DF1 Router

Honeywell Serial Interface setup

Technical Application Note

A-DF1R

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CONTENTS

1. PREFACE

1.1. PURPOSE OF THIS DOCUMENT

This document will assist the user to setup the Honeywell Serial Interface module to communicate with Logix/PLC-5/SLC via the DF1 Router.

1.2. ADDITIONAL INFORMATION

The following resources contain additional information that can assist the user with the module installation and operation.

Resource	Link
Slate Installation	http://www.aparian.com/software/slate
DF1 Router User Manual DF1 Router Datasheet Example Code & UDTs	http://www.aparian.com/products/df1router
Ethernet wiring standard	www.cisco.com/c/en/us/td/docs/video/cds/cde/cde205_220_420/installation/guide/cde205_220_420_hig/Connectors.html
CIP Routing	The CIP Networks Library, Volume 1, Appendix C:Data Management
Map PLC/SLC messages	SLC to CompactLogix Migration Guide: Chapter 3 – Map PLC/SLC Messages (1769-ap001_-en-p.pdf) EtherNet/IP Network Configuration: Chapter 5 – Mapping Tags (enet-um001_-en-p.pdf)

1.3. SUPPORT

Technical support will be provided via the Web (in the form of user manuals, FAQ, datasheets etc.) to assist with installation, operation, and diagnostics.

For additional support the user can use either of the following:

Contact Us web link	www.aparian.com/contact-us
Support email	support@aparian.com

2.   APPLICATION DESCRIPTION

The Aparian DF1 Router can be used to enable the Honeywell TDC 3000 Serial Interface (SI) to exchange data with Logix, SLC, and PLC-5 controllers. The below diagram is an example of a typical network setup.
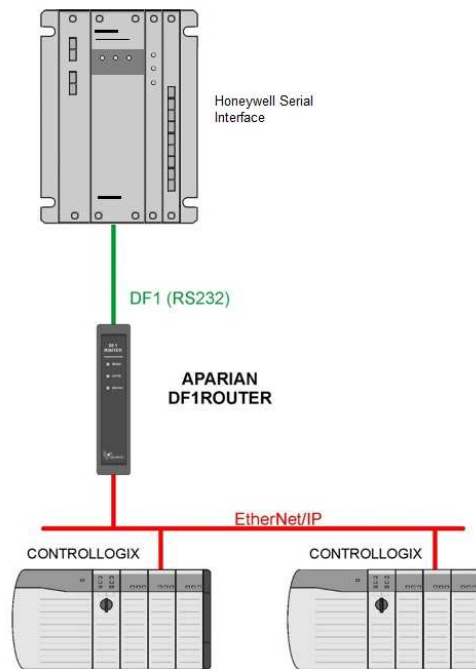

FIGURE 1 - EXAMPLE OF A TYPICAL NETWORK SETUP

When setup correctly the Honeywell TDC 3000 will request data via the SI which will send a DF1 message request (over RS232) to the DF1 Router. The DF1 Router will then convert this message to the required format and relay it to the configured Logix, SLC, or PLC-5 controller.

3.   SETUP

The following sections will describe the installation and configuration of all the required devices to assist the user with the initial setup.

3.1. SERIAL CABLE WIRING

The serial cable pinout is shown in the figure below:
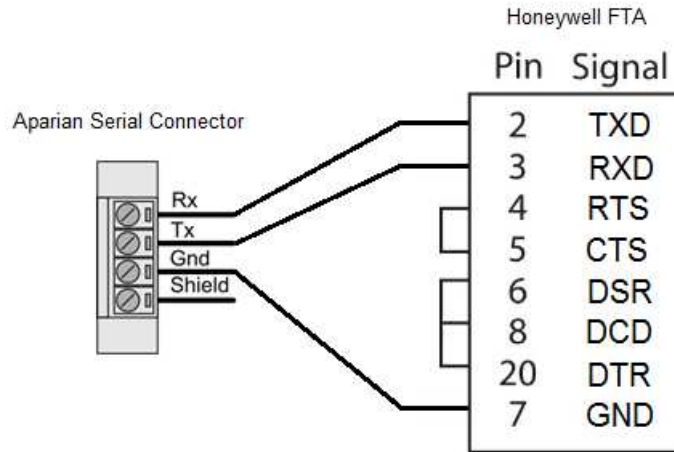

FIGURE 2 – SERIAL CABLE PINOUT

3.2. DF1 ROUTER SETUP

3.2.1. MAPPING

The DF1 Router must be setup in either Transparent PCCC mode or Reactive Tag mode. In Transparent PCCC mode the Logix PLC mapping will be used to route the PLC-5 (or PLC-2) emulated messages to Logix Tags. In Reactive Tag mode the DF1 Router will map the PLC-5 (or PLC-2) emulated messages directly to Logix Tags.

3.2.1.1.   TRANSPARENT PCCC MODE

In transparent mode the DF1 Router will redirect a DF1 PCCC message to a Logix controller at a preconfigured path. Therefore, in this mode, the module will rely on the Logix controller to map the DF1 request to the preconfigured Logix tag.

The transparent map configuration is a two-step process. First the DF1 Router must be configured to route specific DF1 addresses to a controller path. The second step is to map the DF1 addresses to Logix tags using RSLogix 5000.

To open the transparent map configuration window by double clicking on the module in the tree or right-clicking the module and selecting *Configuration.* Once in the configuration

window select the third tab at the top *Transparent PCCC*. The transparent PCCC map configuration is shown in the figure below.
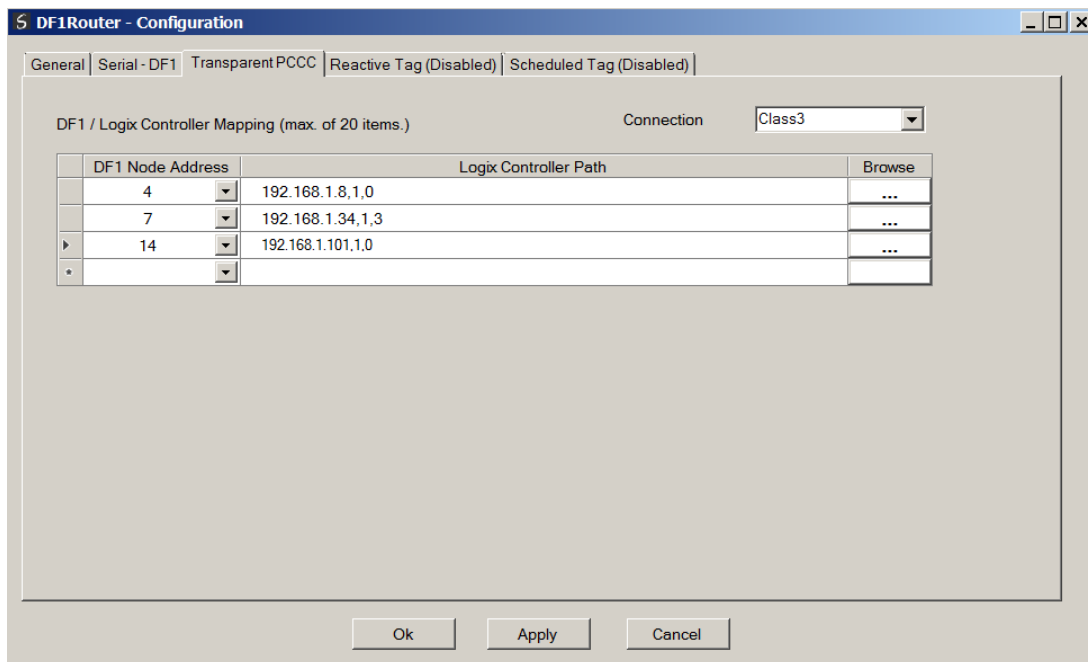

FIGURE 3 - TRANSPARENT MAP CONFIGURATION

The module can emulate more than one destination DF1 Node Address, and thus route multiple messages to different Logix controllers. For this reason it is important to enter the correct associate DF1 Node address in each mapping record.

