FC 83 specification 3 is set to 0, the master module will *trip* when the DSO module fails. Changing specification 3 to a 1 allows the master module to continue to operate if any DSO error condition exists.

The address set on address switch (S1) and in the master module configuration must be the same. The master module generates a **MISSING SLAVE MODULE** error if they do not match. Verify that the address set on S1 is the same as the address in FC 83 specification 1. If not:

CAUTION	**Disable the digital output signals before removing the module to prevent damage to the edge connector (P3) pins.**
ATTENTION	**Invalider les signaux de sortie numerique avant de retirer le module afin d'eviter d'endommager les broches du connecteur plat (P3).**

5. Remove the module and change the setting of S1 to correspond with the master module configuration (refer to

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ERROR INDICATIONS AND CORRECTIVE ACTION

for the procedures to set an address and to install a slave module).

OR

6. Modify the address in the master module configuration (FC 83 specification 1) to correspond with the address set on S1. Use an Infi 90 operator interface to modify the configuration (for procedures on how to modify a function code specification, refer to the Product Instruction for the operator interface you are using).

WARNING	**Disconnect power before installing dipshunts for slave modules on the MMU backplane (slave expander bus). Failure to do so could result in severe or fatal shock.**
AVERTISSEMENT	**Couper l'alimentation avant d'installer les dipshunts sur la plaque arriere du chassis de montage de modules (MMU). Toute negligence a cet egard constitue un risque de choc pouvant entrainer des blessures graves, voire moretiles.**

The master module generates a **MISSING SLAVE MODULE** error if the slave expander bus is not connected between it and the slave module. Verify the bus connection on the MMU backplane.

If you determine the slave module is faulty, replace it with a new one. Refer to Section 7 for procedures to replace a DSO module.

MODULE PIN CONNECTIONS

The slave module has three connection points for external signals and power (P1, P2 and P3). Tables 5-2, 5-3 and 5-4 show the pin connections.

Table 5-2. P2 Power Pin Connections

Pin (P1)	Connection	Pin (P1)	Connection
1	+5 VDC	7	NC
2	+5 VDC	8	NC
3	NC	9	PFI
4	NC	10	PFI
5	Common	11	NC
6	Common	12	NC

NOTES:
NC=Not Connected
PFI=Power Fail Interrupt

Table 5-3. P2 Expander Bus Connections

Pin(P2)	Signal	Pin(P2)	Signal
1	Data 1	7	Data 7
2	Data 0	8	Data 6
3	Data 3	9	Clock
4	Data 2	10	Sync
5	Data 5	11	NC
6	Data 4	12	NC

NC=Not Connected

Table 5-4. P3 Output Signal Pin Connections

Group A			Group B		
Digital Output	Pin(+)	Pin(-)	Digital Output	Pin(+)	Pin(-)
1	A	1	1	K	9
2	B	2	2	L	10
3	C	3	3	M	11
4	D	4	4	N	12
5	E	5	5	P	13
6	F	6	6	R	14
7	H[1]	7	7	S[1]	15
8	H	J	8	S	8

[1]Shared Pins (Outputs 7 and 8)

SECTION 6 - MAINTENANCE

INTRODUCTION

The Digital Slave Output (DSO) module requires limited maintenance. This section contains a maintenance schedule.

MAINTENANCE SCHEDULE

Perform the tasks in Table 6-1 at the specified intervals.

Table 6-1. Maintenance Schedule

Task	Interval
Clean and tighten all power and grounding connections	Every 6 months or during plant shutdown, whichever occurs first

Use a static safe vacuum cleaner to remove dust from:
 	
    Modules
    Module Mounting Unit
    Fan Assembly
    Power Entry Panel
	Every 6 months or during plant shutdown, whichever occurs first

SECTION 7 - REPAIR/REPLACEMENT PROCEDURES

INTRODUCTION

This section explains the replacement procedures for a Digital Slave Output (DSO) module. There are no special tools required to replace an DSO module.

MODULE REPAIR/REPLACEMENT PROCEDURES

If you determine the DSO is faulty, replace it with a new one. ***DO NOT*** try to repair the module; replacing components may affect the module performance. You can remove the module while system power is supplied. To replace a module:

CAUTION	**Disable the digital output signals before removing the module to prevent damage to the edge connector (P3) pins.**
ATTENTION	**Invalider les signaux de sortie numerique avant de retirer le module afin d'eviter d'endommager les broches du connecteur plat (P3).**

1. Push and turn the two front panel captive retaining screws one half turn to unlatch the module. It is unlatched when the slots on the screws are vertical and the open end of the slots face away from the module.

