Dual Switch Controller

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If you need help with the Dual Switch Controller, please contact Burk directly at 978.486.3711, or email at support@burk.com

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1. INTRODUCTION

The Dual Switch Controller monitors the position and provides control for two Dielectric switches with either waveguide or coaxial configuration. The controller provides multiple ways in which to manage switches, including remote control for integration with other systems. The unit also allows customization for transmitter interlock delay to ensure that connected transmitters are powered down before switching.

The Dual Switch Controller provides a high degree of flexibility to users. The unit's status is available to local operators via the front panel touch-screen interface. Additionally, the data are available to remote terminals via a web interface or SNMP. There are also connections available for remote control and monitoring via direct contact connections.

2. SETUP

The Dual Switch Controller is configured at the factory with default values for the transmitter interlock delay and interface settings. In some instances, the pre-configured values may suit the system it is going into; however, it is necessary for the installer to ensure that all pertinent configuration values are set properly after the system is installed (e.g. switch movement delay).

When the Dual Switch Controller is first powered on, or after the rear-panel Master INIT button is pressed, the unit is set to DHCP operation and queries the network for an IP address. If DHCP is not available on the network, the unit sets itself to the default IP address 192.168.0.100. A static IP address must be configured by the user before the network is used for web access, SNMP, or Plus-X communications. The simplest method for setting the static IP address is via the front panel touch screen. By selecting CONFIG -> Network the IP address of the Dual Switch Controller can be set as shown in Figure 1 and Figure 2 below. If front panel access is not possible, the Web interface can be accessed by typing the Hostname DUALRFSWITCH/ into the address field on a web browser.

Figure 1: Configuration screen

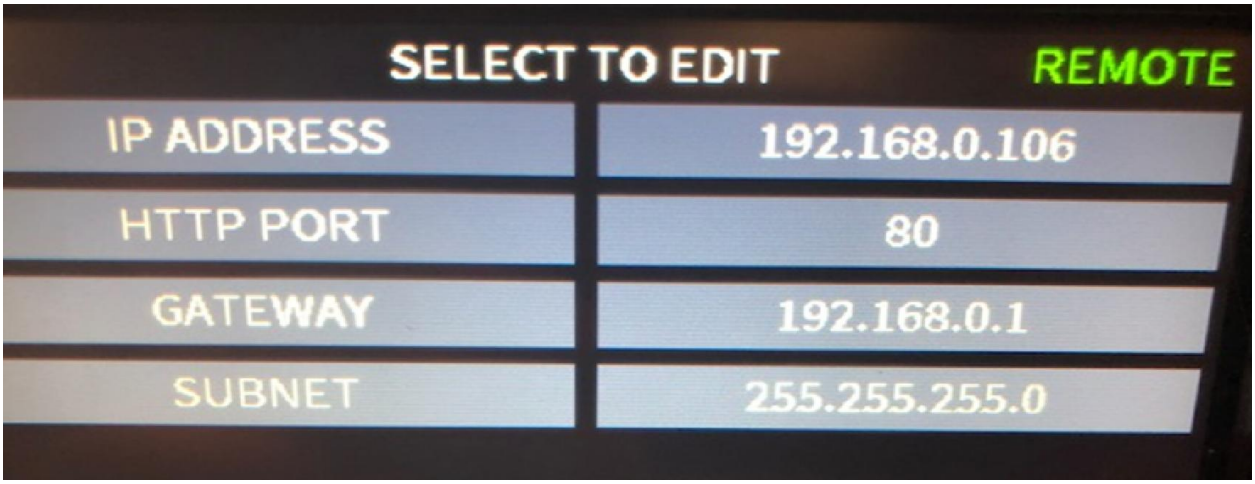


Figure 2: IP Address Configuration

The Control Voltage, either 12 or 24 VDC, can be selected via a touch screen adjustment as shown in Figure 3. The default choice is 12 VDC. Changing this choice only changes the voltage used for switch movement commands. Connections marked as "V+" will always supply 24VDC to supply enough voltage to command the inputs.

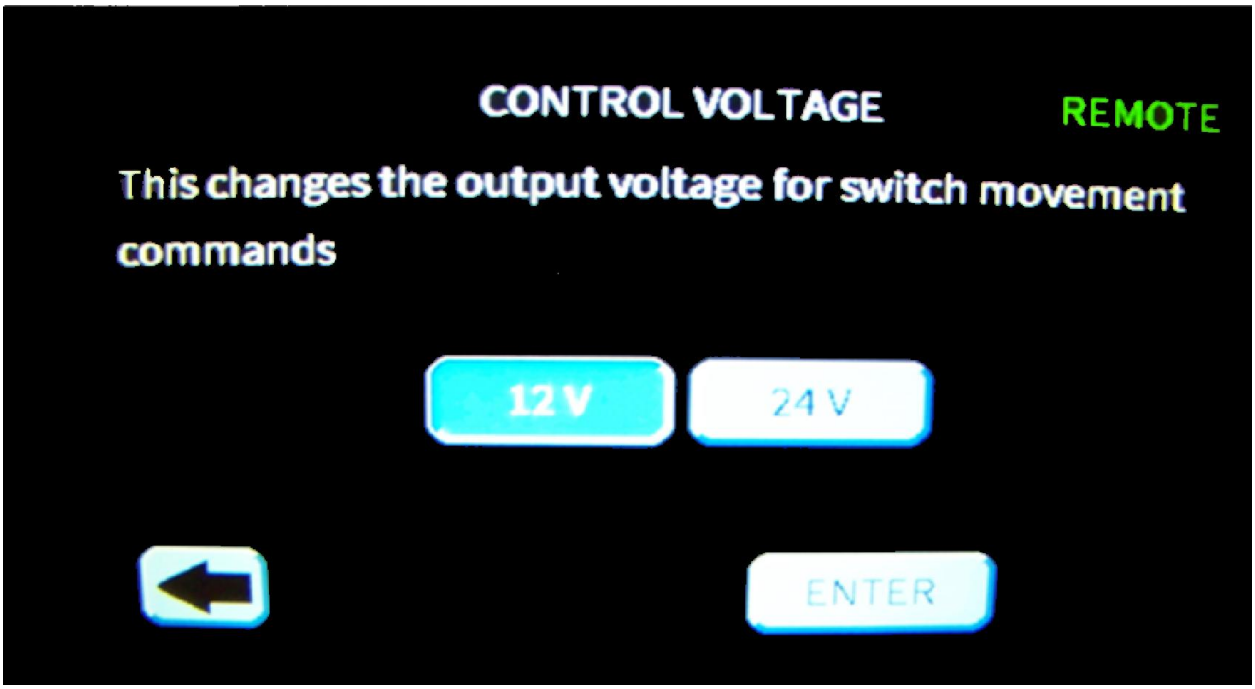


Figure 3: Voltage configuration

Switch 1 and Switch 2 can be configured to enable the switch and the load interlock mode. In addition, the interlock delay can be set to define how long to wait after opening the interlock before starting switch movement as shown in Figure 4. When the Dual Switch Controller receives the command to move a switch under its control it will open the normally closed interlock and then wait the preset delay before giving the command to move. Operators should test that this time limit is enough before operating the switch to prevent the switch from moving while under RF power. This time is user selectable from the touchscreen or web interface. The minimum value is 2 seconds. However, the user can increase this time as desired. The current value for the delay can also be retrieved using SNMP.

