
Engineer's Guide

SMART TRAC™ LAN Card

MagneTek, Inc.- Drives & Systems Division

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Important Safety and Warranty Information

Warnings, Cautions and Notes



WARNING

A statement of conditions which MUST BE OBSERVED to prevent personal injury or death.



WARNING - ESD

A statement of conditions which must be observed to prevent damage to components due to ESD (ElectroStatic Discharge) and to prevent personal injury or death.



CAUTION

A statement of conditions which must be observed to prevent undesired equipment faults, Smart Trac AC1 system degradation and damage to equipment.

IMPORTANT

A statement of conditions which should be observed during Smart Trac AC DeviceNet setup or operation to ensure dependable service.

NOTE: Notes indicate information that is in addition to a discussion of the topic in adjoining text. Alternatively, it may limit or restrict the paragraph(s) that follow(s) to specific models or conditions.

TIP - Tips indicate information that should make a procedure easier or more efficient.

General Safety Precautions - Warnings

Important safety information follows. Please *read and understand* all precautions listed below before proceeding with the specification, installation, set-up or operation of your Smart Trac AC1. Failure to follow any of the following precautions may result in personal injury or death, or damage to the equipment.



WARNING - ESD

The Control Printed Circuit Board (PCB) employs CMOS Integrated Circuits that are easily damaged by static electricity. Use proper ElectroStatic Discharge (ESD) procedures when handling the Control PCB. See Smart Trac AC1 Technical Manual for details. Failure to comply may result in damage to equipment and/or personal injury.

Important Warranty Information.

Do not modify your Smart Trac AC1, its components, or any of the procedures contained in the technical documentation supplied by MagneTek. Any modification of this product by the user is not the responsibility of MagneTek and will void the warranty.

Smart Trac LAN

General Capabilities

The Smart Trac LAN allows programs written with Smart Trac Workstation to communicate with other devices (drives, PLC Gateways, remote displays, remote I/O, and IBM compatible personal computers) on a Smart Trac LAN (Local Area Network). This provides compatibility with previous generations of MagneTek DSD drives and related products. Using a proprietary MagneTek protocol, the Smart Trac LAN communicates information onto an ARCNET LAN.

ARCNET is a token-passing LAN that can communicate to 2.5 Mbps. Up to 255 nodes in a coaxial bus network can be addressed to communicate to a distance of about four miles using active hubs. Smart Trac LAN will support more than ninety networked drives.

The proprietary MagneTek protocol provides a means for drives on the network to remain in sync, allows for zero drift between sections, communication of digital and numeric data, and for program uploads and downloads. The card complies with the PC/104 specification version 2.2 dated July 1994.

Software

The Smart Trac LAN card ships with the Smart Trac LAN I/O driver pre-installed. The driver must be installed according to the instructions in this manual.

Version Check

From time to time, you might need to know the software version of the Smart Trac LAN driver installed on your machine.

To check the driver version installed on your computer:

1. In Control Studio, click the **Interface Cards** folder to expand it.
2. Double click the specific interface card, in this case the **STLAN** card (or the name you chose when installed). The **Smart Trac LAN Configuration** screen appears.
3. Right click the logo in the upper left corner of the dialog box. A screen, similar to the one below, appears.

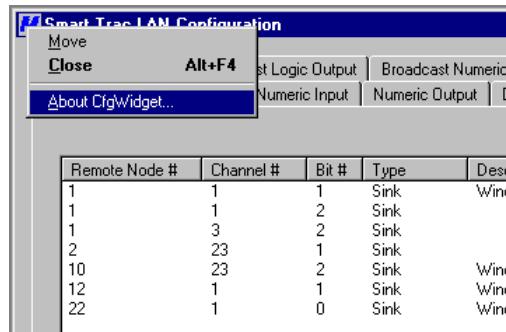


Figure 1. Right click of logo on driver's Configure Board screen

4. Click **About** ... (driver name). A screen appears indicating the software version of the driver.

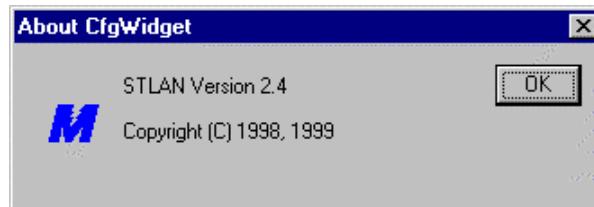


Figure 2. The About (Driver) screen showing version number.

Messaging

Your Smart Trac LAN card will transmit two types of messages: *broadcast* and *directed messages*.

Broadcast Messages

All nodes enabled to receive broadcast messages receive them. Drives generate broadcast messages after the power-up initialization sequence. Such messages include speed references, drive logic status, and synchronizing timing information. At least one drive must be sending a broadcast message to keep all nodes synchronized. More than one node may send broadcast messages.

Directed Messages

Only one node may receive a specific directed message. That is the one node addressed in the message. Directed messages include numeric input and output values, logic input and output states, display data, initial configurations and allocations between drives and other remote nodes.

Drive Coordination

The Smart Trac LAN I/O driver determines one drive on the network, called the *Sync Master*, to broadcast synchronization messages to the other drives. All drives receive each sync message simultaneously and adjust their internal clocks using the information contained in the message.

Installing the Smart Trac LAN I/O Driver

Installation

After you've installed and configured the Smart Trac LAN card by accepting the default settings or changing them for your own unique situation, you may install the Smart Trac LAN I/O Driver.

NOTE: In the procedure below, you will be asked to accept a default base address of 0x2e0 and interrupt of 2/9. Using a different base address and/or interrupt may result in system problems. Consult with your MagneTek Application Engineer if your PC environment requires settings other than the default values.

Installing the Smart Trac Fault Manager Driver

1. Click **START, PROGRAMS, MAG-300, CONTROL MANAGER.**
The Control Manager software loads.
2. Expand the **Project** folder tree and right click the **Drivers** folder. A selection box appears with **New...** highlighted.

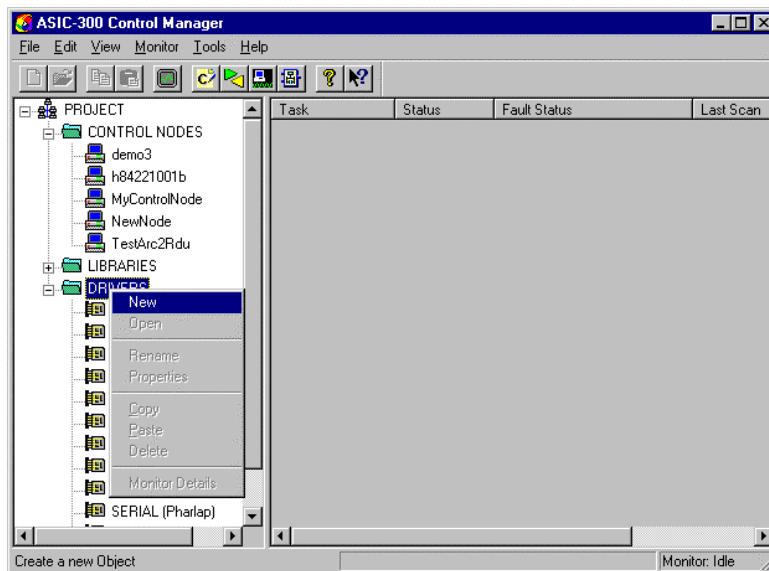


Figure 3. The New Device Driver Selection box.

3. Click the New selection box. The **Install Driver** dialog box appears.

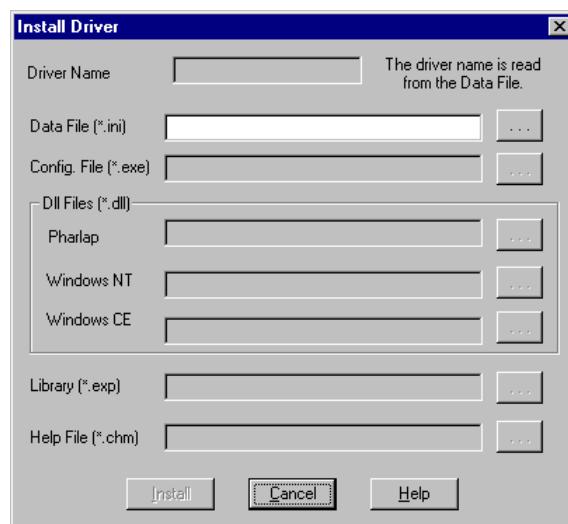


Figure 4. I/O Driver Install dialog box.

To view driver .dll files, you must select View All Files in Windows NT Explorer. If you have Windows NT without IE4.0 installed: from Explorer, click **View**, **Options**, click **View** tab. In **Hidden Files**, click **Show all files**. If you have IE4.0 installed: from Explorer, click **View**, **Folder Options**, click the **View** tab. In **Advanced Settings**, click **Show All Files** in the **Hidden files** folder.

4. Click the small box containing three dots (...) to the far right of the **Data File (*.ini)** box. This allows you to browse for the initialization file on your system (generally the driver will be installed from your CD_ROM). For our example, we assume the file is on a floppy in the A: drive. Find the file **STLAN.ini** and **OPEN** it. Two more boxes, for entry of **Config.exe** and **Help.exe**, become active.
5. Click the small box containing three dots (...) to the far right of the **Config (*.exe)** box. Browse for the **STLAN.EXE** file. Press **TAB** or **ENTER**. More boxes will become active.
6. Click the small box containing three dots (...) to the far right of the **DLL files (*.dll)**, **Pharlap** box. Browse for the **STLAN.dll** file. Press **TAB** or **ENTER**.
7. Click the small box containing three dots (...) to the far right of the **Help (*.chm)** box. Browse for the **STLANEM.CHM** file. Press **TAB** or **ENTER**. The screen should look like the following (if installing from the A:\ drive).

