Technical Support document:

DX940 router configuration for Serial over Frame Relay Application.

Step by step guide, including configuration of physical DDS WAN port, Frame Relay, Terminal Server and Serial port settings.

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Overview

This example steps through the various configuration screens to setup a serial port for a SCADA type application on a DX940 for use in a typical terminal server application where a remote SCADA Master based system requires access to equipment attached to the DX940 over a DDS WAN connection. This example shows the steps using a DX940 the configuration steps would be identical across all DX platforms including the 10ETS and 10XTS models.

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Accessing the DX940 Configuration system

The initial access to DX940 configuration system can be accessed by direct connection to the units console connection, or via an IP based connection using Telnet or SSH. Access to the WEB interface can be achieved using a WEB browser. If this is a new unit the factory default IP address is 192.168.1.2. Please also note that all ports on a factory default setting will be disabled with the exception of the **highest** Ethernet port number. So for a DX940 connect your PC initially to E6.

If you can't access the DX940 via the Ethernet port, because its address is unknown, then the IP address can be reset via the Console port BOOT application. Using a PC Terminal application such as Putty or TeraTerm and connect to the dedicated CONSOLE port (38,400 bps, no parity, 8 data bits and 1 stop bit) using a standard DB9 cross over cable (supplied with the equipment) and holding down the SPACE bar after a DX940 power cycle.

Also note if your application does not want to have IP enabled, then once the unit has been configured for all the necessary parameters for the WAN and Serial ports the IP configurations can be erased (IP addresses) and then admin disable all Ethernet ports.

> *GarrettCom, Inc.*
> *MNS-DX ROM version 3.1.7 (Y12) 200/128*
>
> **** Hold down SPACE to stop boot process ****
>
> *Starting boot menu...*
>
> *Boot Menu*
> *---------*
>
> *1: View System Information*
> *2: Assign System IP Address*
> *3: Install Initial Software Image from FTP Server*
> *4: Install Initial Software Image via TFTP*
> *5: Install Initial Software Image via XMODEM*
> *6: Load Temporary Image from FTP Server*
> *7: Load Temporary Image via TFTP*
> *8: Load Temporary Image via XMODEM*
> *9: Restore System to Factory Defaults*
> *b: Boot*
>
> *MNS-DX>*

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Simply use Option 2: to define the initial IP address, then Option b: to boot. You could also use option "9" to reset all configurations to factory default and the initial IP address of the DX940 should be 192.168.1.2.

Once IP addresses have been assigned one can access to the configuration system , this section covers WEB access.

Once the address is defined then launch a HTTPS: session to the address that was defined. For this example we are using 192.168.2.2 Mask 255.255.255.0.

Please note that only SECURE access methods are enabled by default, so we need to use HTTPS for WEB access, SSH or Direct console for CLI access.

Default passwords for ADMIN access is "manager/manager"
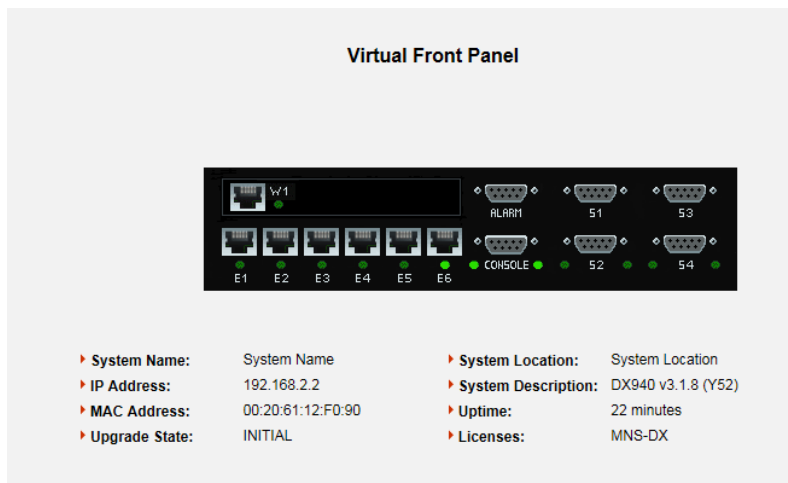
Initial Virtual Front Panel Web screen showing various system level information including software version etc.

