

Operation & Installation Manual

Model 8512 Series Programmable Switch Units

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1. Safety Summary

1.1. Definitions

The following definitions apply to WARNINGS, CAUTIONS, and NOTICES found throughout this manual.



WARNING: An operating or maintenance procedure, practice, statement, condition, etc., which, if not strictly observed, could result in injury and/or death of personnel. Do not proceed beyond a WARNING symbol until all the indicated conditions have been fully understood and/or met.



CAUTION: An operating or maintenance procedure, practice, statement, condition, etc., which, if not strictly observed, could result in damage or destruction of the equipment or long-term health hazards to personnel. Do not proceed beyond a CAUTION symbol until all the indicated conditions have been fully understood and/or met.



NOTICE: An essential operating or maintenance procedure, condition, or statement that must be highlighted.

1.2. General Precautions

The following are general precautions that are not related to any specific procedure and, therefore, do not appear elsewhere in this publication. These are precautions that personnel must understand and apply during various phases of instrument operation or service.



Potentially lethal voltages are present in this instrument. Serious shock hazards from voltages above 70 volts may exist in any connector, chassis, or circuit board. Observe the following precautions.

To minimize shock hazard, the instrument chassis must be connected to an electrical ground. Using the supplied three-conductor power cable ensures that the instrument can be firmly connected to the ac power source and electrical ground at a grounded power outlet. If using a 3-2 wire adapter be sure to connect the ground lead to earth ground.

Use the buddy system any time work involving active high voltage components is required. Turn OFF the power before making/breaking any electrical connection. Regard any exposed connector, terminal board, or circuit board as a possible shock hazard. DO NOT replace any component or module with power applied.

If test conditions to live equipment are required, ground the test equipment before probing the voltage or signal to be tested.

Personnel working with or near high voltage should be familiar with modern methods of resuscitation.

DO NOT wear jewelry (rings, bracelets, metal watches, and/or neck chains) while working on exposed equipment. Be very cautious about using hand tools near exposed backplanes, bus bars, and/or power supply terminals. Use properly insulated tools. When making test connections to the power supply terminals and bus bars, use only insulated probe tips.

Verify that the instrument is set to match the available line voltage and the correct fuse is installed.

DO NOT install substitute parts or perform any unauthorized modification to this instrument. Contact Weinschel to acquire any information on replacement parts or returning the instrument for repair. Unauthorized modification can cause injury to personnel and/or destruction of the instrument.

Operating personnel must not remove instrument covers. Component replacement or adjustments must be performed by qualified service personnel.

DO NOT operate the instrument near or in the presence of flammable gases or fumes.

1.3. Detailed Precautions

The following WARNINGS, CAUTIONS and NOTES appear throughout the text of this manual and are repeated here for emphasis.



CAUTION

All procedures and/or steps identified as must be followed exactly as written and according to industry accepted ESDS device handling procedures. Failure to comply WILL result in ESD damage.

- DO NOT use a nylon bristle brush in any solvent as the bristles may dissolve and cause damage to the circuit card or component.
- DO NOT use ultrasonic cleaning on parts or assemblies containing electrical or electronic components.
- DO NOT bend pins of electrical connectors when using fiber-bristle brush.

Compressed air used for cleaning and/or drying can create airborne particles that may enter the eye. Goggles/face shields should be worn. DO NOT direct air stream towards self or other personnel. Pressure should be restricted to a maximum of 15 psi to avoid personal injury.

Under no circumstances should a wire brush, steel wool, or abrasive compound be used on any surface. Using these items will cause extensive damage to the instrument's surface.

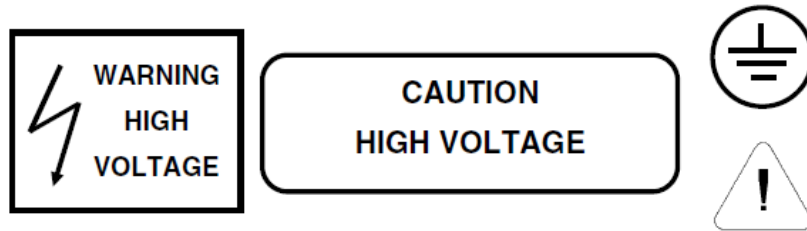


NOTICE


DO NOT return any instrument or component to Weinschel without receiving prior factory authorization.

1.4. Safety Symbols

The following symbols are used to identify safety hazards found throughout this publication and/or located on the instrument.



1.5. Electrostatic Discharge Sensitive

The equipment documented in this manual contains certain Electrostatic Discharge Sensitive (ESDS) components or parts. Therefore, certain procedures/steps are identified by the use of the symbol . This symbol is used in two ways:



CAUTION

- When the ESDS symbol is placed between a paragraph and title, that paragraph, including all subparagraphs, is considered ESDS device handling procedure.
- When the ESDS symbol is placed between a procedure/step number and the text, all of that procedure is considered an ESDS device handling procedure.

All procedures and/or steps identified as ESDS must be followed exactly as written and according to accepted ESDS device handling procedures. Failure to comply WILL RESULT in ESDS damage.

2. General Information

2.1. Document Overview

This manual contains setup and operation information for the Weinschel Model 8512 Series, Programmable Switches.

A general description of the product, information regarding installation and user operation, and maintenance instructions are also included in this manual. Assembly drawings, wiring diagrams, and bill of materials are located in the document appendix.

2.2. Related Manuals

The following manuals contain information that may be used in conjunction with this manual to operate, service, or calibrate this device.

Manual	Title
IM619	Switch Control Center Software manual

2.3. Equipment Overview

Weinschel 8512 Series Programmable Switch Units represent a new streamlined approach in programmable switches for bench test and subsystem applications. Standard 8512 Series designs house and control up to 14 failsafe or latching electromechanical switches via front panel controls, Ethernet, USB and Serial communications interfaces. A GPIB (IEEE-488) interface is also available as an option. It can be configured in a single input multi-channel configuration or can be configured for up to 14 channels each, SP6T switches interconnected externally in a variety of matrix arrangements.

Applications for the Model 8512 Series include:

1. Remote control of up to 14 switches through a single connection
2. Can be configured into multiple full blocking matrices using external coaxial cables, up to a 6 x 6 matrix.
3. Can be configured as a single pole, multi throw switch, up to SP66T.
4. Failsafe and latching options allow for non-contiguous or high power applications, respectively.

Figure 1 below shows the functional block diagram of the module.

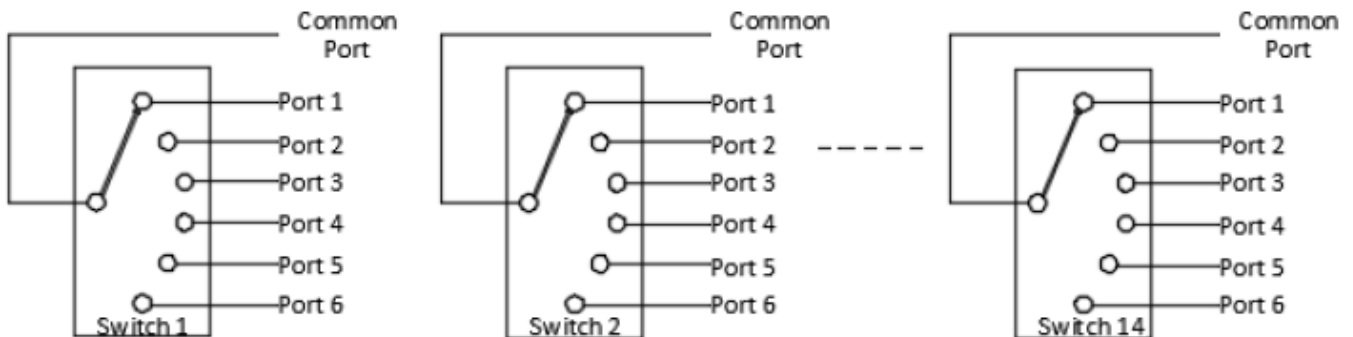


Figure 1: Functional Block Diagram of 8512 series module

3. Installation

Figure-2 and figure-3 below shows the front and rear panels of 6-channel and 14-channel 8512 series module.

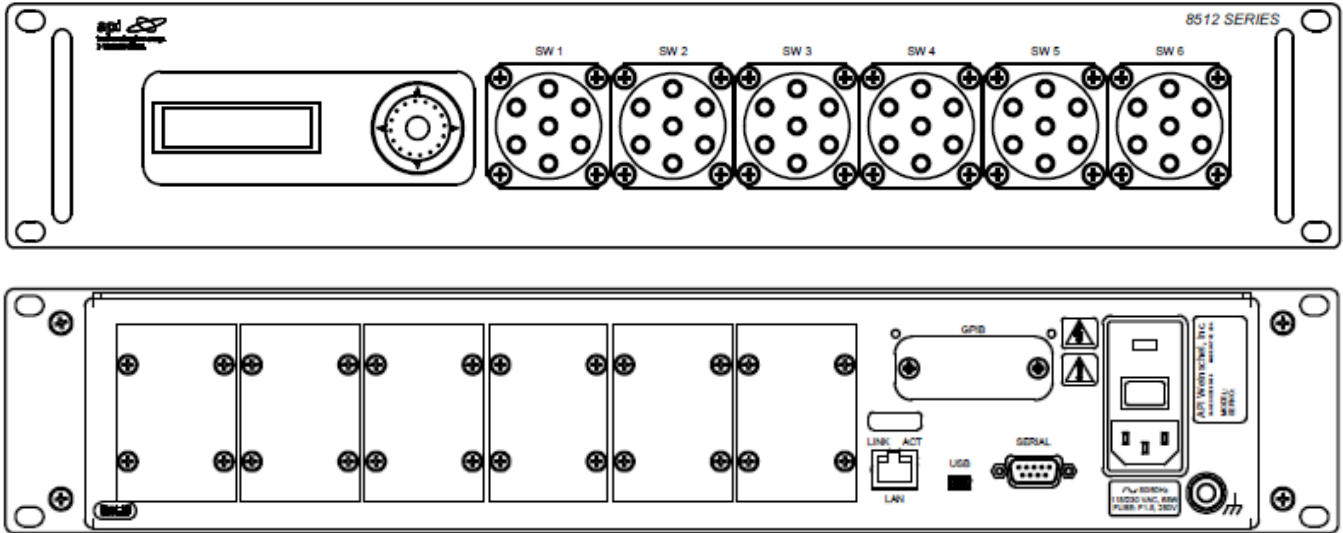


Figure-2: Front and rear panel of 6 channel module

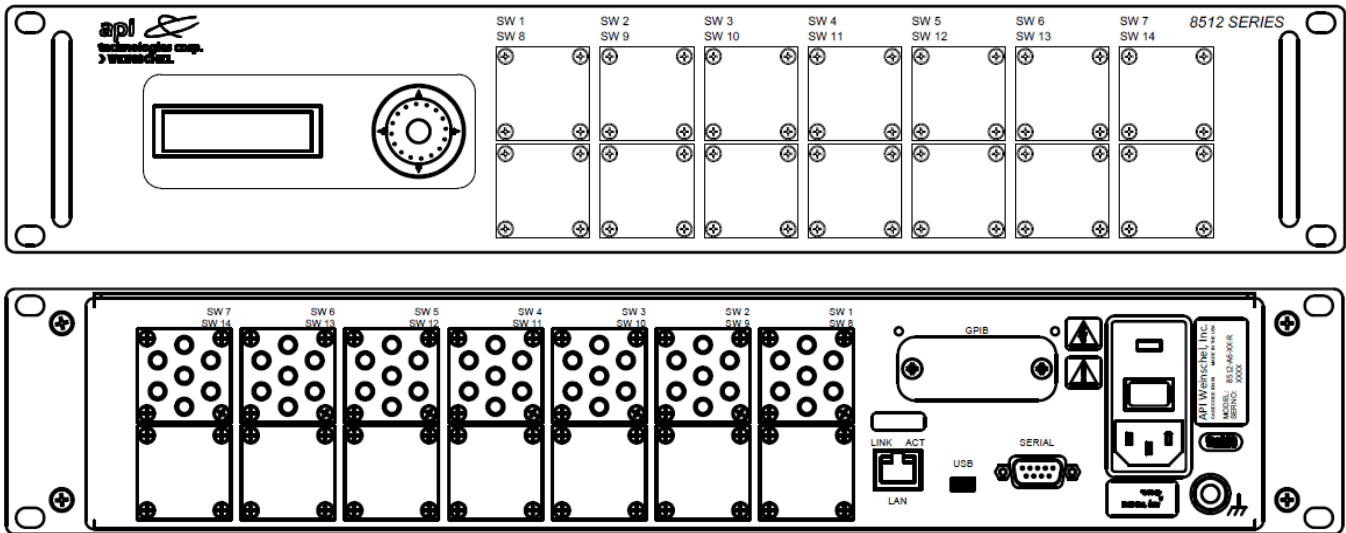


Figure-3: Front and Rear Panel of 14 channel module

3.1. Rack Mounting

The Model 8512 Series can be mounted in any rack or cabinet that conforms to EIA RS-310 or MIL-STD-189.