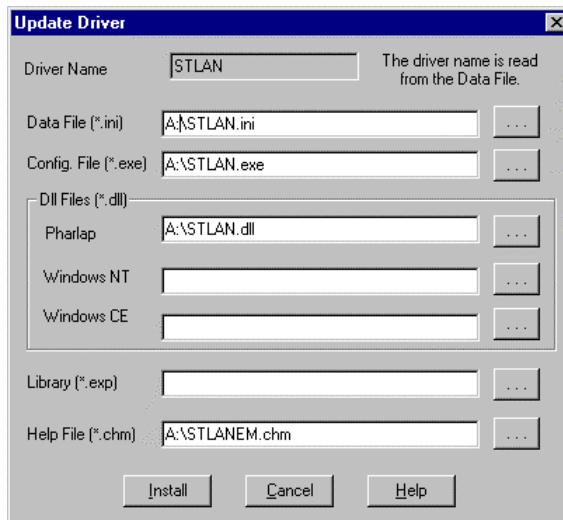


Figure 5 The completed example STLAN Driver Install screen

8. Click **INSTALL**. When finished, you are returned to Control Manager. The driver name should appear in its own folder within the **Drivers** folder.
9. The STLAN card is ready for use.

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Generating Messages on Your Smart Trac LAN

LAN Messages

Smart Trac LAN Messages may be either Broadcast messages or Directed Messages.

How are Broadcast Messages used?

Use *Broadcast* messages for speed reference and to keep scans in sync. This type of message contains 12 bytes of data. It may also contain logic information from a drive.

Any user-programmed broadcast message will transmit once every 30 milliseconds. You program network nodes to transmit broadcast messages when you configure the Smart Trac LAN I/O Driver to define Broadcast Logic Output and/or Broadcast Numeric Output.

The Smart Trac LAN I/O driver scans each 15 milliseconds, alternating between odd and even scans, creating phases. The scans start on all drives at the same time and in phase. During even scans, drives broadcast messages. During odd scans, drives process the information contained in the broadcast message.

During acceleration and deceleration, drives must closely track each other to stay in sync. Broadcast messages contain speed reference and scan synchronizing information that make this possible.

Another type of broadcast message is for a device to announce to the other network devices that it is powered up and ready for instructions.

PLC Gateways, PC, and Remote devices do not receive Broadcast messages.

How Broadcast Messages are Transmitted

Broadcast messages reserve Node 0 for their use only. (This is why Smart Trac LAN nodes use only addresses 1 to 255). To send a broadcast message, the node with the token (i.e., invitation to transmit) specifies node 0 as the destination node. All nodes enabled to receive broadcast messages receive the message. Destination nodes do not acknowledge receipt of a broadcast message. The token is passed to the next node. A broadcast message is always 12 bytes long.

How are *Directed* Messages Used?

Use *Directed* messages to communicate Input/Output commands and status information to specific, networked nodes.

A directed message contains from six (6) to forty-six (46) bytes of information. Each sends information no more than once each 120 milliseconds, when values change and on a timed interval.

How Directed Messages are Transmitted

The node with the token, called the *source* node, makes a Free Buffer Enquiry (FBE) to the intended receiver node, called the *destination* node. The FBE is made to determine whether the destination node is ready to receive information. The destination node responds with a yes (ACK) or a no (NAK).

If the destination node acknowledges a ready state, the source node transmits a packet of information back to the destination node. The message may contain from 1 to 255 bytes of information.

Upon receipt of the message, the destination node performs a CRC (cyclic redundancy check). If the message successfully passes the CRC, the destination node sends another ACK. If the message does not pass the CRC, it does nothing. This causes the source node to time out. The source node will retry on the next token pass.

The transmission sequence terminates and the token is passed to the next node.

LAN Message Generation

Configuring the Smart Trac LAN I/O driver creates symbols for the various types of LAN messages. You can use the Symbol Manager in Smart Trac Workstation to create an application program that sends the value of a program symbol in LAN messages at the appropriate times.

Configuring the Smart Trac LAN I/O Driver

1. Do one of the following:
 - a. Load Control Manager by clicking **Start, Programs, MAG-300, and Control Manager**. The Control Manager main screen appears.
 - b. Double click one of the Control Nodes to open Control Studio for that control node.
- OR
- c. Load Control Studio by clicking **Start, Programs, MAG-300, and Control Studio**. The **Open Node** dialog box appears. Double click a node to open **Control Studio** for the selected node.
2. In Control Studio, expand **Interface Cards** (if not already expanded) by clicking the plus sign to the left of the **Interface Cards** folder.
 3. Right click **Interface Cards**. A small selection box appears.
 4. Select **New Interface Card**. The **New** dialog box appears.

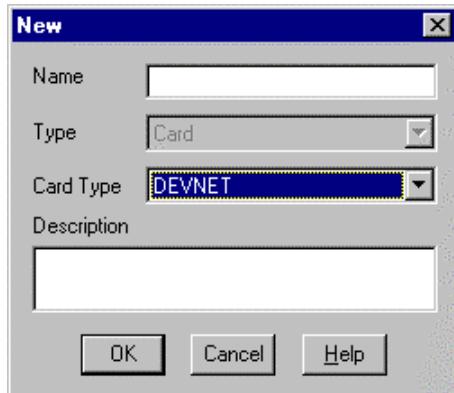


Figure 6. Edit Interface Card dialog box showing the Smart Trac LAN card.

5. Enter a descriptive **Card Name** (i.e., SmartTracLAN).
6. Click the down arrow associated with **Card Type** and select **STLAN**.
7. As an option, you may enter a brief description of the card.
8. Click **OK**. The **Smart Trac LAN Configuration** dialog box appears.

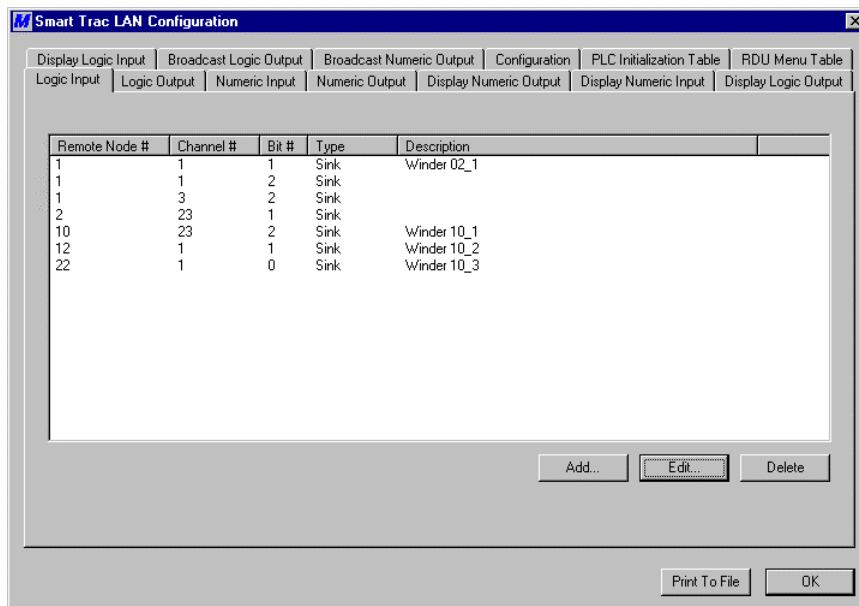


Figure 7. Smart Trac LAN Configuration dialog box.

9. Click the **Configuration** tab. The **Configuration** tab contains the following information: **Drive Name**, **ARCNET Board Base I/O Address**, and **ARCNET Board IRQ**.

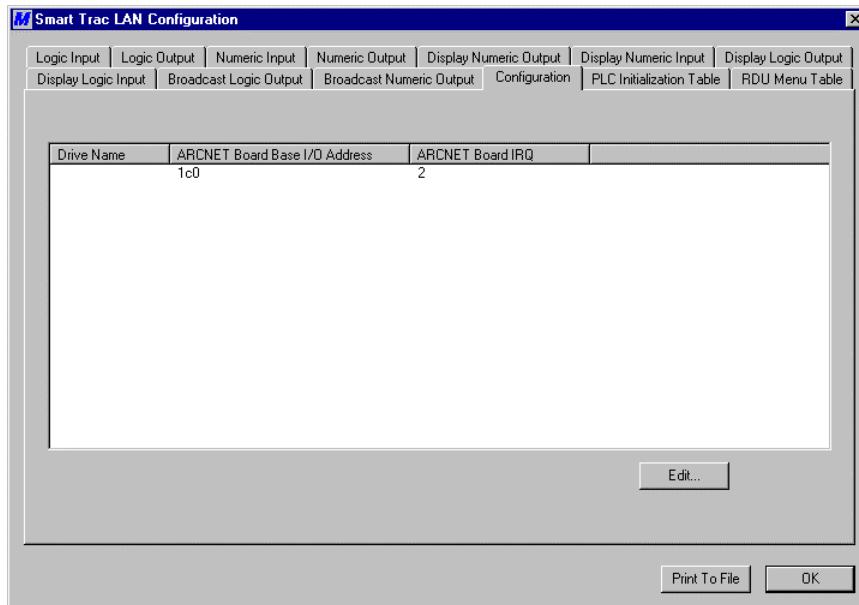


Figure 8. Smart Trac LAN Configuration, Configuration Tab.

10. Click **Edit**. The **Board Settings** dialog box appears.



Figure 9. Board Settings dialog box.

11. You may edit the **Drive Name** to any intelligent name you'd like to describe it (for example, "Winder_10").
12. Using the up and down scrolling arrows on the **Board Settings** dialog box, set the **I/O Port Address** to address "0x02E0."
13. Using the drop-down selector on the dialog box, set the IRQ to "2/9."
14. Click **OK**. The Configuration tab of the Smart Trac Configuration dialog box appears.

NOTE: The Configuration dialog box displays "9" as the **ARCNET Board IRQ** when the IRQ is set to "2/9."

15. Click other tabs, as appropriate to your situation, to configure the **PLC Initialization Table**, the **RDU Menu Table**, **Broadcast Logic Output**, **Broadcast Numeric Output**, **Display Numeric Output**, **Display Numeric Input**, **Display Logic Output**, **Display Logic**

Input, Numeric Output, Numeric Input, Logic Output and Logic Input.

PLC Initialization Table

Adding an Entry to the PLC Initialization Table

Upon power-up of the drive or the remote node, the **PLC Initialization Table** sends information contained in it to the Smart Trac node being configured. This initializes PLC (Programmable Logic Controller) Gateways.

To add an entry to the PLC Initialization Table:

1. From the PLC Initialization Table tab, click **Add**. The PLC Initialization Table Add dialog box appears.

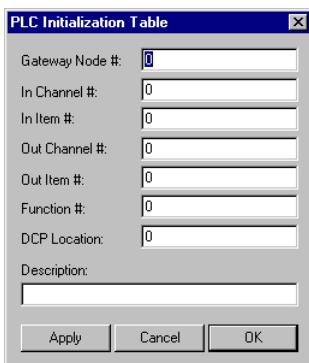


Figure 10. PLC Initialization Table dialog box.

