SECTION 3 - INSTALLATION

INTRODUCTION

This section explains special handling procedures, switch settings for each interface module, and how to install related hardware. Complete the preliminary procedures in this section before placing the INPPR01 into operation.

SPECIAL HANDLING

Plant Loop to Plant Loop Interface modules use Electrostatic Sensitive (ESD) devices. Follow these handling procedures:

> **NOTE:** Always use the Bailey Field Static Kit (P/N 1948385A1) when working with interface modules. This kit connects the static dissipative work surface and technician to the same ground point.

1. Keep the modules in their special anti-static bags until you are ready to install them in the system. Save the bags for future use.

2. Ground the anti-static bag before opening.

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

4. Avoid touching the circuitry when handling the module.

UNPACKING AND INSPECTION

1. Examine the PPT, LIM and BTM immediately to verify that they have 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/or container to store the modules.

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

INPPT01 SWITCH SETTINGS

The INPPT01 consists of two circuit boards, a memory board and a CPU board. The memory board has no user-configurable

operating options. The CPU board has three dipswitches that set the module operating characteristics. These switches provide the means of establishing the type of control, serial port communication rate, and loop address. Figure 3-1 shows the dipswitch locations on the CPU board.

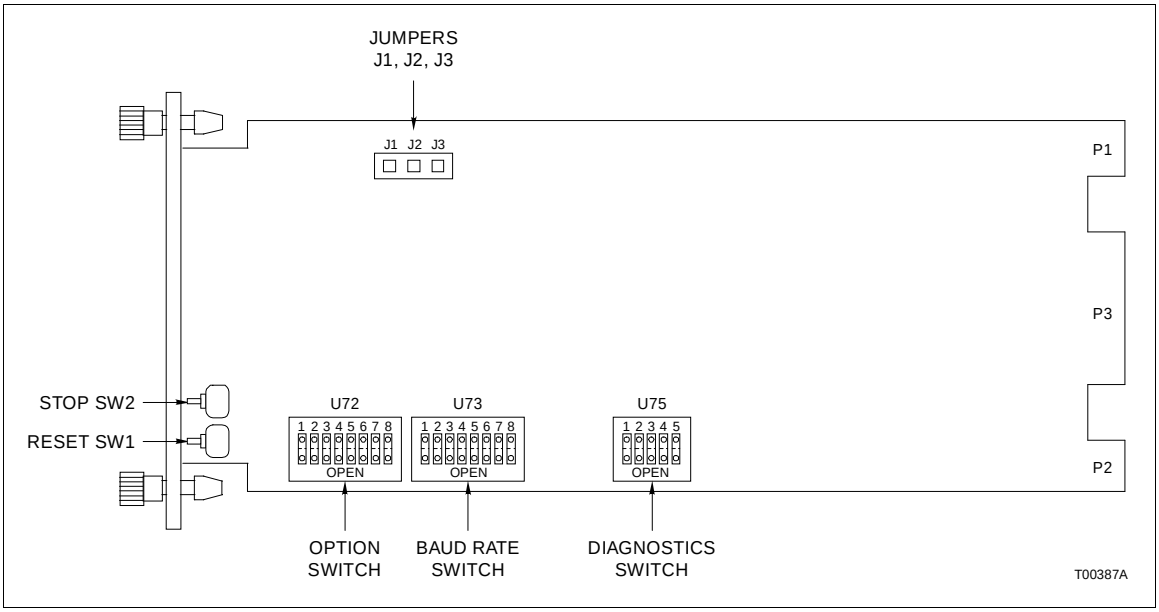

Figure 3-1. Switch Locations on the PPT (CPU board)

Option Switch (U72)

U72 is an eight position dipswitch that determines the operating options of the module. Table 3-1 lists the U72 option settings. Record the U72 settings in the space provided. When setting switches, 0 = Closed (on) and 1 = Open (off).