3.2. Initial Setup

The following initial setup procedures should be performed prior to operating the Model 8512.

1. Perform an initial inspection of the unit.
2. Verify the AC power connection is configured to the correct voltage for your region.

3. If applicable, install the unit into rack or cabinet. Follow all manufacturer instructions regarding installation.
4. Connect all power, RF and communication cables as required to the unit.

3.3. Supply Voltage and Fuse



Model 8512 module can be operated with 115 VAC power supply. An AC external switch, which is located on the rear panel of the UUT, allows user to power up the UUT with AC voltage. The Power Entry Module Assembly located on the rear panel contains a grounded three-prong AC power connector, an on/off power switch, and a fuse drawer.

The AC power connector is used to supply single-phase AC power to the unit. This connector also grounds the chassis of the unit when the AC power cable is connected to a grounded wall outlet. The supplied power cable or equivalent is recommended for safe operation. A grounded three-prong connection is required for safe operation.

The on/off power switch is used to toggle power to the unit for normal operation. To supply power, set the switch to ON or |. To disconnect power, set the switch to OFF or O.

The fuse drawer contains a 5 x 20mm 250 V fuse. The current rating of the fuse is listed on the rear of the unit. Do not install a fuse with a higher current rating than the listed value. Electrical shock can occur if the unit is connected to AC power while changing the fuse. To prevent personal injury, disconnect the power cable from the unit and allow the internal power supply to discharge before removing the fuse.

All electrical rack or chassis and machine elements should be Earth Grounded in installations where high level of electrical noise can be expected. The rack or chassis should be grounded with a rod or attached to a nearby earth structure such as a steel beam support beam. Connect each apparatus to a single ground point in a star configuration with low impedance cable. Scrape away paint and other nonconductive material from the area where a chassis makes contact with the enclosure. In addition to the ground connection made through the mounting bolt or stud, use a one-inch metal braid or size #8 AWG wire to connect between each chassis and the enclosure at the mounting bolt or stud.

3.4. RF Port Connectors



To prevent damage to the device do NOT exceed the maximum allowable power level specifications of the unit at any port. Use a calibrated torque wrench to tighten all RF connections.

Based on selected options, a typical Model 8512 Series Switch Unit can contain up to 14 SP6T switches on the front or rear panels and support SMA connections. Connectors are per MILSTD-348 interface dimensions and mate nondestructively per MIL-STD-212.

3.5. Ground Lug

The unit contains a ¼-20 ground stud on the rear of the chassis for grounding purposes.

4. Remote Operation

4.1. RS-232 Serial

The RS232 port is available on a DE9M connector and utilizes three signals: TXD, RXD and GND along with the optional RTS and CTS handshaking signals. The connector pinout is configured as a DTE device, so connections to an external DTE device (such as a PC) would require the use of a null-modem cable. The format is fixed at N81 (no parity, 8 data bits, 1 stop bit), and the baud rate is selectable via software command at rates of from 9600 to 230400. By default, the unit is shipped to operate at 115200 baud, with the Console mode non-volatile memory (NVM) setting enabled (see below).

The serial port has two modes of operation: console and raw mode. Console mode provides a command-line interface (CLI) and is useful for interactive control via a terminal emulator. The Console mode sends command prompts ('>'), echoes received characters, supports the backspace key for simple editing, provides command line recall (CTRL-R), and issues error messages, while raw mode is a basic serial interface with none of these features and is typically more suitable for programming. The selection of raw versus console mode is done via the CONSOLE command, which can be used to enable/disable the console feature and optionally save the desired setting in non-volatile memory (see the CONSOLE command in the command reference for additional options).

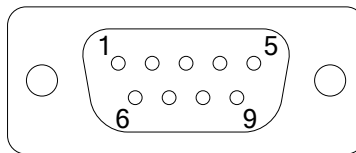


Figure 1: RS-232 DE9M (DTE Pinout)

Pin	Signal	Name	Direction
1			
2	RXD	Receive Data	In
3	TXD	Transmit Data	Out
4			
5	GND	Signal Ground	
6			
7	RTS	Request To Send	Out
8	CTS	Clear To Send	In
9			

A Null Modem cable for DTE to DTE communication requires the TX/RX and CTS/RTS pins to be swapped at one of the connections. A wiring example is show below.

RS-232 Null-Modem Cable (DTE to DTE)				
	DE9F		DE9F	Signal
	1		1	
RXD	2	↔	2	RXD
TXD	3	↔	3	TXD
	4		4	
GND	5	→	5	GND
	6		6	
RTS	7	↔	7	RTS
CTS	8	↔	8	CTS
	9		9	

4.2. Serial Console Boot Display

When the system powers up in serial Console mode, if you have a terminal emulator attached to the serial port you should see a screen showing the various installed features and system status. A typical screen is shown below.

```
Tuesday, January 20, 2015 1:11:02 PM

API Weinschel 8321 Attn System V1.70
firmware: 19311459318H

RF config
  channel count: 12
  attn config: 3200-1E 127dB/1dB, DC-3GHz

gpib port: not installed

default network config
MAC id: 00:1E:C0:B2:BC:F7
IP addr: 0.0.0.0
netmask: 255.255.255.0
gateway: 0.0.0.0

netstat: enabled

DHCP: enabled
AutoIP: enabled

>
**netstat: link down
```

4.3. 10/100BaseT Ethernet

The Ethernet port supports 10/100BaseT operation, with auto-negotiation of the interface speed and duplex mode. LED indicators are provided to indicate network LINK status (green) and TX/RX activity (YELLOW). Supported network protocols include: IP, UDP, TCP, ICMP, ARP, DHCP, and AUTOIP. A TELNET server is provided for a command-line interface that implements many of the functions of the serial console CLI. Both TCP and UDP servers allow connections to be established for general programming purposes. Additionally, the Microchip Announce protocol is implemented to provide support for the Microchip Ethernet Discovery tool, which is a UDP-based protocol used to detect Ethernet devices on the network.

IP addressing modes supported include the use of a statically assigned fixed address, or dynamic address assignment using either DHCP or AutoIP. The use of DHCP requires a DHCP server to reside on the network. AutoIP is an address mode that can be used when no DHCP server is available. It automatically allocates an address from the special block of addresses 169.254.1.0 to 169.254.254.255 reserved for link-local addressing. These addresses are only valid on the link that the host is connected to, such as a local network segment or point-to-point connection, and are unroutable. See the SET IPADDR, SET DHCP, SET AUTOIP, and SHOW IPADDR commands for more information.

The TELNET server communicates using the standard port 23 typically used by the TELNET protocol. The implementation is a reduced-functionality version and does not support the full protocol, but it should function properly with many clients. The server only supports a single connection, does not require any login, and does not support options negotiation except for the initial state of the echo setting. The server does support an inactivity timeout, and allows the use of TELNET NOP commands sent by the client to keep a session open. By default, the timeout is set for 300 seconds (5 minutes), after which the server will automatically close the session if no activity has occurred. Many of these features are configurable by the user (see SET TELNET in the command reference). The status of the server can be seen using the SHOW NET TELNET command. An active TELNET connection may be closed from the telnet application on the client using the 'QUIT' command. The unit provides a TCP server that can be used for control and status of the unit using the same text-based messages used by the serial port. By default, the server is configured to support a single connection and listen on a single port (port 10001), however the number of allowable connections can be changed to support up to 4 simultaneous users. Server settings, such as the number of connections, port number, keepalive timeout, inactivity close timer, and character echoing are programmable by the user (see SET TCP in the command reference). The status of the server(s) can be seen using the SHOW NET TCP command.

A UDP server is also provided that will accept command messages sent via UDP protocol using the same text-based messaging. UDP is a connection-less based protocol that is simpler and has less overhead than TCP. By default, the internal UDP server listens on port 20000, but this can be changed via the SET UDP SERVER command. It is important to note that UDP messages are not buffered, so sufficient time must be allowed between messages for the command to execute or a command/response scheme should be implemented to synchronize the messages.

Various network events generate status messages shown on the serial Console port. These events include TCP and TELNET server connect/disconnect messages and DHCP/AUTOIP address assignment changes. The status messages may be disabled if desired (see SET NETSTAT), but are enabled by default.

For simple device discovery, the Microchip Announce protocol is used. The Microchip Announce protocol is a UDP based scheme used to detect devices supporting the protocol. The protocol broadcasts UDP packets to port 30303 containing the message, "Discovery: Who is out there?", and supporting devices respond with a UDP packet which provides the device IP and MAC address, as well as other info such as the firmware version. A copy of the Ethernet Device Discoverer application for MS Windows-based systems is provided on the CD supplied with unit, or can be downloaded from the Microchip website.

4.4. USB

The USB port provides a USB Communications Device Class device (CDC) interface that allows programming via a virtual COM port using the same text-based commands as the serial port. For interaction with a terminal emulator, a console mode command-line interface (CLI) is provided for ease of use, and is user-configurable via the USB CONSOLE command. Refer to paragraph 4-14 for information on installing the USB CDC driver file.

4.5. GPIB

An optional GPIB interface is available on some units allowing for control via an IEEE-488 controller, and implements the functionality of IEEE488.2 standard protocol. The GPIB bus address is user programmable via the SET GPIB ADDR command or via the front-panel (if installed). The default address is set to 10.

5. Front Panel Control

5.1. Navigation

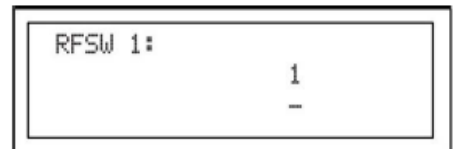
The Navigation Control provides for menu selection and data entry. It consists of four navigation keys: UP, DOWN, LEFT, and RIGHT, along with a SET key and a Scroll wheel. Menu selections are made by using the UP and DOWN keys to highlight the current selection as indicated by the selection arrow in the first column of the display. The currently highlighted item may be selected by using either the SET or RIGHT keys to select the entry. The LEFT key will always exit the current screen and return you to the previous menu.

To change the value of a setting, select the entry (using the SET or RIGHT keys) and you will enter the editing screen for that parameter. The editing screen will show the parameter name on the first line and the current value on the second. The value that is currently selected for editing will be highlighted by underscore characters. For parameters that have multiple fields such as the four bytes of an IP address, the current editing focus can be changed using the RIGHT key to move to the next field.

On the editing screen, the value can be changed using one of two methods: increment mode or editing mode. In increment mode, the UP and DOWN keys can be used to increase or decrease the current value. For RF devices such as attenuators and switches the device will also be programmed to the new setting with no further action required. Other settings may require confirmation with the SET key before changing.