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Frame Relay Provisioning

The DX940 brings a WAN port capability to the Garrettcom DX product line and we recommend that when provisioning a new WAN circuit that you follow the OSI 7 layer guidelines where we step through the various OSI layers starting at the Physical layer, Frame Relay layer and finally configure applications that will use this interface. Figure 1 shows the lower layers we are most interested in.
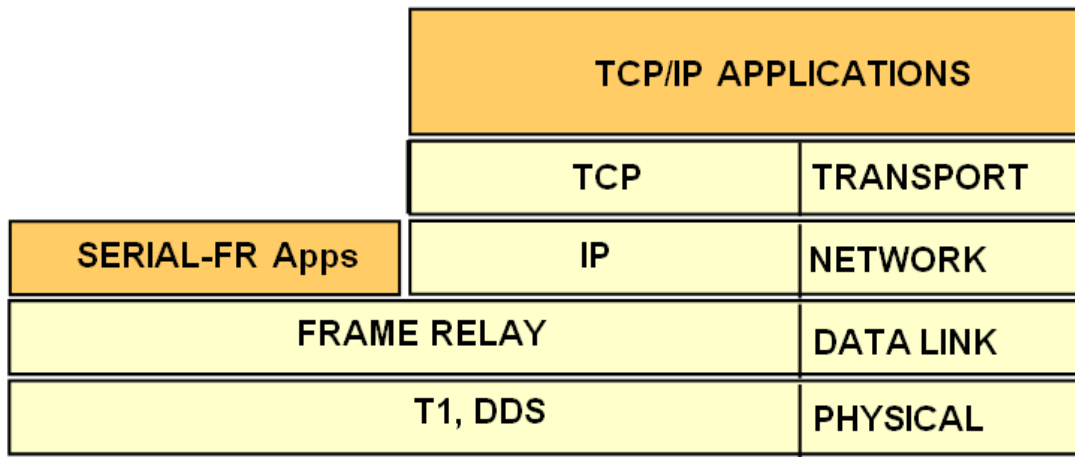
	TCP/IP APPLICATIONS	
	TCP	TRANSPORT
SERIAL-FR Apps	IP	NETWORK
FRAME RELAY		DATA LINK
T1, DDS		PHYSICAL

Figure 1 OSI layers for Frame Relay Applications.

DDS Physical Interface Configuration:

The DX940 can be supplied with either a T1/E1 or DDS type physical WAN interface. In this example we will be using a DDS WAN interface and specifically SERIAL-FR APPS over FRAME RELAY and DDS Physical Interface

The DDS interface has minimal options to configure and is the simpler of the two offerings. DDS circuits are normally provided by a Telecom Service Provider, in most cases running at 56 kilobits of bandwidth (64k is also available) and the clocking provided by the carrier. The DX940 WAN port physical layer configuration is located under the Frame Relay sub-menu "Port Settings"