Table 3-1. Option Switch (U72) Settings

Position	Setting	Function	User Setting
1	0 1	ROM checksumming enabled ROM checksumming disabled	
2	0 1	RS-232-C port in DCE mode (direct connections) RS-232-C port in DTE mode (modem connections)	
3	0 1	Equipment select output de-energized Equipment select output energized[1]	
4	0 1	Port 1 option interface communication Port 1 utility option[2]	
5	0 1	Interface ID local[3] Interface ID remote	
6	0 1	Interface mode two-way control[4] Interface mode one-way control	

Table 3-1. Option Switch (U72) Settings (continued)

Position	Setting	Function	User Setting
7	0 1	Don not initialize NVM Initialize NVM	
8	0 1	Primary/Secondary (one module of redundant pair is set to 0, the other module is set to 1)	

NOTES: 0 = Closed (on), 1 = Open (off)

1. A unique equipment select output can exist between the primary and secondary PPT. The equipment select output is digital output three of a digital slave (IMDSM05 or IMDSO01/02/03/04).
2. Port 1 responds as DCE when it is configured as a utility port. Set switch position 4 = 1 if port 1 is not used as a communication interface.
3. Define only one interface as a local interface (position 5).
4. The following conditions apply when using two-way control (position 6 = 0):
   a. The port 1 option defaults to interface communication (position 4 = 0).
   b. The local INPPR01 uses port 0 as its command port and port 1 as its reply port.
   c. The remote INPPR01 uses port 1 as its command port and port 0 as its reply port.
   d. Both the local and remote interface must have a loop address of 0 (U75).

Serial Port Communication Rate (U73)

U73 is an eight pole dipswitch that sets the serial port communication rate. The communication rate directly affects data throughput. Refer to Table 3-2 for communication rates. Table 3-3 lists message throughput for different point types. Record the U73 setting in the space provided.

Table 3-2. Serial Port Communication Rate (U73)

Switch Position								Baud Rate	User Setting							
Port 0				Port 1					Port 0				Port 1			
1	2	3	4	5	6	7	8		1	2	3	4	5	6	7	8
0	0	0	0	0	0	0	0	50								
1	0	0	0	1	0	0	0	75								
0	1	0	0	0	1	0	0	110								
1	1	0	0	1	1	0	0	134.5								
0	0	1	0	0	0	1	0	150								
1	0	1	0	1	0	1	0	300								
0	1	1	0	0	1	1	0	600								
1	1	1	0	1	1	1	0	1200								
0	0	0	1	0	0	0	1	1800								
1	0	0	1	1	0	0	1	2000								
0	1	0	1	0	1	0	1	2400								
1	1	0	1	1	1	0	1	3600								
0	0	1	1	0	0	1	1	4800								
1	0	1	1	1	0	1	1	7200								
0	1	1	1	0	1	1	1	9600								
1	1	1	1	1	1	1	1	19200								

NOTE: 0 = Closed (on), 1 = Open (off)

Table 3-3. Message Throughput

Point Type	Number of Bytes	Time per Point[1]	Points per Second
Station	19	10.4 msec	96
Analog	8	4.7 msec	214
Digital	5	3.1 msec	322
Remote Control Memory (RCM)	7	4.1 msec	241
Remote Manual Set Constant (RMSC)	7	4.1 msec	241
Device Driver	7	4.1 msec	241

1. These figures are based on the calculated throughput of the various Exception Report data types (at 19200 baud). Regardless of communication rate, the software overhead is approximately 0.5 millisecond per point.

Loop Address (U75)

Dipswitch U75 sets the loop address. Valid addresses are 0 through 31. Table 3-4 shows examples of switch settings for the loop address. Record the loop address in the space provided.

Table 3-4. U75 Loop Addresses

Example Settings						
Address Example	Switch Position	1	2	3	4	5
	Binary Value	16	8	4	2	1
0		0	0	0	0	0
9		0	1	0	0	1
26		1	1	0	1	0

User Setting						
User Address	Switch Position	1	2	3	4	5
	Binary Value	16	8	4	2	1

NOTE: 0 = Closed (on), 1 = Open (off)

INLIM03 SWITCH SETTINGS

The Loop Interface Module (INLIM03), shown in Figure 3-2, has two user-configurable dipswitches: Event/Error Counter Address Switch SW1 and Address Switch SW2. Tables 3-5 and 3-6 list the switch settings for the Event and Error Counters. The LIM faceplate LEDs display the contents of the event/error counters. Switch SW2 poles 1 and 2 are CLOSED for normal operation. Refer to Table 3-7 for SW2 settings. The LIM can have any address from 1 to 63.

