



MLW-4

Operating Manual

Introduction

The Titus Technological Laboratories **MLW-4** was inspired by years of products like the MLW-1, MLW-2, MLW-8, and The Last Word (I and II). The features of the **MLW-4** make it the superior choice for automatic mono, stereo and alternate channel routing.

The **MLW-4** can be used for simple correction of a problem with an input source but be used to integrate EANS broadcast tests and emergency notices, testing of audio sources prior to putting them on the air, AND control of audio for an alternate programming source or even monitoring and control of an AM and FM stereo facility with one box!

Almost all of the automatic functions are programmed via the front panel push buttons including time delays, sequencing, and relay functions. All programming is stored internally in non-volatile ram.

The **MLW-4** is primarily designed for the main audio path, both main channel programming (Primary outputs) and can be located either at the studio end or the transmitter end to provide automatic audio redundancy paths.

The inputs to the **MLW-4** are unity gain inputs balanced, bridging. The output levels are unity as well. The outputs are crossed balanced differential drivers capable of driving 600 ohms or greater.

Manual control provides the user with selection of which source is on the air, and how that source is treated. Automatic routing to another source with an error condition (loss of channel or silence of the source) is also accommodated with threshold which is preset at approximately 24 dB below operating level.

The secondary outputs follow the main Primary outputs channels as an alternate primary output.

One of the features of the **MLW-4** is the ability to have three different time delays. One is the time delay for "channel fill" (Sequence 3). Another is the time delay before changing sources and the third is the time delay before returning to the original source after it returns. The time delays are user programmable in 1 second increments. Since there is an internal real time clock the time delays are quite accurate.

Remote control via the DB-25 provides the user with manual remote control of which source is on line and full relay outputs (dry closure) of either which sources are ACTOVE or which preset is currently on line. This is selectable via the programming menu.

The **MLW-4** is also capable of being controlled via a LAN or Internet connection. Hooking up the RJ45 connector on the rear of the unit to your network with DHCP active will allow the **MLW-4** to obtain an IP address for the unit.

The **MLW-4** can be controlled via the internet. It contains it's own web server with web page control functions and monitoring.

The front panel of the **MLW-4** provides metering and programming messages on an LCD display. Active source LEDs are also provided. Unique to the **MLW-4** is a headphone jack and pushbutton volume controls. Using the source selection control the user can monitor any of the input sources using a pair of headphones. The "MODE" pushbutton lets the user select between headphone balance and volume using the same knob.

OPERATION OF THE MLW-4

The **MLW-4** will need to be configured for the specific needs of the station. All conditions should be tested prior to putting the **MLW-4** on line as there may be unexpected results from some operating conditions. When operating in either the programming mode or the manual mode the **MLW-4** will NOT respond to error conditions on the inputs.

There is a “1/2 Look Ahead” mode that has the **MLW-4** look at the next source and see if it exists. If it doesn't then the **MLW-4** will not bring up that source.

The “1/2/3/4” Cascade mode” has the **MLW-4** keeping a watch the and when the error is removed then switch back to that source. Thus the **MLW-4** will always be looking for audio on one of it's eight audio inputs and put that source on line.

There is a priority arrangement for the **MLW-4** sequencing. The **MLW-4** will always look to the lowest number input that is valid and bring it up. For example if Source 1 and Source 4 were active and Source 1 goes silent then the **MLW-4** will put Source 4 on line after the preset silence time delay (set by the user via the front panel). As soon as Source 1 returns then the **MLW-4**, after the preset recover time delay will bring up Source 1.

MENU:

To get to the **MLW-4** menu simply press the “ENTER” button in the center of the 5 pushbuttons on the front panel. When pressed you have a choice of three actions.

If you press the left button you will enter the “MANUAL” mode.

In MANUAL mode each PRESET button you press will put the various Sequence conditions on the outputs (see the section on Sequence Modes). The unit will not respond to any error conditions but will indicate which sources are active and which are currently on the outputs. The metering will indicate the audio present on the selected outputs (metering follows outputs).

If you press the right button you will enter the “AUTOMATIC” mode.