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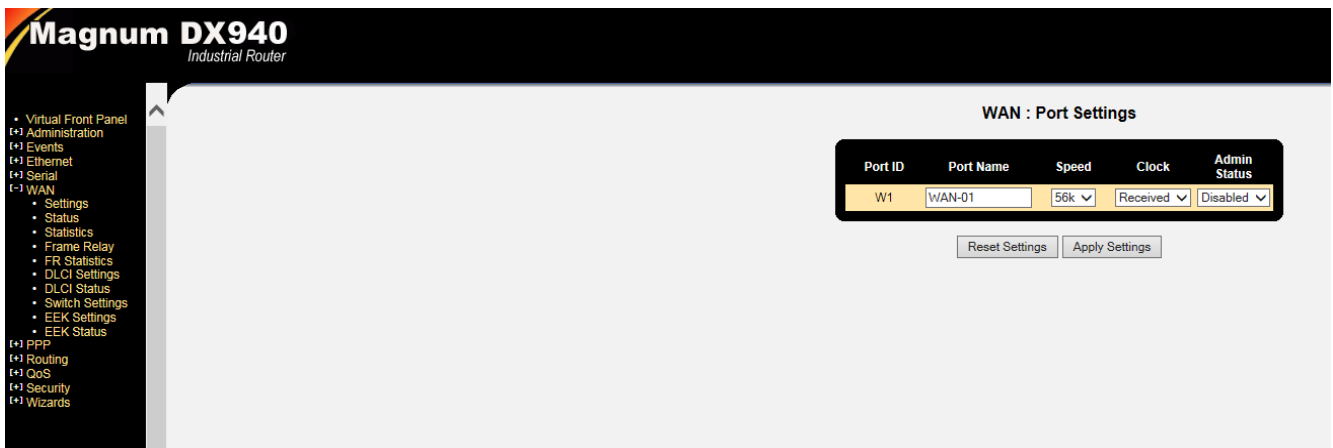
The screen allows the user to give an arbitrary name to the WAN port circuit; typically this might be the real circuit number "DDS-147658A12" or just a name that helps provide immediate recognition "FR to SCADA Master". Other options include the circuit speed (normally 56k), clock source (usually Received) and then the option to administratively enable the port.

The other setting options are used if the DDS circuit is part of a private TDM network operated by the "enterprise" versus a "Carrier" leased circuit, or the circuit is just a 'bare' copper connection not terminated by any other equipment. Under these circumstances the DX can be used as the terminating equipment and can optionally use the additional bandwidth provided by the 64k option. When operating over a dedicated point to point link one unit is nominated to be the "clock source" or LOCAL and the other end "clock receive" or RECEIVED. It does not matter which end is which, so long as one is LOCAL and the other RECEIVED.

You can immediately check the status of the connection by clicking on the "Port Status"

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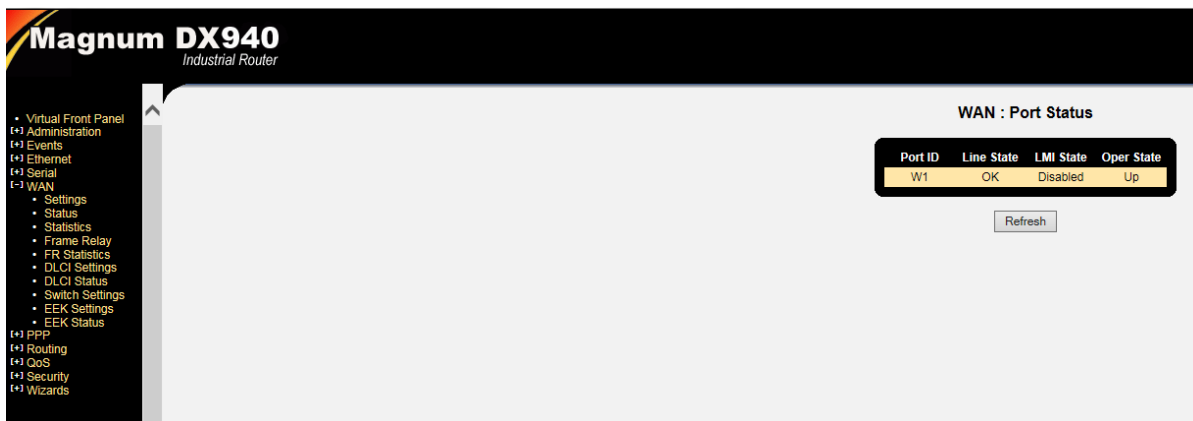
At minimal the "Line State" should show O.K. versus "Carrier Loss". Testing if the correct Line rate (56k or 64k) was selected will not affect this initial status message. Only when we start mapping higher OSI layers will we know for sure if the line rate selected is correct.

