

## Input Binary Function Module

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\* Indicates changes since the last printing.



# Introduction

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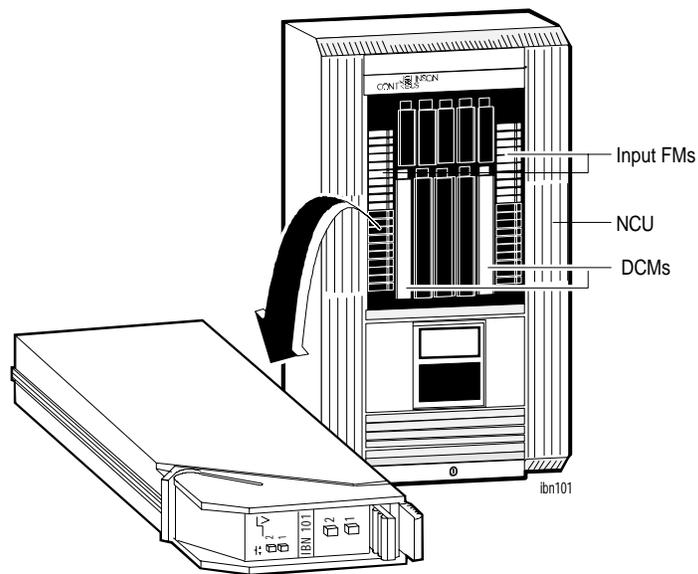
## *Description*

The Input Binary (IBN) Function Module is a signal conditioning device that interfaces incoming field signals to the DCM. The IBN converts field data from two different binary inputs to a voltage for use by the DCM.

The inputs are available as either:

- binary (open/closed) state of dry contacts
- high/low input voltage levels

The IBN Function Module plugs into any of the top ten slots associated with the DCM. Figure 1 shows typical function module locations in the NCU. A five slot panel is pictured.



**Figure 1: IBN Function Module Locations**

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**Application**

The IBN Function Module is typically used to:

- monitor the status of an air or water flow switch
- monitor the presence of voltage at a pilot light

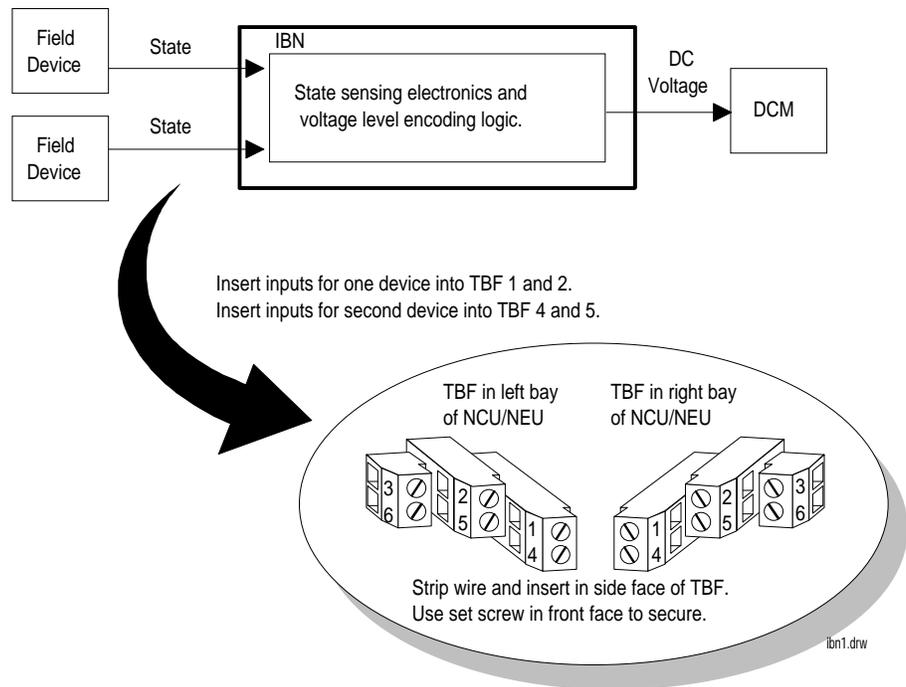
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**Capabilities**