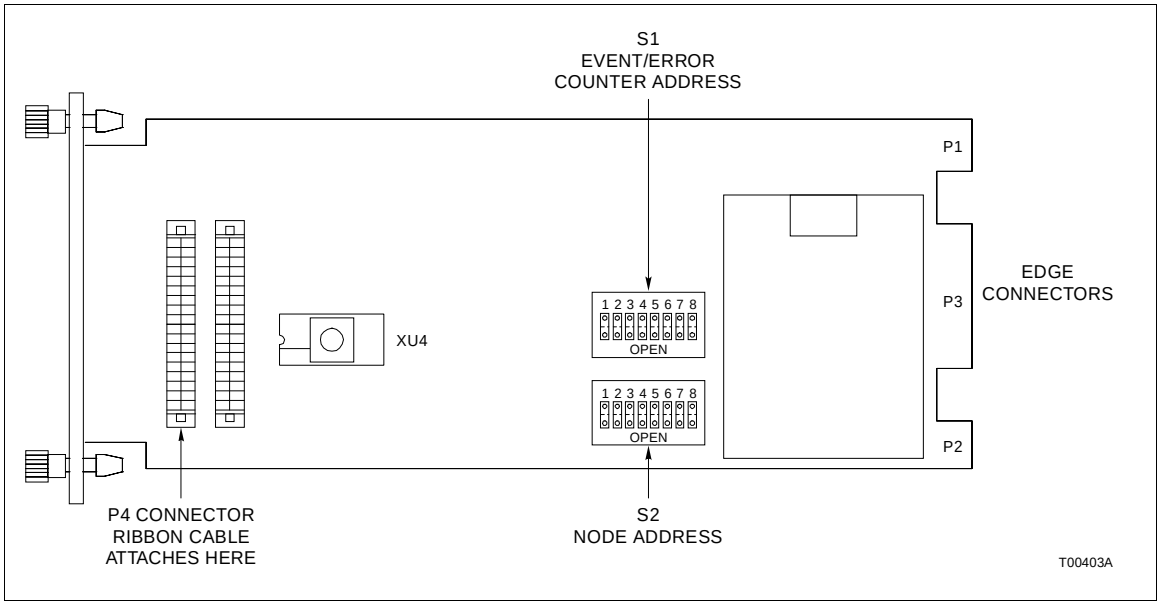

Figure 3-2. LIM Switch Locations

Table 3-5. LIM Event Counter Addresses (SW1)

Counter Address	Hex Address	Switch Position 1 2 3 4 5 6 7 8	Description	User Setting
48	30	0 0 1 1 0 0 0 0	Total messages transmitted, including forwarding.	
49	31	0 0 1 1 0 0 0 1	Transmit retries.	
50	32	0 0 1 1 0 0 1 0	Composite BTM Receive/Transmit, 4 bits each. Receive is viewed at the top LED.	
51	33	0 0 1 1 0 0 1 1	Messages taken from the BTM transmit buffer.	
52	34	0 0 1 1 0 1 0 0	Messages stored in BTM receive buffer.	
53	35	0 0 1 1 0 1 0 1	Interrupt Requests (IRQs) sent by BTM.	
54	36	0 0 1 1 0 1 1 0	High Priority (HP) messages transmitted.	
55	37	0 0 1 1 0 1 1 1	High Priority messages received.	
56	38	0 0 1 1 1 0 0 0	Commands issued by the BTM.	
57	39	0 0 1 1 1 0 0 1	Missed BTM transmit requests.	

Table 3-5. LIM Event Counter Addresses (SW1) (continued)

Counter Address	Hex Address	Switch Position 1 2 3 4 5 6 7 8	Description	User Setting
58	3A	0 0 1 1 1 0 1 0	Spurious Non-Maskable Interrupts (NMI) caused by address present.	
59	3B	0 0 1 1 1 0 1 1	HEY (request for an interrupt; generated by BTM) message sent.	
60	3C	0 0 1 1 1 1 0 0	Messages discarded when the destination is off-line.	
61	3D	0 0 1 1 1 1 0 1	HEY time expirations.	
62	3E	0 0 1 1 1 1 1 0	Passes through the IDLE level (2 bytes wide).	