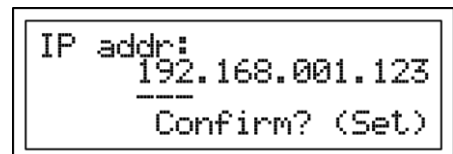
Example:

Changing the current switch setting using incremental editing mode. In editing mode, the SCROLL wheel can be rotated to change the displayed value, but the actual change will not be made until the SET key is pressed. When data is changed in the editing mode, the LCD will show a "Confirm? (SET)" message to indicate that the value has not yet been changed. If you wish to abort editing, you can use the LEFT key to discard any changes and leave the current screen. Otherwise, depressing the SET key will enter the displayed value.



Example:

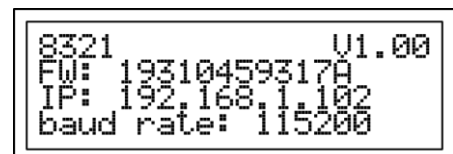
Changing the current IP address value using the scroll wheel editing mode. Each byte is set and confirmed separately.



5.2. Menus

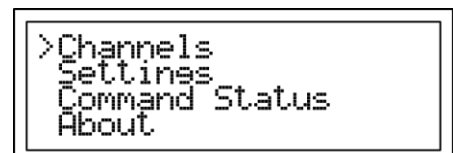
Boot screen

This screen is displayed for a few seconds at power on and shows the model number, firmware revision and file, and the current IP address and serial baud rate settings. Once the system initializes, the unit will switch to display the Main menu.



Main Menu

This screen is displayed after the system has fully initialized. This is the top-level menu and provides access to all controls and settings.



Channels

The Channels menu is used to display and change the settings of the RF devices installed in the unit. If multiple types of RF devices are installed, you may be presented with an additional menu allowing you to select between the different device types.

```
>Attenuators
  RF Switches
```

Once selected, you will be presented with a list of the devices and the current settings. Depending on the capabilities of the unit (such as the number of installed devices) there may be multiple display pages associated with this menu. You can use the UP and DOWN keys to display any additional pages.

```
>RFSW 1      1
  RFSW 2      1
  RFSW 3      1
  RFSW ALL
```

Settings

The Settings menu allows access to the system setup parameters. These include remote communication settings, addresses, and any configurable hardware settings. If more options are available than displayed, the additional settings may be accessed by using the DOWN key to scroll to the next page.

```
>Baud rate
  IP addr
  Netmask
  Gateway
```

Some changes made to system setup parameters in the Settings menu do not take effect until the next system restart. If a change is made to one of these settings, exiting the menu will prompt the user with the option to restart the system. Depressing the SET key will restart the system and load the new settings.

```
**Settings change**
  Restart? (Set)
```

Command Status

The Command Status screen displays remote commands being sent via any of the communication ports, along with the status of the current command error queue. The displays are limited to the first 20 characters of a message and will truncate additional characters

```
Command:
ABC
Error Queue:
E101: invalid cmd
```

The unit is capable of receiving and executing commands faster than the display can update. To minimize the impact that the display would have on command execution, the command display is only updated during idle periods. The display may not update during periods of heavy activity and is provided as a status and troubleshooting aid only.

The Error Queue displays the last entry in the error queue. Once an error has been generated it will be continued to be displayed until the error queue is read or cleared. Sending a valid command does not clear the queue, so the error display may not reflect the result of the current command.

```
Command:
*cls
Error Queue:
```

Under normal operation, the Error Queue line should be empty indicating no errors.

About

The About screen displays the model number, firmware revision, unit serial number and Ethernet MAC address.

```
8321          U1.00
FW: 19310459302A
SN: 001
MAC: 0004A35937D7
```


6. Command Operation

6.1. Application Specific Commands

RFSW

Function: Sets the [select]ed RF Switch to the chosen [setting].

Syntax: RFSW *select setting*

Argument(s): *Select* Switch number, 1-n or ALL
Setting Switch position, must be valid for selected switch

Remarks: This command sets the specified RF switch(s) to the position provided by setting. For most switches setting is a single numeric value that specifies the desired switch position, and may include 0 if the switch supports an OFF setting. Value position settings for a switch can be obtained using RCONFIG? GETCAP RFSW to get a list of the settings. Since some types of switches such as an RF Transfer Switch are typically documented as having an A or a B position, setting may also be a single letter where A=1, B=2, C=3, etc. Note however, that the reported position using the RFSW? query will always be the numeric value. For switches that support position indicators, after setting the switch the position indicators will automatically be read and verified against the requested setting. If the values do not match then an Execution error will be generated.

Return Value: None

Example(s): RFSW 1 2 // Sets RF switch 1 to position 2
RFSW ALL 1 // Sets all switches to position 1

RFSW [select]

Function: Queries the current setting of [select]ed RF Switch.

Syntax: RFSW *select*

Argument(s): *Select* Switch number, 1-n or ALL

Remarks: This command returns the current setting of the selected switch. For switches that support position indicators, this command will read the indicators and attempt to match them to a valid position setting. If a match cannot be found, the value 255 is returned. For switches without indicators, the returned value is the last specified position.

Returns: Switch position

Example(s): RFSW 1 1 // Sets RF Switch 1 to position1
RFSW? 1 //Queries RF Switch 1 and returns "1"

6.2. General RF configuration and Status Commands

SHOW STAT

Function: displays current settings

Syntax: SHOW STAT

Argument(s): none

Remarks: This command displays the current settings of the RF hardware. The list will change to reflect the type and number of devices installed in the system.

Example(s):

```
>show stat
ATTN 1: 63
ATTN 2: 63
ATTN 3: 63
ATTN 4: 63
```

SHOW RCONFIG

Function: Displays current RF configuration
Syntax: SHOW RCONFIG
 SHOW RCONFIG INSTALL
Argument(s): INSTALL optional, displays installation details
Remarks: This command displays the current RF hardware configuration. The optional INSTALL argument will display hardware related details as to the device type, connections, etc.
Example(s):

```
>show rconfig
RF config
channel count: 12
attn config: 4202-63 (0-63/1dB, 0.4-6GHz)
>show rconfig install
ATTN 1 4205A-95.5 0 1 0x01 0x11
ATTN 2 4205A-95.5 0 1 0x11 0x00
```

SET DEFAULT

Function: Sets the default value of [select]ed device to the desired [setting], [type] is used to distinguish different devices.
Syntax: SET DEFAULT ATTN select setting
 SET DEFAULT INIT
Arguments: *select* device select 1-n, or ALL
setting default value
Remarks: This command can be used to change the default device settings. The parameter select specifies the individual device number, or ALL which changes the non-volatile memory default setting for all devices. For attenuators, the parameter setting specifies the attenuation value in dB, and may also be specified as MAX, in which case the maximum value for the attenuator(s) will be used. For RF switches, the parameter setting specifies the initial position setting of the switch(es). The command SET DEFAULT INIT may be used to delete all nvm device default settings.
Returns: none
Example(s): SET DEFAULT ATTN 1 20 // Sets ATTN 1 to a default value of 20 dB for current runtime only.

```
SET DEFAULT ATTN ALL 15 // Sets all installed attenuators to a default value of 15 dB and saves to memory.

SET DEFAULT RFSW 3 2 // Sets RFSW 3 to a default value of position 2 for current runtime only.
SET DEFAULT INIT // remove all SET DEFAULT settings
```

SHOW DEFAULT

Function: displays the default settings for the RF hardware devices
Syntax: SHOW DEFAULT
Argument(s): none
Remarks: This command will show the default settings of all RF devices.
Return Value: none
Example(s):

```
>SHOW DEFAULT
attn defaults:
ATTN 1 max
ATTN 2 max
ATTN 3 max
ATTN 4 max
```

SET RCONFIG *type settings*

Function: Sets the system configurations to the installed hardware

Syntax: *Type* // Selects which device set the selection comes from. CHAN, ATTN, or RFSW
Settings //Sets the configuration to use for the chosen type

Remarks: This command is used to define the RF configuration installed in the unit. CHAN allows you to choose how many channels are installed in the unit. ATTN and RFSW allow you to define the device installed from a list of supported models. If the unit has both attenuators and switches installed, the CHAN type allows both to be defined.

Return Value: none

Example(s):

```
SET RCONFIG CHAN 9 // sets number of installed channels to 9
SET RCONFIG CHAN 5 2 // sets number of installed attenuators to 5 and
number of switches to 2
SET RCONFIG ATTN 4205A-95.5// Sets the installed attenuators to a model
4205a-95.5.
```

RCONFIG?

Function: read chassis configuration items

Syntax: RCONFIG? CHAN // returns the number of installed channels
RCONFIG? ATTN *n* // returns configuration info for attn *n* (model, range, etc)
RCONFIG? RFSW *n* // returns configuration info for RF switch *n*
GETCAP RFSW *n* // Returns the position information for RF switch *n*.
RCONFIG? LIST TYPE // returns a list of supported models

Remarks: These commands can be used to retrieve various chassis configuration settings. Only one argument can be used at a time.
RCONFIG? RFSW 1 Returns the configuration for RF Switch 1
RCONFIG? CHAN returns the number of installed devices. If the unit is configured to support both attenuators and switches then this command returns two values (attenuators, switches). Otherwise it returns a single value.
RCONFIG? ROUTE returns detailed information about the installed switch matrix.
RCONFIG? ATTN returns the attn type, max attenuation, stepsize, switching speed (msec), cycle rate (msec), and a descriptive string.
RCONFIG? LIST TYPE returns a list of the supported attn types

Returns: Various

Example(s):

```
> RCONFIG? RFSW 1
SP6T, 0, 7, 20, 150, "DC-18GHz"

>RCONFIG? ATTN 1
4205A-95.5, 95.5, 0.5, 0, 0, "95.5dB/0.5dB, 0.2-6GHz"

>RCONFIG? CHAN
5, 2 // unit supports 5 attenuators and 2 switches
```

6.3. Counter Commands

Each installed device (with the exception of solid-state attenuators) has a non-volatile counter associated with it that counts the number of operations performed on it. Whenever the device changes settings the counter is incremented and stored. The counter value can be queried, and can also be reset by the user (see SET COUNTER command). Resetting the counter would typically be done as a maintenance step if a device is replaced.

Updating a device counter may take several milliseconds, so by default this function is disabled for fast-switching devices like solid-state attenuators where a counter is of minimal value.