When using PCCC messaging the connection class can be configured by selecting either Class 3 or Unconnected (UCMM) messaging. This is done by selecting from the Connection drop-down box in the Transparent PCCC tab.

The Logix controller paths can either be entered manually or the user can browse to them by clicking the Browse button. The Target Browser requires the controller to be available on the network. The Target Browser will open and automatically scan for all EtherNet/IP devices.

If the Ethernet/IP module is a bridge module, it can be expanded by right-clicking on the module and selecting the Scan option.
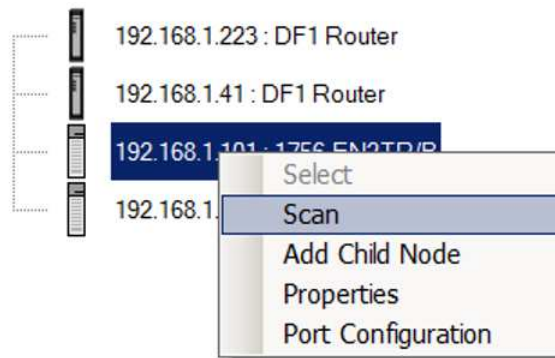
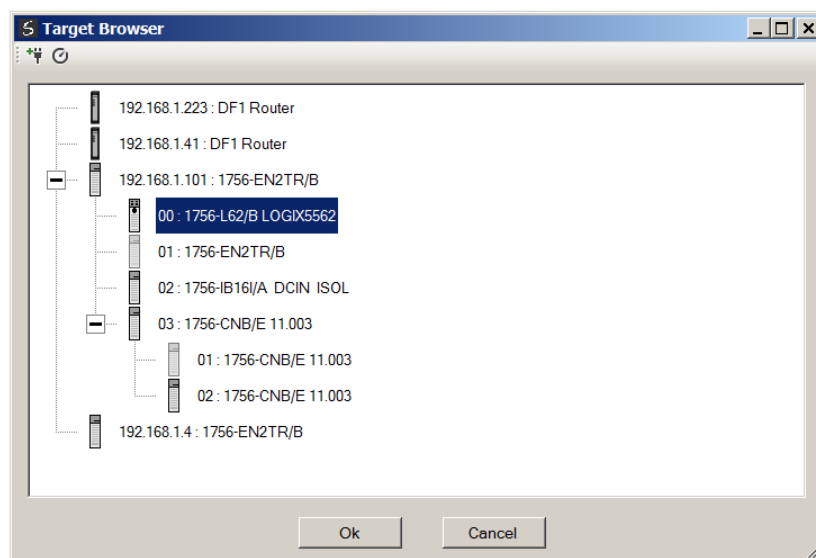FIGURE 4 - SCANNING NODE IN THE TARGET BROWSER

FIGURE 5 - TARGET BROWSER SELECTION

The required Logix controller can then be chosen by selecting it and clicking the Ok button, or by double-clicking on the controller module.

A maximum number of 20 controller mapping entries can be added.

The DF1 message initiator (e.g. DCS gateway) will send a read or write request to a specific DF1 address on RS232. The user must configure the DF1 Router to route the message destined for a specific DF1 address to a Logix controller. This will allow the correct Logix controller to map the request to the Logix PLC/SLC mapped tag. For each route map the user must enter two parameters as described in the table below.

Parameter	Description
DF1 Node Address	This parameter is one of the destination addresses that the DF1 Router will accept. Thus when the DF1 message initiator sends a message to a specific DF1 node address that has been configured in the module it will be accepted and routed to the paired Logix Controller Path. This is the destination node address of the message, and not the source address of the DF1 device.
Logix Controller Path	The CIP path to the end device (e.g. Logix controller). Refer to the additional information section in this document for references to details routed CIP path information. For example: If the controller (slot 0) is in a chassis with a Ethernet bridge (IP address 192.168.1.20) connected to the local network the user would follow the format; *Ethernet bridge IP address, chassis backplane port, module slot etc.* 192.168.1.20,1,0

TABLE 1 - TRANSPARENT MAP PARAMETERS

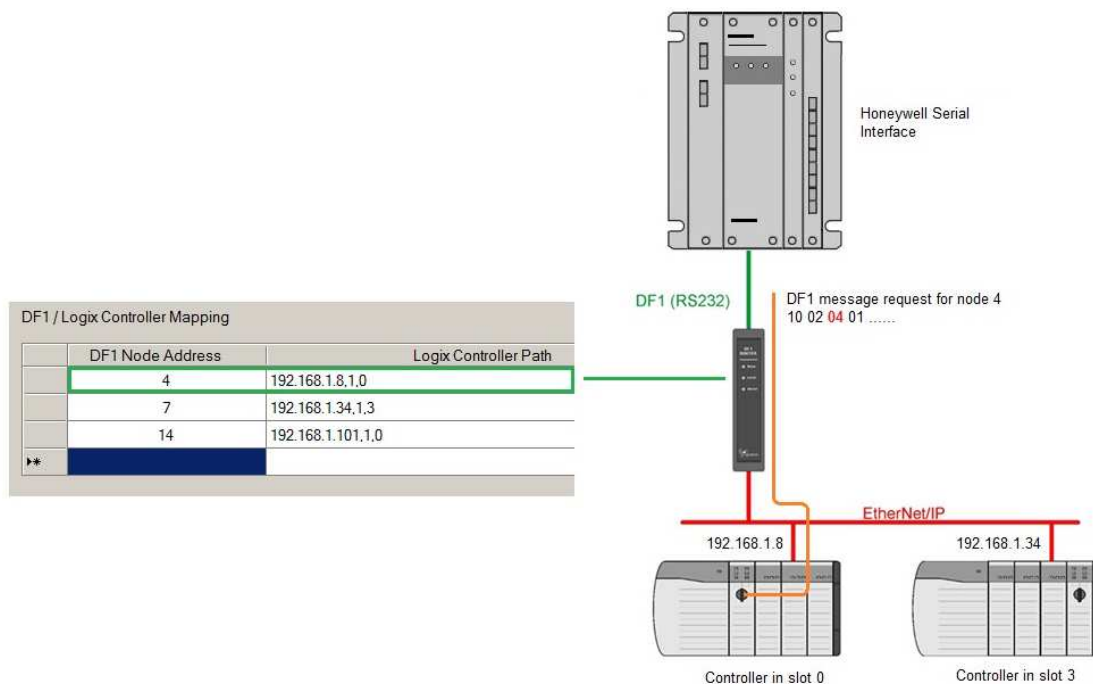Below are two examples of how DF1 messages are routed to the Logix controller.