NOTE: 0 = Closed (on), 1 = Open (off)

Table 3-6. LIM Error Counter Addresses (SW1)

Counter Address	Hex Address	Switch Position 1 2 3 4 5 6 7 8	Description	User Setting
64	40	0 1 0 0 0 0 0 0	Composite error count developed every handshake period - the summation of all other error counters.	
65	41	0 1 0 0 0 0 0 1	Unresolved NMI interrupts.	
66	42	0 1 0 0 0 0 1 0	Unresolved IRQ interrupts.	
67	43	0 1 0 0 0 0 1 1	Unresolved timer interrupts.	
68	44	0 1 0 0 0 1 0 0	Unused.	
69	45	0 1 0 0 0 1 0 1	Queue overflows.	
70	46	0 1 0 0 0 1 1 0	Unresolved BTM IRQs.	
71	47	0 1 0 0 0 1 1 1	Sequence errors.	
72	48	0 1 0 0 1 0 0 0	Header CRC/OVRN errors.	
73	49	0 1 0 0 1 0 0 1	Data CRC/OVRN errors.	
74	4A	0 1 0 0 1 0 1 0	Messages developing data CRC errors on route to destination.	
75	4B	0 1 0 0 1 0 1 1	Transmission failures.	
76	4C	0 1 0 0 1 1 0 0	Watchdog timer expirations.	
77	4D	0 1 0 0 1 1 0 1	Data length errors.	
78	4E	0 1 0 0 1 1 1 0	Loop - 1 Receive (RCV) failure.	
79	4F	0 1 0 0 1 1 1 1	Loop - 2 Receive failures.	
80	50	0 1 0 1 0 0 0 0	Loop - 1 Transmit (TX) failure.	
81	51	0 1 0 1 0 0 0 1	Loop - 2 Transmit failures.	

NOTE: 0 = Closed (on), 1 = Open (off)

Table 3-7. LIM Node Address Setting (SW2)

Example Settings									
Address Example	Switch Position	1	2	3	4	5	6	7	8
	Binary Value	128	64	32	16	8	4	2	1
1		0	0	0	0	0	0	0	1
9		0	0	0	0	1	0	0	1
63		0	0	1	1	1	1	1	1

User Setting									
User Address	Switch Position	1	2	3	4	5	6	7	8
	Binary Value	128	64	32	16	8	4	2	1

NOTE: 0 = Closed (on), 1 = Open (off)

INBTM01 SWITCH SETTINGS

The Bus Transfer Module (INBTM01), shown in Figure 3-3, has one user-configured dipswitch (SW1). SW1 enables module diagnostics. Refer to Table 3-8 and set SW1 for normal operation.

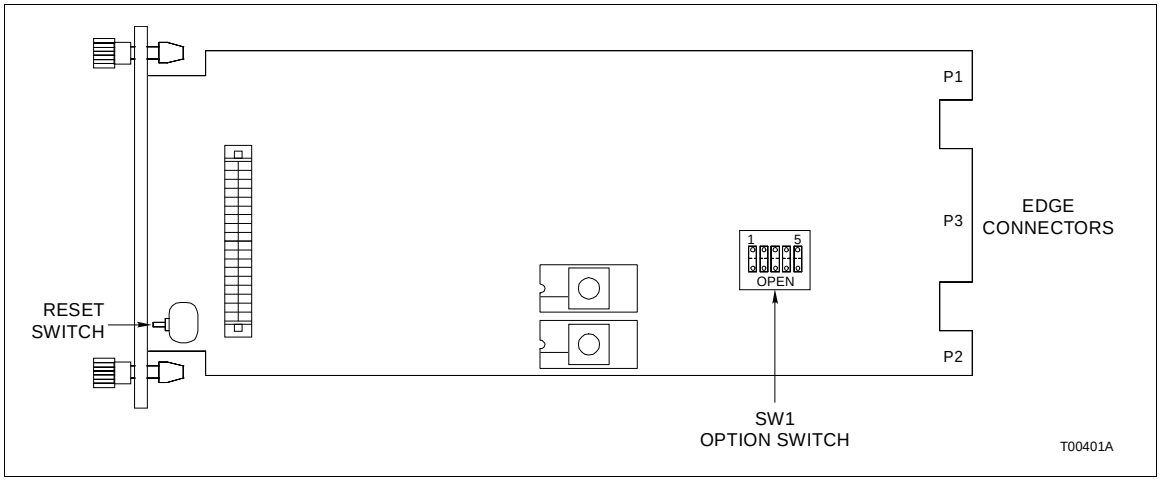

Figure 3-3. BTM Switch (SW1) Location

Table 3-8. BTM Options (SW1)