2. Gently slide the module out of the MMU.

3. Configure the replacement module switch settings. Ensure they are set the same as the original module.

4. In the same slot assignment as the original module, align the replacement module with the guide rails in the MMU; gently slide it in until the front panel is flush with the top and bottom of the MMU frame.

5. Push and turn the two captive retaining screws on the module faceplate one half turn to the latched position. It is latched when the slots on the screws are vertical and the open ends face the center of the module.

6. Return to normal operation.

SECTION 8 - SUPPORT SERVICES

INTRODUCTION

Bailey Controls is ready to help in the use, application and repair of its products. Contact your nearest sales office to make requests for sales, applications, installation, repair, overhaul and maintenance contract services.

REPLACEMENT PARTS AND ORDERING INFORMATION

When making repairs at your facility, order replacement parts from a Bailey sales office. Provide this information:

1. Part description, part number and quantity.

2. Model and serial numbers (if applicable).

3. Bailey instruction manual number, page number and reference figure that identifies the part.

When you order standard parts from Bailey Controls, use part numbers and descriptions from the Recommended Spare Parts Lists. You must order parts without commercial descriptions from the nearest Bailey Controls sales office.

TRAINING

Bailey Controls has a modern training facility that provides service and repair instruction. This facility is available for in-plant training of your personnel. Contact a Bailey Controls sales office for specific information and scheduling.

TECHNICAL DOCUMENTATION

You can obtain additional copies of this manual from the nearest Bailey sales office at a reasonable charge.

INTRODUCTION

APPENDIX A - TERMINATION UNIT (NTDI01) CONFIGURATION

INTRODUCTION

The IMDSO04 uses an NTDI01 for termination. Dipshunts on the Termination Unit (NTDI01) configure the digital outputs that are sent to the process. The Digital Slave Output (DSO) module outputs switch voltages of 24 VDC at 250 mA.

Figure A-1 shows the NTDI01 dipshunt without strapping, and the digital signal path from the DSO module to the field device for a termination unit application. Refer to Table A-1 to determine the dipshunt strapping to configure your application. Figure A-2 shows the terminal assignments for the digital output signals. Refer to this figure when connecting field wiring to the NTDI01.
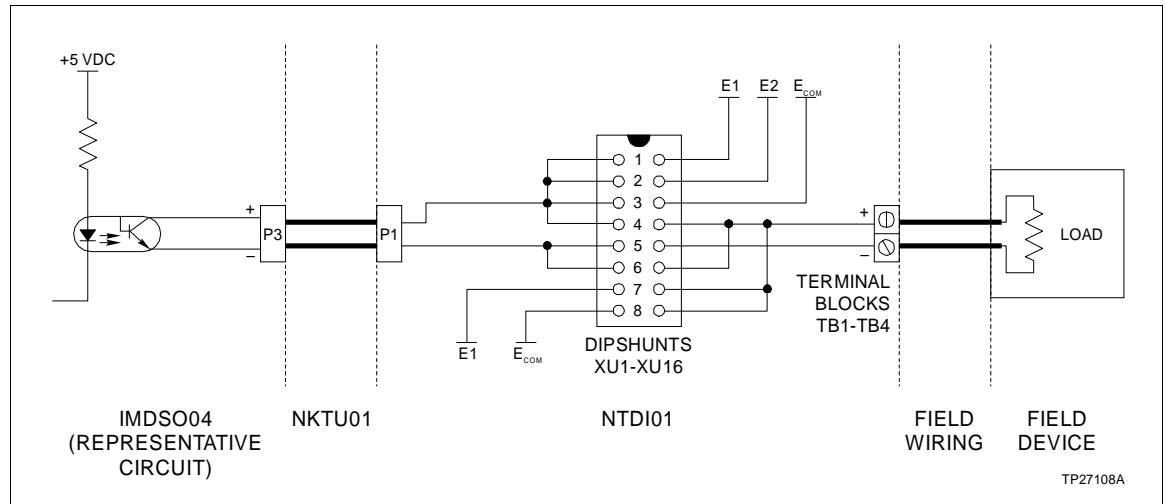
Figure A-1. NTDI01 Dipshunt