**Table 1: Capabilities**

Capability	Description	Purpose
<b>Input from Field</b>	Field devices input two independent, binary state inputs on two channels. Each state can be either: - Contacts (closed vs open) - Voltage (high vs low)	Provides interface of two binary field signals to the DCM.
<b>Input Type Switch</b>	Two 2-position switches select type of input, one for each channel. The input types are: - Contacts (closed vs opened) - Voltage (high vs low)	Each channel is easily configured for different input types.
<b>LED Indicators</b>	A green LED for each input channel indicates the channel state. ON = closed/high	Provides user at the NCU with direct, simple access to current state information.
<b>Output to DCM</b>	Module outputs a DC voltage level according to the input states.	Provides direct, plug-in connection to the DCM.

The figure below is a simplified function diagram of the IBN Function Module.



**Figure 2: IBN Function Diagram**

The process is:

- Up to two field devices provide input signals to the IBN in the form of contact closure or high/low voltage.
- Manual switch selections on the IBN identify the type of input (high/low voltage or contact closures) for each field device.
- State sensing electronics in the IBN track the inputs and encode the current state of the two inputs into an analog output signal (DC voltage).
- Individual LEDs indicate the state of each input. The function of these LEDs cannot be redefined in the field.
- The DCM receives the analog signal (DC voltage) and decodes it. The states are entered in the data files for the two point objects associated with the field device inputs.

## Specifications

**Table 2: Specifications**

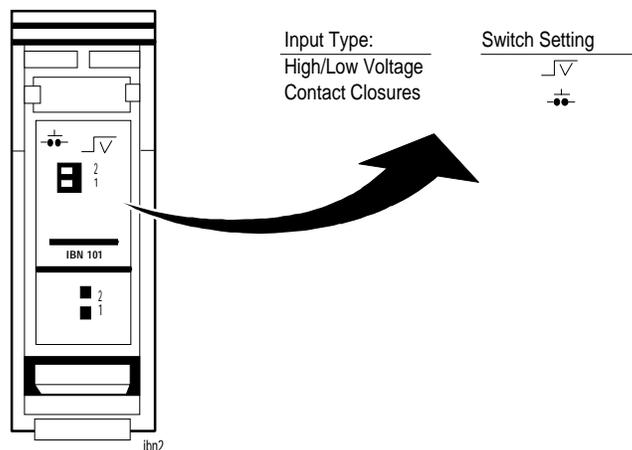
Category	Specifications For Configurations
Product Code Number	FM-IBN101-0
Input Range	Two states indicated by high/low voltage, or by contact closure
Input Threshold	High/low voltage mode > 8V for "ON" < 2V for "OFF" Contact closure mode < 100K ohm for "ON" >800K ohm for "OFF"
Input Limits	Maximum input voltage: 120V DC or RMS (non-destructive)
Input Resistance	>330K ohm (differential). >165K ohm from each input to analog common
Input-Output Characteristics	Four DC output voltage levels corresponding to input states
Output Range	One of four DC voltage ranges, all between 0.05 and 10.5 volts
Response Time	100 msec (max.)
Source Power	Power is from the DCM and NCU/NEU.
Operating Environmental Requirements	32 to 122°F (0 to 50°C). 10 to 90% noncondensing relative humidity 86°F (30°C) maximum dew point
Storage/Shipping Environmental Requirements	-40 to 158°F (-40 to 70°C). 5 to 95% noncondensing relative humidity 86°F (30°C) maximum dew point
Size	0.85 in. H x 2.6 in. W x 7.0 in. L (2.2 cm H x 6.6 cm W x 17.8 cm L)
Weight	0.5 lb. (0.22 kg)
Agency Compliance	FCC Part 15 Subpart J—Class A, UL 916, CSA C22.2 No. 205
Agency Listings	UL Listed and CSA Certified as part of Metasys®

# Engineering

## *Wiring Guidelines*

When installing and connecting function modules:

- follow NEC and local codes
- observe maximums as specified in the specifications table and in these installation guidelines
- use the switches on the module front to select the type of input. See Figure 3 below.