Switch Position 1 2 3 4 5	Function	User Setting
0 0 0 0 0	Normal operation.	
0 0 0 1 0	Normal BTM operation without catastrophic error checking (for Test Purposes ONLY).	
0 0 1 0 0	RAM test mode. If Status LED turns red, the module has failed the test.	
0 0 1 1 0	ROM test mode. If Status LED turns red, the module has failed the test.	
0 1 0 0 0	Execute Interrupt Request (IRQ) LIM handshake diagnostic. Used in combination with the LIM off-line diagnostics.	

NOTE: 0 = Closed (on), 1 = Open (off)

TERMINATION UNIT (MODULE) CONFIGURATION

Two of the interface modules (INLIM03, INPPT01) require termination. The INPPT01 terminates with the NTMF01 or NIMF01/NIMF02. The INLIM03 terminates with the NTCL01 or NICL01. Appendices A through D contain disphunt configuration information. Figure 3-4 shows a diagram of the NTMF01 and NTCL01 in a redundant installation. Figure 3-5 shows a diagram of the NIMF01/NIMF02 and NICL01 in a redundant installation.

NTMF01/NIMF01/NIMF02 Configuration

The TMF and IMF provide the INPPT01 with two RS-232-C ports. Configure these ports to operate as DTE, DCE or diagnostic terminal. Refer to Figures A-1, A-2, and A-3 for NTMF01 dipshunt configurations. Refer to Figures C-1, C-2, and C-3 for NIMF01/NIMF02 dipshunt configurations.

> **NOTE:** You must use the NIMF01 and NIMF02 when using termination modules to terminate a redundant interface. Non-redundant interfaces need only the NIMF01.

ONE-WAY CONTROL

Configure port 0 on the local and remote interfaces to act as DTE. One local INPPR01 can communicate with up to 32 remote interfaces in the one-way control mode. Additional communication equipment such as a modem network, radio link or microwave link is required when interfacing multiple remotes. The user supplies any additional equipment that is needed.