2. Enter numbers or change numbers as required for your situation according to the following:
 - **Gateway Node #** must be within a range of 1-255.
 - **In Channel #** (PLC output item) must be within a range of 0-255. It indicates the data location (channel) within the Logic Controller or gateway from which any changes to the data will originate.
 - **Input Item #** (PLC output item) must be within a range of 0-255. It further defines the data location within the Logic Controller or gateway from which any changes to the data will originate.
 - **Output Channel #** (PLC input channel) must be within a range of 0-255. It indicates the data location within the Logic Controller or gateway to which the data will be sent from the drive.
 - **Output Item #** (PLC input item) must be within a range of 0-255. It further defines the data location within the Logic Controller or gateway to which the data will be sent from the drive.
 - **Function #** (CDU Function Number) indicates the local function number and must be within a range of 1-65535. It is the CDU (Control Display Unit) Function Number of the variable to be received from the drive.
 - **DCP Location** must be within a range of 0-255. It indicates the number of digits to the right of the decimal point (the degree of precision).
 - **Description** is a 256 maximum character field used as a comment to describe this I/O point.
3. After you've entered all PLC Initialization Table values needed, do one of the following:

- Click **Apply** to accept the values you've entered. If you have many data types to enter, choosing Apply saves the values just entered but leaves them on the screen, minimizing re-entry of identical or similar data.
- Click **Cancel** to return to the PLC Initialization Table tab.
- Click **OK** to save your entries and return to the PLC Initialization Table tab.

Editing an entry in the PLC Initialization Table

To edit the PLC Initialization Table:

1. From the PLC Initialization Table tab, click the **Gateway Node #** you wish to edit. When clicked, it will become highlighted.
2. Click **Edit**. The PLC Initialization Table Edit dialog box appears with current values for each parameter.
3. Make changes in accordance with the information described in "Adding an Entry to the PLC Initialization Table."
4. Do one of the following:
 - Click **Apply** to accept the values you've entered and continue to view your edited values.
 - Click **Cancel** to return to the PLC Initialization Table tab.
 - Click **OK** to save your entries and return to the PLC Initialization Table tab.

Deleting an entry in PLC Initialization Table

To delete an entry from the PLC Initialization Table:

1. From the PLC Initialization Table tab, click the **Gateway Node #** you wish to delete. When clicked, it will become highlighted.

NOTE: You may use SHIFT-Click to select more than one contiguous Node # or CTRL-Click to select more than one non-contiguous Node #.

2. Click **Delete**. The warning message "Do you really want to delete this item?" appears. Click **Yes** or **No**, to confirm your decision. If you select **Yes**, you are returned to the PLC Initialization Table tab, which will display all previous information except for the deleted item.

RDU Menu Table

The RDU Menu Table defines the information that is sent to the Remote Display Unit (RDU) on power up of the drive or a remote node. The configuration data in this table is sent to the Remote Node # listed in the line of data upon power up of the drive or remote node.

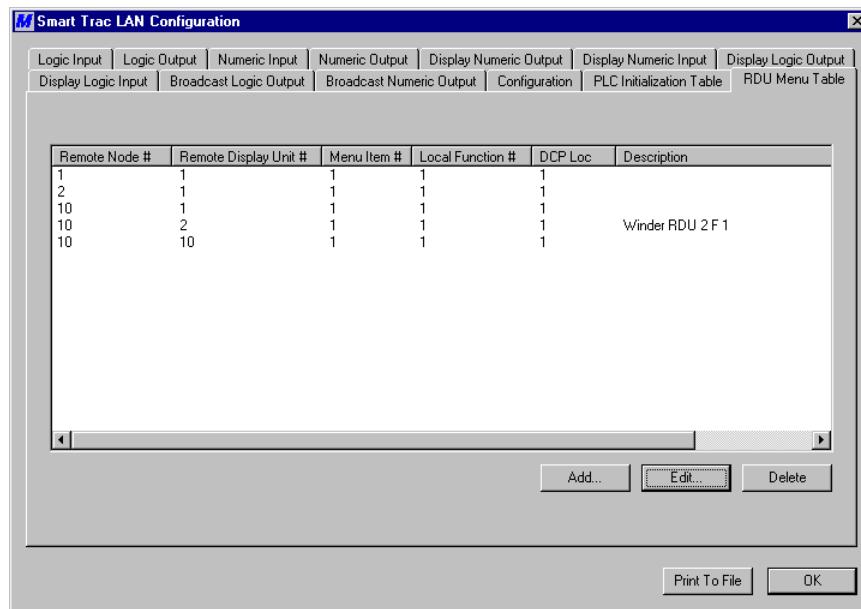


Figure 11. Smart Trac Configuration dialog box, RDU Menu Table tab.

Adding an Entry to the RDU Menu Table

From the RDU Menu Table tab:

1. Click **Add**. The RDU Menu Table dialog box appears.

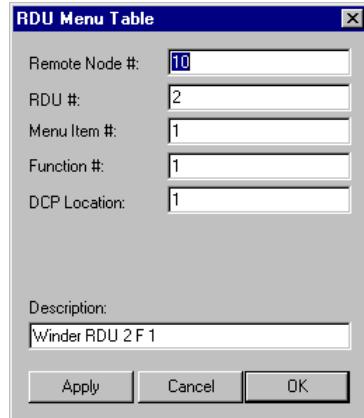


Figure 12. RDU Menu Table dialog box.

2. Enter numbers or change numbers as required for your situation according to the following:
 - **Remote Node #** must be within a range of 1-255.
 - **RDU #** (Remote Display Unit Number) must be within a range of 1-255. The number of the RDU on which the message will be displayed. At least one must be specified as the initial default value.
 - **Menu Item #** must be within a range of 1-255. Since each Remote Display Unit (RDU) may be configured to display and/or modify a number of different values, each RDU has a menu associated to it. The various items on that menu can be accessed (displayed) either

by scrolling through the menu or directly accessed by entering the Function Number associated with that menu item via the keypad.

- **Function #** must be within a range of 1-65535. It is used by the RDU to differentiate between the various values it is configured to display.
 - **DCP Location** must be within a range of 0-255. It indicates the number of digits to the right of the decimal point (the degree of precision).
 - **Description** is a 256 maximum character field used as a comment to describe this I/O point.
4. After you've entered all RDU Menu Table values needed, do one of the following:
 - Click **Apply** to accept the values you've entered. If you have many data types to enter, choosing Apply saves the values just entered but leaves them on the screen, minimizing re-entry of identical or similar data.
 - Click **Cancel** to return to the RDU Menu Table tab.
 - Click **OK** to save your entries and return to the RDU Menu Table tab.

Editing an Entry in the RDU Menu Table

To edit the RDU Menu Table:

1. From the RDU Menu Table tab, click the **RDU #** you wish to edit. When clicked, it becomes highlighted.
2. Click **Edit**. The RDU Menu Table Edit dialog box appears with current values for each parameter.
3. Make changes in accordance with the information described in the Add function.
5. After you've entered all RDU Menu Table values needed, do one of the following:
 - Click **Apply** to accept the values you've entered. If you have many data types to enter, choosing Apply saves the values just entered but leaves them on the screen, minimizing re-entry of identical or similar data.
 - Click **Cancel** to return to the RDU Menu Table tab.
 - Click **OK** to save your entries and return to the RDU Menu Table tab.

Deleting an Entry from the RDU Menu Table

To delete an entry from the RDU Menu Table:

1. From the RDU Menu Table tab, click the **RDU #** you wish to edit. When clicked, it will become highlighted.

NOTE: You may use SHIFT-Click to select more than one contiguous Node # or CTRL-Click to select more than one non-contiguous Node #.

2. Click **Delete**. The warning message "Do you really want to delete this item?" appears. Click **Yes** or **No**, to confirm your decision. If you

select **Yes**, you are returned to the PLC Initialization Table tab that now displays all previous information except for the deleted item.

Logic Input

Adding or Editing a Logic Input

The Logic Input accepts a logic bit from outside the Smart Trac AC1.

To add a logic bit:

1. An **Add** or **Edit** causes the Directed Logic Input dialog box to appear.

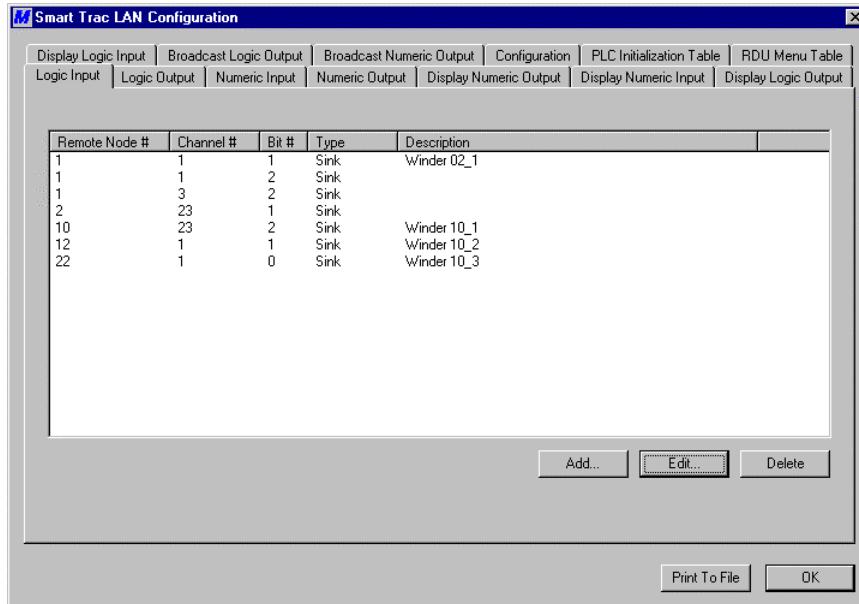


Figure 13. Directed Logic Input dialog box.

2. Make changes in accordance with the information below and your situation:
 - **Remote Node #** must be within a range of 1-255. The number of the node (another drive, an I/O card in another LAN device, a PLC Gateway, or a PC) outside the application program.
 - **Channel #** must be within a range of 0-255. The channel # typically identifies a particular address in memory in another drive, or an I/O card in another LAN device.
 - **Bit #** must be within a range of 0-31.
 - **Sink** or **Source** type input. Not all remote nodes support selection of sink or source. Refer to that remote node's documentation.