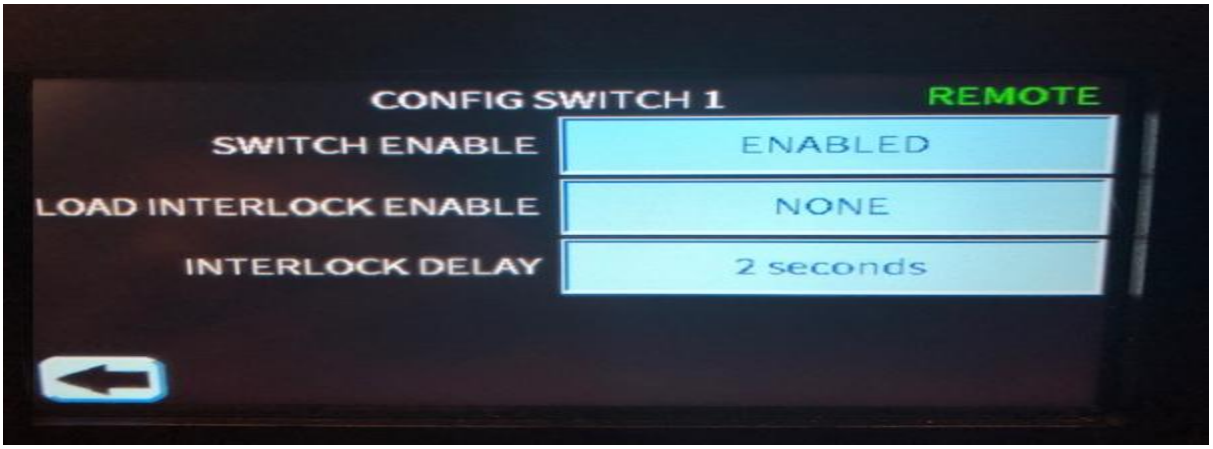


Figure 4: Configuration of the Switch

3. INSTALLATION

The Dual Switch Controller is a rack mounted module built as a 3.5” (2U) enclosure to fit a standard 19” rack. This unit houses the control processor and all the interconnections. The front of the unit allows an operator interface via touchscreen while the rear panel allows access to the remote connection points.

The front panel of the Dual Switch Controller is shown in Figure 5. The LED indicator will show green if the power is on. This same LED will turn red to indicate an alarm condition when a switch is in a failed state or when the load interlock is open.

Figure 5: Front panel for Dual Switch Controller

The rear panel of the Dual Switch Controller is shown in Figure 6. Note that default assignments to the output port labels, *Tx A and Tx B*, and the input port label, *Load*, are used as the nomenclature on the rear panel. Table 1 provides a short functional description of each feature on the rear panel of the Dual Switch Controller.

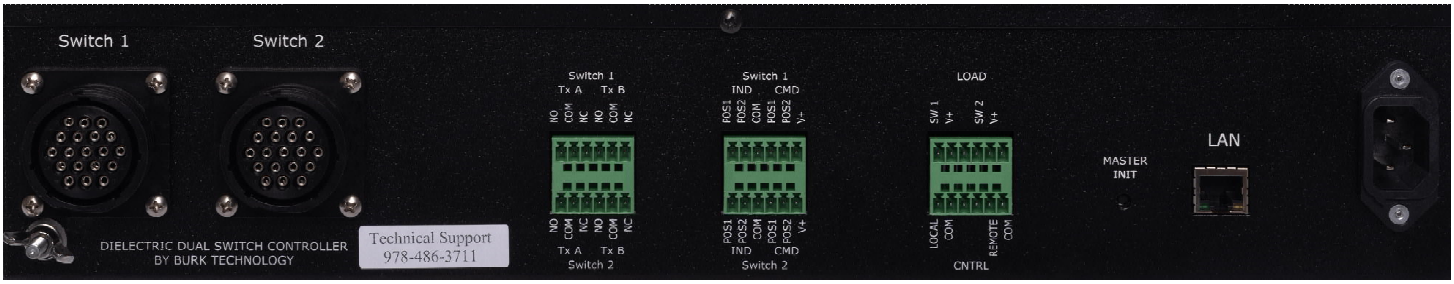


Figure 6: Rear panel connections for Dual Switch Controller

Table 1
Rear panel connections on the Dual Switch Controller

Label	Description
Switch 1	19 Pin Amphenol Connector Direct and only connection to RF Switch No. 1.
Switch 2	19 Pin Amphenol Connector Direct and only connection to RF Switch No. 2.
Switch 1 Tx A Tx B	Terminal Block 1 Interlock control for transmitters associated with RF Switch No. 1.
Switch 2 Tx A Tx B	Terminal Block 4 Interlock control for transmitters associated with RF Switch No. 2.
Switch 1 IND CMD	Terminal Block 2 Remote interface to Dual Switch Controller to control RF Switch No. 1
Switch 2 IND CMD	Terminal Block 5 Remote interface to Dual Switch Controller to control RF Switch No. 2
LOAD	Terminal Block 3 Load interlock inputs associated with RF Switch No. 1 and RF Switch No. 2.
CNTRL	Terminal Block 6 Local / Remote status indication for the Dual Switch Controller.
MASTER INIT	Pushbutton to restore unit to factory default settings
LAN	RJ45 connector for Local Area Network connection to the Dual Switch Controller
110-240 VAC	AC input power to the Dual Switch Controller

The pinouts of the rear panel for the Dual Switch Controller are shown in Figure 7. The configuration uses external pushbuttons and LEDs with dropping resistors for remote control and indication respectively (TB2, TB5 and TB6). Figure 7 assumes normally

closed (NC) interlock contacts for all transmitters and uses the default labels for each of the ports on the RF Switches.