Other possible values for the DDS LINE STATE are:

- OK – The link is UP and is functioning properly.
- Rx Inactive – The receiver is inactive (possibly because it is being reset
- Loss of Sig – The signal has been lost or the signal has dropped more than 6dB.
- Excess BPVs – Excessive occurrence of invalid Bipolar Violation events.
- Data Idle – Receiving Data Mode Idle.
- Cm Idle – Receiving Control Mode Idle.
- Out of Service – Receiving out of Service code.
- Out of Frame – An error has been reported in the framing pattern.
- DSU Loopback – The line is in local DSU loopback. (Looping back to the DX)
- CSU Loopback – The line is in CSU loopback. (Looping back to Network)

One other useful command that is available from the CLI is a command "service wandiag show"

MagnumDX# service wandiag show
W1
Enabled.
Clock is remote.
Loopback Disabled.
Diag Mode: None (normal operation).
Line Speed: 56k
Receiver gain: 0
Loop current: Low
BPV (Line Code Errors): 184

In particular the "Receiver GAIN" is the value of the receiver amplifier, 0 indicates a very strong receiver signal (which is good), this can run to a number between 0 and 40, the higher the number indicates a weaker signal, 40 being extremely weak or no receiver signal. Useful diagnostic field when experiencing loss of contact or Frame Relay circuit indicating down.

Frame Relay Interface Configuration

If the plan is to use the Frame Relay LMI management protocol then we can enable that, the 2 basic settings are LMI protocol selection LMI, ANSI or CCITT version, and then User or Network selection. You will need to consult with the carrier which LMI version to select and then in most cases if you are using an external carrier the Use Case will be "User".

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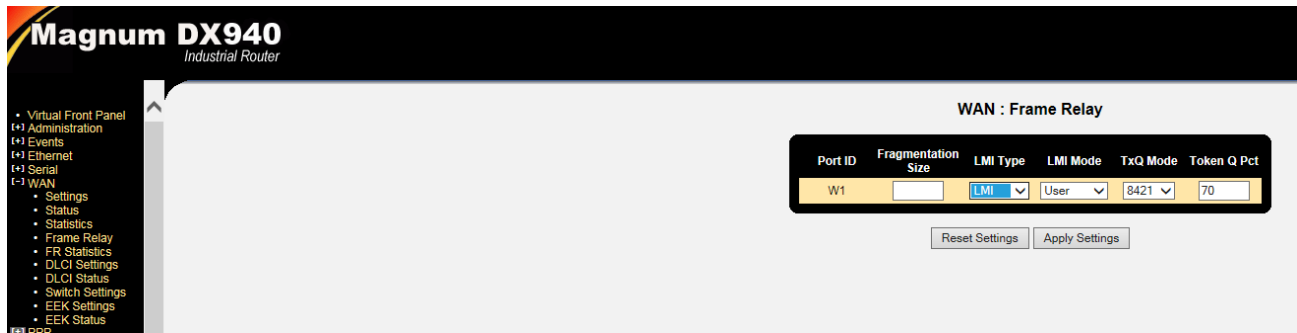
If the settings are correct we should see
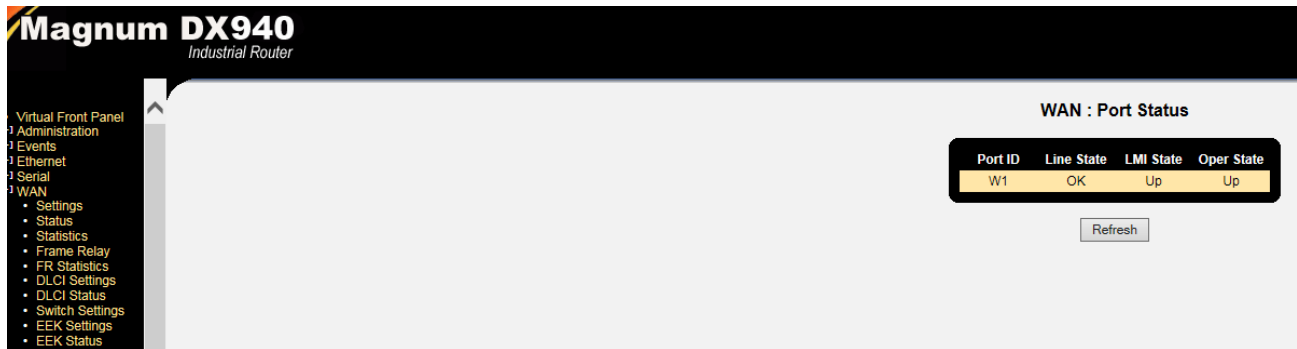
## DDS Frame Relay DLIC Configuration