NOTE: A sink type input is asserted (logic 1) when the input is driven to circuit common. A source type input is asserted (logic 1) when the input is driven towards a given, positive voltage supply.

3. After you've entered all Logic Input values needed, do one of the following:
 - Click **Apply** to accept the values you've entered. If you have many data types to enter, choosing Apply saves the values just entered

but leaves them on the screen, minimizing re-entry of identical or similar data.

- Click **Cancel** to return to the Logic Input tab.
- Click **OK** to save your entries and return to the Logic Input tab.

Deleting a Logic Input

To delete an entry from the Logic Input:

1. From the Logic Input tab, click the Logic Input you wish to edit. When clicked, it will become highlighted.

NOTE: You may use SHIFT-Click to select more than one contiguous Node # or CTRL-Click to select more than one non-contiguous Node #.

2. Click **Delete**. The warning message "Do you really want to delete this item?" appears. Click **Yes** or **No**, to confirm your decision. If you select **Yes**, you are returned to the PLC Initialization Table tab that now displays all previous information except for the deleted item.

Logic Output

The Logic Output sends a logic bit from the Smart Trac AC1 to some other device.

Adding or Editing a Logic Output

1. An **Add** or **Edit** causes the Directed Logic Output dialog box to appear.

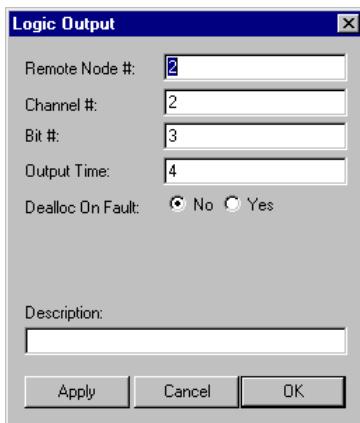


Figure 14. Directed Logic Output dialog box.

2. Make changes in accordance with the information below and your situation:
 - **Remote Node #** must be within a range of 1-255. The number of the node (another drive or an I/O card in another LAN device) outside the application program.
 - **Channel #** must be within a range of 0-255. It points to a specific address of a one-byte wide space in RAM. The channel # typically identifies a particular address in memory in another drive or an I/O card in another LAN device.
 - **Bit #** must be within a range of 0-31.
 - **Output Time** is the time without communication before the Remote Node declares a communications fault. It must be within a range of 0-36 seconds. A value of "0" indicates no timeout.

- **Dealloc On Fault** is used to indicate whether the output is to be or is not to be deallocated on a communications fault. When a communication fault occurs, the selection here will tell the remote node how to reestablish communication. If you select **Yes**, the remote node will require the drive to send a new initialize message before setting the output. If you select **No**, the remote node will simply set the output to the next value the drive sends to it.
 - **Description** is a maximum 32-character description used as a comment to describe this I/O point.
3. After you've entered all Logic Output values needed, do one of the following:
- Click **Apply** to accept the values you've entered. If you have many data types to enter, choosing Apply saves the values just entered but leaves them on the screen, minimizing re-entry of identical or similar data.
 - Click **Cancel** to return to the Logic Output tab.
 - Click **OK** to save your entries and return to the Logic Output tab.

Deleting a Logic Output

To delete an entry from the Logic Output:

1. From the Logic Output tab, click the **Logic Output** you wish to edit. When clicked, it will become highlighted.

NOTE: You may use SHIFT-Click to select more than one contiguous Node # or CTRL-Click to select more than one non-contiguous Node #.

2. Click Delete. The warning message "Do you really want to delete this item?" appears. Click Yes or No, to confirm your decision. If you select Yes, you are returned to the PLC Initialization Table tab that now displays all previous information except for the deleted item.

Numeric Input

The Numeric Input is used to receive an input of a numeric value from outside the application program environment.

Adding or Editing a Numeric Input

To add or edit a Numeric Input:

1. An **Add** or **Edit** causes the Numeric Input dialog box to appear.

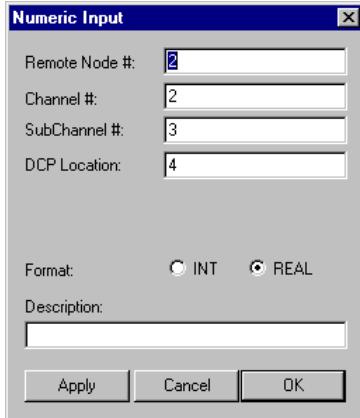


Figure 15. Numeric Input dialog box.

2. Make changes in accordance with the information below and your situation:
 - **Remote Node #** must be within a range of 1-255. The number of the node (another drive or an I/O card in another LAN device) outside the application program.
 - **Channel #** must be within a range of 0-255. It points to a specific address of a one-byte wide space in RAM. The channel # typically identifies a particular address in memory in another drive or an I/O card in another LAN device.
 - **SubChannel #** must be within a range of 0-65535.
 - **DCP Location** indicates the number of digits to the right of the decimal point (precision). A value of 255 means no number conversion is required because the number is already IEEE floating point.
 - **Format: INT/REAL** offers the selection of one of two formats for the Directed Numeric Input: Integer or Real.
 - **Description** is a maximum 32-character description used as a comment to describe this I/O point.
3. After you've entered all Logic Output values needed, do one of the following:
 - Click **Apply** to accept the values you've entered. If you have many data types to enter, choosing Apply saves the values just entered but leaves them on the screen, minimizing re-entry of identical or similar data.
 - Click **Cancel** to return to the Logic Output tab.
 - Click **OK** to save your entries and return to the Logic Output tab.

Deleting a Numeric Input

To delete an entry from the Numeric Input tab:

1. From the Numeric Input tab, click the **Numeric Input** you wish to edit. When clicked, it will become highlighted.

NOTE: You may use SHIFT-Click to select more than one contiguous Node # or CTRL-Click to select more than one non-contiguous Node #.

2. Click **Delete**. The warning message "Do you really want to delete this item?" appears. Click **Yes** or **No**, to confirm your decision. If you select **Yes**, you are returned to the PLC Initialization Table tab that now displays all previous information except for the deleted item.

Numeric Output

The Numeric Output is used to send an output of a numeric value to the outside application program.

1. An **Add** or **Edit** causes the Numeric Output dialog box to appear.

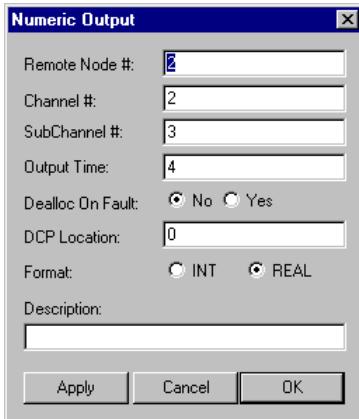


Figure 16. Numeric Output dialog box.

2. Make changes in accordance with the information below and your situation:
 - **Remote Node #** must be within a range of 1-255. The number of the node (another drive or an I/O card in another LAN device) outside the application program.
 - **Channel #** must be within a range of 0-255. It points to a specific address of a one-byte wide space in RAM. The channel # typically identifies a particular address in memory in another drive or an I/O card in another LAN device.
 - **SubChannel #** must be within a range of 0-65535.
 - **Output Time** is the time without communication before the Remote Node declares a communications fault. It must be within a range of 0-36 seconds. A value of "0" indicates no timeout. The default value is 480 milliseconds.
 - **Dealloc On Fault** is used to indicate whether the output is to be or is not to be deallocated on a communications fault. When a communication fault occurs, the selection here will tell the remote node how to reestablish communication. If you select **Yes**, the remote node will require the drive to send a new initialize message before setting the output. If you select **No**, the remote node will simply set the output to the next value the drive sends to it.
 - **DCP Location** indicates the number of digits to the right of the decimal point (precision). A value of 255 means no number

conversion is required because the number is already IEEE floating point.

- **Format: INT/REAL** offers the selection of one of two formats for the Directed Numeric Input: Integer or Real.
 - **Description** is a maximum 32-character field used as a comment to describe this I/O point.
3. After you've entered all Numeric Output values needed, do one of the following:
 - Click **Apply** to accept the values you've entered. If you have many data types to enter, choosing Apply saves the values just entered but leaves them on the screen, minimizing re-entry of identical or similar data.
 - Click **Cancel** to return to the Numeric Output tab.
 - Click **OK** to save your entries and return to the Numeric Output tab.

Deleting a Numeric Output

To delete a Numeric Output:

1. From the Numeric Output tab, click the **Numeric Output** you wish to edit. When clicked, it will become highlighted.

NOTE: You may use SHIFT-Click to select more than one contiguous Node # or CTRL-Click to select more than one non-contiguous Node #.

2. Click **Delete**. The warning message "Do you really want to delete this item?" appears. Click **Yes** or **No**, to confirm your decision. If you select **Yes**, you are returned to the PLC Initialization Table tab that now displays all previous information except for the deleted item.

Display Numeric Output

The Display Numeric Output delivers a numeric value to a location outside the application program environment.

Adding or Editing a Numeric Output

To add or edit a Numeric Output:

1. An **Add** or **Edit** causes the Display Numeric Output dialog box to appear.

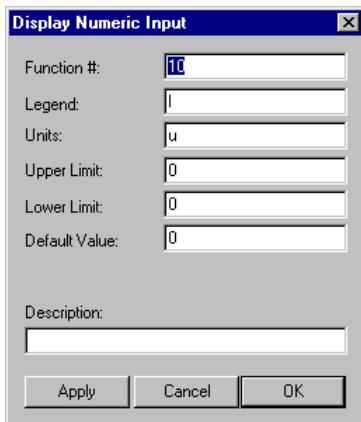


Figure 17. Display Numeric Output dialog box.

2. Make changes in accordance with the information below and your situation:
 - **Function #** must be within a range of 1-65535 and value must not be used by another display data type.
 - **Legend** indicates a legend for the data of up to 16 characters.
 - **Units** indicates the units described in three (3) characters.
 - **Description** is a maximum 256-character field used as a comment to describe this I/O point.
3. After you've entered all Display Numeric Output values needed, do one of the following:
 - Click **Apply** to accept the values you've entered. If you have many data types to enter, choosing Apply saves the values just entered but leaves them on the screen, minimizing re-entry of identical or similar data.
 - Click **Cancel** to return to the Display Numeric Output tab.
 - Click **OK** to save your entries and return to the Display Numeric Output tab.