COUNTER?**Function:** read an device operations counter**Syntax:** COUNTER? RFSW select**Argument(s):** select device select 1-n**Remarks:** This command returns the current setting of the specified device counter**Return Value:** number of switching operations**Example(s):**

```
COUNTER? RFSW 1 // read switch 1 counter value
518 // returns switch 1 counter (518 switching operations)
```

SHOW COUNTER**Function:** Queries the current number of cycles recorded for the [select]ed RF Switch.**Syntax:** SHOW COUNTER [ALL]
SHOW COUNTER ATTN**Argument(s):** none**Remarks:** This command displays the current settings of the RF hardware counters, either displaying ALL counters (the default) or by individual type**Returns:** List of Counters**Example(s):**

```
>SHOW COUNTER
1: 8
2: 14
```

SET COUNTER**Function:** sets an RF switch operations counter**Syntax:** SET COUNTER RFSW *select val***Argument(s):** *select* switch select 1-*n*
val counter value**Remarks:** This command can be used to set an RFSW counter value. This is primarily for use when replacing a switch to reset the counter value to 0.**Return Value:** none**Example(s):**

```
SET COUNTER RFSW 1 0 // resets switch 1 counter to 0
```

6.4. 488.2 Common Commands***CLS****Function:** clears the error status**Syntax:** *CLS**Argument(s):** none**Remarks:** This function is used to clear the Error Queue**Return Value:** none**Example(s):**

```
*CLS
```

IDN?*Function:** Reads the system identification information**Syntax:** *IDN?**Argument(s):** none**Remarks:** This function is used to read the system identification info, which is a string consisting of the following data: manufacturer, model, serial number, and firmware version.**Return Value:** *idstr* string *id* info**Example(s):**

```
*IDN?
Weinschel, 8300, 002, V1.00
```

***OPC**

Function: generate operation complete message
Syntax: *OPC
Argument(s): none
Remarks: The Operation Complete command generates an operation complete message in the Standard Event Status Register when all pending operations have been finished.
Return Value: none
Example(s): *CLS; *OPC

***OPC?**

Function: Operation complete query
Syntax: *OPC?
Argument(s): none
Remarks: This function loads a '1' into the output queue when the Program Message Unit is executed. Its primary use is to provide an indication of command completion by including the command as the last one in a series of commands. It can be useful to synchronize operation and to prevent input buffer overflow.
Return Value: 1 integer constant command completed
Example(s):
 CMD1 1; CMD2 2; *OPC?
 1 // sends a '1' response when the three commands have been parsed
 and executed

***ESR?**

Function: Event Status Register query
Syntax: *ESR?
Argument(s): none
Remarks: This function reads the 488.2 Event Status Register. Reading the register also clears it.
Return Value: *int8* integer status register
Example(s):
 *ESR?
 32 // indicates a Command Error

***RST**

Function: Performs a device application level reset.
Syntax: *RST
Argument(s): none
Remarks: This function is used to reset the device application settings. For a full device reset, see the REBOOT command.
Return Value: none
Example(s): *RST

***TST?**

Function: Self-test query
Syntax: *TST?
Argument(s): none
Remarks: This function performs an internal self-test. Upon completion, the results of the test are loaded into the output queue.
Return Value: *testresults* integer '0' indicates test passed. Non-zero indicates test failed.
Example(s):
 *TST?
 0 // returns a '0' when the test completes successfully.

***SRE**

Function: Sets the Service Request Enable Register
Syntax: *SRE *mask*
Argument(s): *mask* byte, 0-255
Remarks: This command sets the Service Request Enable Register. The mask parameter represents the bit values of the register, where a bit value of one indicates an enabled condition and a bit value of zero indicates a disabled condition.
Return Value: none
Example(s):
 *SRE 255 // enable all bits

***SRE?**

Function: Read the Service Request Enable Register
Syntax: *SRE?
Argument(s): none
Remarks: This query returns the contents of the Service Request Enable Register.
Return Value: byte, 0-255
Example(s):
 *SRE?
 255 // SRE register

***ESE**

Function: Sets the Event Status Enable Register
Syntax: *ESE *mask*
Argument(s): *mask* byte, 0-255
Remarks: This command sets the Event Status Enable Register. The mask parameter represents the bit values of the register, where a bit value of one indicates an enabled condition and a bit value of zero indicates a disabled condition.
Return Value: none
Example(s):
 *ESE 255 // enable all bits

***ESE?**

Function: Read the Event Status Enable Register
Syntax: *ESE?
Argument(s): none
Remarks: This query returns the contents of the Event Status Enable Register.
Return Value: byte, 0-255
Example(s):
 *ESE?
 255 // ESE register

ERR?

Function: Read the Error Queue
Syntax: ERR?
 SYST:ERR?
Argument(s): none
Remarks: This function returns the last entry in the error status queue, and a string description of the error code. Repeating the command will return the next entry, until the error queue is empty and returns a zero. The error queue may be cleared via the *CLS command. Note that when using the command-line interface the Error Queue contents are automatically displayed after each command prior to issuing the CLI prompt.
Return Value: error number, "error description"
Example(s):
 ERR?
 101, "invalid command"

ERR?
0, "no error"

LLO

Function: Local lockout
Syntax: LLO *enable*
Argument(s): *enable* byte, 0-1 (or OFF/ON)
Remarks: This command controls the local lockout function which can be used to disable front panel control. Setting local lockout ON disables local operation, while setting it OFF enables local use. By default, this parameter is OFF.
Return Value: none
Example(s):

```
LLO 1 // turns on local lockout, disabling front panel
LLO OFF // turns off lockout, enabling front panel operation
```

LLO?

Function: Local Lockout query
Syntax: LLO?
Argument(s): none
Remarks: This function returns the current setting of the Local Lockout function.
Return Value: integer '0' indicates lockout off. Non-zero indicates lockout is active.
Example(s):

```
LLO OFF;
LLO?
0 // returns a '0' indicating lockout is off
```

6.5. Setup and Configuration Commands

NOTE: The SET commands are used to update settings which are stored in non-volatile memory (NVM), and do not typically take effect until the next system restart event (see REBOOT) unless otherwise noted. The settings listed here are dependent on the installed hardware, so not all settings are available on some implementations, such as the LCD and CANbus interfaces.

SET EOS

Function: sets the Program Message Terminator and/or Response Message Terminator end of string characters
Syntax: SET EOS *interface inout val*
Argument(s): *interface* protocol selection SERIAL, USB, GPIB, TCP, UDP, or ALL
inout PMT (input) or RMT (output)
val word, eos characters
Remarks: This function sets the input Program Message Terminator (PMT) or the output Response Message Terminator (RMT) sequences. Each communications port/protocol can have separate definitions. The *val* parameter specifies the character sequence used, and can specify up to two characters, typically as a hex word high byte-low byte pair. Common definitions for the terminators include the ASCII CR (0x0D) and LF (0x0A) characters. A single character may be specified either by using 0 for the high byte, such as 0x000D, or by only specifying a single character (ie 0x0D). On input, the message will terminate when either of the two character codes are received, while for output the characters are sent low byte then high byte, unless it is specified as 0. Note that the serial CONSOLE and network TELNET servers are excluded from this selection and always use a fixed CRLF (0x0A0D) sequence. The current settings may be viewed using the SHOW EOS command.
Return Value: none
Example(s):

```
SET EOS SERIAL PMT 0x0A0D // set serial input to terminate on either CR or LF
SET EOS SERIAL RMT 0x0A0D // set serial output sequence as CR-LF
SET EOS USB PMT 0x0A0D // set usb input to terminate on either CR or LF
```

```

        SET EOS USB RMT 0x0A0D // set usb output sequence as CR-LF
        SET EOS TCP PMT 0x0A0D // set tcp socket input to terminate on either CR or
LF
        SET EOS TCP RMT 0x0D // set tcp output sequence as a single CR character
        SET EOS UDP PMT 0x0A // set udp socket input to terminate on Lf character
only
        SET EOS UDP RMT 0x0D // set udp output sequence as a single LF character

```

6.5.1 Serial Port

SET SERIAL BAUDRATE

Function: RS232 serial port baud rate setting

Syntax: SET SERIAL BAUDRATE *rate*

Argument(s): *rate* int32

Remarks: This function sets the baud rate for the RS232 serial port. The *rate* parameter may be any value from 9600 to 230400, with the standard rates being 9600, 19200, 38400, 57600, 115200, and 230400. This command will take effect immediately, and does not require a reboot. Note that this setting may be overridden by hardware DIP switches located on the controller assy.

Return Value: none

Example(s):

```
SET SERIAL BAUDRATE 115200
```

SET SERIAL FLOW

Function: RS232 flow control

Syntax: SET SERIAL FLOW *enable*

Argument(s): *enable* byte, 0-1 (or OFF/ON)

Remarks: This function can be used to selectively enable or disable the serial port hardware RTS/CTS flow control signals. A value of 0 (or OFF) disables flow control, while any other value (or ON) enables RTS/CTS handshaking. Flow control can be used to prevent loss of input data while the system is busy executing commands.

Return Value: none

Example(s):

```
SET SERIAL FLOW 1 // enable RTS/CTS flow control
```

6.5.2 Network

SET IPADDR

Function: Sets the network IP address/mode

Syntax: SET IPADDR [*ipaddr* | DHCP | AUTOIP]

Argument(s): *ipaddr* static IP address, in the form DDD.DDD.DDD.DDD
 DHCP selects DHCP address mode (default)
 AUTOIP selects AUTOIP mode

Remarks: This function sets the default IP address mode, allowing the choice between static or dynamic modes. There is some interaction between the various settings, but typically selecting one mode disables the others as follows:

Static IP

Setting a static fixed IP address automatically disables DHCP and AutoIP operation.

DHCP

Setting DHCP mode will enable both the DHCP and AutoIP modes. The existing static IP address (if any) will be erased. DHCP takes preference over any other selected mode. If the system is unable to obtain an address from a DHCP server on the network, it will switch over to AutoIP mode, where it will attempt to assign a link-local address.

AutoIP

Setting AUTOIP mode will enable the AutoIP function and disable DHCP operation for networks where a DHCP server is not available. The existing static IP address (if any) will be erased.

You can also use the SET DHCP and SET AUTOIP commands to combine modes and override the default addressing mode operation selected by this command. If doing so, you should use the SET IPADDR command prior to using SET DHCP or SET AUTOIP, as it has precedence. For example, you can use the SET IPADDR *ipaddr* to set a fixed IP, followed by SET DHCP ON to enable DHCP. The system would attempt to use DHCP, and if unable to obtain an address would use the static IP address *ipaddr*. Likewise, you can use SET IPADDR DHCP followed by SET AUTOIP OFF, in which case the system would only use DHCP and would never switch over to AutoIP mode. You can use the SHOW IPADDR command to view the current address in use, as well as the status of the DHCP and AUTOIP clients.

Return Value: none

Example(s):

```
SET IPADDR 10.0.0.2           // sets static IP, disables DHCP and AUTOIP
SET IPADDR DHCP              // enables DHCP (and AutoIP)
SET IPADDR AUTOIP            // enables AutoIP (disables DHCP)
```

SET GPIB ADDR [address]

Function: Sets the GPIB bus [address].

Syntax: Set GPIB addr [*address*]

Argument(s): *Address* Sets the bus address to the value chosen, 0 – 30 range.

Remarks: This function sets the GPIB bus address for both talker and listener functions. The [address] parameter may be any value from 0 to 30. This command will take effect immediately, and does not require a reboot. The default setting for the GPIB address is 10.

Return Value: none

Example(s): SET GPIB ADDR 16 // Sets the GPIB bus address to 16.

SET DHCP

Function: DHCP client control

Syntax: SET DHCP *enable*

Argument(s): *enable* byte, 0-1 (or OFF/ON)

Remarks: This function can be used to selectively enable or disable the DHCP client. A value of 0 (or OFF) disables DHCP, while any other value (or ON) enables DHCP.

Return Value: none

Example(s):

```
SET DHCP 1                   // enable DHCP
SET DHCP ON                  // enable DHCP
SET DHCP OFF                 // disables DHCP
```

SET AUTOIP

Function: AutoIP client control

Syntax: SET AUTOIP *enable*

Argument(s): *enable* byte, 0-1 (or OFF/ON)

Remarks: This function can be used to selectively enable or disable the AutoIP client. A value of 0 (or OFF) disables AutoIP, while any other value (or ON) enables AutoIP.