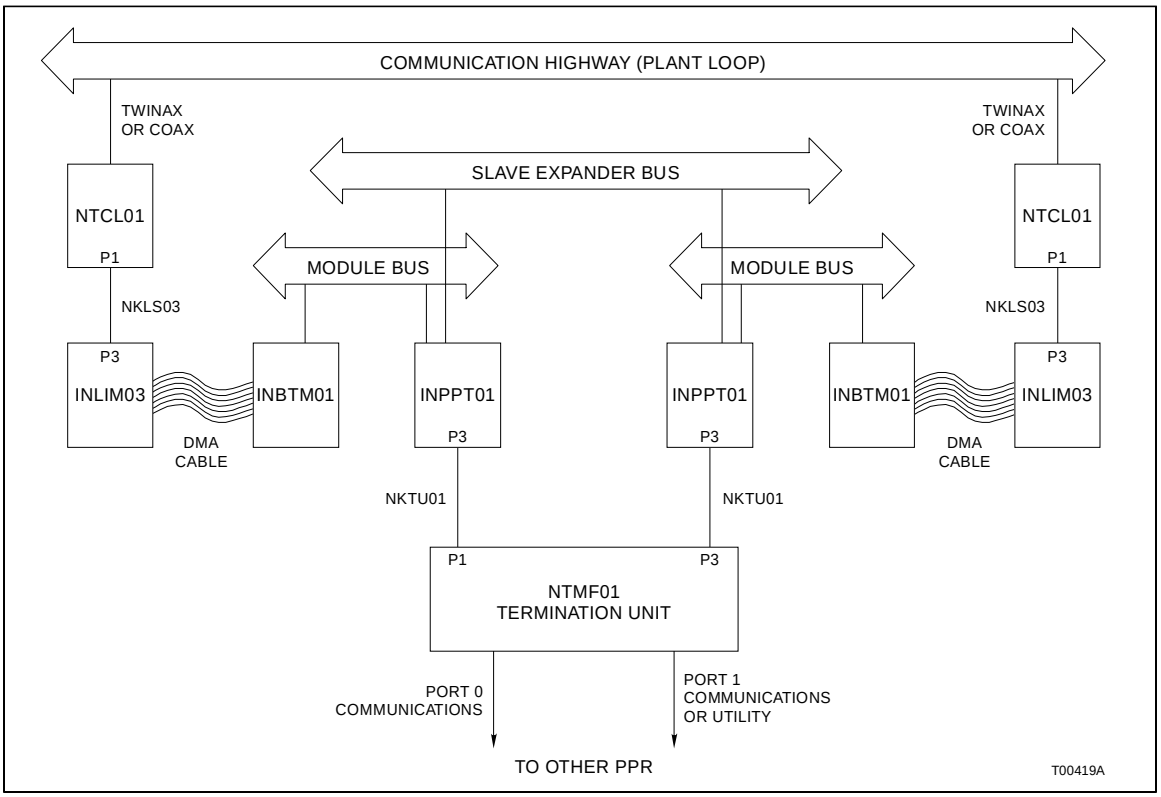

Figure 3-4. NTMF01 and NTCL01 in a Redundant Installation

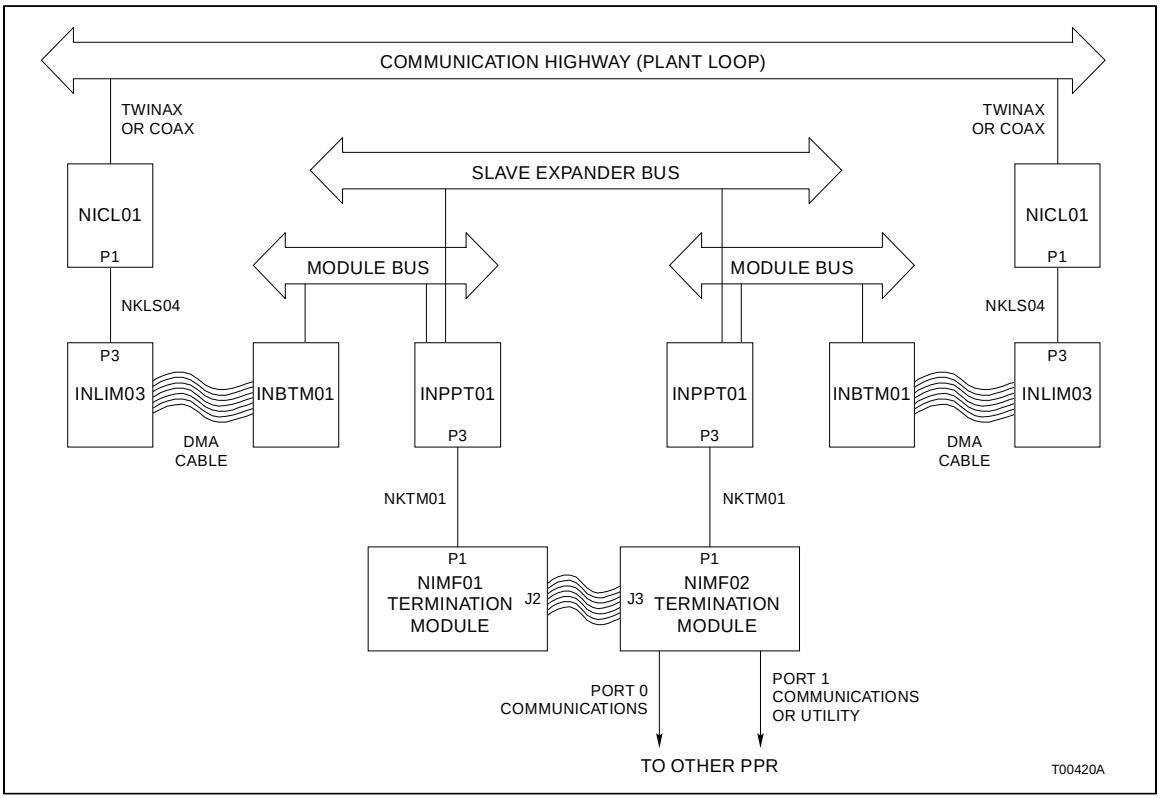

Figure 3-5. NIMF01/NIMF02 and NICL01 in a Redundant Installation

When directly connecting only one remote interface in one-way control, set port 0 on the local interface to act as a DTE. Set port 0 on the remote interface to act as DCE.