Deleting a Display Numeric Output

To delete a Display Numeric Output:

1. From the Display Numeric Output tab, click the **Display Numeric Output** you wish to edit. When clicked, it will become highlighted.

NOTE: You may use SHIFT-Click to select more than one contiguous Node # or CTRL-Click to select more than one non-contiguous Node #.

2. Click **Delete**. The warning message "Do you really want to delete this item?" appears. Click **Yes** or **No**, to confirm your decision. If you select **Yes**, you are returned to the PLC Initialization Table tab that now displays all previous information except for the deleted item.

Display Numeric Input

Adding or Editing a Display Numeric Input

The Display Numeric Input gets a set-up value from a remote device (e.g. PLC Gateway, PC, Remote Display) and stores it in nonvolatile RAM (NVRAM).

To add or edit a Display Numeric Input:

1. An **Add** or **Edit** causes the Display Numeric Input dialog box to appear.

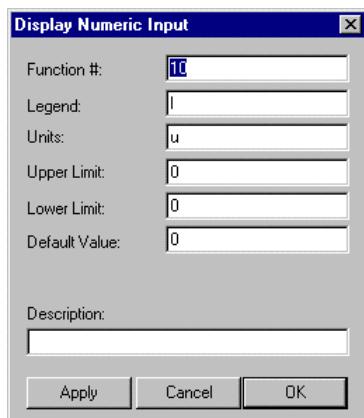


Figure 18. Display Numeric Input Edit dialog box.

2. Make changes in accordance with the information below and your situation:
 - **Function #** must be within a range of 1-65535 and value must not be used by another display data type.
 - **Legend** indicates a legend for the data of up to 16 characters.
 - **Units** indicates the units described in three characters.
 - **Upper Limit** is a 32-bit floating-point number that represents the maximum value that can be set.
 - **Lower Limit** is a 32-bit floating-point number that represents the minimum value that can be set.
 - **Default Value** is a 32-bit floating-point number that is used as the initial value after an application program download to the node. A Display Numeric Input can be reset to this default value at any time. See "Special Symbol Types" for details.
 - **Description** is a maximum 32-character field used as a comment to describe this I/O point.
3. After you've entered all Display Numeric Input values needed, do one of the following:
 - Click **Apply** to accept the values you've entered. If you have many data types to enter, choosing Apply saves the values just entered but leaves them on the screen, minimizing re-entry of identical or similar data.
 - Click **Cancel** to return to the Display Numeric Input tab.
 - Click **OK** to save your entries and return to the Display Numeric Input tab.

Deleting a Display Numeric Input

To delete an entry from the Display Numeric Input tab:

1. From the Display Numeric Input tab, click the **Display Numeric Input** you wish to edit. When clicked, it will become highlighted.

NOTE: You may use SHIFT-Click to select more than one contiguous Node # or CTRL-Click to select more than one non-contiguous Node #.

2. Click **Delete**. The warning message "Do you really want to delete this item?" appears. Click **Yes** or **No**, to confirm your decision. If you select **Yes**, you are returned to the PLC Initialization Table tab that now displays all previous information except for the deleted item.

Display Logic Output

The Display Logic Output displays a logical condition to a remote LAN device (i.e. PC).

Adding or Editing a Display Logic Output

To add or edit a Display Logic Output:

1. An **Add** or **Edit** causes the Display Logic Output dialog box to appear.

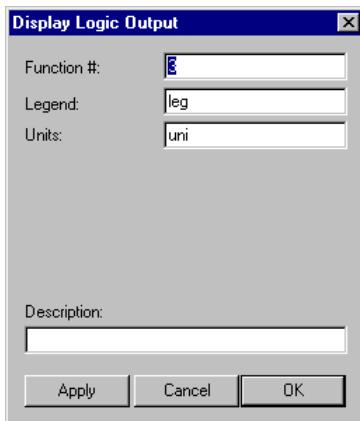


Figure 19. Display Logic Output dialog box.

2. Make changes in accordance with the information below and your situation:
 - **Function #** must be within a range of 1-65535 and value must not be used by another display data type.
 - **Legend** indicates a legend for the data of up to 16 characters.
 - **Units** indicates the units described in three characters.
 - **Description** is a maximum 256-character field used as a comment to describe this I/O point.
3. After you've entered all Display Logic Output values needed, do one of the following:
 - Click **Apply** to accept the values you've entered. If you have many data types to enter, choosing Apply saves the values just entered but leaves them on the screen, minimizing re-entry of identical or similar data.
 - Click **Cancel** to return to the Display Logic Output tab.
 - Click **OK** to save your entries and return to the Display Logic Output tab.

Deleting a Display Logic Output

To delete a Display Logic Output:

1. From the Display Logic Output tab, click the **Display Logic Output** you wish to edit. When clicked, it will become highlighted.

NOTE: You may use SHIFT-Click to select more than one contiguous Node # or CTRL-Click to select more than one non-contiguous Node #.

2. Click Delete. The warning message "Do you really want to delete this item?" appears. Click Yes or No, to confirm your decision. If you select Yes, you are returned to the PLC Initialization Table tab that now displays all previous information except for the deleted item.

Display Logic Input

The Display Logic Input gets a set-up value from a remote device (i.e., PC) and stores it in NVRAM.

Adding or Editing a Display Logic Input

To add or edit a Display Logic Input:

1. An **Add** or **Edit** causes the Display Numeric Input dialog box to appear.

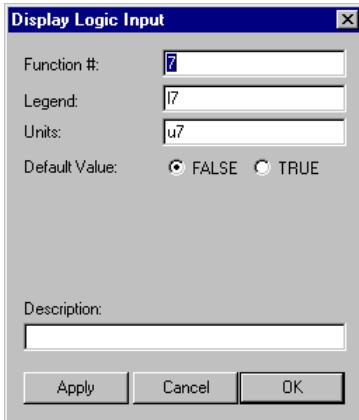


Figure 20. Display Logic Input dialog box.

2. Make changes in accordance with the information below and your situation:
 - **Function #** must be within a range of 1-65535 and value must not be used by another display data type.
 - **Legend** indicates a legend for the data of up to 16 characters.
 - **Units** indicates the units described in three characters.
 - **Default Value (True/False)** is the initial state after a download of an application program to the node. A Display Logic Input can be reset to this Default Value at any time. See "Special Symbol Types" for details.
 - **Description** is a maximum 256-character field used as a comment to describe this I/O point.
3. After you've entered all Display Logic Input values needed, do one of the following:
 - Click **Apply** to accept the values you've entered. If you have many data types to enter, choosing Apply saves the values just entered but leaves them on the screen, minimizing re-entry of identical or similar data.
 - Click **Cancel** to return to the Display Logic Input tab.
 - Click **OK** to save your entries and return to the Display Logic Input tab.

Deleting a Display Logic Input

To delete a Display Logic Input:

1. From the Display Logic Input tab, click the **Display Logic Input** you wish to edit. When clicked, it will become highlighted.

NOTE: You may use SHIFT-Click to select more than one contiguous Node # or CTRL-Click to select more than one non-contiguous Node #.

Broadcast Logic Output

Adding or Editing a Broadcast Logic Output

2. Click Delete. The warning message "Do you really want to delete this item?" appears. Click Yes or No, to confirm your decision. If you select Yes, you are returned to the PLC Initialization Table tab that now displays all previous information except for the deleted item.

The Broadcast Logic Output data type makes the logic status of a drive available to other drives on the LAN. It sends up to eight logic outputs and must be used only in LAN configurations. The logic outputs will be transmitted as part of the high priority LAN broadcast message made by the Smart Trac AC1 when used in an application program.

To add or edit a Broadcast Logic Output:

1. An **Add** or **Edit** causes the Broadcast Logic Output dialog box to appear.

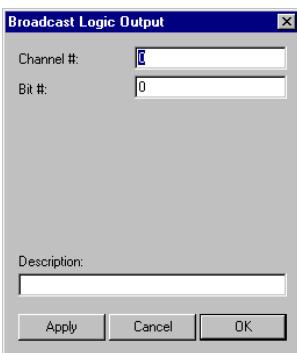


Figure 21. Broadcast Logic Output dialog box.

2. Make changes in accordance with the information below and your situation:
 - **Channel #** must be within a range of 1-8. It points to a specific address of a one-byte wide space in RAM. The channel # typically identifies a particular byte in memory in another drive, an I/O card in another LAN device, or a specific latch of local (non-LAN) hardware.

NOTE: When using a Broadcast Numeric Output, you are limited to four Broadcast Logic Outputs, channels 1 through 4.

- **Bit #** must be within a range of 1-8.
 - **Description** is a maximum 256-character description of the function.
3. After you've entered all Broadcast Logic Output values needed, do one of the following:
 - Click **Apply** to accept the values you've entered. If you have many data types to enter, choosing Apply saves the values just entered but leaves them on the screen, minimizing re-entry of identical or similar data.
 - Click **Cancel** to return to the Broadcast Logic Output tab.
 - Click **OK** to save your entries and return to the Broadcast Logic Output tab.

Deleting a Broadcast Logic Output

To delete an entry from the Broadcast Logic Output:

1. From the Broadcast Logic Output tab, click the **Broadcast Logic Output** you wish to edit. When clicked, it will become highlighted.

NOTE: You may use SHIFT-Click to select more than one contiguous Node # or CTRL-Click to select more than one non-contiguous Node #.

2. Click Delete. The warning message "Do you really want to delete this item?" appears. Click Yes or No, to confirm your decision. If you select Yes, you are returned to the PLC Initialization Table tab that now displays all previous information except for the deleted item.

Broadcast Numeric Output

The Broadcast Numeric Output forces a broadcast over the LAN of a special reference message. It takes a numeric value as its input, inserts the value into the formatted message and broadcasts it over the LAN, once every 30 milliseconds, to all other nodes on the LAN. Only one such broadcast output is allowed.

Adding or Editing a Broadcast Numeric Output

The **Add** button displays only when no Broadcast Numeric Output exists. **Edit** and **Delete** displays when a Broadcast Numeric Output exists.

To add or edit the Broadcast Numeric Output:

1. An **Add** or **Edit** causes the Broadcast Numeric Output dialog box to appear.



Figure 22. Broadcast Numeric Output Selection box.