The next step is to configure the DLCI's that will be used to carry the Serial/SCADA traffic. Each DLCI carries one data flow, so if you want to use 4 serial ports, you would configure 4 DLCI's here.

In this example we selected DLCI 100, in the next box we unclick IP to NO, as we simply want to encapsulate the traffic directly in Frame Relay and not IP based. Further configuring CIR (Commited Information Rate) and EEK (End to End Keepalive) are for further more detailed implementation designs and not covered here.

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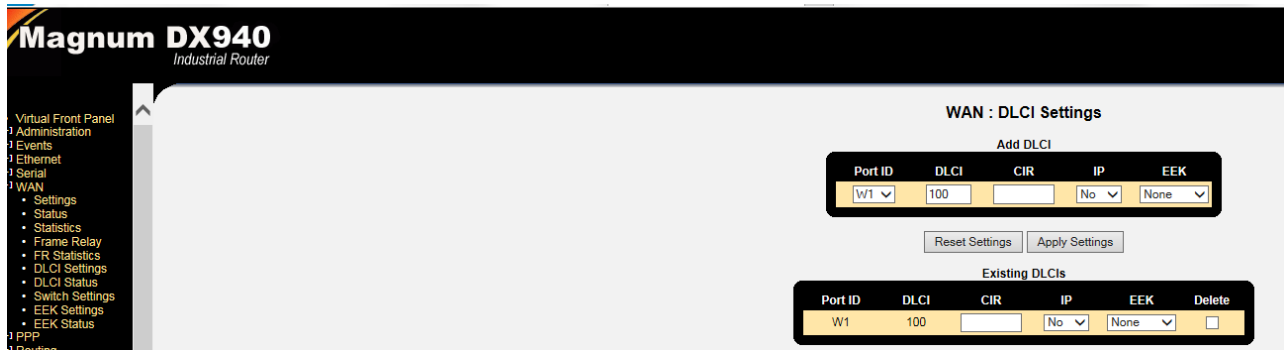
Serial Port Provisioning

First steps in configuring the serial ports is to first define a profile, the profile defines things like Speed, Parity etc in this example we set the name of the port "SCADA DNP3", set the electrical interface type (RS232/RS485), Speed and Stops bits and Parity to match the attached serial device. The other settings we recommend are: "Ignore DSS" set to YES, this overrides the normal requirement to have an active incoming "data set signal" from the attached serial device and also modify the "Pkt Time" parameter from 200 to 20 (20mS forwarding timer).
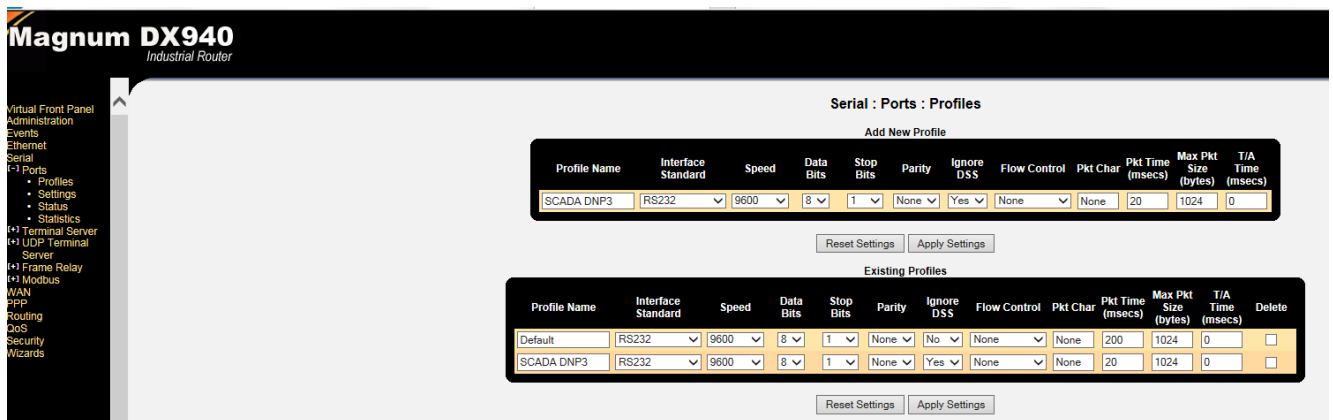
In order to meet some of the new security requirements for this type of equipment the DX940, by default, disables any serial ports that have not been explicitly activated. So this step is required to activate the appropriate ports, S1 and also to apply the PORT Profile to the port. In this case S1 will use the "SCADA DNP3" profile. Don't forget to change the Admin Status to Enabled on the ports to prepare them for operation.