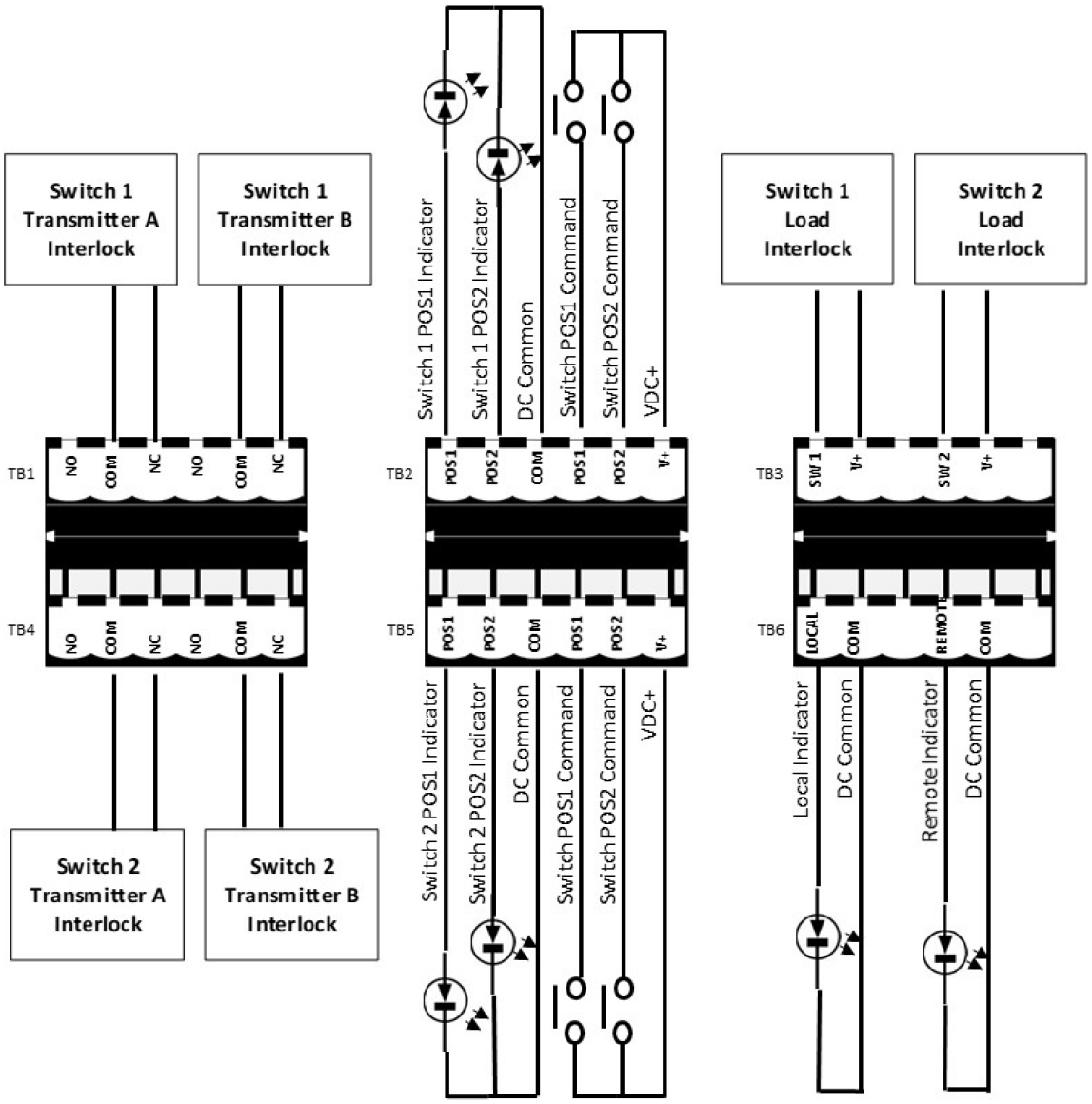


Figure 7: Pinouts on rear panel of the Dual Switch Controller

Note: connections labeled V+ on the rear panel terminal blocks shall always be held at +24VDC independent of user selected RF Switch Control Voltage.

The Dual Switch Controller is designed for use with one or two 4-Port RF Switches of either waveguide or coaxial configuration. Factory default settings assign the following labels to each of the four ports of the two switches that may be simultaneously controlled by the Dual Switch Controller (see Figure 8):

- Input Port 1 = Tx A

- Input Port 2 = Tx B
- Output Port 1 = Ant
- Output Port 2 = Load

Note: Unless otherwise stated, the rest of this document will assume the default labels are applied to each port of the RF Switch.

The operator can adjust the labels for each switch from the web interface.

The prescribed pinouts for the rear panel RF Switch Connectors (Switch 1 and Switch 2) are provided in Table 2. There are two versions of the waveguide switch before the 60000 series, one with a numerical pin-out and one with an alphabetic pin-out. Please contact the Dielectric factory for questions on these older units.

Table 2
RF Switch connector wiring table (Switch 1 and Switch 2)

50000 Series (Coaxial Switch)		60000 Series (Coaxial and Waveguide Switch)		DUAL CONTROLLER
PIN	COMMENT	PIN	COMMENT	PIN
R	POS #1 CONTACT S2A NO	16	POS #1 CONTACT S2A NO	16
S	POS #1 CONTACT S2A COM	15	POS #1 CONTACT S2A COM	15
T	POS #1 CONTACT S1A NO	17	POS #1 CONTACT S1A NO	17
P	POS #1 CONTACT S1A COM	14	POS #1 CONTACT S1A COM	14
E	POS #1 CONTACT S2B NO	5	POS #1 CONTACT S2B NO	5

F	POS #1 CONTACT S2B COM	6	POS #1 CONTACT S2B COM	6
C	COMMAND FOR POS #1	3	COMMAND FOR POS #1	3
A	AC POWER	N/A	N/A	N/A
B	AC POWER	N/A	N/A	N/A
N	COMMAND COMMON	13	COMMAND COMMON	13
D	COMMAND FOR POS #2	4	COMMAND FOR POS #2	4
M	POS #2 CONTACT S3A COM	12	POS #2 CONTACT S3A COM	12
L	POS #2 CONTACT S3A NO	11	POS #2 CONTACT S3A NO	11
K	POS#2 CONTACT S4A COM	10	POS#2 CONTACT S4A COM	10
J	POS#2 CONTACT S4A NO	9	POS#2 CONTACT S4A NO	9
H	POS#2 CONTACT S4B COM	7	POS#2 CONTACT S4B COM	7
G	POS#2 CONTACT S4B NO	8	POS#2 CONTACT S4B NO	8

4. OPERATION

The Dual Switch Controller is designed to control two RF switches. The Dual Switch Controller serves three functions for each of the two RF Switches controlled:

1. Control of the RF Switch position
2. Status report for the RF Switch position
3. Control of transmitter interlocks based on:

a. Operation request

b. Limit switch status from RF Switch

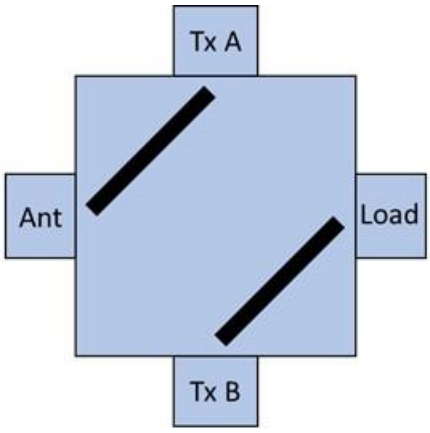
c. Load interlock status

Commands to the Dual Switch Controller can be initiated by the user via one of five methods:

1. Local command initiated from the front touch panel display on the Dual Switch Controller.
2. Remote contact closure input from CMD pin POS1 or POS2 to V+ for Switch 1 or Switch 2 on the rear panel of the Dual Switch Controller. (Contact closure shall be no less than 100 msec in duration to initiate an RF Switch position move.)
3. Remote SNMP command via the LAN connection
4. Web interface command to the Dual Switch Controller via the LAN connection
5. ARC Plus remote-control equipment connected via network interface connection (LAN or WAN) using Burk Technology Plus-X communication protocol.

a. RF Switch movement

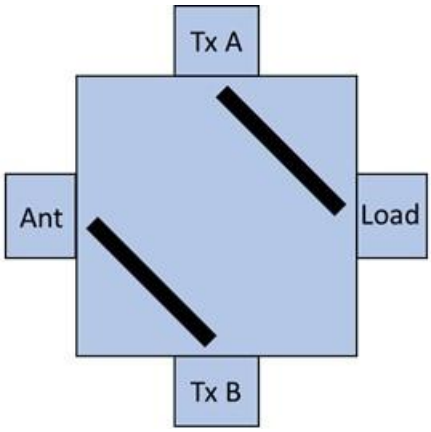
Figure 8 is an illustrative example of the operation of the RF Switch when commanded to move by the Dual Switch Controller using the default label assignments for each port.



For this example, assume the RF Switch is in Position #1 (POS #1) and that in POS #1 the RF signal flow is:

- Tx A ⟶ Ant
- Tx B ⟶ Load

The three redundant limit switches inside the RF Switch will provide feedback to the Dual Switch Controller that the RF Switch is in POS #1.



Upon receiving an activation command from the Dual Switch Controller, the RF Switch moves to Position #2 (POS #2). The RF signal flow is:

- Tx A ⟶ Load
- Tx B ⟶ Ant

The three redundant limit switches inside the RF Switch will provide feedback to the Dual Switch Controller that the RF Switch is in POS #2.

Note: The Dual Switch Controller controls transmitter interlocks during the movement from one position to another.

Figure 8: RF Switch movement illustration

Regardless of the operational mode in which the user starts a move command to the Dual Switch Controller, the Switch move shall always be commanded from the Dual Switch Controller via application of a control voltage across pins in the proper Amphenol type connector:

- Switch 1 or Switch 2 connector on the rear panel of the Dual Switch Controller
- Across pins 3 and 13 for POS #1 and pins 4 and 13 for POS #2 (see Table 2
- The control voltage shall be applied for a minimum of 0.5 seconds to latch the control in the RF Switch. Driving the control voltage for longer than 0.5 seconds shall not harm the RF Switch.

The Dual Switch Controller checks the status of limit switches inside each RF Switch to determine the position of the RF Switch. There are three redundant limit switches for each position (POS #1 and POS #2) in the RF Switch. Figure 9 shows the limit switch configuration and pinouts at the RF Switch connector. Note that these pinouts are consistent with the columns in Table 2 Before setting the POS #1 status indicator high the Dual Switch Controller must get a closed status for POS #1. Likewise, before setting the POS #2 status indicator high the Dual Switch Controller must get a closed status. If the limit switch status does not indicate either POS #1 or POS #2, then it shall be assumed that the switch is not in either position and proper transmitter interlocks shall be commanded open via the contacts in TB1 and TB4.