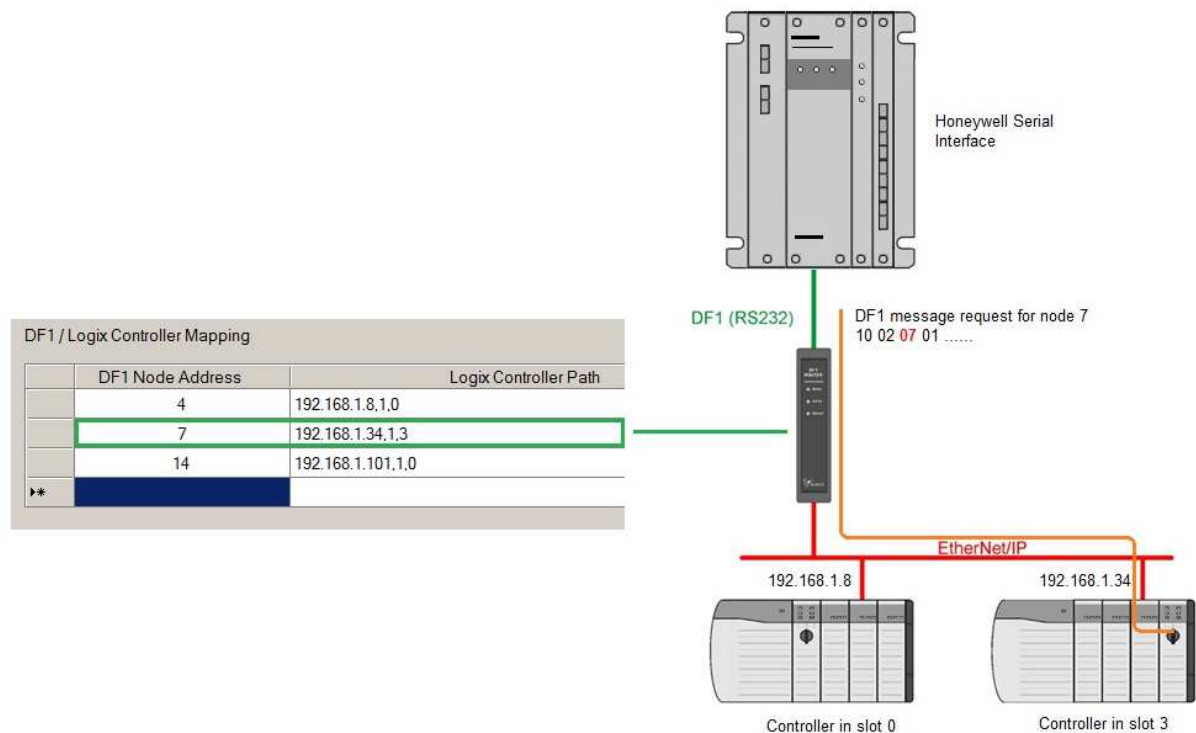FIGURE 6 – EXAMPLE 1 - TRANSPARENT ROUTING MAP – NODE 4

FIGURE 7 – EXAMPLE 2 – TRANSPARENT ROUTING MAP – NODE 7

3.2.1.2. REACTIVE TAG MODE

The Reactive Tag routing mode allows mapping of virtual Data Files to Logix tags across multiple controllers. This is similar to the Transparent PCCC mode except the mapping of data files to Logix tags, is no longer managed in Logix, but in the DF1 Router itself.

Thus the routing of the Node address to Logix controller as well as DF1 File Number to a Logix tag is managed by the DF1 Router where in transparent mode, the DF1 File Number was routed to a tag by the Logix controller. In the Reactive Tag mode the DF1 Router can operate completely independently from the Logix controller by directly reading and writing to Logix tags.
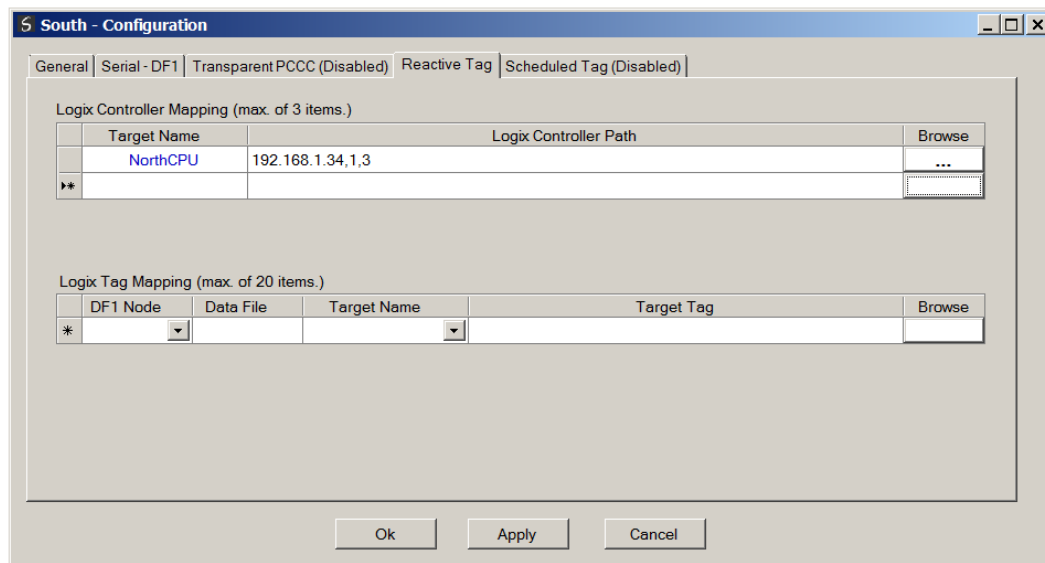
FIGURE 8 - REACTIVE TAG MODE CONFIGURATION

The Reactive Tag mode is configured in two steps. First the user must create a Target Name (CIP path to the destination Logix controller) which will be used to link the DF1 File Number to the destination Logix tag.

The Logix controller paths can either be entered manually or the user can browse to them by clicking the Browse button. The Target Browser will open and automatically scan for all available EtherNet/IP devices.