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Magnum DX940
Industrial Router

Virtual Front Panel
Administration
Events
Ethernet
Serial
[-] Ports
  • Profiles
  • Settings
  • Status
  • Statistics
[+] Terminal Server
[+] UDP Terminal
    Server
[+] Frame Relay
[+] Modbus
WAN
PPP

Serial : Ports : Settings

Port ID	Port Name	Profile	Admin Status
S1	SCADA DNM3	SCADA DNP3 ⌄	Enabled ⌄
S2	Serial-02	Default ⌄	Disabled ⌄
S3	Serial-03	Default ⌄	Disabled ⌄
S4	Serial-04	Default ⌄	Disabled ⌄

Reset Settings   Apply Settings

Serial Port status and port statistics are available to check the port operation.

Serial : Ports : Status

Port ID	DCD	CTS	DSR	Oper State
S1	Off	Off	Off	Up
S2	Off	Off	Off	Disabled
S3	Off	Off	Off	Disabled
S4	Off	Off	Off	Disabled

Refresh

Serial : Ports : Statistics

Port ID	Tx Chars	Rx Chars	Breaks	Parity Errors	Framing Errors	Overruns
S1	0	0	0	0	0	0
S2	0	0	0	0	0	0
S3	0	0	0	0	0	0
S4	0	0	0	0	0	0

Refresh   Clear Counters

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Assigning the Serial Port to the Frame Relay connection

The final steps are to match up the serial port and the Frame Relay DLCI. To do this we select the Frame Relay tab Channel Settings and assign the serial port number and configured DLCI. The "payload offset" may be required if interoperability with DynaStar products is required.