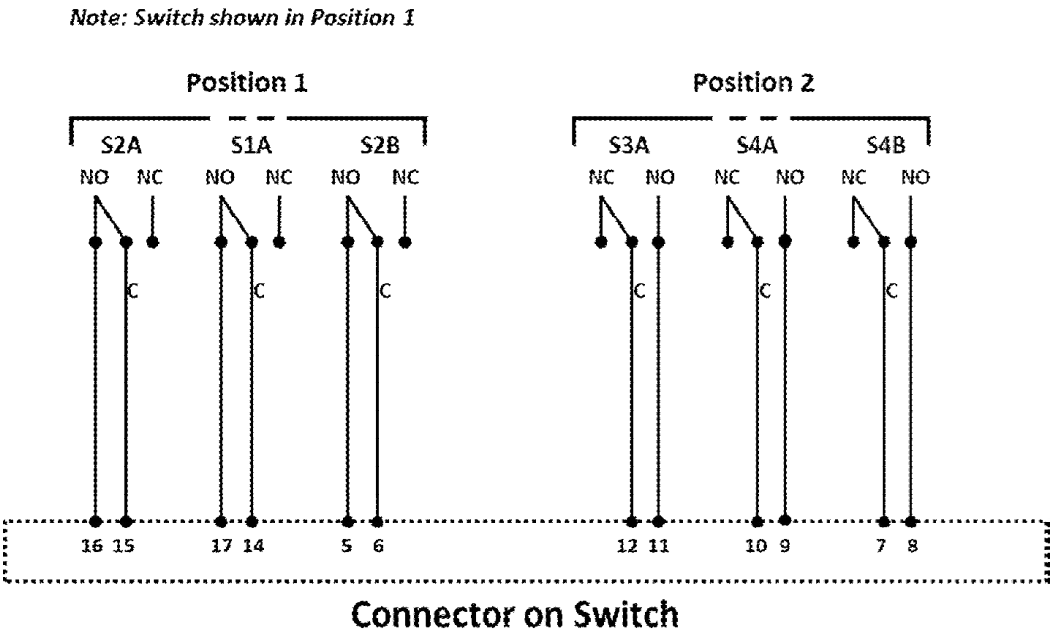


Figure 9: Limit switch configuration and pinout in RF Switch

Figure 10: Switch position details

Figure 10 is showing the position of the 3 redundant limit switches for each RF switch.

b. Switch Operation

In addition to initiating movement of the RF Switch, the Dual Switch Controller also:

- Monitors the RF Switch position (Reporting POS #1 or POS #2)
- Maintains control of transmitter interlocks.
- Monitors independent load interlock inputs for each RF Switch to rapidly command a transmitter interlock to open if an open load interlock is sensed

Figure 11 below shows the switch position using the default labels.

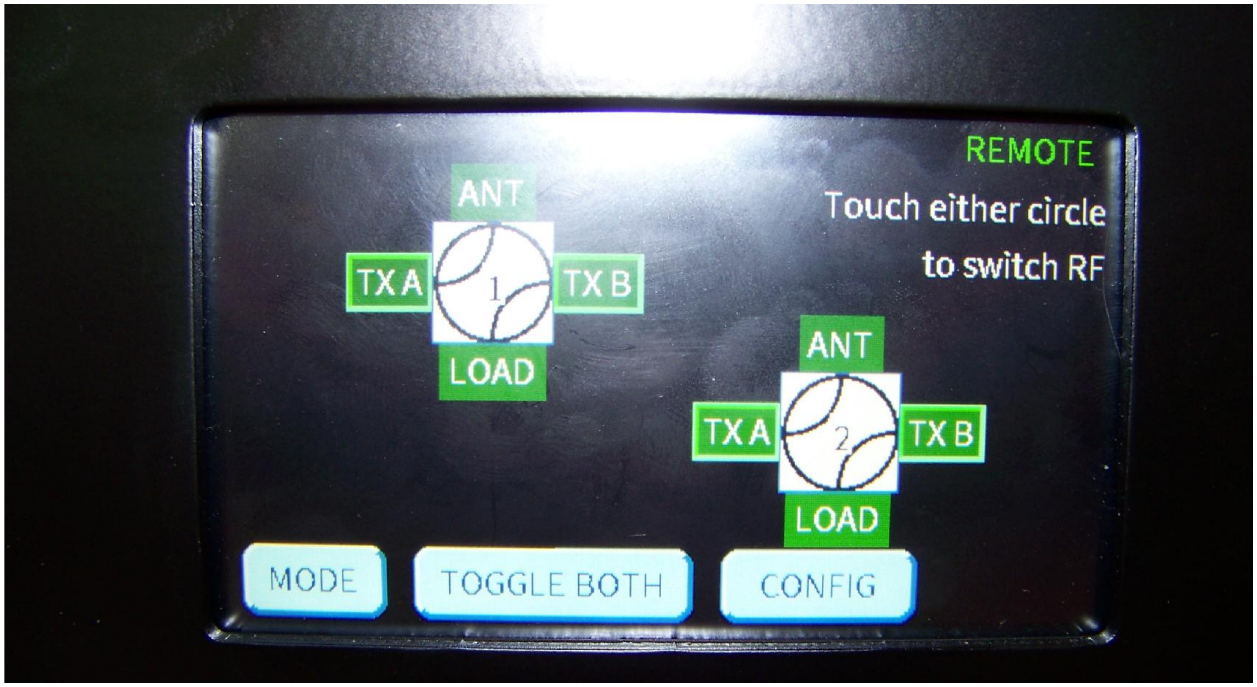


Figure 11: Dual switch controller monitoring RF switch position

Both switches controlled by the Dual Switch Controller can be toggled simultaneously by pushing the "TOGGLE BOTH" button on the touch screen or the web interface or by issuing a single command via the Plus-X interface from a connected ARC Plus Remote-Control System. The toggle will cause both switches to move at once regardless of their initial positions.

c. Transmitter Interlock Control

The Dual Switch Controller has the capability to be part of the Transmitter Interlock loop on up to four transmitters independently and simultaneously: Transmitter A (Tx A) and Transmitter B (Tx B) on each of two RF Switches (Switch 1 and Switch 2).

In the case of normally closed (NC) Dual Switch Controller operation the transmitter interlock loop shall be made up between pins COM and NC (TB1 for RF Switch 1 and TB4 for RF Switch 2). The interlock loop is closed by the Dual Switch Controller enabling the transmitter to operate. The Dual Switch Controller also provides an open contact between COM and NC to open the transmitter interlock, disabling transmitter operation during switching cycles, when the load interlock is enabled and open or if the switch does not properly report its status.

Normally closed operation would allow the transmitter to operate even if a power failure makes the Dual Switch Controller inoperable. For this reason, NC operation is the recommended mode of operation for these interlock contacts. In other words, if the Dual Switch Controller is powered off, the interlocks will not open. Similarly, a transmitter will

continue to send power to the load, even though the Dual Switch Controller is powered off.

When the Dual Switch Controller receives the command to move a switch under its control it will open the normally closed transmitter interlock and then wait the preset Interlock Delay before commanding the switch to move. Operators should test that the Interlock Delay is enough to allow the transmitter to shut down before the switch operates. The Interlock Delay time is user selectable from the touchscreen or via the web interface. The current value for the delay can also be retrieved using SNMP. The minimum value and default setting for the Interlock Delay is 2 seconds.

d. Load interlock Status Monitoring

The Dual Switch Controller can monitor the Load Interlock status for either or both RF Switches via the rear panel SW1 and SW2 inputs on terminal block TB3 (LOAD). Each load indicates that it is ready for RF by applying a contact closure between the SW1 or SW2 input and its adjacent V+ pin, which in turn applies a positive voltage to the SW1 or SW2 input.