2. Make changes in accordance with the information below and your situation:
 - **Format: INT/REAL** offers the selection of one of two formats for the Broadcast Numeric Output: Integer or Real. One or the other format must be selected.
3. Do one of the following:
 - Click **Cancel** to return to the Broadcast Numeric Output tab.
 - Click **OK** to save your entry and return to the Broadcast Numeric Output tab.

Deleting a Broadcast Numeric Output

To delete an entry from the Broadcast Numeric tab:

1. From the Broadcast Numeric tab, click **Delete**. When clicked, the Broadcast Numeric Output is deleted, both **Edit** and **Delete** buttons disappear and the Add button appears.
2. You may add the Broadcast Numeric Output back at any time.

Creating Symbols Whose Values are Communicated in LAN Messages

To access the Symbol Manager and create a Symbol for a LAN message:

1. Click **Start, Programs, MAG-300, and Control Manager.**
 2. Double click a node to expand its directory (if not already expanded).
 3. Do one of the following:
 - Right click **Symbols**. Click **Open**. The **Symbol Editor** dialog box appears.
- Or
- Double click **Symbols**. The **Symbol Editor** dialog box appears.

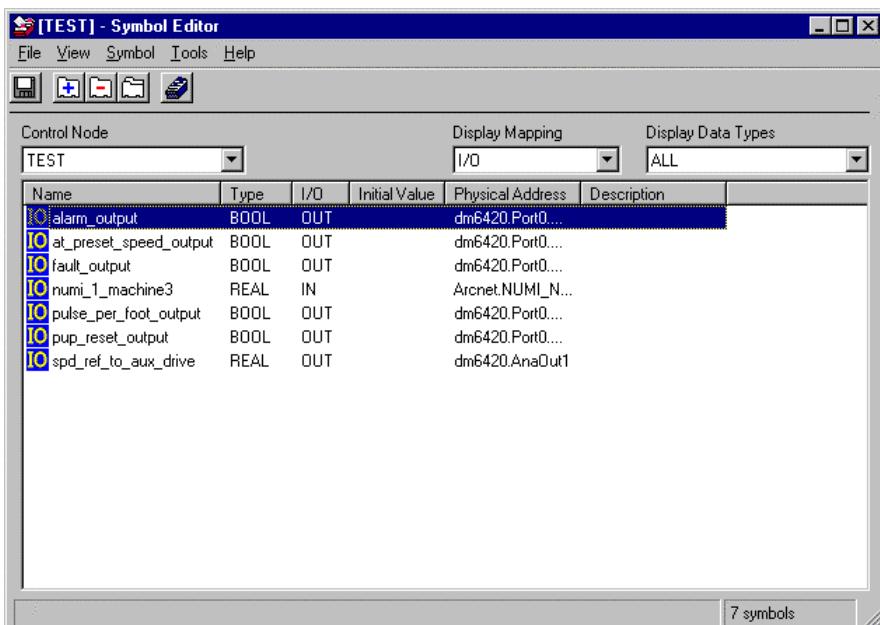


Figure 23. The Symbol Editor

4. Do one of the following:
 - Click the icon which shows the blue plus (+) sign. The **Add Symbol** dialog box appears.

OR
 - Click **Symbol, New**. The **Add Symbol** dialog box appears.

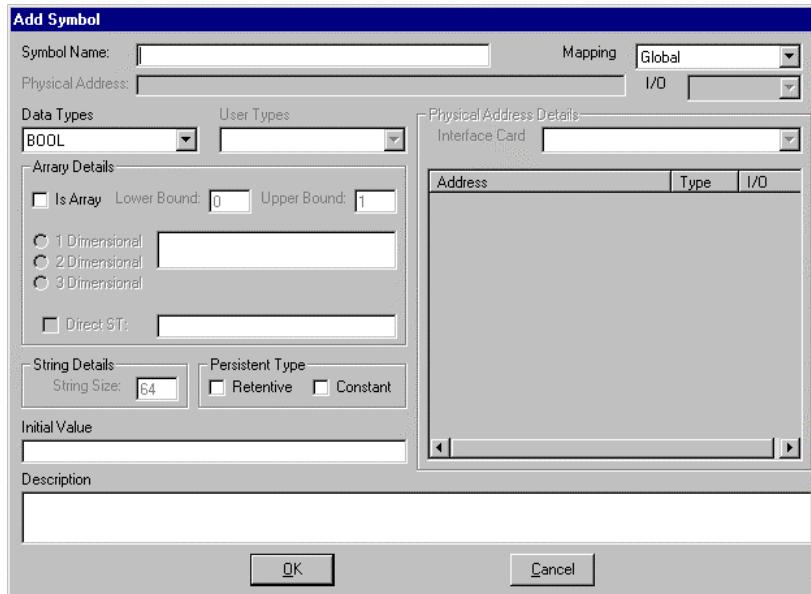


Figure 24. The Add Symbol dialog box

5. Click the down arrow for the **Mapping** selection box and select **I/O**. The **Interface Card** selection box in the **Physical Address** Details area becomes active (highlighted).

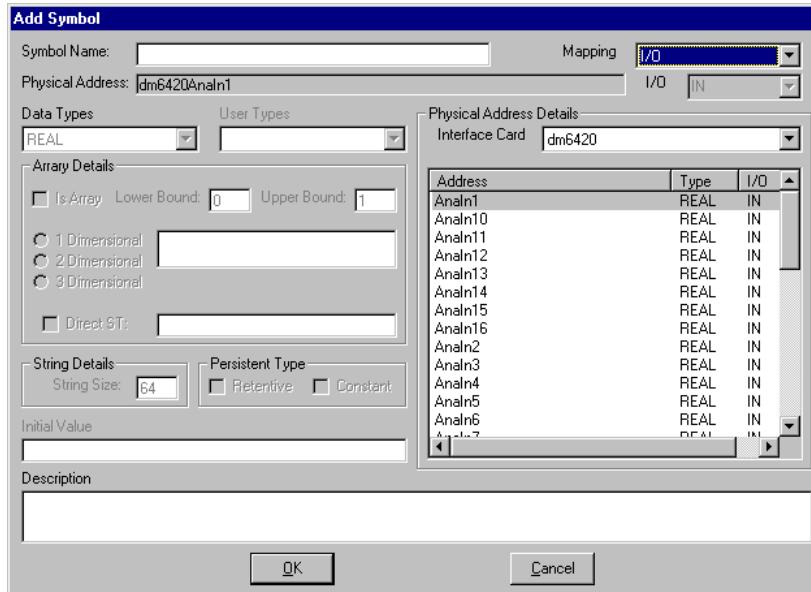


Figure 25. Mapping I/O Selection

6. Click the down arrow for the **Interface Card** selection box and select **STLAN** or the name you gave to Smart Trac LAN Interface Card. Many **Address**, **Type**, and **I/O** entries appear.

Symbol names and types that are shown in the Physical Address area in the screen shot show terminology used in previous generation MagneTek systems. It is used here to show how Smart Trac AC1 is backward compatible with such systems.

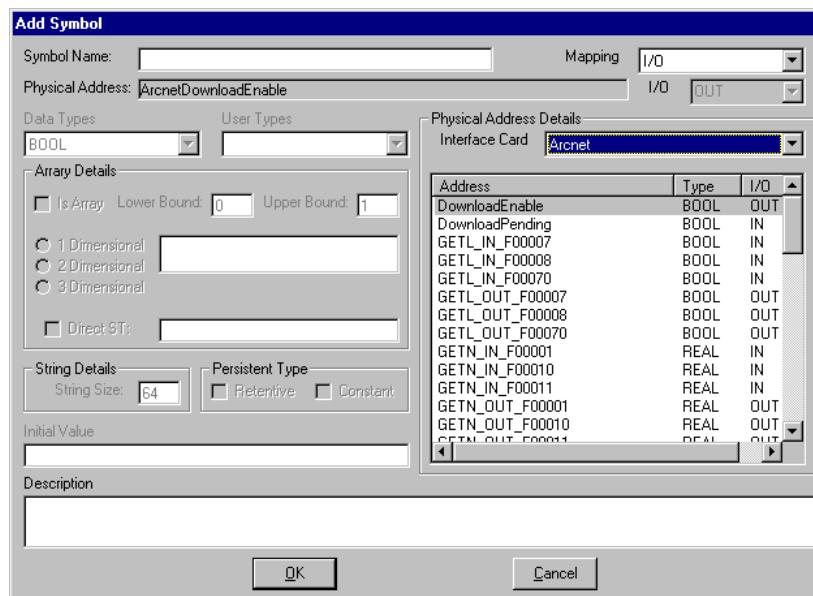


Figure 26. Physical Address Details data for the STLAN Interface Card

7. Do one of the following:

- Click and drag the slider bar to find the Input or Output Address to which you want to assign a symbol.

OR

- Click the up and down arrows to move the slider bar to find the Input or Output Address to which you want to assign a symbol.

8. Click the Input or Output Address to which you want to assign a symbol. The address will appear highlighted.

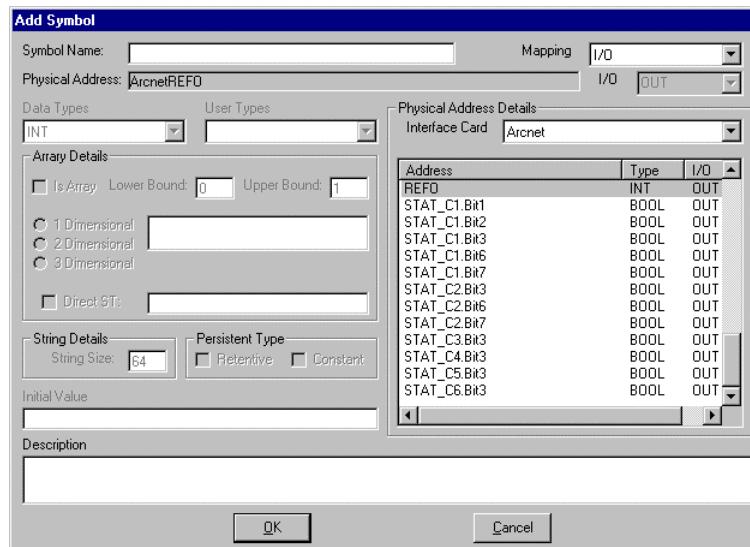


Figure 27. Assign Symbol with REFO Physical Address selected

9. Enter a **Symbol Name** of your choice to represent the selected Input/Output point address. Enter your own description of the symbol. You do not have access to any of the other fields.
10. You may now save your changes and exit the Symbol Editor. Click **OK** to save your entry and return to the Symbol Editor. Newly created symbols will appear as Global symbols in any program editor.