If the Ethernet/IP module is a bridge module, it can be expanded by right-clicking on the module and selecting the Scan option.
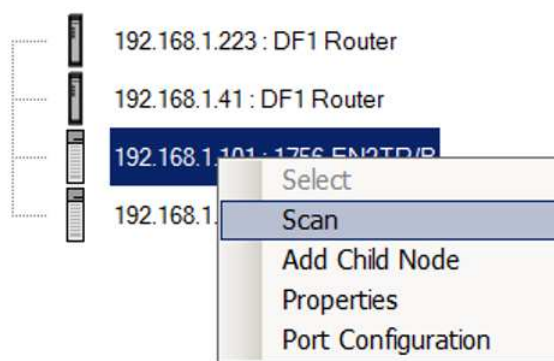

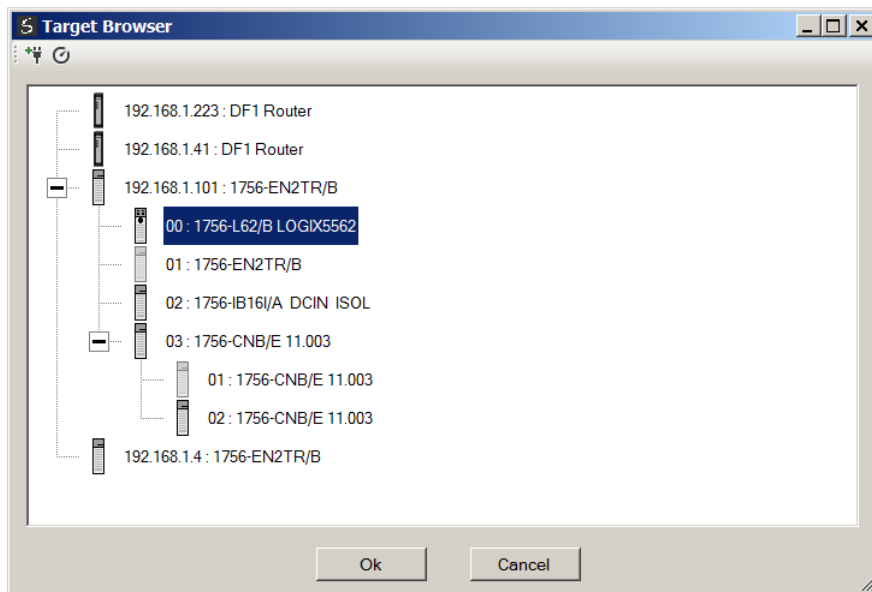FIGURE 9 - SCANNING NODE IN THE TARGET BROWSER

FIGURE 10 - TARGET BROWSER SELECTION

The required Logix controller can then be chosen by selecting it and clicking the Ok button, or by double-clicking on the controller module.

A maximum number of 8 controller mapping entries can be added.

The second part of the Reactive Tag mode is to configure the link between a DF1 node and File Number combination to a Logix tag. This will allow the DF1 message initiator to effectively write to, or read from, a Logix tag using traditional File Numbers (e.g. N7, F8, etc.).

FIGURE 11 – REACTIVE TAG MAPPING

The module can emulate more than one destination DF1 Node Address, and thus route multiple messages to different Logix controllers. For this reason it is important to enter the correct associate DF1 Node address in each mapping record.

The next column is used to enter the DF1 data file. It is important to enter only the file here (e.g. N11) and not a data word address (e.g. N11:0). The first element of the entered DF1 file (e.g. N11:0) will then map to the first element of the Logix array and so on.

Below is an example of the target tag selection. The Target Tag can be either entered manually or selected using the Tag Browser in Slate. The Tag Browser requires the controller to be available on the network.

To browse to the tag, click on the Browse button. The Tag Browser will open and scan all the tags inside that controller. If the controller has been recently scanned in this Slate session, then a cached version of the tags will be displayed. A rescan of the tags can be triggered by selecting the Refresh button in the Tag Browser's toolbar.

All the non-array tags will be disabled, guiding the user to select a suitable tag.

NOTE: When mapping PLC5 Boolean files (e.g. B3) it is recommended that the destination Logix tag be a SINT array, rather than a Boolean array. Using the latter may result in unexpected results due to the packing format of Logix Boolean arrays.
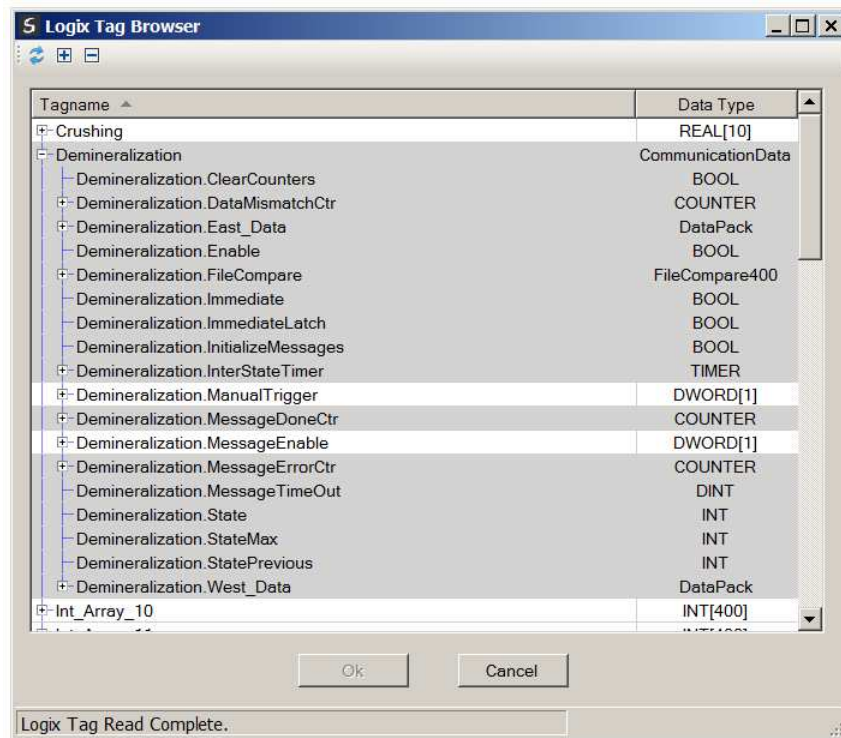
FIGURE 12 – TAG BROWSER TAG SELECTION

The two figures below is an example of how DF1 messages are routed to the Logix tags using the Reactive Tag Map mode.

NOTE: It is the user's responsibility to ensure that the Logix tag array datatype and size matches that of the DF1 File Number. Failing to do this can result in communication faults.
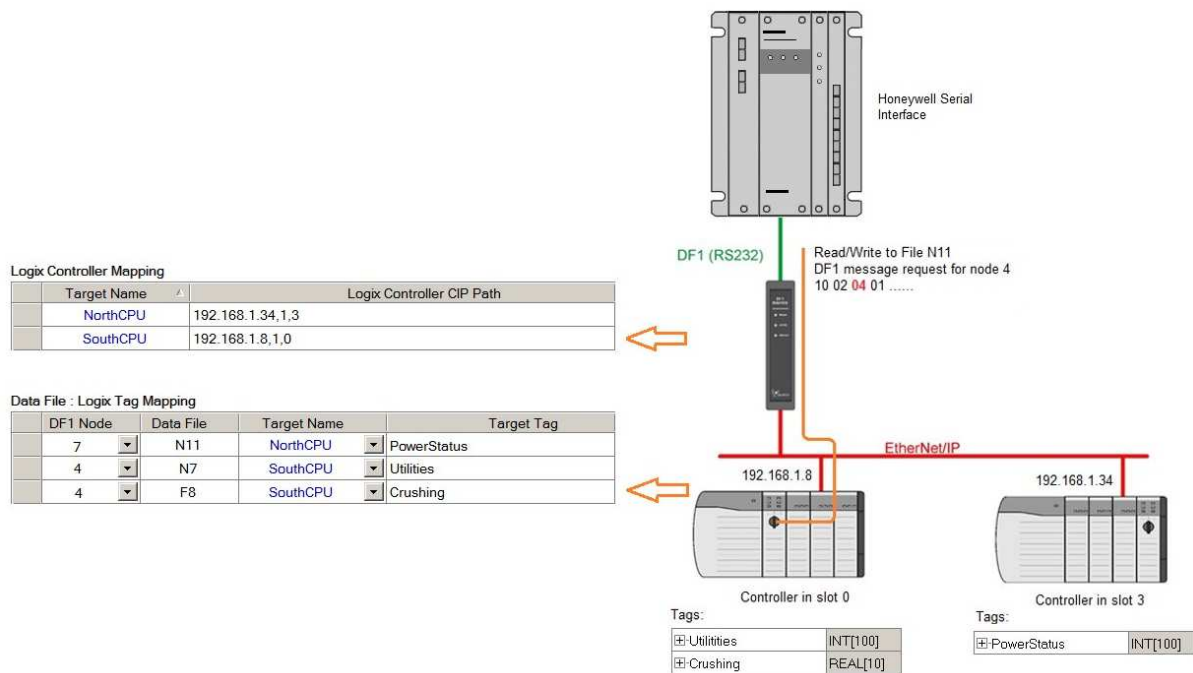
FIGURE 13 - REACTIVE TAG MODE CONFIGURATION IN SLATE