By default, this status monitoring option is disabled at the factory. If the user enables this function and there is a valid path for RF energy to flow through the RF Switch, the Load Interlock status for that switch will be continuously monitored to ensure that the load is ready for RF. If the Load Interlock status for SW1 or SW2 goes false, then the Dual Switch Controller will at once open the Transmitter Interlock Loop for the transmitter that is directed to the Load position of that RF Switch. The Transmitter Interlock Loop for the transmitter not directed to the position with the Load Interlock Enabled will not be affected. Software restricts the load interlock to be enabled for only one of the switch outputs. .

e. Modes of operation

Using the front panel touch screen, an operator can configure the different modes that can be used as shown in Figure 12.

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Figure 12: Dual Switch Controller modes of operation

1. Local control mode – operation is controlled from the front panel menu display. Remote operation is not allowed in this mode.
    a. The front panel interface is fully operational, allowing switch control, status display, and configuration settings.
    b. The rear panel command inputs (TB2 and TB5) are disabled.
    c. The web interface displays status information and allows configuration changes, but switch operation is disabled.
    d. The SNMP interface allows retrieval of status information (SNMP Get Requests) but does not act based on switch commands (SNMP Set Requests).
    e. The ARC Plus remote-control interface via LAN or WAN allows display of status information but switch operation is disabled.
2. Remote control mode – operation may be controlled from any of the remote interfaces in addition to the local display on the front panel:
    a. The front panel interface is fully operational, allowing switch control, status display, and configuration settings.
    b. The rear panel command inputs (TB2 and TB5) are enabled.
    c. The web interface is fully operational, allowing switch control, status display, and configuration settings.

d. The SNMP interface is fully operational, allowing switch control (SNMP Set Requests) and retrieval of status information (SNMP Get Requests).

e. The ARC Plus remote-control interface via LAN or WAN is fully operational, allowing switch control and status display.

3. Lockout mode – when in lockout mode the unit will not respond to commands from either local or remote-control functions.

   a. The front panel interface displays status information and allows configuration changes, but switch operation is disabled.

   b. The rear panel command inputs (TB2 and TB5) are disabled.

   c. The web interface displays status information and allows configuration changes, but switch operation is disabled.

   d. The SNMP interface allows retrieval of status information (SNMP Get Requests) but does not act based on switch commands (SNMP Set Requests).

   e. The ARC Plus remote-control interface via LAN or WAN allows display of status information but switch operation is disabled.

f. Local / Remote operation status

Terminal block 6 (TB6) indicates the current operating mode for the Dual Switch Controller. When in Local operating mode pin LOCAL is kept at +24VDC with respect to DC Common (COM) and pin REMOTE is kept at the 0VDC. When in Remote operating mode, pin REMOTE is kept at +24VDC level with respect to COM and pin LOCAL is kept at 0VDC. In Lockout mode, both the REMOTE and LOCAL pins are kept at 0VDC. These pins can be used to drive visual indicators or to provide discreet logic signals based on the LOCAL / REMOTE status of the Dual Switch Controller.

g. Mode Persistence

The Dual Switch Controller mode of operation is persistent in case of a power loss. When power is restored after a power loss, the Dual Switch Controller returns to the operational mode that was present at the time of the power loss. If the Dual Switch Controller is in remote mode and it temporarily loses power, it will return to remote mode once powered up again. If power to Dual Switch controller is lost and switch is moved manually to a valid position, then the Dual Switch controller will sense the new position and report it. If the switch is between positions, then the switch controller will show a fault on the switch.

5. USING THE WEB INTERFACE

After setting the IP address of the Dual Switch Controller, when the web page is accessed for the first time, you will be asked to create a password for the web page administrator account and log in using the new password. Once the password is set, the webpage is launched to view and control the Dual Switch Controller.

If the IP address is not set, the Web interface can be accessed by typing the Hostname DUALRFSWITCH/ into the address field on a web browser. After completing the first login sequence described again, navigate to Configuration>Networking. You will be prompted to enter a static IP address as shown in Figure 13 below.

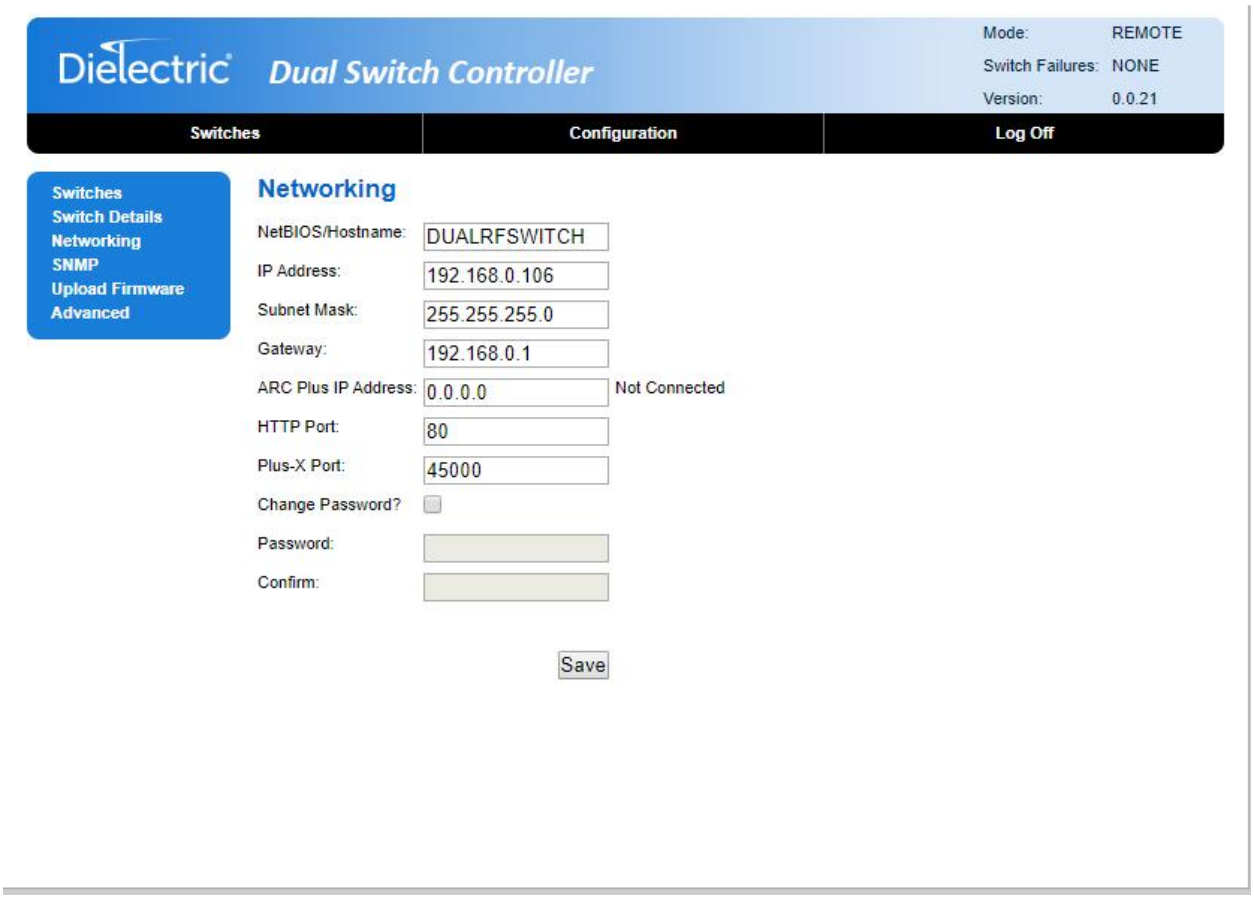

Figure 13: Configure network settings and password using web interface

Selecting Configuration -> "Switches" displays the position of the switch as shown in below. This screen allows the operator to configure the switches by defining labels for the input and output functions, setting the voltage and the interlock delay.