In AUTOMATIC mode the **MLW-4** will respond automatically to each error condition and time delay as programmed in the Setup programming. Again, metering follows the outputs. Sources that have audio will show in the “Active Source” window.

If you press “ENTER” button you will enter the “SETUP and PROGRAMMING” mode.

In SETUP you can Exit by hitting the right button or enter Setup by pressing the left button. Setup has two menus. Menu "SETUP 1" lets you set the time delays (left button "Tds") or relay action (right button "Relays"). Pressing the "down" button will enter the "SETUP 2" menu.

Pressing the "<Tds" button allows you to setup the four time delays. Pressing the left button lets you set the silence action time delay. This is the time delay before the unit goes to an alternate lower priority source. Pressing the right button lets you set the "Recovery" time delays. This is the time delay before the **MLW-4** returns to another higher priority source. The "S2TD" is the time delay that Source 2 will be online before switching to Source 3 (Sequence 3 only – 1 second to 4 minutes and 30 seconds). Entering "0" turns off this function.

Pressing the "Relays>" button will tell the **MLW-4** how the relays react. In the "Silence" mode the 8 relays will indicate with source is active and which are silent. In the "Preset Number" mode the 8 relays will indicate which preset number is active. In Sequence 1 (mono mode) it will indicate which source is on line. In Sequence 2 (simple stereo mode) it will indicate which stereo source is on line following the channel fill pattern. In Sequence 3 it will indicate which stereo source is on line (regardless of channel fill).

Pressing the down button will put you into the setting of the "Channel Fill" time delays. This is the time delay in "Sequence 3" mode that allows a stereo source that is missing a channel to fill the missing channel with the existing working channel.

The "SETUP 2" menu is reached from the "SETUP 1" menu by hitting the down button. This will bring you to the SEQUENCE MODES.

SEQUENCE MODES:

The **MLW-4** (at this point) has 4 Sequence modes as follows:

Sequence Mode 1 turns the **MLW-4** into a MONO source switcher. All inputs are treated as 8 mono sources with the source feeding BOTH outputs (left and right). If a source is missing, in a priority fashion then the next highest source is put into the outputs. The time delay actions apply (silence and recovery). In this mode the **MLW-4** will attempt to keep an audio source on the outputs switching to the next highest priority audio source as it gets on line.

Sequence Mode 2 turns the **MLW-4** into a simple Stereo switcher. The inputs are treated as 4 stereo inputs. Normally the first stereo input is put to the stereo outputs. If the right channel is missing the **MLW-4** will put the left channel into both outputs. If the left channel is missing the **MLW-4** will do nothing but replicate the stereo input with a missing channel. Again, the **MLW-4** will switch in

a priority fashion to the next stereo source when the higher priority source is missing.

Sequence Mode 3 turns the **MLW-4** into a common Stereo switcher (similar to the MLW-2). The inputs are treated as 4 stereo inputs however, audio channel fill is incorporated as well. This means that if a source is missing a channel the MLW-4 will put the channel with audio into both outputs after the Channel Fill time delay. If both channels are missing (silent) then the **MLW-4** will switch to the next highest priority stereo source after the programmed Silence time delay. This switching will keep occurring as sources appear or disappear.

Sequence Mode 4 turns the **MLW-4** into a common Stereo switcher just as in Sequence Mode 3 above. The inputs are treated as 4 stereo inputs however, audio channel fill is NOT incorporated. The **MLW-4** will switch to a back-up source if one or both channels are missing.

If a higher priority source that was silent reappears then the **MLW-4** will switch to it after the Recovery time delay as expired. (Momentary higher priority source audio will not affect the recovery time delays. This prevents the **MLW-4** from returning to an unstable audio source).

Sequence 1 is recommended for MONO programming. Sequence 3 is recommended for STEREO programming.

Exiting the menu system is accomplished by either hitting the enter button or the up arrow until the "<MANUAL AUTOMATIC>" is seen in the LCD window. At this point the user should select either Manual or Automatic.

LEVEL SETTING

The **MLW-4** has input attenuators on each input. From the factory they are set for unity gain through the unit. The meters will indicate a -10 with a +4 dBm input signal. Each input can be set for a different input level. The LEVEL SETTING lets you select which source you wish to attenuate and how much you wish to do. A unity gain is indicated by a 0 dB attenuation.