3.2.2. SERIAL PARAMETERS

The serial parameters must be setup as shown in the figure below:

FIGURE 14 – DF1 SERIAL SETTINGS FOR HONEYWELL SERIAL INTERFACE

Refer to the user manual for a detailed description of each parameter.

3.3. LOGIX SETUP

When the DF1 Router is setup in Transparent PCCC mode the user will need to map the PLC5 messages to a Logix Tag using the *Map PLC/SLC Messages* function. When the DF1 Router is setup in Reactive Tag mode then no Logix configuration is required.
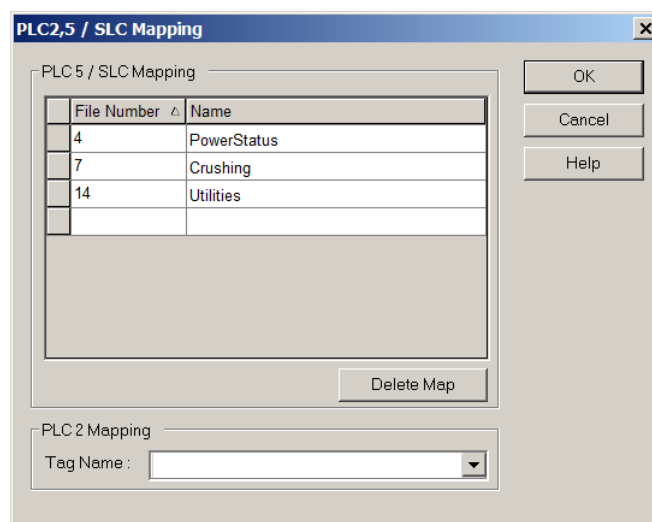

FIGURE 15 – LOGIX PLC/SLC MAPPING

3.4. HONEYWELL SETUP

This section will discuss in general terms the procedures for setting up the Honeywell system to accept the data from the ControlLogix. For complete set up procedures please consult a Honeywell Technical Specialist.

All information communicated through the Serial Interface must be communicated through Array tags. Figure 16 below is the first page of 5 in the configuration of a Honeywell Array tag. The first page of this configuration is information that is specific to the Honeywell system. The user must know a valid Honeywell Unit, a Network number (NTWKNUM), and a Node number (NODENUM). The Network and Node number refers to where the actual Honeywell serial interface module resides and it must match the actual hardware configuration or errors will occur and the tag will not be valid.

FIGURE 16 – HONEYWELL PAGE 1

Page 2 of the Array tag configuration is shown below in Figure 17. The only parameters that must be configured on this page are the Slot Number (SLOTNUM) and the External Data (EXTDATA) type. Within the Honeywell system configuration, there are a limited number of Array tags that can be configured. The user must enter a slot number that is unused in this field. The External Data type refers to the type of data being communicated through this Array tag. This data type must match the data type configured in AB_DATA3 on page 3 of the configuration.
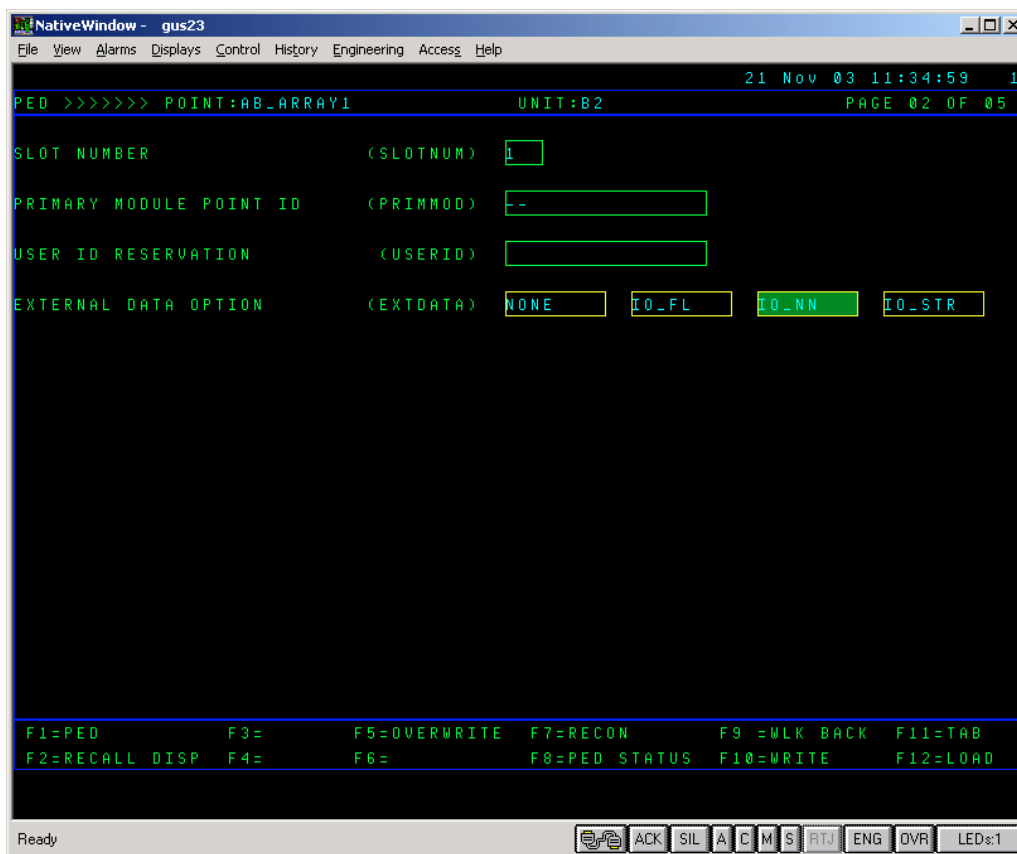
FIGURE 17 – HONEYWELL PAGE 2

Page 3 of the Array tag configuration is shown below in Figure 18. The following parameters must be configured:

IOPNUM – Valid number are 1-40. This number represents which slot the SI module is placed within the Card Files (Racks) of Honeywell IOP's.