> **NOTE:** Always configure port 1 as a utility port if it is not used as an interface communication port. The PPT option switch (U72) position 4 must be set to 0 (utility option). Port 1 will always act as a DCE in this configuration.

TWO-WAY CONTROL

The interface requires both serial communication ports in the two-way control mode. Connect port 0 of the local Plant Loop to port 0 of the remote Plant Loop. Connect port 1 of local Plant Loop to port 1 of the remote Plant Loop.

Configure the termination unit to act as DTE to enable the Plant Loop to Plant Loop Transfer Module to communicate with DCE (i.e, a modem). Configure the termination unit to act as DCE to enable the PPT to communicate with DTE (i.e., a terminal). Figure A-4 shows how the termination dipshunt configuration directs the RS-232-C signals.

NTCL01/NICL01 Configuration

The TCL and ICL provide the INLIM03 with Plant Loop termination. The user has the option of using Twinax or Coax cable to connect the interface to the Plant Loop. Tables B-3 (NTCL01) and D-3 (NICL01) show the jumper settings for twinax and coax cables. Set the jumpers accordingly for your application.

> **NOTE:** For complete cable and TU/TM installation information, refer to the ***Termination Unit Manual*** (***I-E93-911***).

INSTALLING THE INTERFACE MODULES

If the switch settings on the interface modules are complete, they are ready to be installed in the Module Mounting Unit (MMU).

Installing the INPPT01

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 arrlere du chassis de montage de modules (MMU). Toute negligence a cet egard constitue un risque de choc pouvant entrainer des blessures graves, voire moretlles.**

To install the PPT:

1. Verify the PPT slot assignment in the MMU.

   a. If you are installing redundant PPTs, install a 24 pin disphunt in the Slave Expander Bus socket between the slot used by the primary PPT and the slot used by the secondary PPT. Both PPTs must reside on the same Slave Expander Bus.

   b. Each PPT must reside on its own module bus.

2. Attach the hooded end of the cable (NTKU01 for the NTMF01; NKTM01 for the NIMF01 and NIMF02) to the MMU backplane cable connector opening for the PPT. The other end of the cable attaches to the termination unit or backplane of the Termination Mounting Unit (NTMU01).

3. Guide the top and bottom edges of the circuit card along the top and bottom rails of MMU.

4. Slide the module into the slot; push the module until the front panel is flush with the top and bottom of the MMU frame.

5. Turn the two captive latches a half turn to lock the module in place.

Installing the INLIM03 and INBTM01

The LIM and BTM should be installed as a pair in adjacent slots. To install the LIM/BTM:

1. Verify the MMU slot assignments for the modules. If you are installing redundant LIM/BTM pairs, each BTM must be installed on the module bus that belongs to its related PPT.

2. Attach the hooded end of the cable (NKLS03 for NTCL01; NKLS04 for the NICL01) to the MMU backplane cable connector opening for the LIM. The other end of the cable attaches to the termination unit or TMU backplane.

3. Connect one end of the Bailey supplied ribbon cable (DMA cable) to the P4 connector on the LIM. Connect the other end of the DMA cable to the P4 connector on the BTM (see Figures 3-2 and 3-3).

4. Guide the top and bottom edges of both circuit cards along the top and bottom rails of adjacent slots in the MMU.

5. Slide the modules into the slot; push the module until the front panels are flush with the top and bottom of the MMU frame.

6. Turn the two captive latches a half turn to lock the module in place.

INSTALLING A REDUNDANT INTERFACE

Installing a redundant interface requires an additional set of INPPT01, INLIM03 and INBTM01 modules. Both PPT modules must be on the same Slave Expander Bus, but reside on separate Module Bus. Each PPT has a pair of LIM/BTM modules on a dedicated Module Bus.