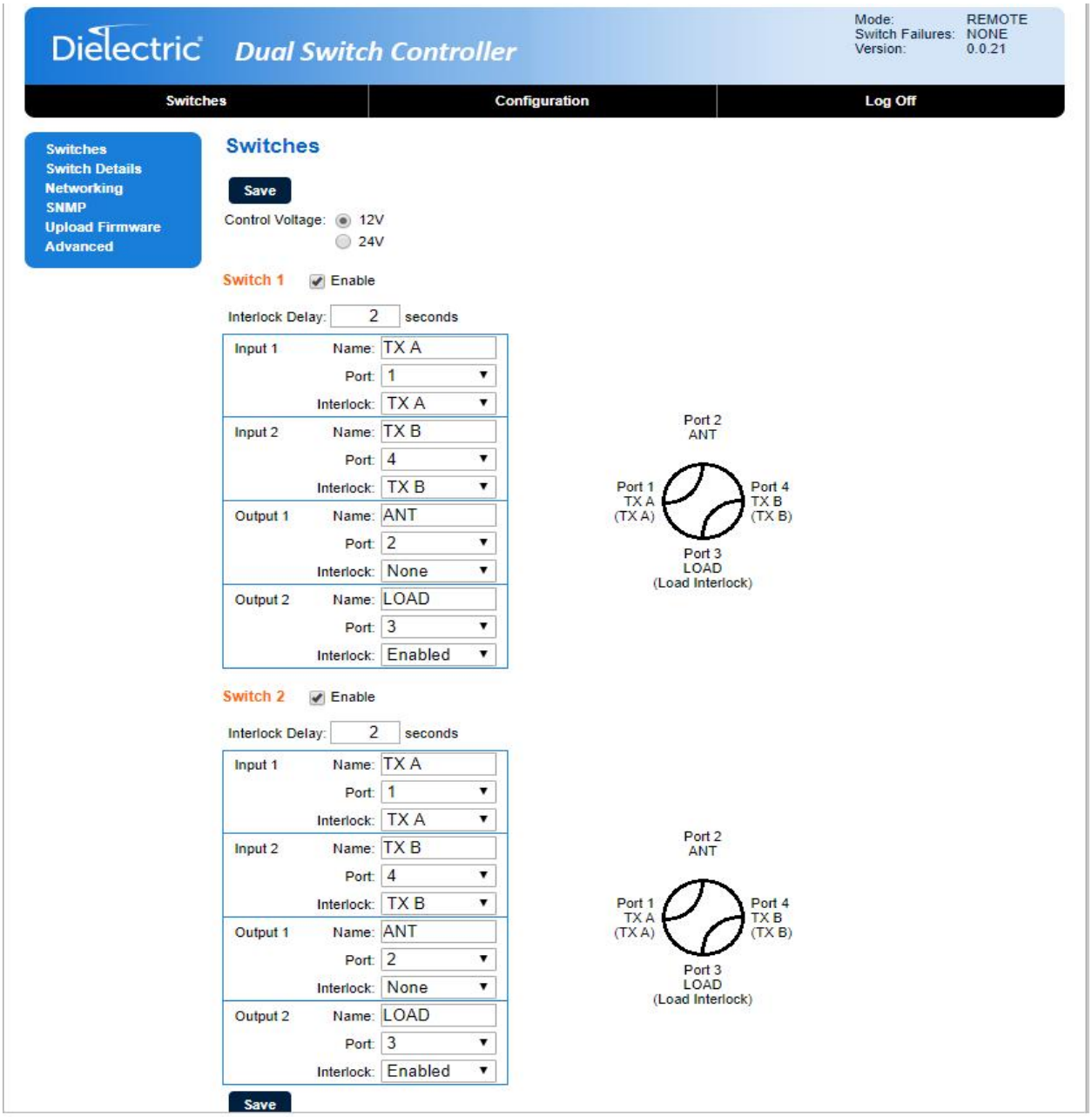

Figure 14: Switch configuration using web interface

Switch details provide the position of the switches and the status of the interlock as shown in Figure 15 below.

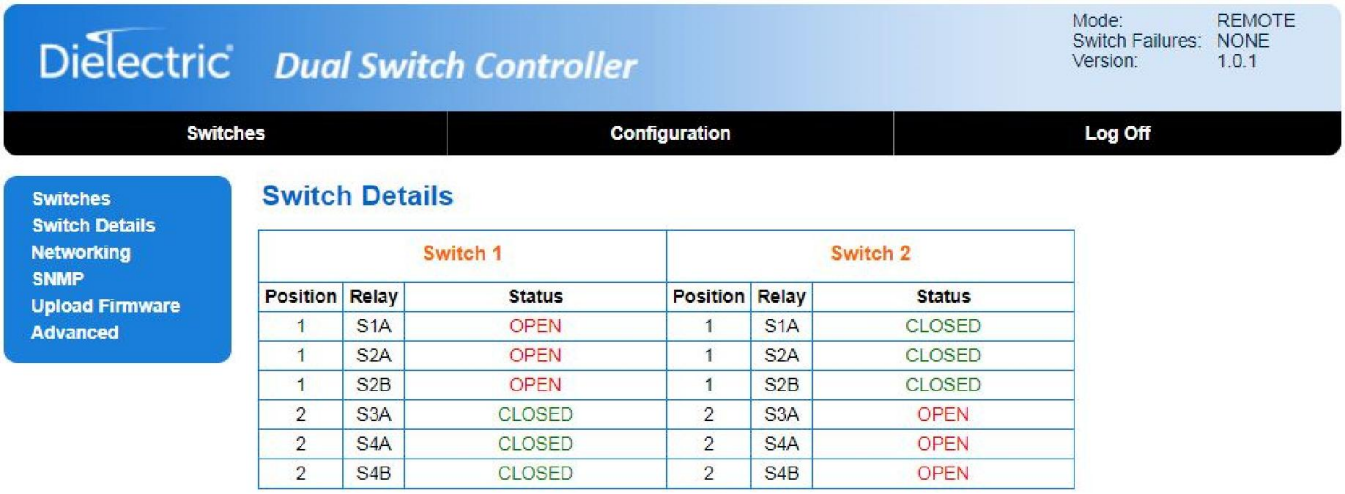

Figure 15: Switch interlock status

SNMP is configured using the web interface. The standard default settings for SNMP are shown in Figure 16.

Figure 16: SNMP configuration using web interface

To update the firmware on the Dual Switch Controller, use the "Upload Firmware" setting in the Configuration section. The operator needs to first install the Burk Firmware Loader application and obtain a zip file containing the Firmware and Webpages files. A separate file will be required to update the Display Firmware. Then follow the instructions to begin the Upload process as shown in Figure 17. Note there are two steps involved to successfully update the firmware. First, the Burk Firmware Loader is used to update the Firmware and Webpages. Following that the Display firmware needs to be updated. In most cases, only the Firmware Loader needs to be updated and not the display firmware since there are no changes in the display firmware file.