FTANUM – Each SI module can have 2 FTA's connected to different systems. For example, FTA 1 can be an AB interface and FTA 2 can be a Modbus interface. An illustration is shown in Figure 18. The connection identified as Unit 0 refers to FTA 1 and Unit 1 refers to FTA 2.

DEVADDR – This entry is the destination DF1 Node address which will be used by the DF1 Router to route the message. The address is entered in Octal (e.g. 13), whereas in the DF1Router mapping, it must be configured in Decimal (e.g. 11).

SCANPRI – This can be left at the default of Low.

AB_DATA1 – This is the Allen-Bradley PLC family type and 5 should be entered. In the ControlLogix configuration done above, mapping was done to emulate the PLC-5 file structure. (Valid entries are 2, 3, and 5. Each one of the entries represents the PLC-2, PLC-3, and PLC-5 respectively.)

AB_DATA2 – This refers to the file type that was created in the mapping shown in Figure 1. This number is entered in decimal (this parameter and the file number are both in Decimal) and must match the file number done within the mapping.

AB_DATA3 – The Data type of the file being communicated. The data types can be seen in Figure 18 and must be the same as the data type contained in the file configured in AB_DATA2. The file type must also match what is configured in parameter EXTDATA.

PLC-5 Data Type	AB_DATA3	Array Type
Output	0	Flag
Input	1	Flag
Status	2	Flag
Bit	3	Flag
Integer	*4,5	Numeric (unsigned 16 bit)
Integer	7	Numeric (signed 16 bit)
Floating Point	8	Numeric (IEEE Single Precision)
ASCII	9	String
*These Allen-Bradley file types are read only and writes to these file types are ignored.		

FIGURE 18 – HONEYWELL DATA TYPES

AB_DATA4 – This is the frequency at which the Array tag within Honeywell is updated from the ControlLogix data file. This can be set to 1 for a 1 second update. The valid range is 0-256 seconds whereas 0 indicates as fast as possible.
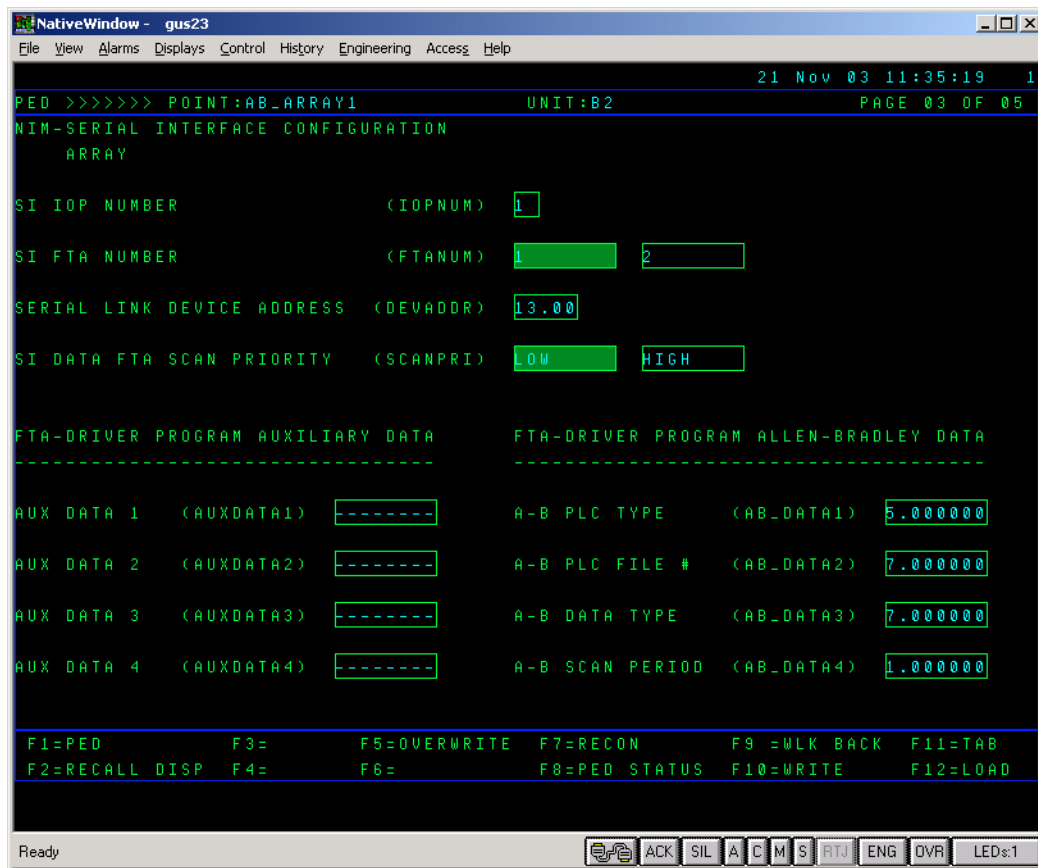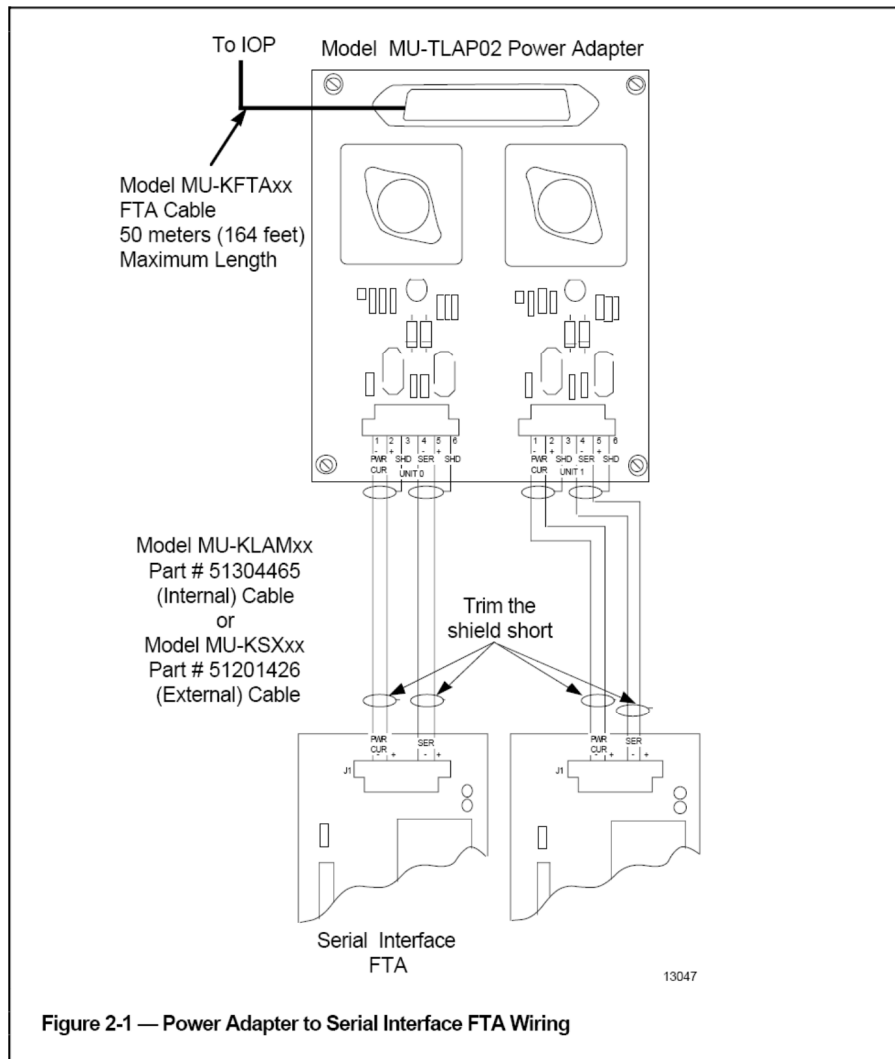
FIGURE 19 – HONEYWELL PAGE 3