**Figure 3: Switch Settings**

Six kinds of applications that input to the IBN are described on the following pages. Three common applications connect to the IBN without alteration to the circuit:

- devices wired across a load
- devices wired across non-grounded (dry) contacts
- devices in contact mode with open inputs and one side grounded

Three other applications require a small modification before connecting to the function module because unloaded IBN voltage inputs are sensitive to noise, especially when one of the input lines is earth grounded. This noise results in faulty readings.

- unpowered Triac or SCR contact
- high powered (> 1 amp) non-wiping contact
- neon lamp applications

Wiring methods for each of the six applications are shown on the following pages.

### Binary Input Wired Across the Load

A binary input wired across the load is a typical wiring configuration and requires no alteration to the circuit. Set the IBN mode switch to voltage. Examples of these loads include:

- fan motors
- pumps
- lights
- compressors

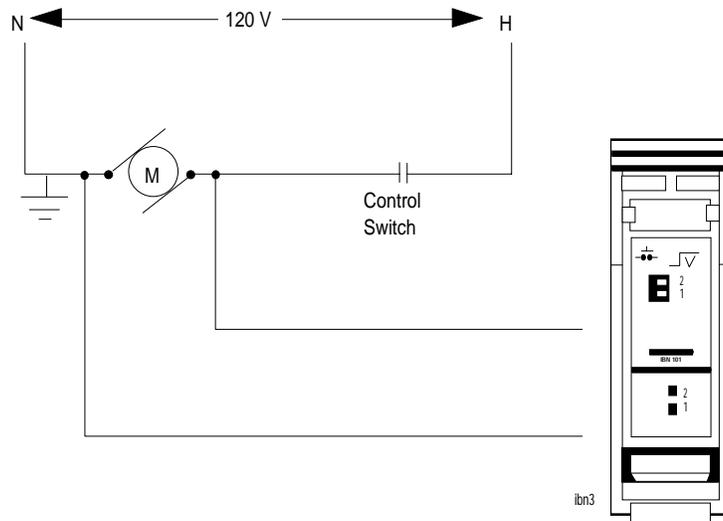


Figure 4: Wiring Across the Load

For applications normally wired across the load, make sure you don't wire across the control switch.

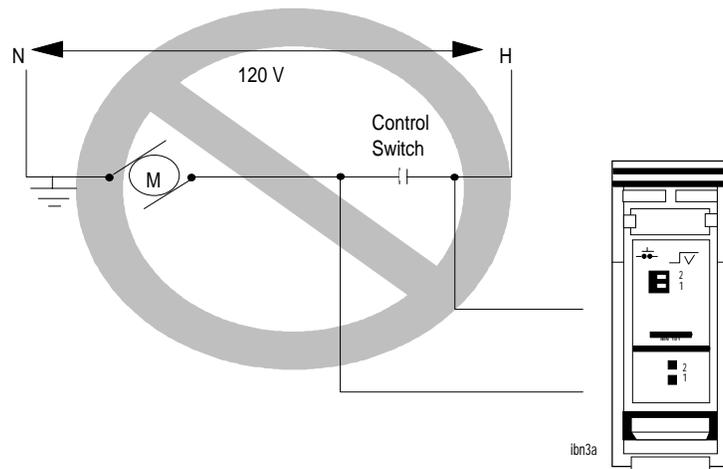


Figure 5: Incorrect Wiring Method (Across Control Switch)

### Binary Input Wired Across the Dry Auxiliary Contacts

A binary input wired across the dry auxiliary contacts is a second typical wiring configuration. It also requires no alteration to the circuit. Set the IBN mode switch to contact. Examples of these loads include:

- starters for motors or pumps
- retrofits where control contacts are already in place
- high-voltage devices controlled by auxiliary contacts