Return Value: none

Example(s):

```
SET AUTOIP 1                 // enable AutoIP
SET AUTOIP ON                // enable AutoIP
SET AUTOIP 0                 // disables AutoIP
```

SET NETMASK

Function: Sets the network IP address subnet mask
Syntax: SET NETMASK *ipmask*
Argument(s): *ipmask* subnet mask, in the form DDD.DDD.DDD.DDD
Remarks: This function sets the default IP subnet mask used when static IP addressing is selected. The default value is 255.255.255.0
Return Value: none
Example(s):
 SET NETMASK 255.255.255.0

SET GATEWAY

Function: Sets the network Gateway IP address
Syntax: SET GATEWAY *ipaddr*
Argument(s): *ipaddr* IP address, in the form DDD.DDD.DDD.DDD
Remarks: This function sets the default gateway/router IP address. Network packets that have a destination not reachable by the current IP configuration are sent to this address. The default value is 0.0.0.0, which disables the gateway function.
Return Value: none
Example(s):
 SET GATEWAY 10.0.0.100

SET TCP CONNECT

Function: Sets the number of TCP server connections
Syntax: SET TCP CONNECT *numconnect*
Argument(s): *numconnect* max number of connections, 1-4
Remarks: This function sets the maximum number of allowed simultaneous connections (users) that are supported by the TCP server. The default is 1, allowing a single user.
Return Value: none
Example(s):
 SET TCP CONNECT 4 // sets the server to allow up to 4 users

SET TCP SERVER

Function: Sets the TCP server port number
Syntax: SET TCP SERVER *portno*
Argument(s): *portno* initial server port, 1024-65530
Remarks: This function sets the port number used to communicate with the internal TCP server(s). If multiple servers are installed then each server opens successive ports from this initial setting. For example, if 3 servers are installed, and *portno* = 10001, then server #1 opens port 10001, server #2 opens port 10002, and server #3 opens port 10003 (The system is set to use a single server by default. Consult the factory if multiple servers are required). The default port is 10001.
Return Value: none
Example(s):
 SET TCP SERVER 1024 // sets the server to listen for connections on port 1024

SET TCP KEEPALIVE

Function: Sets the TCP keepalive rate
Syntax: SET TCP KEEPALIVE *tout*
Argument(s): *tout* keepalive timer value, in seconds (0, 10-7200)
Remarks: This function sets the value of the TCP keepalive timeout parameter. The TCP server uses this setting in order to keep a socket open by periodically sending keepalive packets during periods of inactivity. The value can be set for 10 to 7200 seconds (2 hours), or 0 to disable the keepalive function. The default is 30 seconds.
Return Value: none
Example(s):
 SET TCP KEEPALIVE 60 // sets the keepalive timer to 60 seconds

SET TCP TIMEOUT

Function: Sets the TCP server inactivity timeout

Syntax: SET TCP TIMEOUT *tout*

Argument(s): *tout* inactivity timer value, in seconds (0 - 60)

Remarks: This function sets the value of the TCP server inactivity timeout parameter. The TCP server uses this setting in order to automatically close a connection if the client is inactive for a period of time. The value can be set for 0 to 60 seconds, with 0 (or OFF) disabling the inactivity timeout function. The default is 0 (inactivity timeout disabled).

Return Value: none

Example(s): SET TCP TIMEOUT 10 //close connection if host is inactive for 10 seconds

SET TCP ECHO

Function: Sets the TCP server character echoing

Syntax: SET TCP ECHO *onoff*

Argument(s): *onoff* byte, 0-1 (or OFF/ON)

Remarks: This function controls the setting of character echoing for the TCP server(s). With echo on, the server echos each received character back to the sender on a character by character basis, while with the setting off no such echoing occurs. This is useful for testing connectivity, but can result in a large number of packets transactions and degrade performance. By default, TCP echo is OFF.

Return Value: none

Example(s):
SET TCP ECHO OFF // disables character echoing
SET TCP ECHO 1 // enables character echoing

SET UDP SERVER

Function: Sets the UDP server port number

Syntax: SET UDP SERVER *portno*

Argument(s): *portno* server port, 1024-65530

Remarks: This function sets the port number used to communicate with the internal UDP server. The default port is 20000.

Return Value: none

Example(s): SET UDP SERVER 1024 // sets the server to listen for messages on port 1024

SET TELNET

Function: Set TELNET server controls

Syntax: SET TELNET ECHO *onoff* // local server echo
SET TELNET OPTNEG *onoff* // TELNET options negotiation
SET TELNET KEEPALIVE *onoff* // TELNET NOP keepalive
SET TELNET LOGIN *onoff* // require login
SET TELNET TIMEOUT *secs* // session inactivity timeout

Argument(s): *onoff* byte, 0-1 (or OFF/ON)

Remarks: This function controls various settings of the TELNET server operation. The current settings can be viewed using the SHOW NET TELNET command. Note that there are two TELNET server implementations available, a full and a reduced-functionality version, and not all parameters are supported by the reduced version. The default settings are: echo on, optneg on, NOP keepalive on, logon off, and an inactivity timeout of 300 seconds.

Return Value: none

Example(s): none

SET NETSTAT

Function: network status message events control
Syntax: SET NETSTAT *enable*
Argument(s): *enable* byte, 0-1 (or OFF/ON)
Remarks: This function can be used to control the display of network status messages on the serial console, including link up/down and port connect/disconnect messages. A value of 0 (or OFF) disables messages, while any other value (or ON) enables them. The default setting is on.
Return Value: none
Example(s): SET NETSTAT 1 // enables logging of network events to the console

Example NETSTAT messages:

```
**netstat: link up
**netstat: link down
**netstat: port 23: socket 2 connected to 10.0.0.101
**netstat: port 23: disconnected
```

IPCONFIG?

Function: return network settings
Syntax: IPCONFIG?
Argument(s): none
Remarks: This query command returns the current network settings, including the IP address, subnet mask, gateway address, DHCP enable, AutoIP enable, TCP server port, and the UDP server port.
Return Value: IP addr, netmask, gateway, DHCP enable, AutoIP enable, TCP port, UDP port
Example(s):
 IPCONFIG?
 10.100.103.80, 255.255.255.0, 0.0.0.0, 0, 0, 10001, 20000

6.6. Macro Commands

The MACRO feature allows the user to create a series of commands that will be executed at unit power on initialization. Currently, there are provisions for a single 'poweron' macro that can store up to 128 commands in non-volatile memory. Macro strings can contain any valid command (including concatenated command strings), up to the 128 character per command length restriction.

MACRO OPEN

Function: opens macro storage for writing
Syntax: MACRO OPEN
Argument(s): none
Return Value: none

MACRO CLOSE

Function: finalizes macro
Syntax: MACRO CLOSE
Argument(s): none
Return Value: none

MACRO ADD

Function: adds (appends) command strings to the existing macro
Syntax: MACRO ADD "*commandstr*"
Argument(s): *commandstr* command text, in quotes
Return Value: none

MACRO DELETE

Function: deletes existing macro contents
Syntax: MACRO DELETE
Argument(s): none
Return Value: none

SHOW MACRO**Function:** display macro contents**Syntax:** SHOW MACRO**Macro Example:**

```
// Here we create a poweron macro to change the default setting of four rf switches, RFSW
1-RFSW 4
```

```
// after setting the defaults, adding a *RST will reinitialize the RF hardware to the new
default values
```

```
MACRO OPEN                // open macro for editing
MACRO ADD "set default rfsw 1 1" // change rfsw default settings
MACRO ADD "set default rfsw 2 2"
MACRO ADD "set default rfsw 3 1"
MACRO ADD "set default rfsw 4 2"
MACRO ADD "*RST"          // adding a *RST to the macro will init the RF
MACRO CLOSE              // close macro (and save it)

SHOW MACRO
name: poweron
num lines: 5
"set default rfsw 1 1"
"set default rfsw 2 2"
"set default rfsw 3 1"
"set default rfsw 4 2"
"*RST"
```

6.7. Show Commands

The SHOW commands provide a method to view a variety of system settings and information. They are primarily meant for CLI usage such as the console mode or telnet, as the contents are system dependent and may change depending on the current mode, settings, and installed implementation features.

SHOW BUILD**Function:** Queries the current firmware and revision.**Syntax:** Show Build**Argument(s):** none**Remarks:** Outputs the current firmware and revision**Return Value:** none

Example(s): Show Build //Query the current firmware.
Firmware: 19311459312

SHOW EOS**Function:** Shows a summary of the EOS PMT and RMT message terminator settings**Example(s):**

```
>show eos
serial pmt: 0x0A0D
serial rmt: 0x0A0D
usb pmt: 0x0A0D
usb rmt: 0x0A0D
tcp pmt: 0x0A0D
tcp rmt: 0x000D
udp pmt: 0x0A0D
udp rmt: 0x000D
```

SHOW SET**Function:** Shows a summary of various configuration SET command settings

Syntax: Show Set
Argument(s): none
Remarks: Outputs a list of all the current settings for various set commands.
Returns: Various
Example(s):

```
>show set
serial baudrate: 115200

IP address = 10.0.0.2
subnet mask = 255.255.255.0
gateway = 0.0.0.0
addr_conf = 0x03 (DHCP)
tcp keepalive timeout = 30
server port = 10001
telnet_conf = 0x0F
telnet timeout = 300
hostname = core18
```

SHOW USB

Function: Shows USB settings
Example(s):

```
>show usb

protocol: CDC
VID: 0x25EA
PID: 0x206C
ver: 0.10
status: 0xC1
```

Show GPIB

Function: Shows GPIB settings
Syntax: Show GPIB
Argument(s): none
Remarks: Outputs GPIB settings
Return Value: none
Example(s):

```
>show GPIB
conf: installed
addr: 10
pmt: 0x000A
rmt: 0x000A
```

SHOW NET

Function: Shows general network settings
Example(s):

```
>show net
link status: up
phy speed: 100
phy duplex: full

MAC address: 00:04:A3:12:2D:45
IP address : 10.0.0.2
subnet mask: 255.255.255.0
gateway    : 0.0.0.0
DHCP: enabled
```

SHOW IPADDR**Function:** Shows IP address mode and status**Example(s):**

```
// Example #1: SET IPADDR DHCP    status: no DHCP server found, using AUTOIP
>show ipaddr
```

```
IP address : 169.254.127.57
subnet mask: 255.255.0.0
default IP : 0.0.0.0
```

```
DHCP client: enabled
server IP: none detected
addr stat: not bound
```

```
AutoIP client: enabled
addr stat: bound
```

```
// Example #2: SET IPADDR 10.0.0.2, SET DHCP ON    status: no DHCP server found, using
static IP
>show ipaddr
```

```
IP address : 10.0.0.2
subnet mask: 255.255.255.0
default IP : 10.0.0.2
```

```
DHCP client: enabled
server IP: none detected
addr stat: not bound
```

```
AutoIP client: disabled
```

```
// Example #3: SET IPADDR 10.0.0.2, SET DHCP ON    status:, DHCP server detected, using
DHCP
```

```
>show ipaddr
IP address : 192.168.0.2
subnet mask: 255.255.255.0
default IP : 10.0.0.2
DHCP client: enabled
server IP: 192.168.0.1
addr stat: bound
AutoIP client: disabled
```

SHOW NET TCP**Function:** Shows TCP server settings/status**Example(s):**

```
>show net tcp
```

```
tcp keepalive: 30
tcp echo: on
tcp server timeout: 0
tcp server port: 10001
```

```
number of servers: 1
connections per server: 1
port 10001: no connection
```

```
port 10001: socket 1 connected to 10.100.103.113
```

SHOW NET UDP

Function: Shows UDP server settings/status

Example(s):

```
>show net udp
udp server port: 20000
```

SHOW NET TELNET

Function: Shows TELNET server settings/status

Example(s):

```
>show net telnet

timeout: 300
flags
echo: 1
keepalive: 1
neg options: 1
login: 0

max connections: 1
port 23: no connection
```

6.8. Misc. Commands

CONSOLE

Function: Console mode enable

Syntax: CONSOLE *mode*

Argument(s): *mode* byte 0, 1, 2, 3 or OFF, ON, ENABLE, DISABLE

Remarks: This function enables/disables the serial port console mode command-line interface and optionally updates the nvm setting. Setting *mode=0* turns console off, *mode=1* turns console on, *mode=2* enables the console, and *mode=3* disables the console. Modes 0 and 1 (OFF and ON) update the nvm setting, while modes 2 and 3 (ENABLE and DISABLE) do not. Note: This setting may be overridden by a hardware DIP switch located on the controller assembly.