Special Symbol Types

Four symbol names that appear in the Physical Address area of the Add Symbol dialog box are not accessible from the Smart Trac LAN Configuration dialog box. These symbols are: **LanSyncClock**, **LoadDefaultRequest**, **Download Enable**, and **Download Pending**.

LanSyncClock is a 32-bit counter that is incremented every fifteen (15) milliseconds. It is intended for use in an application program as a timing mechanism. You may read the value but cannot write to it.

LoadDefaultRequest is a boolean or true/false symbol. When a "1" is written to it, all Display Numeric Inputs and Display Logic Inputs will reload their respective Default Values. A rising edge, from "0" to "1", causes default values from NVRAM (non-volatile random access memory) to be reloaded.

DownloadEnable and **DownloadPending** are reserved for future use.

Follow instructions in "LAN Message Generation" to add any special symbol type.

LAN Data Types

The following descriptions of LAN data types correspond, in previous generation MagneTek systems, to *PAC blocks*. The Smart Trac AC1 uses many of the same terms for Smart Trac LAN I/O data types.

LAN data types must be defined when the Smart Trac LAN I/O driver is installed using procedures in "Installing the Smart Trac LAN I/O Driver." To generate LAN messages with proper data, they must be referenced in a user program, by an assigned symbol name.

LAN data types that generate broadcast messages include Broadcast Numeric Output, Broadcast Logic Output. Directed Numeric Input, and Directed Logic Input are used to read the broadcast data.

Broadcast Messages

REFO

The REFO address is generated as a result of configuring a Broadcast Numeric Output. It takes the numeric value supplied to its input as an output, inserts that value into the specially formatted message, and then broadcasts it via the LAN to all other receiving nodes on the LAN once every 30 milliseconds.

While all drives on the LAN may receive this message, those destination drives designated to receive this message should be programmed with a Directed Numeric Input data type whose source is defined as the source drive node number and channel 0.

NOTE: Channel 0 is reserved for broadcast numeric messages.

In a multi-drive, coordinated system, the speed reference of any "lead" drive can be sent to any other drive in the system via a REFO broadcast message. The receiving drive can read the speed reference by defining a Directed Numeric

Input data type addressed to read channel 0 of the node assigned to the lead drive.

The transmission of speed references and the calculations required to modify the speed references take a significant amount of time. Because of this, the lead drive will know its speed command long before the last drive of the cascade. The REFQ function block provides a way to synchronize all drives with the speed reference.

Each drive defined with a REFO data type will transmit its speed reference once every 30 milliseconds (scan phase). Drives further down the cascade receive a speed reference from a source drive. They modify the reference (i.e. apply draw), broadcast it to the next cascaded drive within the next 30 millisecond period, and then place the modified value in a queue for its own use at a later time. The number of cascaded drive sections from the lead drive, following the longest path, is called the *cascade number* and determines this later time. Each cascaded drive of a reference increments the cascade number of all preceding drives in the cascade by one (1).

Example: The lead drive in a cascade of five (5) drives would have a cascade number of 5. In any given 30-millisecond period, it would calculate a new speed reference and broadcast it to follower drives within the next 30-millisecond period. To set its speed, it would use the speed calculated five periods before. At the same time, the last drive of the cascade would reference the lead drive's speed of five (5) periods before but would receive this reference last.

You must program the cascade number as an input to the REFQ function block by setting the **Cascade Input**. To prevent a change to the cascade number while a drive is running, define **Reset Input** to be true only when the drive is in a stopped condition (i.e., loop contactor open).

You must program the REFQ function block in a faster scan than the reference transmission time base.

STAT

Each STAT address is generated as a result of each entry in the Broadcast Logic Outputs. The Status, Packed Logic Output, data type makes one drive's logic status available to other drives. It accepts up to eight (8) logic byte outputs, for a total of 64 logic outputs. The STAT data is packed into a logic byte and transmitted as part of a high priority broadcast message.

To allow any drive on the LAN to read these logic bits, use the Directed Logic Input data type. Reference the node number of the source drive, the channel number assigned to the STAT type in the source drive program and the bit number of one of eight bits assigned to the STAT data type.

More than one (1) STAT data type may be programmed into a user program. Assign Channel numbers in consecutive order starting with channel 1. Each STAT must be assigned its own, unique channel number. As many as 8 channels may be assigned.

NOTE: When configuring Broadcast Numeric Output (REFO), you must use only Broadcast Logic Output Channels 1 through 4 (STAT1 through STAT4).

Directed Messages

LAN data types that generate directed messages include Display Numeric Input (GETN), Display Numeric Output (PUTN), Display Logic Input (GETL), Display Logic Output (PUTL), Directed Numeric Input (NUMI), Directed Numeric Output (NUMO), Directed Logic Input (LOGI) and Directed Logic Output (LOGO).

GETN	Each GETN address is generated as a result of each entry in the Display Numeric Input. The Display Numeric Input gets a value from a remote node, stores it in non-volatile Ram (NVRAM) and makes it available to the user program. On the LAN, this value may come from a number of sources.
PUTN	Each PUTN address is generated as a result of each entry in the Display Numeric Output. It takes the value from an output of a user program and makes it available to a remote node.
GETL	Each GETL address is generated as a result of each entry in the Display Logic Input. The Display Logic Input gets a value from a remote node, stores it in NVRAM, and makes it available as an input to a user program.
PUTL	Each PUTL address is generated as a result of each entry in the Display Logic Output. It takes the value from a logic output of a user program and makes it available to a remote node.
NUMI	Each NUMI address is generated as a result of each entry in the Directed Numeric Input. The Directed Numeric Input function block receives a Numeric Input from outside the application program environment.
NUMO	Each NUMO address is generated as a result of each entry in the Directed Numeric Output. The Directed Numeric Output function delivers a numeric value to outside the application program environment. The remote device will be sent an initialization message on power-up which states this drive's expectations.
LOGI	Each LOGI address is generated as a result of each entry in the Directed Logic Input. The Directed Logic Input function receives a logic bit from outside the application program environment. The remote device will be sent an initialization message on power-up which states this drive's expectations.
LOGO	Each LOGO address is generated as a result of each entry in the Directed Logic Output. The Directed Logic Output function delivers a logic bit from the application program to outside the application program environment. The remote device will be sent an initialization message on power-up which states this drive's expectations.

LAN Traffic Management

Proper configuration of the various types of LAN data types (Directed Logic Output, Display Numeric Input, etc) minimizes LAN traffic. The following guidelines offer ways to properly configure your Smart Trac LAN.

- Keep Directed Logic Output and Directed Numeric Output timeouts as high as possible (10 seconds recommended). The drive will send redundant value information at half the programmed timeout time, to a maximum 4-second interval.
- Use DAVE (the Discontinuous Average function block) to dither numeric values. When values are rapidly changing (i.e., Current Feedback) and not necessarily or immediately needed at a remote location, use the DAVE function block to average the value over a programmed interval to "pace" the outgoing LAN messages.
- Pack logic messages together for Directed Logic Output and Directed Logic Input data to and from a drive. Each Logic Update message contains thirty-two (32) values of logic for a channel, whose bit position defines the SubChannel. Therefore, 32 logic values are sent or received regardless if only one subchannel or all 32 subchannels are used.

- If a drive is broadcasting, use the STAT function block to piggyback logic information meant for other drives into its broadcast message. The LAN I/O driver reserve logic byte locations for Reference and LAN Sync broadcast messages, whether or not they are used. Therefore, there is no penalty to use them.
- If a drive is not broadcasting, use directed messages to send logic information to other drives whenever possible. The LAN sends broadcast messages every 30 milliseconds but sends directed messages when data changes or typically at 4 second intervals.
- With PC Data Server (DDE or OCX), use the Display data types instead of Directed data types. Display data type LAN messages can be turned ON and OFF. Directed data types are always ON. Use:
 - Display Numeric Input functions instead of Directed Numeric Input functions
 - Display Numeric Output instead of Directed Numeric Output
 - Display Logic Input or GETM instead of Directed Logic Input
 - Display Logic Output instead of Directed Logic Output.
- Always send Directed Numeric Input, Directed Numeric Output, Directed Logic Input and Directed Logic Output messages over the LAN to prevent drive faults caused by information not being received. This means that messages from these functions will constantly generate network traffic even if the information is not displayed at the remote device.
- Start Display Numeric Input, Display Numeric Output, Display Logic Input and Display Logic Output messages when a screen is entered and stop them when the screen is exited to reduce traffic on the LAN as well as the PC.

Drive to Drive Communication

You must configure the communication between drives using four different types of messages: Directed Logic; Directed Numeric; Broadcast Logic; and Broadcast Numeric. Each input and output must be associated with a unique *Channel* and *bit* or *SubChannel* that together define the Input or Output address.

Using these specific addresses, a directed message may be sent from a source drive to the intended destination drive. Likewise, certain drives may be designated as broadcasting (source) drives and others as receivers of broadcast messages (destination drives).

Drive to Drive Directed Logic Message

To configure the *source* drive of a directed logic message:

1. Click the **Logic Output** tab of the Smart Trac LAN Configuration dialog box.
2. Click **Add**. The **Logic Output** dialog box appears.
3. Configure the source drive with the information needed to send information to the destination drive:
 - Enter the node # of the destination drive in the **Remote Node #** field.

- Enter the **Channel #** of the destination drive's address.

Note: When assigning a directed logic output for a destination drive, you may not use Channels 0-8. These channels are reserved for Broadcast Logics.

- Enter the **Bit #** of the destination drive's address.
- Enter **Sink** or **Source**. Sink and Source selection is not applicable in drive-to-drive communication.

To configure the destination drive for a directed logic message:

1. Click the **Logic Input** tab of the Smart Trac LAN Configuration dialog box.
2. Click **Add**. The **Logic Input** dialog box appears.
3. Configure the *destination* drive with the information needed to receive information from the source drive:
 - Enter the node number of the source drive in the **Remote Node #** field.
 - Enter the **Channel #** of the source drive's address. This must match the Channel # entered in the source drive's Logic Output.

Note: When assigning a directed logic output for a source drive, you may not use Channels 0-8. These channels are reserved for Broadcast Logics.