By changing the attenuation from 0 to a minus number will put in less input level attenuation up to 7 dB above unity. Changing the attenuation from 0 to a higher positive number puts in more attenuation, up to 12 dB below unit. Thus an input signal of -3 dBm would yield an output level of +4 dBm with the attenuator set to a - 7 dBm level (no attenuation is at a - 7 setting). Using the level set allows up to a 19 dB level difference for each audio input.

METERING

The **MLW-4** metering is designed to indicate the **average** level of the selected output source. Typically the meter will read -10 when the input level matches +4 dBm.

AUDIO MONITORING

The front panel headphone jack provides the user with a handy way to quickly “QC” the source audio for all of the inputs on the **MLW-4**. Pressing the Preset button in Manual mode will change the selected source not only in the headphones but on the Primary and Secondary outputs as well). The Volume rotary pot only control the headphone audio level. Pressing the “MODE” button changes the balance in the headphones.

REMOTE CONTROL

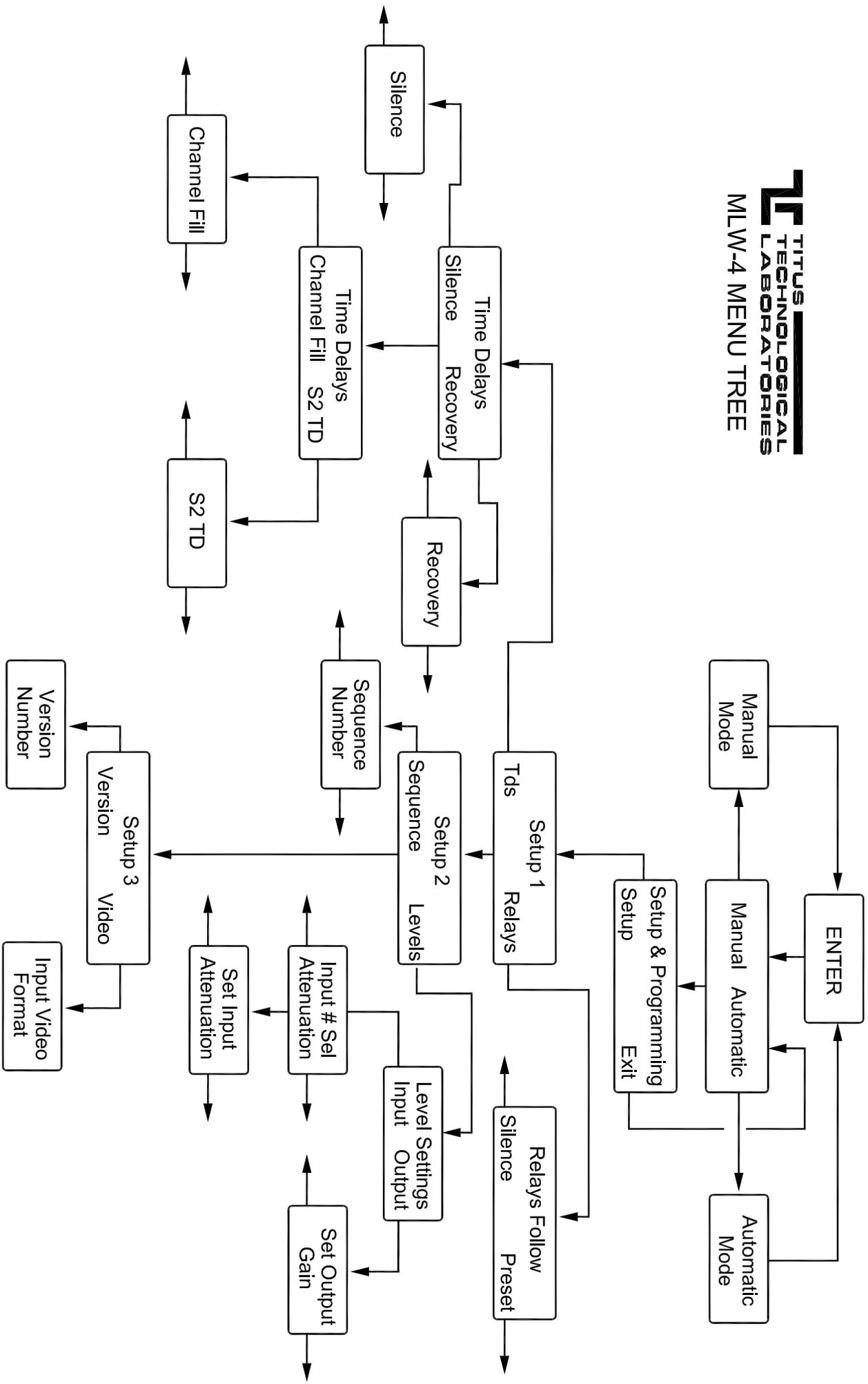
Remote control of the **MLW-4** is detailed in the **MLW-4 REMOTE CONTROL GUIDE**. All inputs are TTL low active - non buffered. Care should be taken to minimize the length of the leads to the **MLW-4** for control functions, limiting the length to under 10 feet. The relay outputs are dry closure outputs and pull in when audio is PRESENT on the inputs or pull in to show which preset condition is on line.