Return Value: none

Example(s):

```
CONSOLE ON // turns on the console and updates nvm setting
CONSOLE ENABLE // turns on console for this session only
CONSOLE 0 // turns off the console and updates nvm setting
CONSOLE DISABLE // turns off console for this session only
```

CONSOLE?

Function: Console mode query

Syntax: CONSOLE?

Argument(s): none

Remarks: This function returns the serial console mode nvm and DIP switch settings

Return Value: *nvm, dipsw* integer, integer

Example(s):

```
CONSOLE?
1, 0 // console nvm flag = 1, DIP switch = 0
```

USB CONSOLE

Function: USB Console mode enable

Syntax: USB CONSOLE *mode*

Argument(s): *mode* byte 0, 1, 2, 3 or OFF, ON, ENABLE, DISABLE

Remarks: This function enables/disables the USB CDC console mode command-line interface and optionally updates the nvm setting. Setting *mode=0* turns console off, *mode=1* turns console on, *mode=2*

enables the console, and *mode=3* disables the console. Modes 0 and 1 (OFF and ON) update the nvm setting, while modes 2 and 3 (ENABLE and DISABLE) do not.

Return Value: none

Example(s):

```
USB CONSOLE ON           // turns on the USB console and updates nvm setting
USB CONSOLE ENABLE      // turns on USB console for this session only
USB CONSOLE 0           // turns off the USB console and updates nvm setting
USB CONSOLE DISABLE     // turns off USB console for this session only
```

DELAY

Function: Delays execution (Pause)

Syntax: DELAY *msecs*

Argument(s): *msecs* word, 0-65535 in msecs

Remarks: This command pauses execution for the specified time in msecs.

Return Value: none

Example(s):

```
ATTN 1 0; DELAY 100; ATTN 1 10 // waits 100 msecs between attn commands
```

REBOOT

Function: system reset

Syntax: REBOOT

Argument(s): none

Remarks: This command performs a system reboot, similar to a poweron reset.

Return Value: none

Example(s):

```
REBOOT
```

RUN

Function: run an auxiliary program function

Syntax: RUN *cmd*

Argument(s): *cmd* command function

```
LOADER
```

Remarks: This command runs an external function, such as the Flash Bootloader for downloading program updates

Return Value: none

Example(s):

```
RUN LOADER // invokes the flash bootloader for update
```

LCD

Function: Adjust LCD display (if installed)

Syntax: LCD CONTRAST *n*

```
LCD BKLIGHT n
```

Argument(s): *n* byte, 0-255

Remarks: This function can be used to adjust the viewing parameters of the LCD display. Default values are CONTRAST 128 and BKLIGHT 255.

Return Value: none

Example(s):

```
LCD CONTRAST 128
```

```
LCD BKLIGHT 0 // turns off backlight
```

TEMP?

Function: reads internal temperature sensor

Syntax: TEMP? [*sensor*]

Argument(s): *sensor* byte optional sensor number, 0-2. default=0 (internal)

Remarks: This function returns the current temperature, in degrees C. Resolution is 0.5 degrees

Return Value: degC

Example(s):

TEMP?
30.0

TIME?

Function: reads execution time
Syntax: TIME?
Argument(s): none
Remarks: This function returns the current execution time from the start of the command message, in msecs.
Return Value: msecs integer32
Example(s):
 CMDSTATS 0; TIME?; DELAY 10; TIME
 1;11

TIMESTAMP**TIMESTAMP?**

Function: sets/reads timestamp timer
Syntax: TIMESTAMP [*clear*]
 TIMESTAMP?
Argument(s): *clear* byte flag
Remarks: These functions can be used to time long periods, such as the elapsed time between a series of commands. TIMESTAMP records the current system 1ms tick counter, and TIMESTAMP? returns the time since the last TIMESTAMP command. Sending TIMESTAMP with a parameter of 0 erases the current timestamp, causing the TIMESTAMP? query to return the value of the system tick counter directly.
Return Value: ticks integer32
Example(s):
 TIMESTAMP; DELAY 10; TIMESTAMP?; TIMESTAMP 0;TIMESTAMP?
 10; 5065915

REPEAT

Function: Enables command repetition/looping
Syntax: REPEAT *count*
Argument(s): *count* word, 1-65535
Remarks: This function causes the remainder of the current command message to be repeated count number of times. Any commands included prior to REPEAT are executed a single time.
Return Value: none
Example(s):
 ATTN 1 0; REPEAT 50; INCR 1; DELAY 100 // repeats INCR and DELAY 50 times

SYSTEST

Function: performs a low-level system test
Syntax: SYSTEST *select*
Argument(s): *select* test select, varies by platform
 WDT // test the watchdog timer function
 STACK // test the stack over/underflow reset function
 ALL // test aux hardware board
 FP // front-panel (if installed)
Remarks: This command performs a low-level test on the selected hardware. NOTE: These tests should be used with great caution, and should typically NOT be performed with any attached RF devices/hardware, as they may exercise them in an invalid fashion. They are typically used in serial console mode only. Consult the factory prior to performing any of these tests.
Return Value: various status messages
Example(s): >sytest //runs system test and outputs results

FACTORY PRESET**FACTORY PRESET VERIFY**

Function: Sets all NVM parameters to their factory default setting.

Syntax: FACTORY PRESET
FACTORY PRESET VERIFY

Argument(s): none

Remarks: The FACTORY PRESET command restores all NVM parameters to the factory default. The default settings will take effect on the next restart. FACTORY PRESET VERIFY may be used to verify the integrity of the preset memory. A return value of 0 indicates the integrity check passed, while any other result indicates a failure.

Example(s): none

HELP

Function: Displays a list of supported commands

Syntax: HELP [*level*]
? [*level*] (console mode enabled)

Argument(s): *level* help level, ALL or 1-3

Remarks: This command will display a list of all the commands with a short description of their function. The list is divided into multiple levels, with each level including more commands. HELP ALL will display a list of all supported commands.

Return Value: none

Example(s):
HELP // displays main application level commands
HELP ALL // displays all commands

6.9. MISC Network Commands**PING**

Function: Sends ICMP ECHO packets

Syntax: PING *ipaddr*

Argument(s): *ipaddr* destination IP address, in the form DDD.DDD.DDD.DDD

Remarks: This function performs a ping of the specified network address. It is primarily for console usage

Example(s):
>ping 10.100.103.113
pinging 10.100.103.113
reply time: 1 ms
reply time: 1 ms
reply time: 1 ms
reply time: 1 ms

TCP SERVER

Function: TCP server control

Syntax: TCP SERVER *cmd*
INIT // reinitializes all server ports
CLOSE // closes all server ports
OPEN // reopens server ports

Remarks: This function allows control of the TCP server. It is primarily for testing/troubleshooting purposes

Returns: Various

Example(s): none

7. Instrument Security Procedures for Secure Environments

This section describes the types of memory and their usage in units based on the 193R-11459 controller board, including the 8320, 8321, and 8331 series. It provides the specific steps required to declassify an instrument through memory clearing or sanitization procedures. The procedures are designed to meet the requirements specified by the US Defense Security Services (DSS) and follow the recommended guidelines set forth in DoD 5220.22-M and NIST SP 800-88 publications.

7.1. Types of Memory

The unit contains various memory components. The following table describes the type, size, usage, and location.

Memory Type	Size	Content	Volatility	User Data	Sanitization Procedure
SRAM 18F87K22 (193R-11459 Processor Assy)	4KB	Temp information storage for instrument firmware	Volatile	Yes	Turn off instrument power
Flash 18F87K22 (193R-11459 Processor Assy)	128KB	Bootloader Instrument Firmware	Non-volatile	No	None required (no user data)
EEPROM 18F87K22 (193R-11459 Processor Assy)	1KB	User data, instrument settings	Non-volatile	Yes	See Sanitizing Internal Memory
EEPROM 25LC512 (193R-11459 Processor Assy)	64KB	User data, default settings, cycle counters	Non-volatile	Yes	See Sanitizing Internal Memory

7.2. Clearing and Sanitization

Clearing is the process of eradicating the data so that it can no longer be retrieved using the standard instrument interfaces. Clearing is typically used when the instrument is to remain in an environment with an acceptable level of protection.

Sanitization is the process of eradicating stored data so that the data cannot be recovered using a reasonable level of effort using any known technology. Sanitization is appropriate when an instrument is to be removed from a secure environment.

7.3. Clearing Internal Memory

Clearing can be performed using the RS232 serial interface. Connect to the unit as in normal operation and send the command FACTORY PRESET. This will set all user-data to factory defaults. Turn off power to clear the volatile memory.

7.4. Sanitizing Internal Memory

Internal memory sanitization follows the guidelines set in NIST SP 800-88 for flash and EEPROM memories. This includes:

1. Performing a sector erase (if applicable). As some devices do not support this feature, for these devices the entire chip is written with all 1's (0xFF) which is the normal erased state for most flash/EEPROM memory.
2. Write a pattern to all locations. Verify the pattern.
3. Write the inverse pattern to all locations. Verify the inverse pattern.

4. Write all 0's (0x00) to all locations. Verify the locations contain 0.
5. Write all 1's (0xFF) to all locations. Verify the contents contain 0xFF.

Sanitization can be performed using the RS232 serial interface. Connect to the unit as in normal operation and send the command FACTORY SANITIZE. You will see the "sanitizing" message along with a progress indicator as the internal firmware performs the sanitization procedure. If the sanitization is successful you will then see a message stating "*TURN OFF POWER*" to complete the clearing of volatile memory. The instrument may now be removed from the secure environment.

```
>FACTORY SANITIZE
sanitizing.....
*TURN OFF POWER*
```

After performing the sanitization you can also verify that the procedure was successful. Prior to turning off power send the command FACTORY SANITIZE VERIFY. You should see the following, indicating that the memory is sanitized:

```
>FACTORY SANITIZE VERIFY
verifying...clear
```

Any other responses to the above commands indicates that the sanitization was unsuccessful.

During the first reboot after performing a sanitization you will see a variety of Error 3xx "failure" messages as the unit detects the erased memory areas and performs a factory preset action. This is normal. Reboot the unit and the factory presets should be in effect.

8. Firmware and Drivers

8.1. Updating Device Firmware via Serial Port

The internal bootloader allows for downloading and programming of the unit via an RS-232 serial port. It features a simple command-line interface, and supports downloading of standard Intel HEX format files that contain application Program Code memory (flash), Configuration memory settings, and Data memory (EEPROM) initialization sections.

The bootloader supports transfers using the XMODEM-CRC protocol, so it can be used with any standard terminal emulator software such as Windows Hyperterminal. By default, transfers are done with a serial rate/format of 115200N81.

Requirements:

- A terminal emulator that supports XMODEM-CRC transfer (ex. Windows HyperTerminal, Tera Term)
- Valid HEX programming file (19311459xxx.HEX), where 'xxx' represents the specific file/revision.

Note: any CRC and version numbers displayed will change depending on the actual data file used.