FIGURE 20 – SERIAL INTERFACE FTA CONNECTION

Page 4 of the Array tag configuration is shown below in Figure 21. The only parameters that need to be entered are the Start Index and the number of Flags or Numerics, depending upon what the Array tag is configured for. The start index is typically 0 but could be any number. The Flags or Numerics in Honeywell are offset from the Bits and Words in the ControlLogix array. The Flags and Numerics in Honeywell are offset by +1 from the ControlLogix Bits and Words.
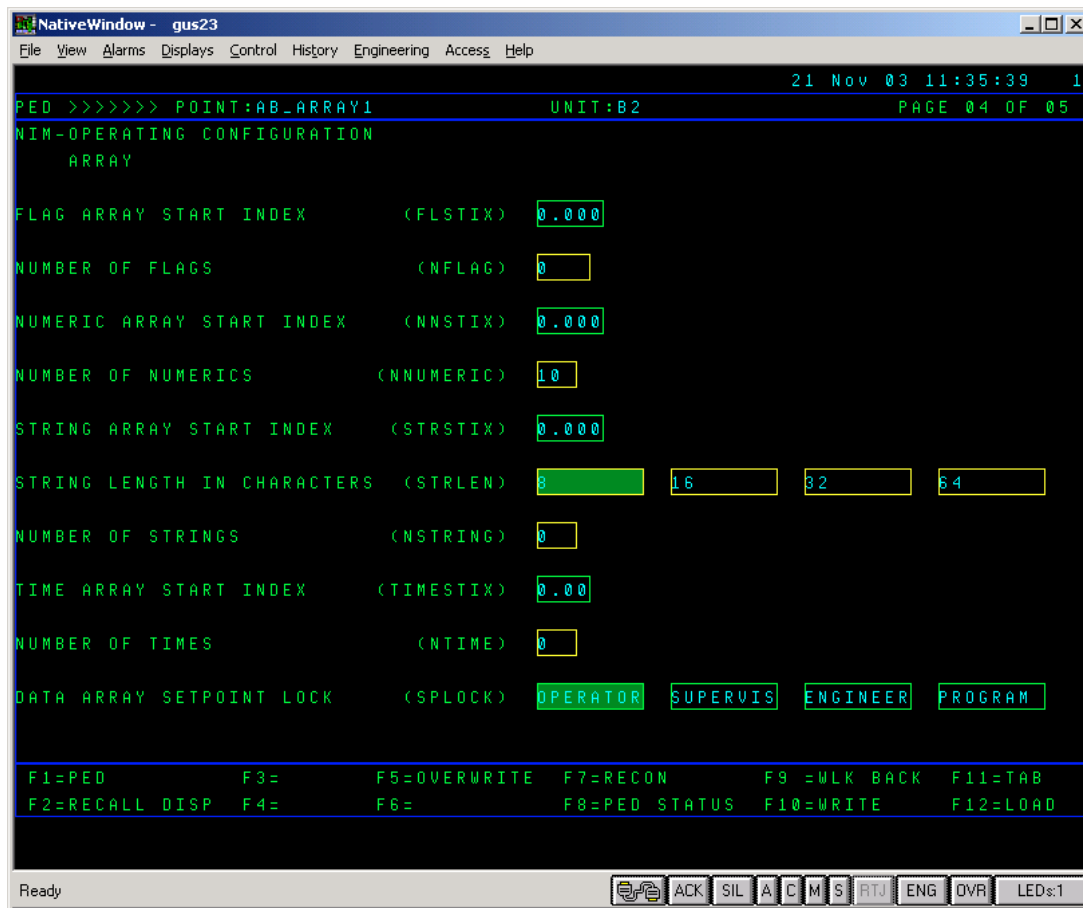
FIGURE 21 – HONEYWELL PAGE 4

Page 5 of the Array tag configuration is shown below in Figure 22. None of these parameters are required to be entered.
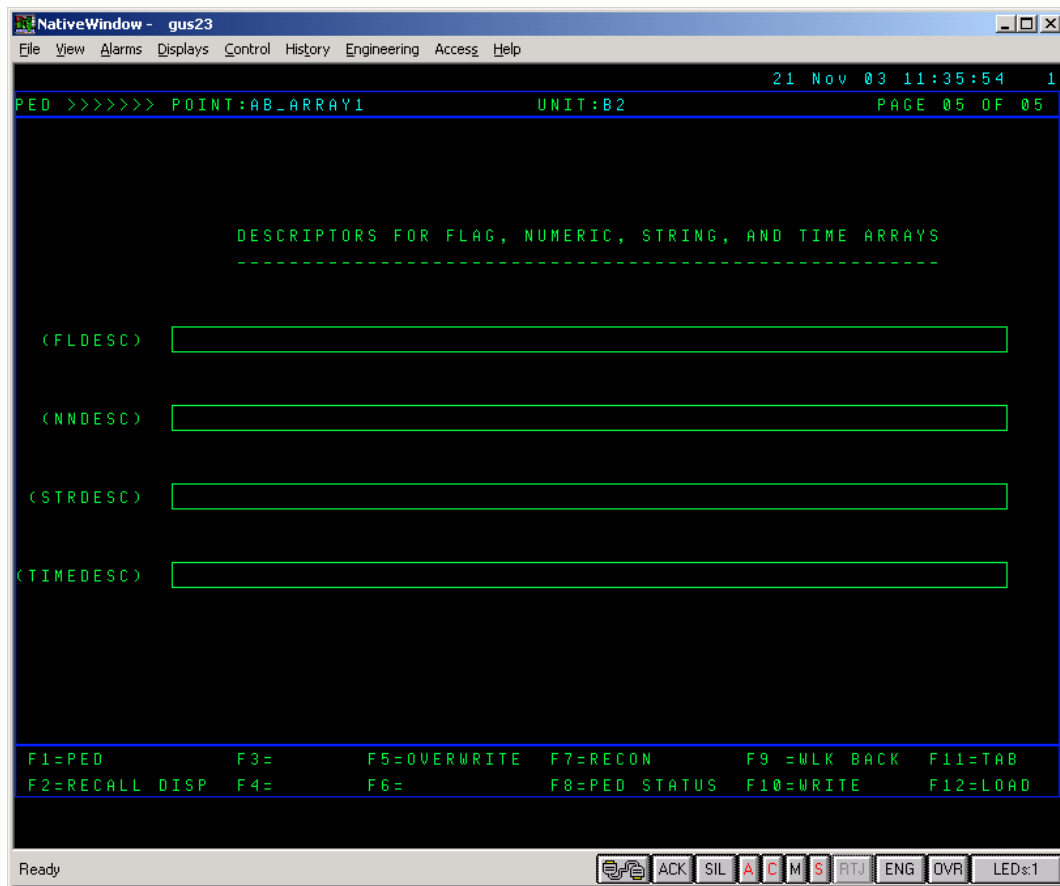
FIGURE 22 – HONEYWELL PAGE 5