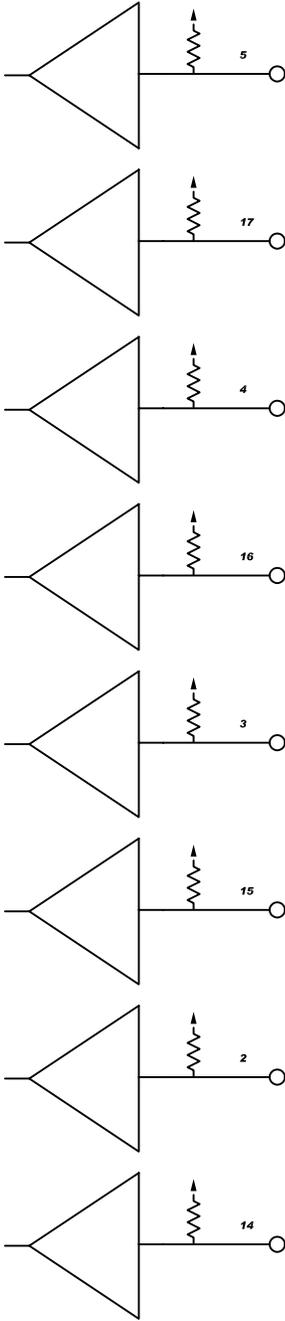
MLW-4 REMOTE CONTROL GUIDE

The following is the pin-out for the **MLW-4** rear panel remote control. The inputs are TTL level, momentarily Ground to activate.

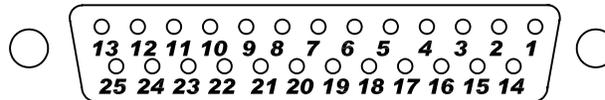
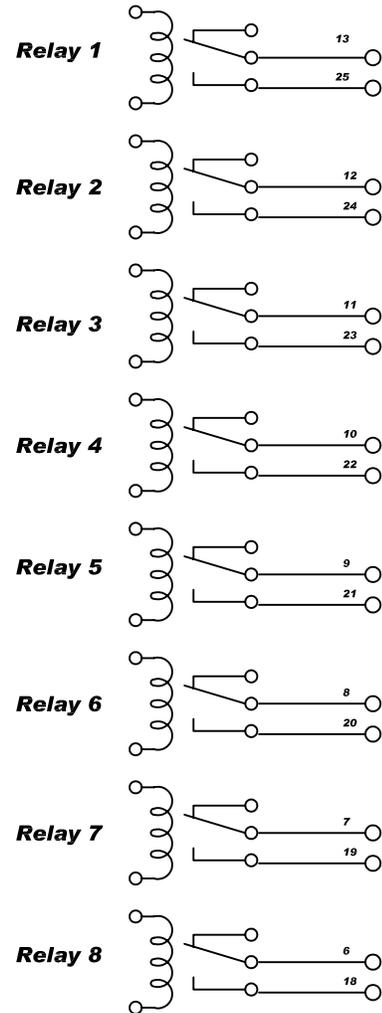
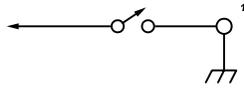
<u>PIN #</u>	<u>FUNCTION</u>	<u>PIN #</u>	<u>FUNCTION</u>
1.	GROUND	14.	Put Preset 8 on line
2.	Put Preset 7 on line	15.	Put Preset 6 on line
3.	Put Preset 5 on line	16.	Put Preset 4 on line
4.	Put Preset 3 on line	17.	Put Preset 2 on line
5.	Put Preset 1 on line	18.	Source 8 ON relay
6.	Source 8 ON relay	19.	Source 7 ON relay
7.	Source 7 ON relay	20.	Source 6 ON relay
8.	Source 6 ON relay	21.	Source 5 ON relay
9.	Source 5 ON relay	22.	Source 4 ON relay
10.	Source 4 ON relay	23.	Source 3 ON relay
11.	Source 3 ON relay	24.	Source 2 ON relay
12.	Source 2 ON relay	25.	Source 1 ON relay
13.	Source 1 ON relay		