To get into bootloader mode, use the command RUN LOADER from the main application command prompt.

```
API Weinschel Model xxxxx Vx.xx
firmware: 19311459xxx
>run loader
```

When the bootloader executes in 'loader' mode, you should see a sign-on message similar to:

```
>run loader
Weinschel core18K loader V0.01
firmware: 19311459301x
osc stat: 00000011
:
```

The loader uses the ':' colon character as it's prompt. Because of program space constraints of the bootloader, there are minimal messages and responses to most commands. A '#' character indicates an error was detected. Other status messages are typically issued in the form:

```
stat: 11000000
```

The commands to the bootloader are short two or three ASCII character sequences, and can be either upper or lowercase. A simple line-editor allows the use of the BACKSPACE key, and commands are executed when a carriage return (CR) is detected. Commands include:

Command	Definition
AC	Allow Configuration word update
AD	Allow Data Memory update
BL	Blank check
DL	Download and program HEX file
DLW	Download and program with 10 second wait
ED	Erase Data Memory
EP	Erase Program Memory
RS	Reset (reboot)
RN	Run application in Program Memory
XS	Checksum Program Memory (display only)
XSU	Checksum Program Memory and update ID locations

Since there is limited memory available to the microcontroller, there is only space for a single application. This requires the program memory to be erased prior to downloading a new file, and the programming must be performed as the HEX file is being transferred. Because of this, any failure in the download/programming process will leave the PIC without an application, and the process will have to be repeated. To simplify the operation, the DL download command performs all the steps typically required to reprogram an application. It performs a blank check, erases the ID checksum location (to signify that the program memory is invalid), erases the program code memory if necessary, downloads (and programs) the code, and, if successful, computes and updates the checksum IDLOC. A typical display of the DL operation looks like the following (note that the actual crc displayed will vary with the file downloaded)

```
:dl
blank check...*not blank*
erasing program...
begin download...CCCCCCC <begin XMODEM-CRC file transfer on PC>
stat: 11000000
crc: B6E3
```

Here you see the resulting status warnings indicating that Configuration and Data memory updates were disabled, and that programming was successful. Any other status result should produce a **'*fail*'** message in place of the crc display.

After issuing the DL command, you will see the **'begin download...'** message and a series of **'C'** characters as the loader attempts to initiate an XMODEM download. At this point, send the HEX file via XMODEM-CRC using your terminal emulator program. Many terminal emulators will automatically detect the XMODEM transfer type, but if it gives a choice, select XMODEM-CRC. For example, using Windows Hyperterm you would use the **'Transfer | Send File...'** menu, enter the HEX file in the **'Filename'** box (19311459xxx.HEX), select **'Xmodem'** as the Protocol, and click 'Send'. Hyperterm will detect that the loader is using CRC error checking (as opposed to checksum). If you need to abort the download operation, send a few CTRL-C characters, and the loader should terminate the download.

You can use the XS command to check the status of the Program memory, which will perform a CRC checksum on the program memory contents as compared to the IDLOC CRC contents, which should match.

```
:xs  
crc: B6E3  
idloc: B6E3
```

To exit the bootloader and run the main application, use the RN command (or cycle power). When the unit reboots, you should see the new version sign on message.

```
:rn  
running app...  
API Weinschel Model xxxxx Vx.xx  
firmware: 19311459xxx
```

8.2. USB Driver Installation

A signed USB driver is included in the software bundle shipped with the unit. Direct the hardware installer to the included driver to complete installation.

9. Maintenance

The following paragraphs provide general inspection and maintenance guidelines for the unit.

9.1. Inspection

Perform a visual inspection in conjunction with the maintenance activities schedule when a malfunction is suspected, or whenever an assembly is removed or replaced.

9.2. Preventative Maintenance

While the unit requires very little preventative maintenance, it should not be subjected to physical abuse, severe mechanical shock, high humidity, or operating temperatures outside the specification range. The instrument should be kept free of excessive dirt and dust, since these can interfere with connector functions and with normal heat dissipation. The following paragraphs provide the preventive maintenance that is to be performed on the Unit.

Care should be taken to prevent strain on the interconnecting cables, since damage here may not always be apparent. Occasionally check the external cables and connectors for signs of cracked insulation and/or bent or worn pins. Tests show that connectors must be clean for accuracy and stability. This requires an inspection and cleaning of each connector immediately before use. When cleaning precautions are observed regularly, connectors can maintain their stability for over several thousand connection cycles. Refer to Appendix for more information about cables and connectors.

9.3. Machined Surfaces and Hardware

To remove light dirt and dust from mechanical parts such as castings, covers and other hardware proceed as follows:



Compressed air used for cleaning and/or drying can create airborne particles that may enter the eye. Goggles/ face-shields should be worn. DO NOT direct air stream towards self or other personnel. Pressure should be restricted to a maximum 15 psi to avoid personal injury.



Under no circumstances use a wire brush, steel wool, or abrasive compound. Using these items will cause extensive damage to the instrument's surface. DO NOT use a nylon bristle brush in solvent as the bristles may dissolve and cause damage to the circuit card or component.

- Use 5 psi of clean, moisture-free compressed air or preferably dry nitrogen to blow loose dirt and dust from surface of item.
- Briskly brush isopropyl alcohol onto area to be cleaned with a fiber-bristle brush.
- Remove residue with lint-free cloth and repeat previous step as a rinse.
- When parts are thoroughly clean, dry parts using 5 psi of clean, moisture-free compressed air or preferably dry nitrogen.
- Clean smaller mechanical parts or hardware by dipping into a container of isopropyl alcohol. Remove dirt by brushing with fiber-bristle brush after parts have been immersed for several hours.
- Remove parts from isopropyl alcohol and rinse by immersing into a different container of isopropyl alcohol.
- When parts are thoroughly cleaned, dry parts using 5 psi of clean, moisture-free compressed air or preferably dry nitrogen.

9.4. Chassis Cleaning

Clean chassis using a lint-free cloth moistened with water and mild detergent. For harder to clean areas, such as inside corners of chassis, use a vacuum cleaner.

9.5. Connector Cleaning

Where small amounts of rust, corrosion, and/or oxide deposits are present on connectors, clean externally with a soft-bristle brush, aluminum wool, or internally with an acid brush; then wash with a non-corrosive solvent. Exercise care to ensure no metal filing or residue remains inside the connector and the connector is thoroughly dry. Where rust, corrosion, and/or oxide deposits are present in large quantities, replace the connector.

9.6. Line Voltage Fuse Replacement

The following steps provide procedures to replace the AC fuse. Please see the parts list for appropriate fuse size.



Sufficient power levels are present at the Power Input Assembly to cause personal injury. Ensure that the power cord is disconnected before attempting to change fuses.

Do NOT connect or apply power to this instrument until the power entry module has been adjusted to the operational line voltage.

1. Turn off the unit and disconnect the power cord from the power entry module.
2. Use a small screwdriver to open the fuse drawer cover.
3. Use a small screwdriver to slide the fuse drawer out of the power entry module.
4. Remove the defective fuse and install replacement fuse.
5. Insert the fuse drawer back into the power entry module.
6. Close the fuse drawer cover and verify that the indicated voltage is correct for your region. If voltage is incorrect, repeat steps 2 – 3 to remove fuse drawer and reorient to proper voltage.
7. Fuse is now replaced and unit is ready for normal operation.

10. Replacement Parts List and Drawings

The assembly/component locations and schematic diagrams for the Model 8512 are located in the Appendix by the drawing number. Drawing find numbers have also been included in the manuals RPL to help locate components or hardware.

10.1. Factory Service and Repairs

DO NOT send products back to the factory without prior authorization.

Please contact the Weinschel Customer Service Department to discuss your product and resolve any issues that may be corrected without returning the product to the factory. If the issue cannot be corrected, you may be issued an RMA number and instructed to return the product. Additionally, you may be requested to submit additional information regarding the product failure to help verify your complaint.

When contacting customer service, please provide the following information:

1. Product Model Number
2. Product Serial Number
3. Date of Original Purchase
4. Company Name
5. Name
6. Phone Number

If a product has been approved to be returned to the factory, follow these instructions to ensure timely service.

1. If possible, use the original packing container and cushioning material. If the original materials are not available, use a strong shipping container and protect the product with shock absorbing material.
2. Shock absorbing material should be 3/4 inch thickness or greater and should protect all sides of the unit, as well as prevent movement.
3. Attach a tag to the product with the following information:
 - Model and serial numbers of all returned products
 - Service being requested
 - Description of malfunction
 - Return address
 - Authorization to conduct repairs
 - Return authorization number (RMA #)
4. Seal the packaging and mark it as FRAGILE.
5. Ship the product to the listed address or to an authorized sales representative. This information will be supplied by Weinschel.

11. Contacting Weinschel

Please use the general information below to contact Weinschel for any inquiries.

Mail Weinschel
5305 Spectrum Drive
Frederick, MD 21703-7362
U.S.A.

Telefax 1-301-846-9116

Phone Toll Free: 1-800-638-2048
Toll call: 1-301-846-9222

Website <http://weinschel.apitech.com/>

E-mail weinschel-sales@apitech.com

11.1. Manufacturer Warranty

PRODUCTS - Weinschel, a part of API Technologies Corp., warrants each product it manufactures to be free from defects in material and workmanship under normal use and service anywhere in the world. Weinschel's only obligation under this Warranty is to repair or replace, at its plant, any product or part thereof that is returned with transportation charges prepaid to Weinschel by the original purchaser within TWO YEARS from the date of shipment.

The foregoing Warranty does not apply Weinschel's sole opinion to products that have been subject to improper or inadequate maintenance, unauthorized modifications, misuse, or operation outside the environmental specifications for the product.

SOFTWARE PRODUCTS - Weinschel software products are supplied without representation or Warranty of any kind. Weinschel, therefore, assume no responsibility and will not accept liability (consequential or otherwise) arising from the use of program materials, disk, or tape.

The Warranty period is controlled by the Warranty document furnished with each product and begins on the date of shipment. All Warranty returns must be authorized by Weinschel prior to their return.

Weinschel's Quality System Certified to:



Certificate No.: 94-289K

12. Appendix

12.1. Revision History

Revision	Date	Description of Changes
A	8/16/19	ERN19-085 Initial Release

The remaining pages of this user manual are reserved for supporting documentation and drawings.

Bill of Materials (193-8500-038)

REV:C

Find No.	Part Number	Description	Count	UOM	Ref. Deg.	Vendor	MFG. Part No.
1	193-8214	ENCLOSURE	1	EA			
2	193-8196	COVER	1	EA			
5	193R-11459-038	ASSY, PCB, CONTROLLER, W/BOOTLOADER	1	EA	A1		
7	001R-740-12	POWER SUPPLY, 12V, 65W, 5.25A	1	EA	A3		
9	193R-11579-000	ASSY, PCB, 128-BIT I2C DIGITAL I/O, 16-PORT	1	EA	A5		
10	193-8359-1	DISPLAY, LCD, SETUP & TESTED	1	EA	A6		
11	193R-11575-000	ASSY, PCB, SCROLL WHEEL BOARD	1	EA	A7		
12	193-8200	COVER PLATE, GPIB PORT	1	EA			
13	193-8216	COVER PLATE, FRONT	5	EA			
14	193-8217	COVER PLATE, REAR	6	EA			
15	001-690-68	SWITCH, RF,SP6T,12V DC-26.5GHz, NOR OPEN W/TTL,9 PIN D	1	EA	SW1	63745	CCR-58S360-TS
18	193R-11749-000	ASSY, PCB, ADAPTER, DSUB9 TO 10-PIN HDR	1	EA	A8		
19	068-21	CORD PWR 3-CONDUCTOR DTCH 7.5FT 10A-125V NEMA5-15P/IEC320-C1	1	EA		16428	17250
20	074-170-5	CABLE TIE, #4-40 TIE DOWN	5	EA		56501	TY-33M
22	074-971-1	HANDLE,2.5 INCH RACK .25 DIA X8-32 THD	2	EA		04729 40337	A3557 8126-832-SS-20
24	074-1052	SPACER, NYLON .250 OD X .147 ID	4	EA		32559	905-280
25	051-40-4	FUSE HOLDER, POWER INPUT, W/ SWITCH	1	EA	XF1	05245 05245	PSOSS6B 5-6609107-8
26	052-1-1/5	FUSE 1.5 AMP, 250V	1	EA	F1	75915	31201.5HXP
30	193-8319-1	ASSY, CABLE, GND (RoHS)	1	EA	W1		
31	193-8342-2	ASSY, CABLE, PSU GND (RoHS)	1	EA	W2		
32	193-8220	ASSY, CABLE, AC POWER	1	EA	W3		
33	193-8219	ASSY, CABLE, DC POWER	1	EA	W6		
34	068R-109-12	CABLE ASSY, 10 COND, RIBBON, 2mm	1	EA	W7	55322	TCSD-05-D-12.00-01-N
36	068R-109-10	CABLE ASSY, 10 COND, RIBBON, 2mm	1	EA	W8	55322	TCSD-05-D-10.00-01-N
37	193-8461	ASSY, CABLE, DISPLAY TO SCROLL WHEEL	1	EA	W4		
38	068R-116-6	CABLE, RIBBON, 6 POS 6", SINGLE ROW, .10 CENTERS, SKT/S	1	EA	W5	55322	IDSS-06-D-06.00
39	068R-121	CABLE, USB-MINI B/ USB-A, 6.5 FT/2m	1	EA		OK2J7 PROSG OK2J7	AK672M/2-2-R USB2-062 AK672M/2-2
40	193-10568-3	ASSY, CABLE, DRIVER (ROHS)	1	EA	W10		
41	062-184-8	CONN SCREW LOCK FEMALE, .13 HIGH	1	EA		04963	3341-1S
44	MS51859-2	WASHER FLAT #4 NYLON	4	EA			
45	MS35649-244	NUT HEX #4	2	EA			
46	MS15795-809	WASHER, FLAT, 1/4	1	EA			
47	MS35333-74	WASHER, LOCK, INTERNAL TOOTH, .25 X .47 OD	1	EA			
48	MS35649-2254	NUT HEX # 1/4-20	1	EA			
50	MS24693-C3	SCR FLAT HD 4-40 X 5/16 LG 100	14	EA			