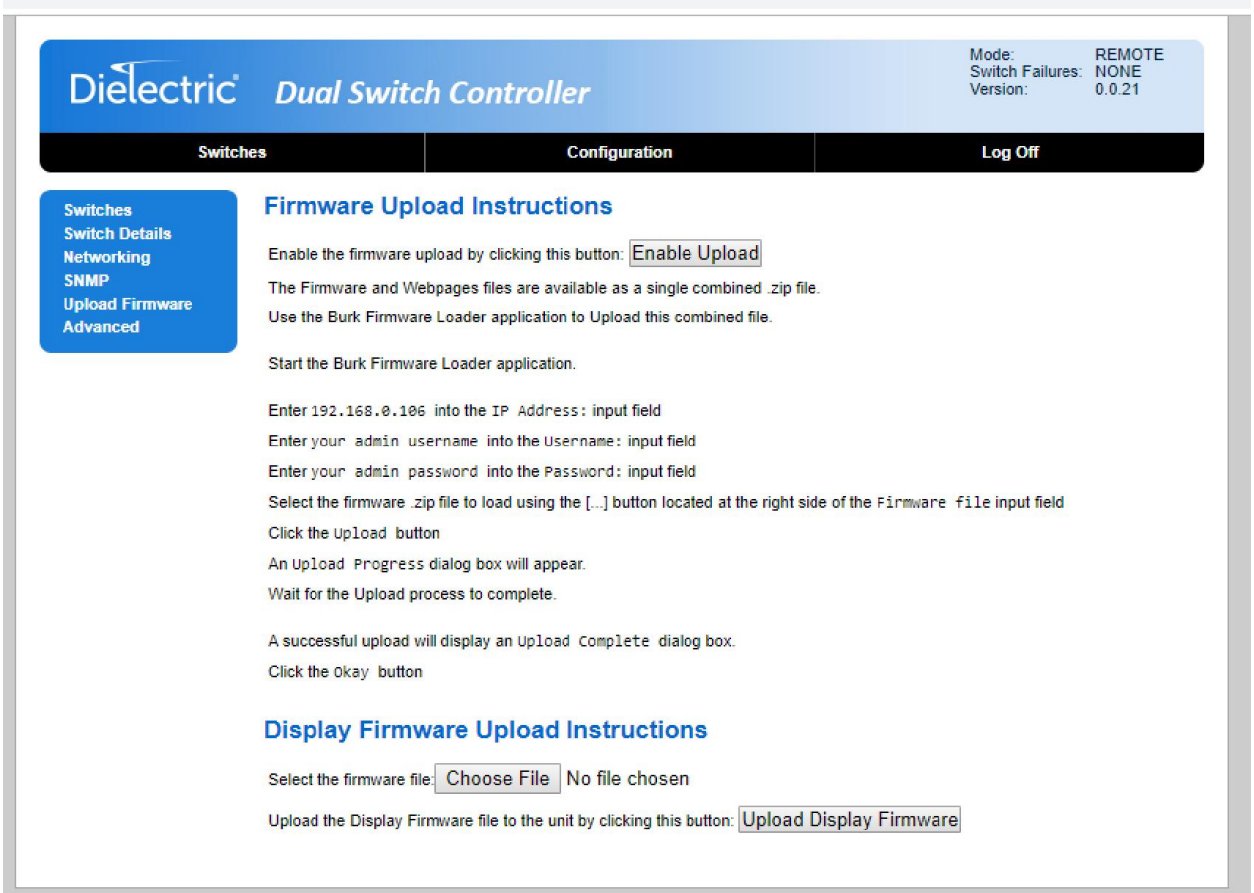

Figure 17: Update firmware on the Dual Switch Controller using the web interface

The "Advanced" option in the Configuration tab as shown in Figure 18 allows users to:

- Factory default – Reset the unit to factory default settings and clear logs by clearing all earlier settings. Caution: This action will reset the network interface to its default configuration. The static IP address will need to be restored before web communication can continue.
- Reboot – Reboot the Dual Switch Controller unit
- Download configuration – Save the Dual Switch Controller configuration to a local file. Figure 19 depicts an example of the settings that are saved for the Dual Switch Controller configuration.
- Restore configuration – Use a previously saved configuration file to restore the Dual Switch Controller settings.

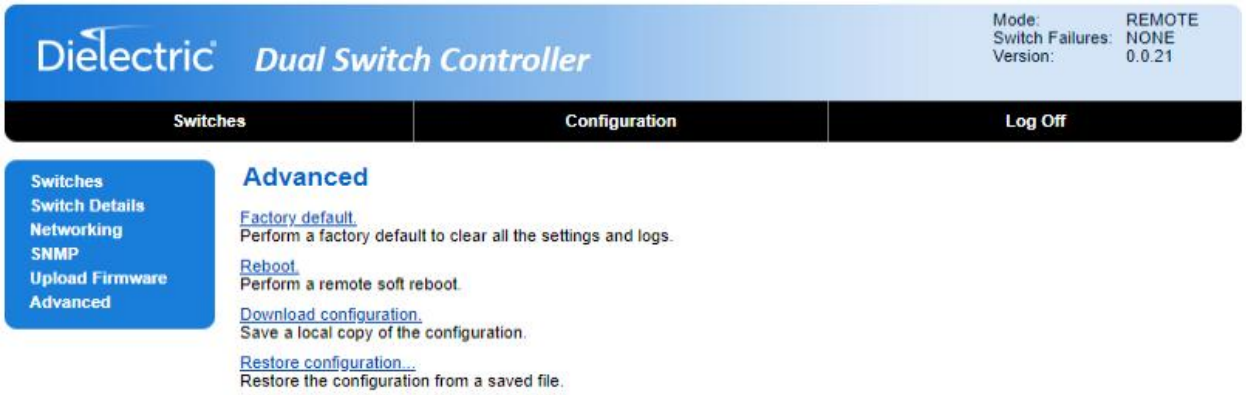

Figure 18: Advanced configuration using web interface

Figure 19: Example of a saved configuration

As depicted on the touch screen interface on the front panel, the Switches page of the web interface displays the positions of the two switches and provides the ability to initiate movement of either switch by clicking on the switch symbol, or to toggle both switches simultaneously by clicking on the Toggle Both buttons as shown in Figure 20.

Figure 20: Switch position display using web interface

6. USING SNMP

The Dual Switch Controller supports SNMPv1 and SNMPv2c, and, acting as an SNMP Agent, accepts compatible SNMP communications over the LAN connection. As shown in Figure 16, the default read and write community strings are public and private, respectively. The default port used for SNMP agent is port 161.

To issue commands and get status inputs, a SNMP Manager or MIB Browser needs to be configured. Download the MIB file available from the "SNMP" configuration tab and load it into the SNMP Manager or MIB Browser. Point to the IP address of the SNMP agent (Dual Switch Controller). The MIB file browser will display the different commands, known as Object Identifiers (OIDs) available for SNMP Monitoring and control as shown in

Figure 21 below.