Figure 23 and 24 show the actual point detail of the data point AB_Array1 that one would see when the tag is operating in the system.
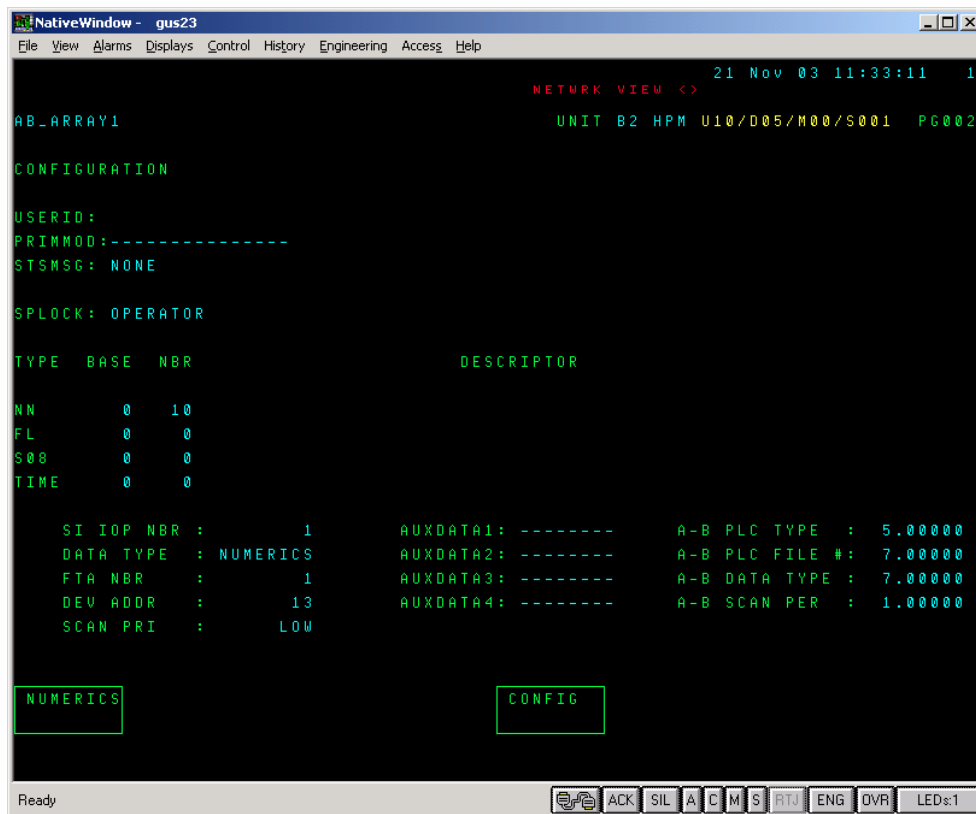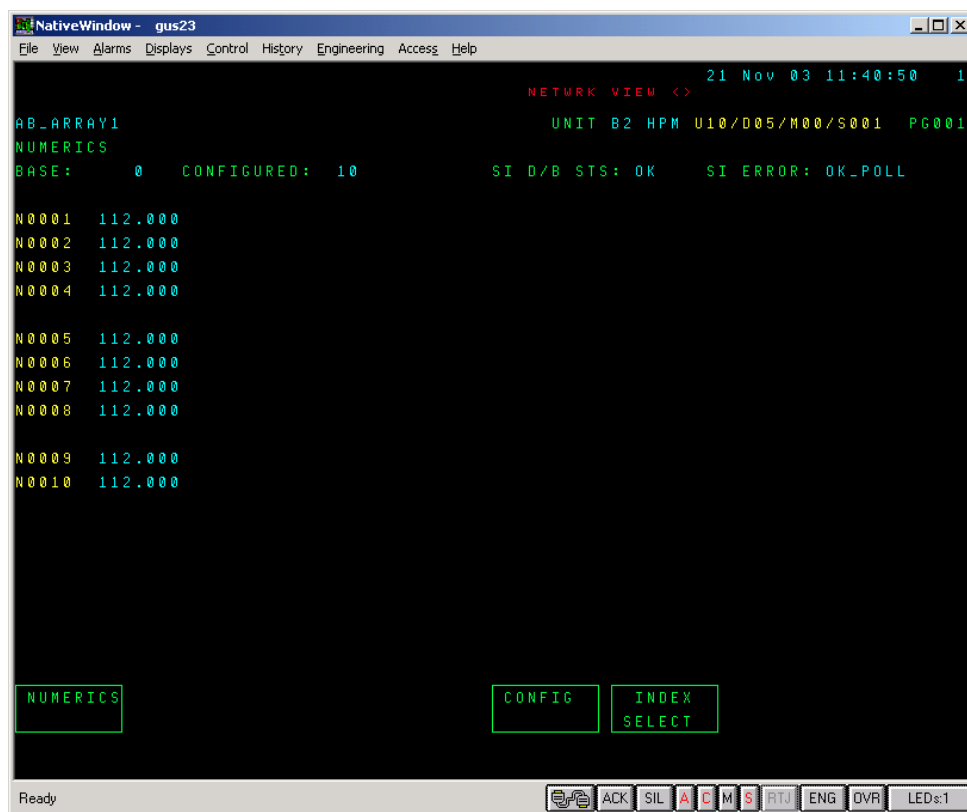
FIGURE 23 – DATA POINT AB_ARRAY1

FIGURE 24 – DATA POINT AB_ARRAY1

# 4.	NOTES

## 4.1.	SERIAL INTERFACE ARRAY TAG CONSIDERATIONS

The   Array Tag does not actually contain the data, the data resides in the external ControlLogix processor or other PLC. The SI actually writes to this external data and reads back the data. This can be seen when a Numeric or flag is changed from Honeywell (from a graphic like Figure 24). The data immediately changes within the external device (written on exception). Depending upon what AB_DATA4 (Scan Period) is set to, it may take some time to actually see the Honeywell information update.

It should also be noted that data must not be continually written to the Honeywell Array tag. Any information written to the tag should be written only when it changes (write on exception). Within Honeywell, even if the tag has not changed states, it will continually be written to the state it is currently in even though it has not changed states. If an Array Flag or Numeric is used within another tag such as a Logic Block, each time that logic block executes, the Flag or Numeric will be written. The amount of data that can be written from a Serial Interface is approximately 10 writes/second. Note, all Honeywell array tags configured to a Serial Interface contribute to the 10 writes/second limit. In the case of having an Array Flag or Numeric in a Logic Block, it is possible to have the Logic Block configured to execute every ¼ second, that is 4 writes of the 10 so extreme caution should be used when doing this.

## 4.2.	EXAMPLE RSLOGIX AND SLATE CODE

To assist the user an example RSLogix 5000 project as well as an example Slate project has been placed on the Aparian website. These two projects have been configured as a pair allowing the user to simply download both without additional work required.

REFERENCES

Gibson, D., & DeWitt, K. (2013). *ControlLogix and 1770-KFC15 to Honeywell SI (Serial Interface) Connection and Testing.*