You will see here we get an error message when we try to do this and the reason for this is that all the serial ports are assigned to the IP Terminal Server application by default. So knowing most folks would not know that I used the screen shot to indicate the error you will likely see.
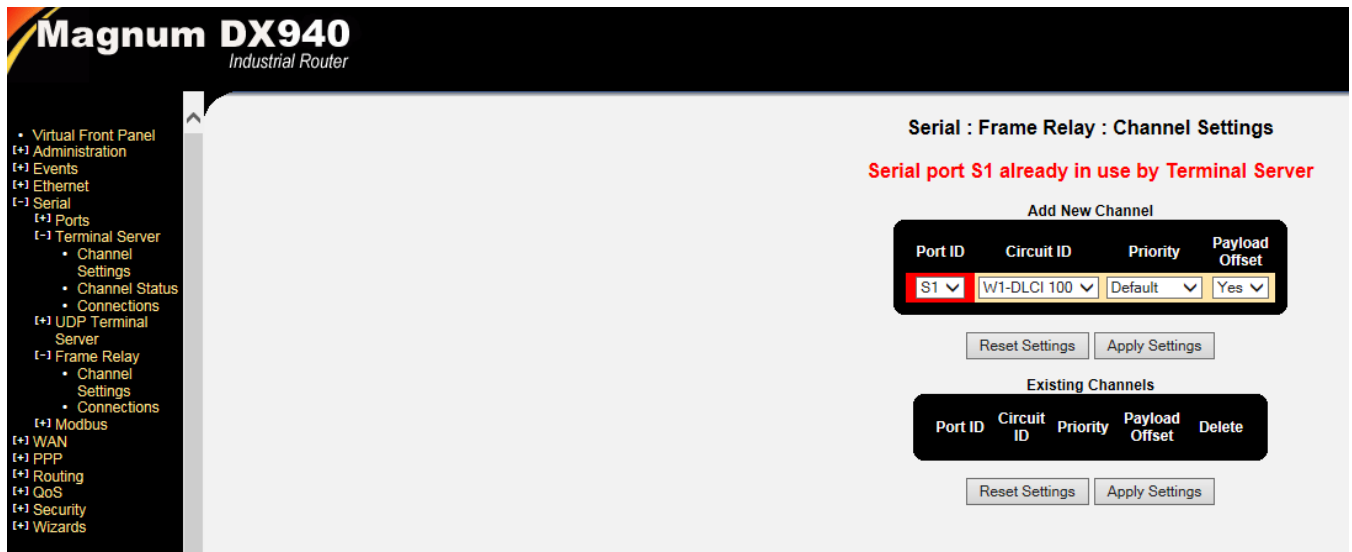
To fix this we go to the IP Terminal Server configuration and "unassign" the serial ports we want to use for Frame Relay encapsulation applications. So there is a "check box" to delete a connection, so here I show S1 deleted from this Terminal Server table.
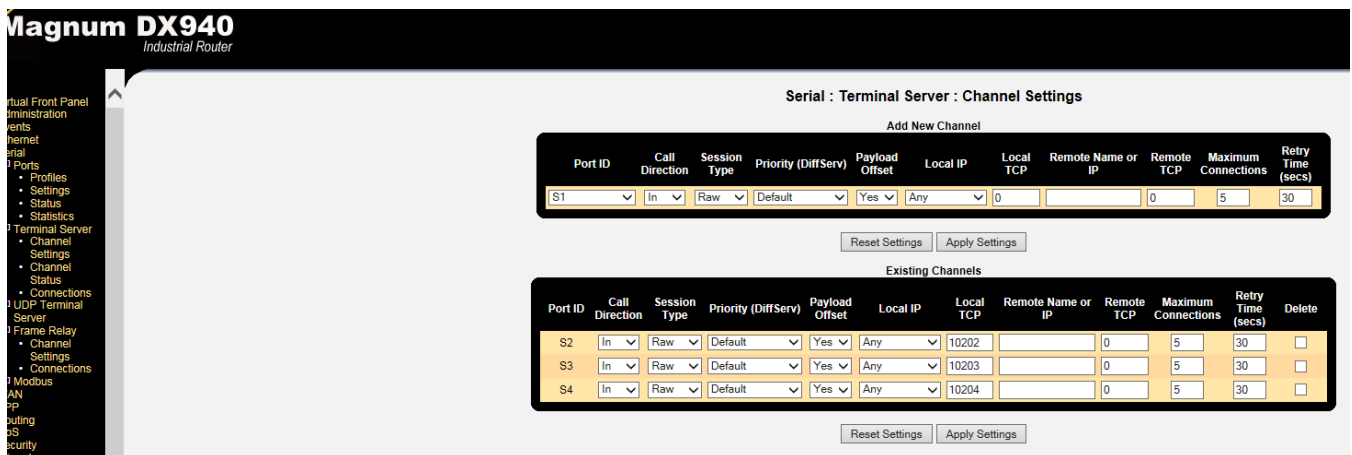
Now when we assign the serial port S1 to Frame Relay DLCI 100 we are successful

This should complete the configurations, you can also view statistics for this serial connection by viewing Frame Relay connections

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Saving Configurations

Please make sure you SAVE the configurations we have made by hitting the "SAVE" ICON at the bottom right of the WEB screen, the button is highlighted when there are configurations that have not been saved.

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