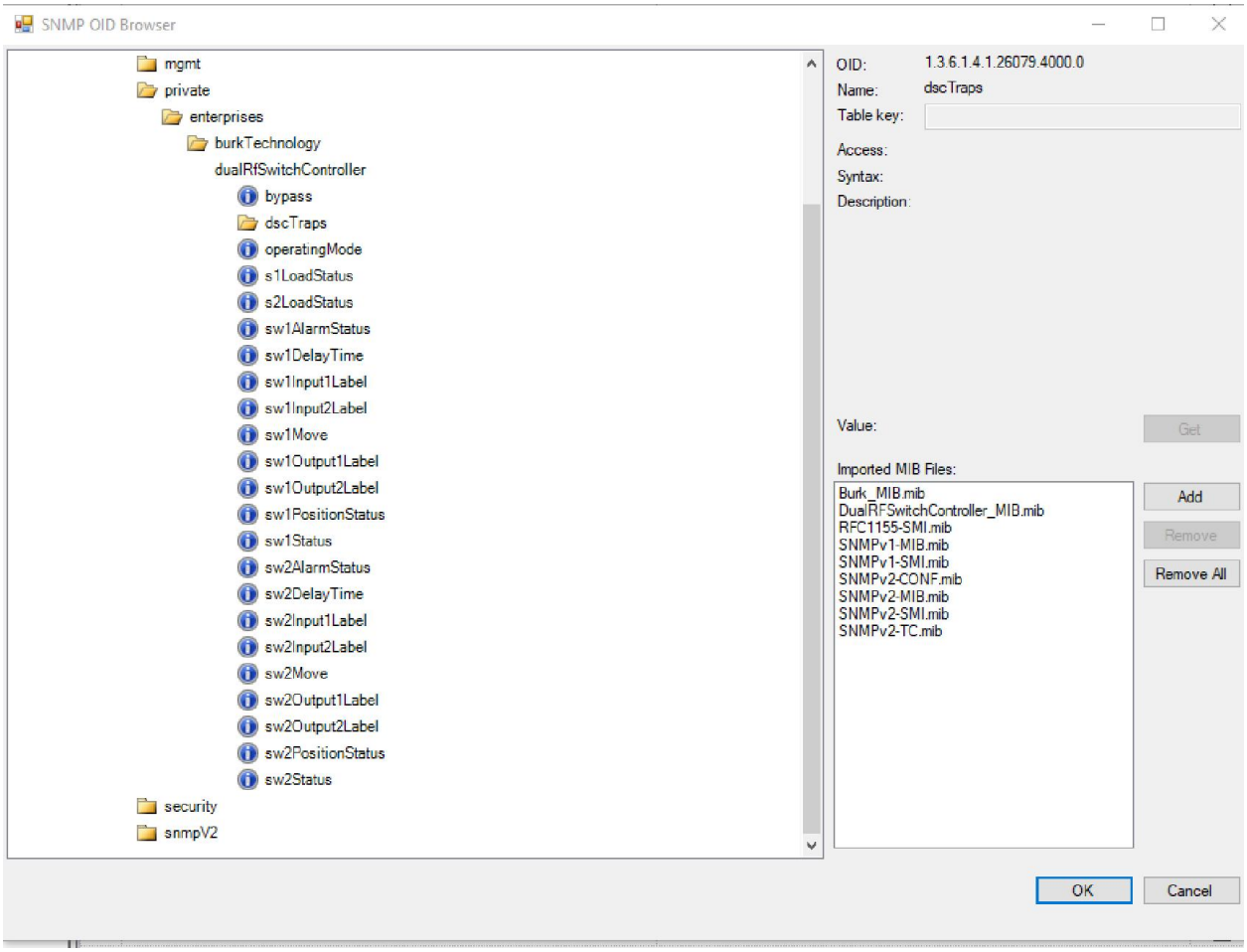

Figure 21: SNMP mib file browser showing list of SNMP functions

Table 3 supplies a minimum list of GET and SET for the Dual Switch Controller SNMP Agent.

Table 3
SNMP agent minimum message set

MSG Type	MSG Name	MSG Description
SET	bypass	Action: RF SW1 and RF SW2 both toggle from their current position to the opposite position.
TRAPS	--	For SW1 and SW2 Load interlock. Alarm is Load Interlock is Open or Closed
GET	operatingMode	Report Operation Mode Responses: Local, Remote, Lockout

Table 3
SNMP agent minimum message set

MSG Type	MSG Name	MSG Description
GET	s1LoadStatus	Report SW1 Load Interlock Status
		Responses: SW1 Load Open, SW 1 Load Closed
GET	s2LoadStatus	Report SW2 Load Interlock Status
		Responses: SW2 Load Open, SW 1 Load Closed
GET	sw1AlarmStatus	Report switch alarm status
		Responses: Switch Alarm, Load Alarm, No Alarm
GET	sw1DelayTime	Report Delay Timer Setting for Switch 1
		Responses: Delay = <XX> Sec
GET	sw1Input1Label	Report user defined label for SW1 IP 1
		Responses: Default (Tx A) or User Defined Label
GET	sw1Input2Label	Report user defined label for SW1 IP 2
		Responses: Default (Tx B) or User Defined Label
SET	sw1Move	Parameter = POS1 or POS2
		Action: SW1 move to either Pos1 or Pos2
GET	sw1Ouput1Label	Report user defined label for SW1 OP 1
		Responses: Default (Ant) or User Defined Label
GET	sw1Output2Label	Report user defined label for SW1 OP 2
		Responses: Default (Load) or User Defined Label
GET	sw1PositionStatus	Report RF SW1 Position
		Responses: POS1, POS2, MOVING or FAILED
GET	sw1Status	Report Status of SW1
		Responses: Enabled or Disabled

Table 3
SNMP agent minimum message set

MSG Type	MSG Name	MSG Description
GET	sw2AlarmStatus	Report switch alarm status Responses: Switch Alarm, Load Alarm, No Alarm
GET	sw2DelayTime	Report Delay Timer Setting for Switch 2 Responses: Delay = <XX> Sec
GET	sw2Input1Label	Report user defined label for SW2 IP 1 Responses: Default (Ant) or User Defined Label
GET	sw2Input2Label	Report user defined label for SW2 IP 2 Responses: Default (Tx B) or User Defined Label
SET	sw2Move	Parameter = POS1 or POS2 Action: SW2 move to either Pos1 or Pos2
GET	sw2Output1Label	Report user defined label for SW2 OP 1 Responses: Default (Ant) or User Defined Label
GET	sw2Output2Label	Report user defined label for SW2 OP 2 Responses: Default (Load) or User Defined Label
GET	sw2PositionStatus	Report RF SW 2 Position Responses: POS1, POS2, MOVING or FAILED
GET	sw2Status	Report Status of SW2 Responses: Enabled or Disabled

Traps are supported with SNMPv1. Configuration of Traps for the Load interlock state (either Open or Closed) for both Switch 1 and Switch 2 for alarm notification are shown in Figure 22.

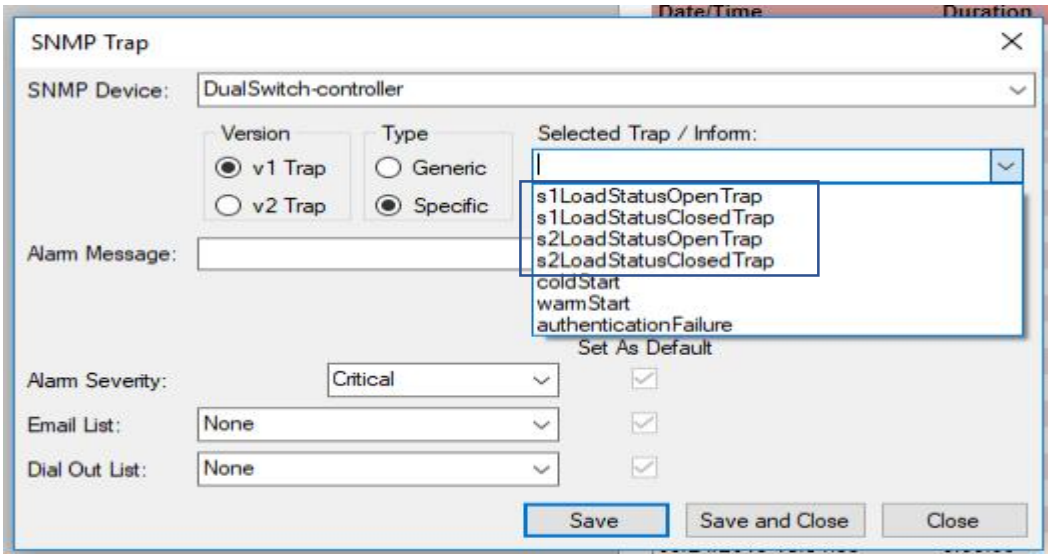

Figure 22: SNMP TRAPS

7. INTEGRATION WITH AN ARC PLUS REMOTE-CONTROL SYSTEM

The Dielectric Dual Switch Controller can be integrated with a Burk Technology ARC Plus remote-control unit to alert proper personnel with selective alarms via email, SMS or optional telephone Recordable Speech Interface (RSI) and to combine DUAL SWITCH CONTROLLER management with other critical site functions. In this configuration, the Dual Switch Controller acts as a Plus-X device, providing full monitoring and control access via the ARC Plus system.
Furthermore, the ARC Plus remote-control unit can monitor the Dual Switch Controller via SNMP and send an email, SMS or telephone alarm via the optional telephone Recordable Speech Interface (RSI) for critical events.

For more details on the benefits of using the Burk Arc Plus Touch remote control, please see link below.
https://www.burk.com/products/Broadcast-1/ARC-Plus-Touch-1

If you need assistance with the Dual Switch Controller, please contact Burk directly at 978-486-3711, or email at support@burk.com.

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