TITUS TECHNOLOGICAL LABORATORIES
MLW-4 MENU TREE





(Example - Put Source/Presets
3 ONLINE)



(Relays are dry NO contacts)

- | | |
|-------------------------|--------------------------|
| 13 - Relay 1 | 25 - Relay 1 |
| 12 - Relay 2 | 24 - Relay 2 |
| 11 - Relay 3 | 23 - Relay 3 |
| 10 - Relay 4 | 22 - Relay 4 |
| 9 - Relay 5 | 21 - Relay 5 |
| 8 - Relay 6 | 20 - Relay 6 |
| 7 - Relay 7 | 19 - Relay 7 |
| 6 - Relay 8 | 18 - Relay 8 |
| 5 - Put Preset 1 ONLINE | 17 - Put Preset 2 ONLINE |
| 4 - Put Preset 3 ONLINE | 16 - Put Preset 4 ONLINE |
| 3 - Put Preset 5 ONLINE | 15 - Put Preset 6 ONLINE |
| 2 - Put Preset 7 ONLINE | 14 - Put Preset 8 ONLINE |
| 1 - ground | |



MLW-4

Remote I/O

WEB OPERATIONS

The MLW-4 WEB CONTROL has its own embedded web site server. This web server includes all of the web pages necessary to interface between the internet and the sources that are being monitored and controlled.

Once the appropriate IP address is selected in your web browser the first page displayed is the password page. You must enter the user name and the password prior to operating the *WEB REMOTE CONTROL*. Setting of the user name and the password are contained in the section on WEB Configuration. The user name "admin" and password "admin" allows administrative access to the device server configurations. The user name "tweb" with password of "tweb" allow end user access only to the web functions.

The web server in the MLW-4 is set up as a DHCP device. It will be looking for an address assignment from your router or system management. To find the IP address for the MLW-4, plug it into your network router. After a minute load the Device Discovery program into your computer and run it. This utility will find the IP address for your MLW-4. DO NOT try to access the MLW-4 web server from this utility. Only use it to find the IP address.

Type the IP address into your browser address bar. You will be prompted for the USER NAME and PASSWORD. Enter the ones given above. At this point you will see the MLW-4 control page on your browser.

On this page you can monitor the same functions that appear on the front of the MLW-4 such as which source is feeding which output, which sources have audio and which are silent, and the PRESET number. Clicking on one of the preset number buttons will have the MLW-4 change the preset it is operating under. This preset number will be different for the different sequence numbers you set during the programming. The MLW-4 will not bring up a source that doesn't have audio so if you click on a dead source preset, the outputs will not try to put the dead audio onto the outputs.

WEB CONFIGURATION

The MLW-4 WEB CONTROL uses the DIGI International embedded device server as a means of communicating with the internet or a LAN. This section describes some of the basic features of this powerful device server.