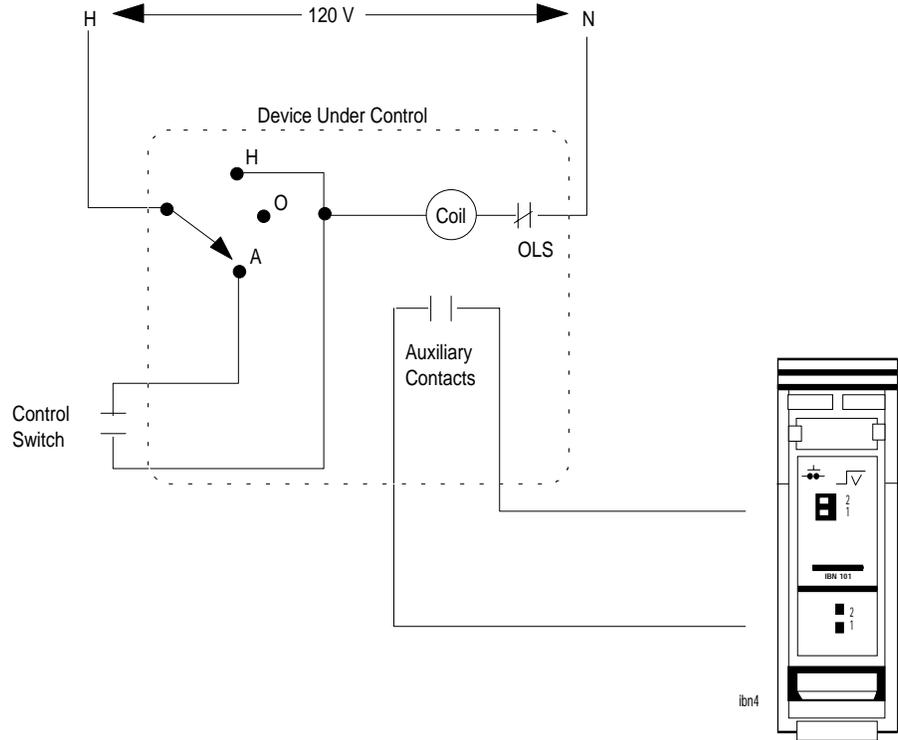


Figure 6: Wiring Across Dry Contacts

### Open Inputs With One Side Grounded

If an open input device is wired to ground on one side of the circuit, set the IBN switch to contact mode to provide accurate readings.

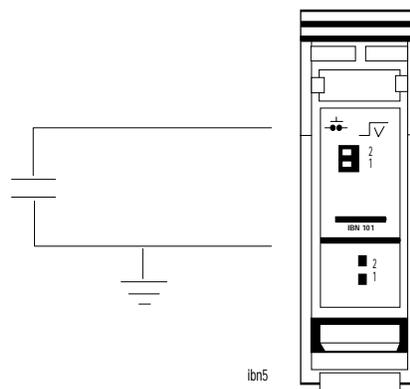


Figure 7: With Open Binary Inputs and One Side Grounded, Set IBN Switch to Contact Mode

**Unpowered Triac or SCR**

If the input device leading to the IBN is an unpowered Triac or SCR circuit, an antenna is created when the contact is open. Connect a voltage bias circuit to add a power line and ground to the previously ungrounded side for reference. The following equation defines the resistor size in the added bias circuit:

$$\text{Resistor} = \frac{\text{Voltage Supply} - 1.6}{\text{Current Holding}}$$

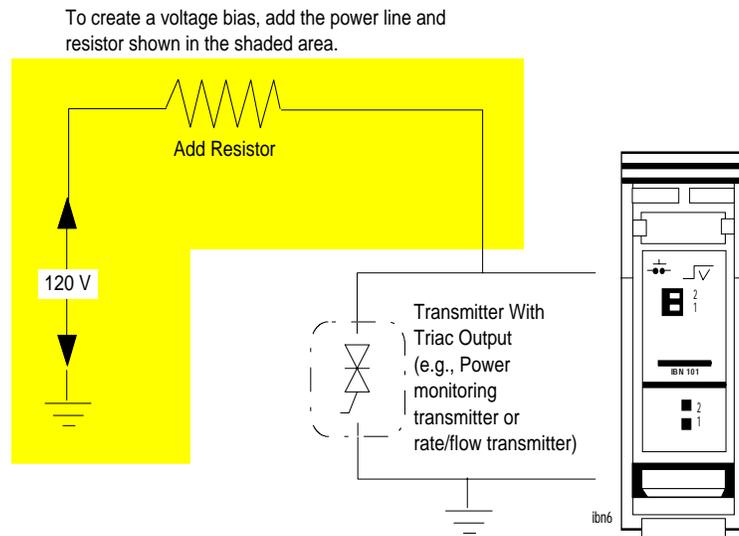
The holding current is listed in the Triac or SCR rating.

Determine the wattage of the added resistor by either of these two equations (power is doubled in the equations to accommodate safety standards):

$$P = 2I^2R$$

$$P = \frac{2E^2}{R}$$

Set the IBN switch to voltage mode.



**Figure 8: Adding a Voltage Bias Circuit to an Unpowered Triac or SCR Device**

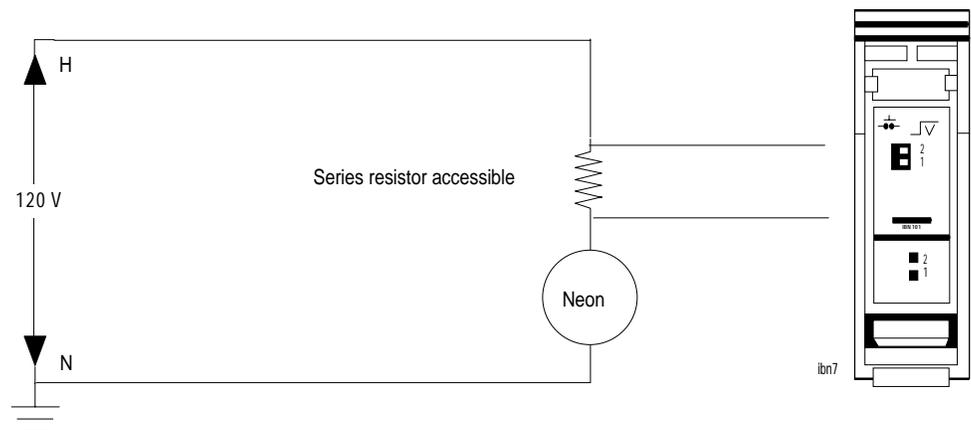
**High Powered (>1 Amp) Non-Wiping Contact**

An example of this kind of device is the KZ-4000 series relay. Since corrosion may form on the contacts, use of a voltage bias circuit will overcome resistance caused by the corrosion. Add the voltage bias circuit to the device in the manner illustrated above, using a 100K ohm, 1/2 watt resistor. Set the IBN switch to voltage mode.

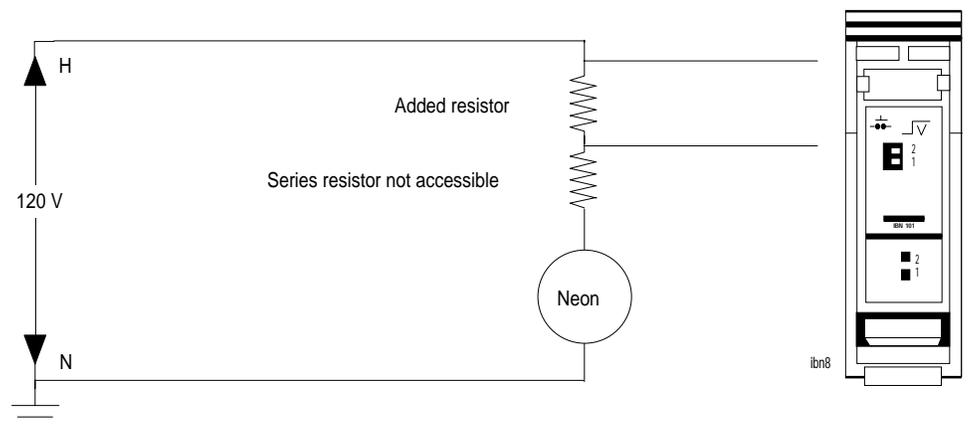
## Neon Lamps

In neon lamp applications, the circuit appears open when the lamp is off. That grounds the binary input at one side and leaves a long wire on the other, acting as an antenna and making the circuit very sensitive to noise. Any of the following modifications will keep a load across the input:

- Add a pilot relay. (Set the IBN switch to contact mode.)
- Connect across the lamp's built-in resistor, if it is accessible. (Set the IBN switch to voltage mode.)
- Sense across an added series resistor, one tenth the size of the built-in resistor. Use this method when the built-in resistor is difficult to access. (Set IBN switch to voltage mode.)

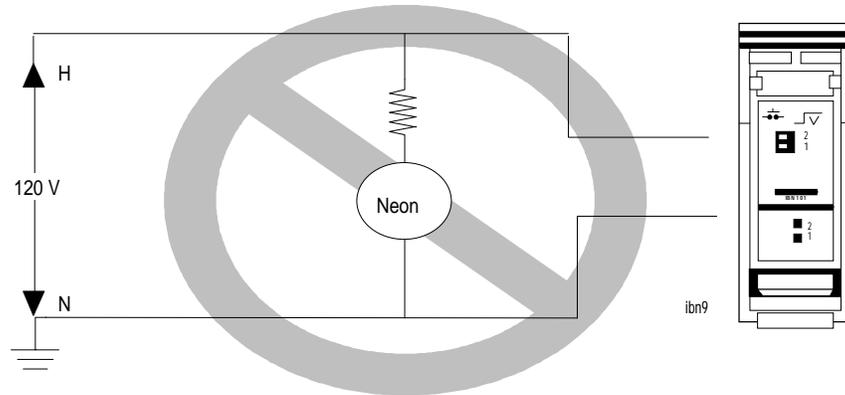


**Figure 9: Connecting Across the Resistor for Neon Lamp Applications**



**Figure 10: Sensing Across the Added Series Resistor for Neon Lamp Applications**

Do not connect a neon lamp device in the following manner, which still leaves the circuit open when the lamp is off and allows for noise to collect on the “antenna” of the ungrounded side.



**Figure 11: Incorrect Wiring for Neon Lamp Application**

# Commissioning Procedures

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## ***Physical Installation***

### **Assumptions**

The following procedure for the physical installation of the Input Binary (IBN) Function Module assumes:

- NCU/NEU panel is installed.
- Connections to field devices are complete.
- You have engineering drawings defining details for the installation.
- You are familiar with Metasys Network terminology, and the location and operation of power switches.

### **Procedure**

For each IBN Function Module in the network, perform the following steps.

1. Set Input Type switch for contact or voltage inputs. See the *Wiring Guidelines* section for an explanation of switch selections.
2. Refer to Figures 3 to 11, and identify the proper panel and slot number location for this module.
3. Open the latch.
4. Insert the module in the appropriate slot.
5. Close latch, locking function module in place.

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**Software  
Verification**

The following procedure for the software verification of the IBN Function Module assumes:

**Assumptions**

- Physical installation at the NCU/NEU panel is complete, including NCM, DCM, FM, etc.
- The operating software for the network has been downloaded to the NCM controlling the panel.
- An Operator Workstation is available.

**Procedure**

For each IBN Function Module in the network, perform the following steps.

1. Select the System summary that includes this IBN object.
2. Verify that the point object defined in the System summary, the function module, and the field devices, are connected as defined by the engineering drawing. Correct if necessary.
3. Verify that the object's Value attribute (as seen in the summary) matches the actual value for the field devices.
4. Change State of each field device, and verify that the IBN object's Value attributes change accordingly.

# Troubleshooting Procedures

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## *Troubleshooting Chart*

Use the diagram in Figure 12 (next page) as a troubleshooting guide. It applies for failures between point objects and field devices connected through an IBN Function Module.