Observe the following conditions when installing a redundant interface:

1. U72 position 8 must be set to 0 on the primary PPT.

2. U72 position 8 must be set to 1 on the secondary PPT.

3. SW1 all positions must be set to 0 on both BTMs.

4. The slave expander bus of two adjacent MMUs (one on top of the other) are connected with the expander bus extender cable (Bailey P/N 1958502A0340).

5. The module bus between these MMUs are not connected.

Applications that use redundant communication equipment may require additional hardware. Figure 3-6 shows a diagram of the interface using the IMDSM05 to enable redundant transceivers. Function Code 130 provides the software the PPT needs to enable the transceivers. Voltage levels and polarities of enable signals to transceivers and other communication equipment may vary. Refer to the applicable user manual when connecting this equipment to the IMDSM05, IMDSO01/02/03/04 Digital Slave Module.

INTERFACE CONFIGURATION

The user must configure the PPT with the proper function codes before it can be placed into service. The PPT configuration determines interface operating characteristics such as time synchronization, serial communication rate, node definition, point definitions and general execution characteristics.

Table 3-9 lists the function codes used by the INPPR01. Refer to the ***Function Code Application Manual*** (***I-E93-900-20***) for information about the function codes in Table 3-9.

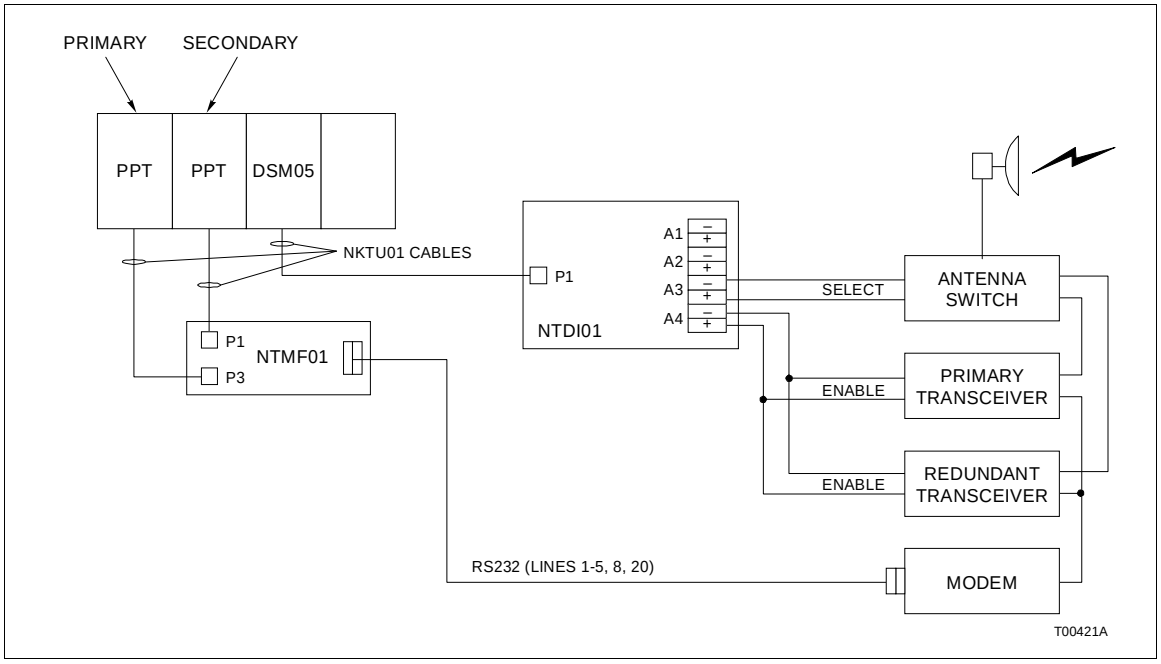

Figure 3-6. Redundant Transceiver

Table 3-9. INPPR01 Function Codes

Function Code	Title
FC 127	Plant Loop Gateway Node Map
FC 130	Plant Loop Gateway Executive
FC 131	Plant Loop Gateway Point Definition