NOTE: SOME SETTINGS CAN RESULT IN THE MLW-4 WEB CONTROL CEASING TO FUNCTION PROPERLY. *DO NOT CHANGE ANY SETTINGS WITHOUT UNDERSTANDING HOW THESE CHANGES WILL AFFECT PROPER OPERATION OF THIS UNIT.*

To reach the device server web configuration page in your browser address window type in the IP address followed by “/home.htm”.

LOGIN: The username and password are required to make access or make any changes to the MLW-4 WEB CONTROL. The default **ADMINISTRATIVE USERNAME** for the MLW-4 WEB CONTROL series is: “admin” in small letters. The default **PASSWORD** is “admin” as well.

HOME: The HOME page gives a summary of the IP Address and the MAC address for this device server. Do not attempt to make changes to this page. Selections from this page are Configuration or Administration.

Configuration Functions

Configuration NETWORK: This is a series of 3 pages selected by clicking on the bottom tab. The IP SETTINGS allow you to select whether you want to force an IP address or use DHCP for the selection. The default is letting the DHCP server assign an IP address to the MLW-4 WEB CONTROL.

Configuration NETWORK SERVICE SETTINGS: On this page you can select which services you desire for the *WEB REMOTE CONTROL*. The only services actually needed are “Enable Network Management Protocol (SNMP)” and “Enable Web Server (HTTP)”. Do not change the port settings as these are the standard ports for these services.

Configuration ADVANCED NETWORK SETTINGS: Do not make changes to this page.

Configuration SERIAL PORTS: This page allows you to make minor changes to the way the device server handles internal data from the access port. Clicking on the “PORT1” will bring you to the port settings page. The default settings should be maintained. These are “TELNET PORT” enabled (checked) at port number 2001, “RAW TCP ACCESS” enabled (checked) at port number 10001, and “SECURE SOCKET ACCESS” enabled (checked) at port number 2601. Do not change the profile or the TCP client settings from the factory default.

Configuration SERIAL PORTS – BASIC SERIAL SETTINGS: This page should not be changed from the factory settings of 57600 baud, 8/N/1/N. This is an

internal serial data bus and is NOT any port on the MLW-4 WEB CONTROL!
That serial port is not addressable and is fixed.

Configuration SERIAL PORTS –ADVANCED SERIAL SETTINGS: No changes should be made to this page. All of the settings are unchecked.

Configuration GPIO: This page selects the direction of the internal alarm bus. :
No changes should be made to this page. Any other selection will result in damage to the *WEB REMOTE CONTROL!*

Configuration – ALARMS CONFIGURATION: If you wish to be notified by email and/or SNMP when an alarm occurs then select the “Enable alarm notifications” check box. Then enter the SMTP IP address (the IP address of your email server) and the email “from” address. (May or may not be implemented)

Configuration – ALARMS CONDITIONS: This section is where you specifically assign which alarm goes to which email address and with what alarm message. BE CAREFUL WHEN YOU MAKE CHANGES. THE ORDER OF THE ALARMS IS SPECIFIC TO HOW THEY ARE INTERNALLY ADDRESSED BY THE “TRIGGER” VALUES. Checking the box next to the alarm number will enable that alarm to send email and SNMP alarms. Click on the alarm number and you are presented with the conditions under which the alarm will be sent.

The GPIO trigger states are factory set for the 5 bit binary number representing the decimal number of the alarm. Do not change these settings. “Send Alarm Based on GPIO States” should be checked. “Serial Pattern” should NOT be checked. “Alarm Destinations Send Email” should be checked if you want email notification of a specific alarm. Type in the information for the recipient, the CC recipient, the priority of the email, and the subject line. The subject line is the alarm specific information you want your email recipient to get. For example, “Transmitter Audio Missing” could be a subject. There is no body to the alarm email messages. “Send SNMP trap to following destination when alarm occurs” is checked if you want to enable the SNMP alarm trap for this alarm. The destination address is selected in the “Configuration – Systems” section below. Repeat this process for each alarm. **REMEMBER TO HIT THE “APPLY” BUTTON TO SAVE THE SETTINGS!**

Configuration – SYSTEM: This brings up the system device settings. You can make changes to this page to identify the device server to something different. **DO NOT CHANGE THE DEVICE ID. DOING SO WILL MAKE THE WEB REMOTE CONTROL NON-FUNCTIONAL.**

Configuration – SYSTEM-Simple Network Management Protocol (SNMP) Settings:

This is the area where the SNMP IP address and configuration is set. It is recommended that no client be able to “SET” in the device server. There are no user settable SNMP conditions on this device server.