Table A-1. NTDI01 Dipshunt Configuration

Application/Signal Type	Dipshunt Configuration
Field powered contact	XU1-XU16 1 2 3 4 5 6 7 8 XU17 1 2 3 4 5 6 7 8
System powered from E1, 24 VDC	XU1-XU16 1 2 3 4 5 6 7 8 XU17 1 2 3 4 5 6 7 8
System powered from E2, 24 VDC	XU1-XU16 1 2 3 4 5 6 7 8 XU17 1 2 3 4 5 6 7 8 TP27139A
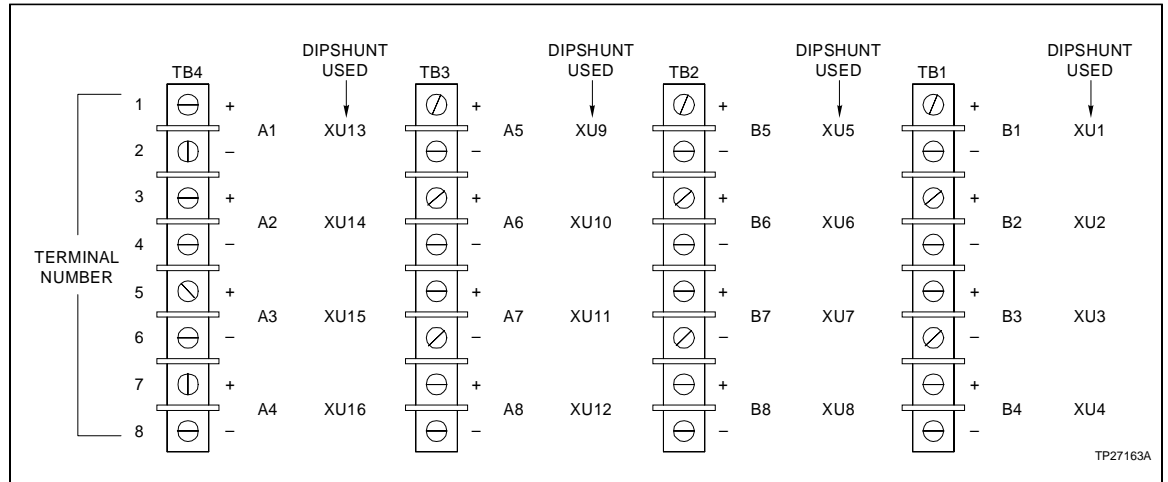
Figure A-2. NTDI01 Terminal Assignments

APPENDIX B - TERMINATION MODULE (NIDI01) CONFIGURATION

INTRODUCTION

The IMDSO04 uses an NIDI01 for termination. Jumpers on the Termination Module (NIDI01) configure the digital outputs that are sent to the process. The Digital Slave Output (DSO) module outputs switch voltages of 24 VDC at 250 mA. Refer to Table B-1 to determine the jumper setting to configure your application. Figure B-1 shows the terminal assignments for the digital output signals. Refer to this figure when connecting field wiring to the NIDI01.

Table B-1. NIDI01 Jumper Configuration

Application/Signal Type	Jumper Configuration
24 VDC	J1-J10 1 2 3 4 5 6 7 8 9 10 TP27137A
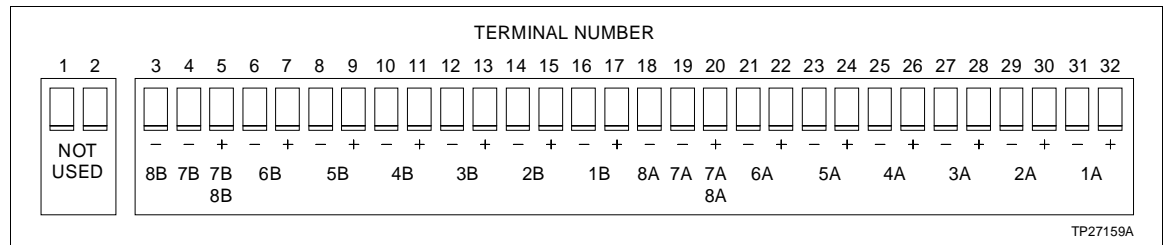
Figure B-1. NIDI01 Terminal Assignments