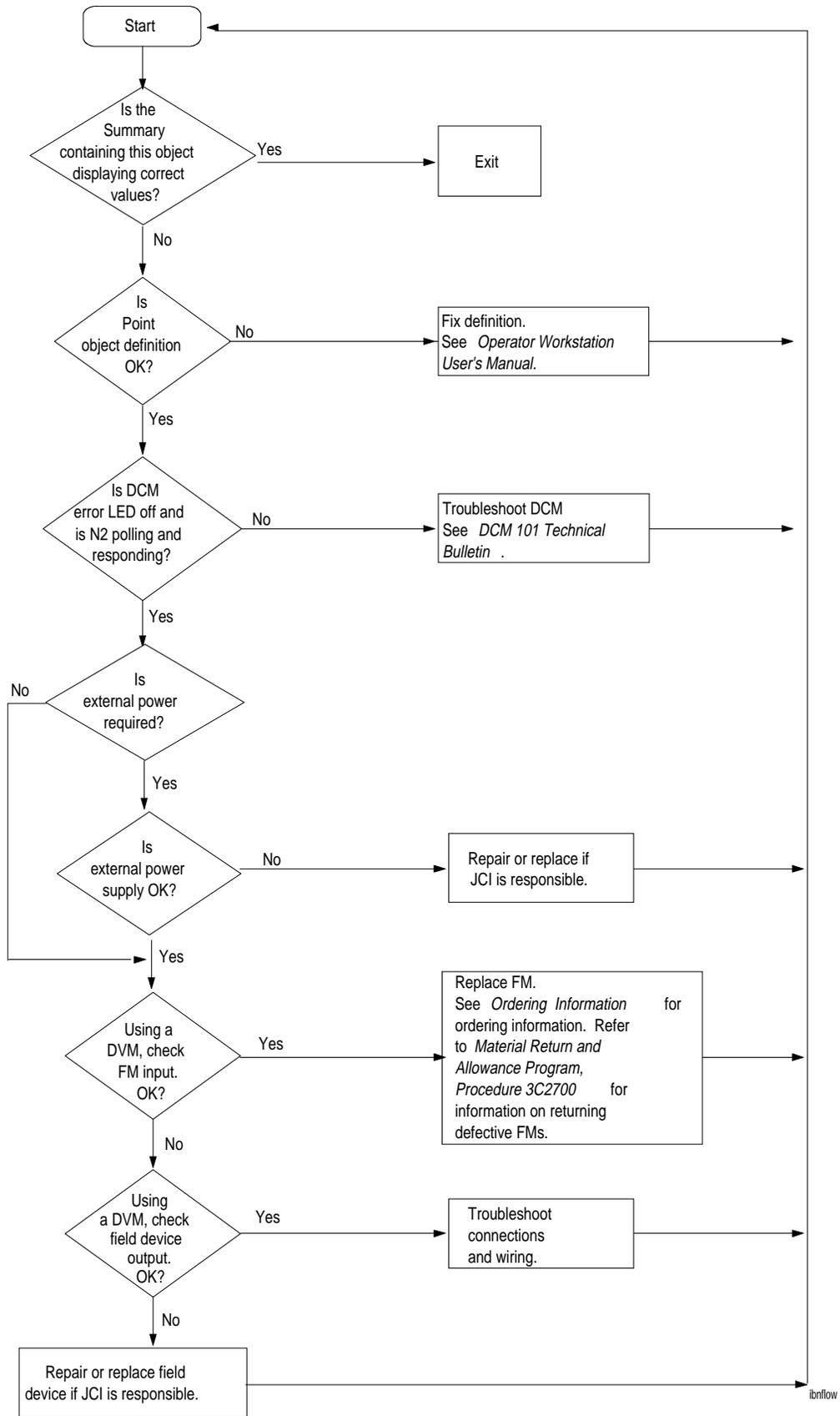


Figure 12: Troubleshooting

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**Ordering  
Information**

**Table 3: Code Number**

Description	Product Code Number
IBN Function Module	FM-IBN101-0

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## Notes

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## Notes

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# Notes



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