Configuration – REMOTE MANAGEMENT - CONNECTIONS: There should be nothing checked on this page.

Configuration – REMOTE MANAGEMENT – SECURITY: One nice feature of the MLW-4 WEB CONTROL is the extensive security features. On this page

you can select the level and degree of SSL you wish to incorporate into this unit.
Configuration – REMOTE MANAGEMENT – ADVANCED: Normally the default settings for this page are sufficient to maintain adequate connections between the *WEB REMOTE CONTROL* and a user.

Configuration – USERS: This area is where you can designate two users for the *WEB REMOTE CONTROL*. Select a user and the level of access that use has to this device server, not the MLW-4 WEB CONTROL! Normally a system administrator will need access to all of the functions of the device server and should have administrator privileges. A non administrator user only needs access to the web server part which incorporates the functions of the *WEB REMOTE CONTROL*. Each user has a password and privileges. It is recommended that the administrator have administrator privileges and his/her own username and password and all of the other users share the same username and password. Remember that no serial configuration is performed on the device server! Do not change any serial settings!

Configuration – Serial Ports: Displays information relative to the internal serial port.

Configuration – Connections: Shows the IP address of the currently connected user.

Administration Functions

Administration – FILE MANAGEMENT: This area is where the device server stores the working pages for the MLW-4 WEB CONTROL. DO NOT CHANGE ANY FILE OR TRY TO UPLOAD ADDITIONAL FILES! DOING SO WILL MAKE THE *WEB REMOTE CONTROL* NON-FUNCTIONAL.

Administration – SYSTEM INFORMATION: This is a handy area to see how the device server is working. Remember that the device server is only the window between the MLW-4 WEB CONTROL *and the outside internet world*. Within this area you can see how long the device server has been online and the TCP and IP statistics and packet information.

Administration – REBOOT: Rebooting the device server will not cause damage to the MLW-4 WEB CONTROL but also really doesn't do anything that a total power recycling of the *WEB REMOTE CONTROL* wouldn't do better as it only resets one small area of the whole device.

Administration – BACKUP/RESTORE: No changes to this page are necessary.

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LIMITED WARRANTY

TITUS TECHNOLOGICAL LABORATORIES warrants to Purchaser that the equipment sold is free of defects of workmanship or material and conforms to the specifications referred to of set out herein. This warranty, applying only to the user, extends from date of shipment for a period of one year

No claim shall be maintained hereunder unless written notice is received by Seller within thirty days after the discovery of the facts giving rise to the claim. The sole or exclusive liability of Seller for breach of warranty shall be to refund the purchase price of the item sold, or at its option, to replace or repair the item or part concerned FOB its factory, or such other place as it may designate. **Titus Technological Laboratories'** liability shall arise only if Purchaser causes the defective part or item to be delivered to **Titus Technological Laboratories** for inspection upon **Titus Technological Laboratories'** request at Purchaser's expense. This warranty shall not be effective if the alleged defect is due to maltreatment, exposure, excessive moisture or any other use of the equipment other than the use for which the manufacturer prescribed.

No warranties expressed or implied shall be applicable to any equipment sold hereunder, and the foregoing shall constitute the Buyer's sole right and remedy under the agreements contained in this paragraph. In no event shall **Titus Technological Laboratories** have any liability for consequential damages, or for loss, damage, or expense directly or indirectly arising from the use of the products, or any inability to use them either separate or in combination with other equipment or materials, or from any other cause.

Titus Technological Laboratories Reserves the right to discontinue products and to change specifications or change equipment design at any time without incurring any obligation to incorporate new features in products previously sold.

Titus Technological Laboratories' warranty is given solely to the original user and only to the extent above described. No dealer or agent is authorized to make any other or additional guaranty or warranty.