- Enter the **Bit #** of the source drive's address. This must match the bit entered in the source drive's Logic Output.
- Enter **Sink** or **Source**. Sink and Source selection is not applicable in drive-to-drive communication.

To configure a source drive for a directed numeric message:

1. Click the **Numeric Output** tab of the Smart Trac LAN Configuration dialog box.
2. Click **Add**. The **Numeric Output** dialog box appears.
3. Configure the source drive with the information needed to send information to the destination drive:
 - Enter the node # of the destination drive in the **Remote Node #** field.
 - Enter the **Channel #** of the destination drive's address.

Note: When assigning a directed numeric output for a destination drive, you may not use Channel 0. This channel is reserved for Broadcast Numerics.

- Enter the **SubChannel #** of the destination drive's address.

To configure the destination drive for a directed numeric message:

1. Click the **Numeric Input** tab of the Smart Trac LAN Configuration dialog box.

2. Click **Add**. The **Numeric Input** dialog box appears.
3. Configure the *destination* drive with the information needed to receive information from the source drive:
 - Enter the node of the source drive in the **Remote Node #** field.
 - Enter the **Channel #** of the source drive's address. This must match the Channel # entered in the source drive's Numeric Output.

Note: When assigning a directed numeric input for a destination drive, you may not use Channel 0. This channel is reserved for Broadcast Numerics.

- Enter the **SubChannel #** of the source drive's address. This must match the subchannel # entered in the source drive's Numeric Output.
- Enter **DCP Location** and **Format**, Integer or Real, as required for your application.

Broadcast Logic Messages

To configure a source drive for a broadcast logic message:

1. Click the **Broadcast Logic Output** tab of the Smart Trac LAN Configuration dialog box.
2. Click **Add**. The **Broadcast Logic Output** dialog box appears.
3. Configure the source drive with the information needed to send information to the destination drive:
 - Enter the **Channel #** of the destination drive's address.

Note: When assigning a Broadcast Logic Output for destination drive, you must only use Channels 1-4 if there is a Broadcast Numeric Output. Channels 5-8 are only available if there is not a Broadcast Numeric Output.

- Enter the **SubChannel #** of the destination drive's address.

To configure a destination drive for a broadcast logic message:

1. Click the **Logic Input** tab of the Smart Trac LAN Configuration dialog box.
2. Click **Add**. The **Logic Input** dialog box appears.
3. Configure the *destination* drive with the information needed to receive information from the source drive:
 - Enter the node # of the source drive in the **Remote Node #** field.

Note: When assigning a directed logic input for a source drive, you may not use Channels 0-8. These channels are reserved Broadcast Numerics.

- Enter the **Channel #** of the source drive's address. This must match the channel # entered in the source drive's Broadcast Logic Output.

- Enter the **SubChannel #** of the source drive's address. This must match subchannel # entered in the source drive's Broadcast Logic Output.

NOTE: If you must configure a Broadcast Numeric Output, Broadcast Logic Output channels 5-8 will not be sent in the broadcast LAN message. This is because Broadcast Logic Output channels share the same "message space" as the Broadcast Numeric Output value in the LAN message.

Broadcast Numeric Messages

To configure a source drive for a broadcast numeric message:

1. Click the **Broadcast Numeric Output** tab of the Smart Trac LAN Configuration dialog box.
2. Click **Add**. The **Broadcast Numeric Output** dialog box appears.
3. Select **REAL** or **INT** number format, depending on your situation.

To configure a destination drive to receive a broadcast numeric message:

1. Click the **Directed Numeric Input** tab of the Smart Trac LAN Configuration dialog box.
2. Click **Add**. The **Directed Numeric Input** dialog box appears.
3. Configure the *destination* drive with the information needed to receive information from the source drive:
 - Enter the node # of the source drive in the **Remote Node #** field.
 - Enter the **Channel #** as "0".
 - Enter the **SubChannel #** as "0" (although any valid value for SubChannel is acceptable).
 - Enter **DCP Location**.
 - Select **REAL** or **INT** number format, depending on your application. The format must be identical in format as that designated for the source drive.



SMART TRAC LAN Driver

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FAQs: How Do I . . .

What is the difference between a Smart Trac LAN and an *ARCNET LAN*?

ARCNET is a communications protocol that transmits data a series of eight-bit characters at 2.5 megabits per second. It passes tokens in a *logical ring* sequence. Smart Trac LAN uses the ARCNET LAN protocol, which defines the network physical medium and structure of data packets. MagneTek designed the contents of the data packets and the algorithms used to synchronize nodes on the network.

What is a *token*?

In Smart Trac LAN, a *token* is really an "Invitation To Transmit", or ITT. A unique set of data bits, a token authorizes transmission rights to a node on the network.

What is a *logical ring*?

In Smart Trac LAN, a *logical ring* refers to the logical sequence of token passing, moving the token from one node to another. The token always passes to the node with the next highest address. When the token reaches the active node with the highest address, the token is passed to the node with the lowest address and the sequence repeats.

How do I know which node is "master" of a Smart Trac LAN?

With the Smart Trac LAN, you may have several types of "masters." The first designates the node in control of the network while tokens are passed from one node to another. The second, or *sync master*, is determined by the Smart Trac LAN I/O Driver and determines which node transmits broadcast LAN Sync messages to other drives in the LAN. A third, or Logical Master, is determined by the User program and determines which node controls the drive system or a drive section.

In the first type of master, the ARCNET protocol relinquishes control of the network to the node receiving the token. That node becomes "master" and can

transmit a message over the network. In this way, each node on the network will receive master status sometime if it is an active participant on the network. If the master has no data to send, it immediately passes the token to the node with the next highest address, relinquishing master status to that node.

In the second type of master, the drive selected as *Sync Master* by the Smart Trac LAN I/O Driver may be one of many. Generally, the drive with the lowest Node ID that is broadcasting becomes Sync Master. However, regardless of which drive is the sync master or has the token at a point in time, the user program determines the drive to be master to the system or a section.

How do I reconfigure a Smart Trac LAN after I add or remove a node?

A Smart Trac LAN reconfigures itself.

Because it relies on a token-passing protocol, a newly added node will allow 840 milliseconds to recognize that it never receives an Invitation to Transmit (ITT) - the *token* - to become "master" of the network. Not to be outdone, the newly added node sends a *reconfiguration burst* over the network. This burst of activity (for 2754 microseconds) jams the network so much that tokens cannot be passed, destroying the token. The burst indicates to the other nodes that a reconfiguration is occurring.

Each node retains the node ID of its neighbor in memory. When a reconfiguration occurs, it sets this node ID to its own node ID.

After 78 microseconds, the node with the highest address (the "neighbor") times out. It starts transmitting a new token-passing sequence and tries to send the token to the node with the next highest address.

If that node doesn't respond within 74 microseconds, it is determined to be inactive or absent from the network. The node increments the address and attempts to pass the token to the node with the newly calculated address.

The process continues until an active neighbor node is found. The token is released to the responding neighbor node and the address of that node is retained in memory.

All nodes repeat this sequence until each node learns its logical neighbor. Each node memorizes the node ID of its neighbor and resumes passing the token only to this neighbor. This completes the reconfiguration sequence.

Glossary of Terms

Active hub	A device that accepts a data signal into a port, repeats the signal, regenerates it, and sends it to all connected ports (all devices networked through the active hub).
algorithm	A logical procedure for solving a problem.
ARCNET	Acronym for Attached Resource Computer Network, it is one of the oldest forms of networks. Created in 1977 by Datapoint Corporation, ARCNET uses token passing in combination with star/bus topology to transmit data at 2.5 Mbps (megabits per second). It is simple, inexpensive and reliable, and is a good solution for small LANs. Cabling may include RG-62, 90-ohm or 93-ohm coaxial, UTP and fiber optic. It will support as many as 255 nodes.
broadcast message	A type of LAN message in which one node sends information to all other nodes. The message contains the source of the message, but the destination is all nodes that have been enabled to receive broadcast messages.
channel	The second level address used to further define the location of information external to the programming environment. (The first level of addressing is the Node ID). To use a Channel number also requires use of the associated Node ID (i.e., Node 230, Channel 123).
directed message	A LAN message that is sent by one node and received only by the node addressed in the message. Also referred to as "directed."
hub	A connection device that receives a signal and transmits it to the connected devices.
IRQ	Acronym for Interrupt Request. A value that a device sends to a computer's central processing unit to interrupt processing when that device needs to send some information.
LED	Acronym for Light Emitting Diode.
node	An intelligent device connected to the Local Area Network (LAN) that participates in token passing. It is identified by a number from 1 to 255. An ARCNET node is a device with an active ARCNET controller chip requiring an ARCNET device address.
PAC block	A function that has an associated symbol that is used in a MagneTek defined graphical programming environment called Program Application Control (PAC). The symbol represents executable code that is compiled (along with other connected symbols) to run on MagneTek equipment (i.e. drives).

packet

A packet or "data packet" is a grouped set of data sent to one or more nodes. A data packet might contain, for example, an Alert Burst, SOH (start of header character), SID, DID, Data Count, a variable amount of data, and a CRC check.

Passive hub

A non-powered device which receives a signal from one device on the network and sends it to all networked devices with no signal regeneration or amplification.

PC/104 specification

An embedded bus standard. The standard defines the mechanical size of a self-stacking bus. Also an IEEE draft standard, called the P996.1 Standard for Compact Embedded PC Modules, the PC/104 Specification, Version 2.1, July 1994, PC/104 Consortium.

protocol

A set of formal rules describing how to transmit data, especially across a network. This includes electrical and physical standards at the lowest level to data formatting, the syntax of messages and the device to device dialogue at the highest levels.

Remote Display Unit

A device that connects logically to a drive via the Smart Trac LAN and allows easy interface between the operator and the drive for setting parameters and viewing drive data.

segment

A local area network segment is any portion of the complete LAN cabling system isolated by one or more hub ports. The simplest network configuration, using no hubs at all, consists of only one segment with two or more nodes. An active controller chip requiring an address is a node. Hubs do not require addresses. For this reason, they are not considered network nodes.

Allowable segment cable length depends on the transceiver used and the type of cable installed.

SubChannel

A SubChannel is the third level of definition of a location of information. By describing the Node ID, Channel # and SubChannel #, a specific input or output of a given Node and Channel is defined.

token-passing

A scheme used by some networks that employs the passing of a combination of bits, or token, which grants an "Invitation to Transmit," or ITT.

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