Bill of Materials (193-8500-038)

REV:C

Find No.	Part Number	Description	Count	UOM	Ref. Deg.	Vendor	MFG. Part No.
51	MS24693-C48	SCR FLAT HD 8-32 X 3/8 LG 100	4	EA			
52	MS35338-136	WASHER LOCK #6	4	EA			
53	NAS1635-04LR8	SCR PAN HD SELFLOCK 4-40 X 1/2	4	EA			
55	NAS1635-04LR4	SCR PAN HD SELFLOCK 4-40 X 1/4	10	EA			
56	MS24693-C26	SCR FLAT HD 6-32 X 3/8 LG 100	24	EA			
57	MS24693-C26B	SCR, FLT HD, #6-32 X 3/8 LG, 100 BLACK OXIDE	20	EA			
58	MS51957-29	SCR PAN HD 6-32 X 7/16 LG	4	EA			
59	NAS620C4	WASHER FLAT #4 SS	27	EA			
60	MS15795-805	WASHER FLAT .156 ID .312 OD	4	EA			
61	NAS1676C4	WASHER LOCK #4	13	EA			
63	NAS671C4	NUT HEX #4 CRES SMALL PATTERN	15	EA			
69	074-1055	LABEL, RoHS COMPLIANT	1	EA			
70	090-301	* LABEL STD 1.5 X .75 IN	1	EA			
71	090-526-1	*LABEL, POWER INPUT 100W	1	EA			
72	090-285	*NAMEPLATE HIGH VOLTAGE	1	EA			
73	090-353	* LABEL GROUND	2	EA			
74	074-889-2	LABEL, THERMAL TRANSFER, PERM MTLZ POLYEST, .75 X .25IN	1	EA			
75	193-8501-032	WIRING DIAGRAM, SWITCH UNIT, MODEL 8512-CX-X-X	0	EA			
76	089-4573	ICD, SWITCH UNIT, MODEL 8512-CX-X-X	0	EA			
77	193-8502-000	CONFIG FILE, SWITCH UNIT, MODEL 8512	0	EA			
78	ATP1049	ACCEPTANCE TEST PROC MODEL 8512	0	EA			
79	188-002	DISK, MODEL 8512, INCL MANUALS, TOOLS, DRIVERS & SOFTWARE	1	EA			
80	089-4557	ICD, SWITCH MATRIX, ELECTRICALSPECS MODEL 8512-XX-XX	0	EA			
81	088-264	PROCEDURE, CREATING MAC ADDRESS LABEL	0	EA			
82	IM635-1	MANUAL, MODEL 8512 SERIES ILLUSTRATIONS PLs & SPECS	0	EA			

NOTES: UNLESS OTHERWISE SPECIFIED

- POWER CORD, ITEM 19, SUPPLIED BUT NOT SHOWN.
- APPLY LOCTITE ON ALL HARDWARE AS REQUIRED.
- SEE DETAIL H FOR SWITCH INSTALLATION ORIENTATION.
- ALL MATERIALS AND PROCESSES ARE TO BE IN COMPLIANCE WITH THE EUROPEAN DIRECTIVE RESTRICTION OF HAZARDOUS SUBSTANCES (RoHS). (REF: 080-638).

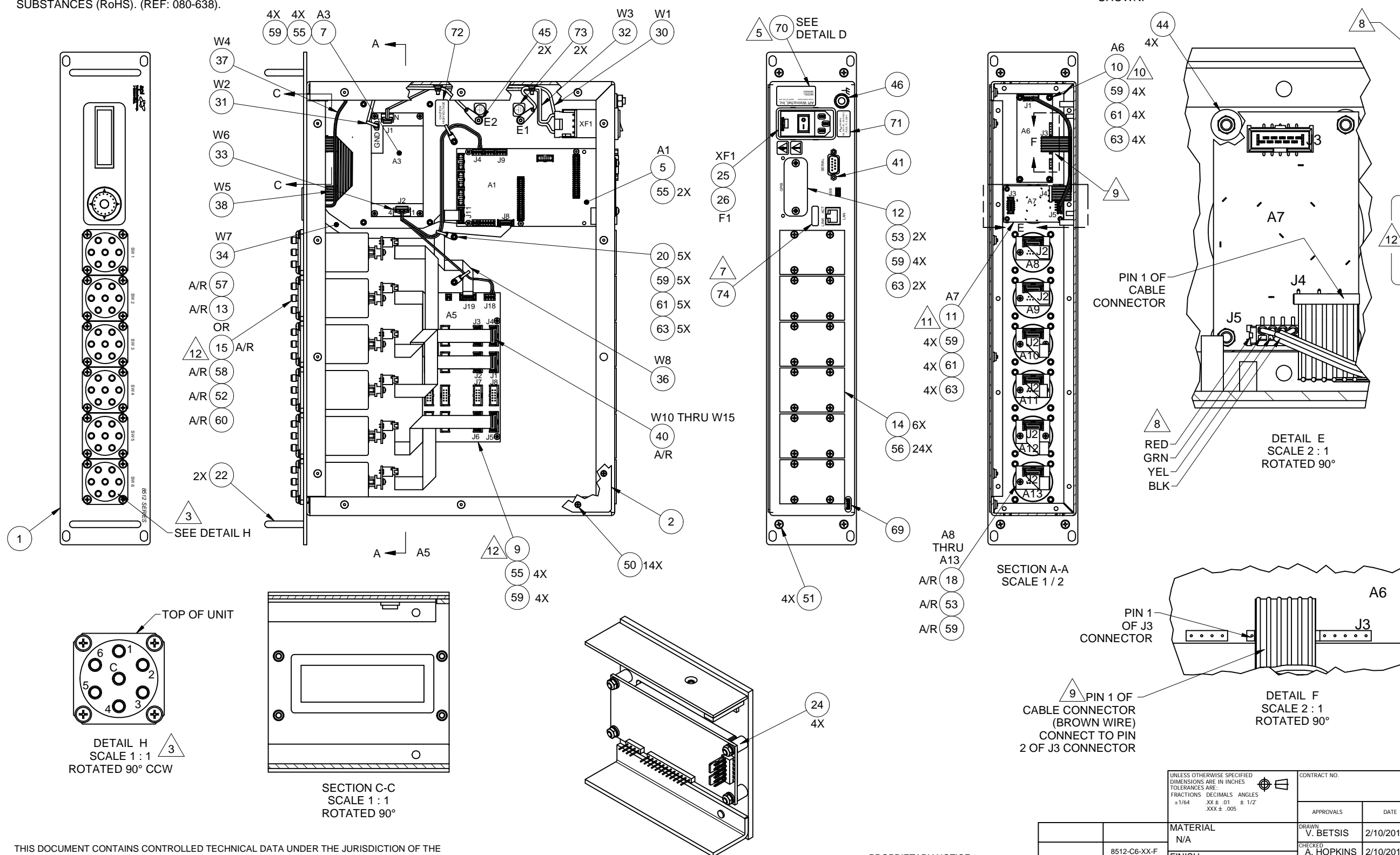
- PERMANENTLY MARK LABEL, ITEM #70, PER DETAIL D, LOCATE APPROXIMATELY AS SHOWN. REPLACE XX WITH NUMBER OF SWITCHES INSTALLED IN UNIT.
- USB CABLE, ITEM 39, SUPPLIED BUT NOT SHOWN.
- AFTER PRE-TEST, AND BEFORE FINAL TEST OBTAIN UNIT MAC ADDRESS USING PROCEDURE 088-264. PRINT MAC ADDRESS ON LABEL, ITEM 74. POSITION LABEL AS SHOWN.

- CUT ITEM #37 TO 8.0" LONG, STRIP WIRE ENDS .25".
- MAKE SURE THAT CONNECTOR GOING TO A6-J3 IS PLACED ON PINS 2 THRU 7. SEE DETAIL F.
- REMOVE PROTECTIVE FILM FROM DISPLAY, ITEM 10 PRIOR TO INSTALLATION IN UNIT.

- MAKE SURE SCROLL WHEEL, ON ITEM 11, IS SEATED PROPERLY IN PANEL AND THAT ALL BUTTONS MOVE FREELY BEFORE FULLY TIGHTENING HARDWARE.
- SWITCH (ITEM 15), TOGETHER WITH ITEMS 52, 58, 60, AND 40 OR COVER PLATE (ITEM 13), TOGETHER WITH ITEM 57, INSTALLED AS REQUIRED BY UNIT CONFIGURATION. 6 SWITCH UNIT CONFIGURATION SHOWN.

REVISION HISTORY				
ZONE	REV	DESCRIPTION	DATE	APPROVED
	A	ERN 15-022	VB	2/15
	B	ECN 17-281	SB	10/2017
	C	ECN 19-033	SB	2/2019

WIRING CHART			
DES	FROM	TO	ITEM
W1	XF1-GND	CHASSIS GND (E1)	30
W2	A3-GND	CHASSIS GND (E2)	31
W3	XF1	A3-J1	32
W4	A6-J1	A7-J5-1 (BLK) A7-J5-2 (YEL) A7-J5-3 (GRN) A7-J5-4 (RED)	37
W5	A6-J3 (PIN 2 THRU PIN 7)	A7-J4	38
W6	A3-J2-1 A3-J2-3 A3-J2-2 A3-J2-4	A1-J4-1 (ORN) A1-J4-2 (WHT/BLK) A5-J18-1 (ORN) A5-J18-2 (WHT/BLK)	33
W7	A1-J8	A7-J3	34
W8	A1-J11	A5-J19	36
W9			
W10	A8-J2 (S1)	A5-J1	40
W11	A8-J2 (S2)	A5-J2	40
W12	A8-J2 (S3)	A5-J3	40
W13	A8-J2 (S4)	A5-J4	40
W14	A8-J2 (S5)	A5-J5	40
W15	A8-J2 (S6)	A5-J6	40



API Weinschel, Inc.
 CAGE CODE 93459 MADE IN THE USA
 MODEL: 8512-C6-XX-F
 SERNO: XXXX
 DETAIL D SCALE 2 : 1 ROTATED 180°
 REPLACE XX WITH NUMBER OF CHANNELS

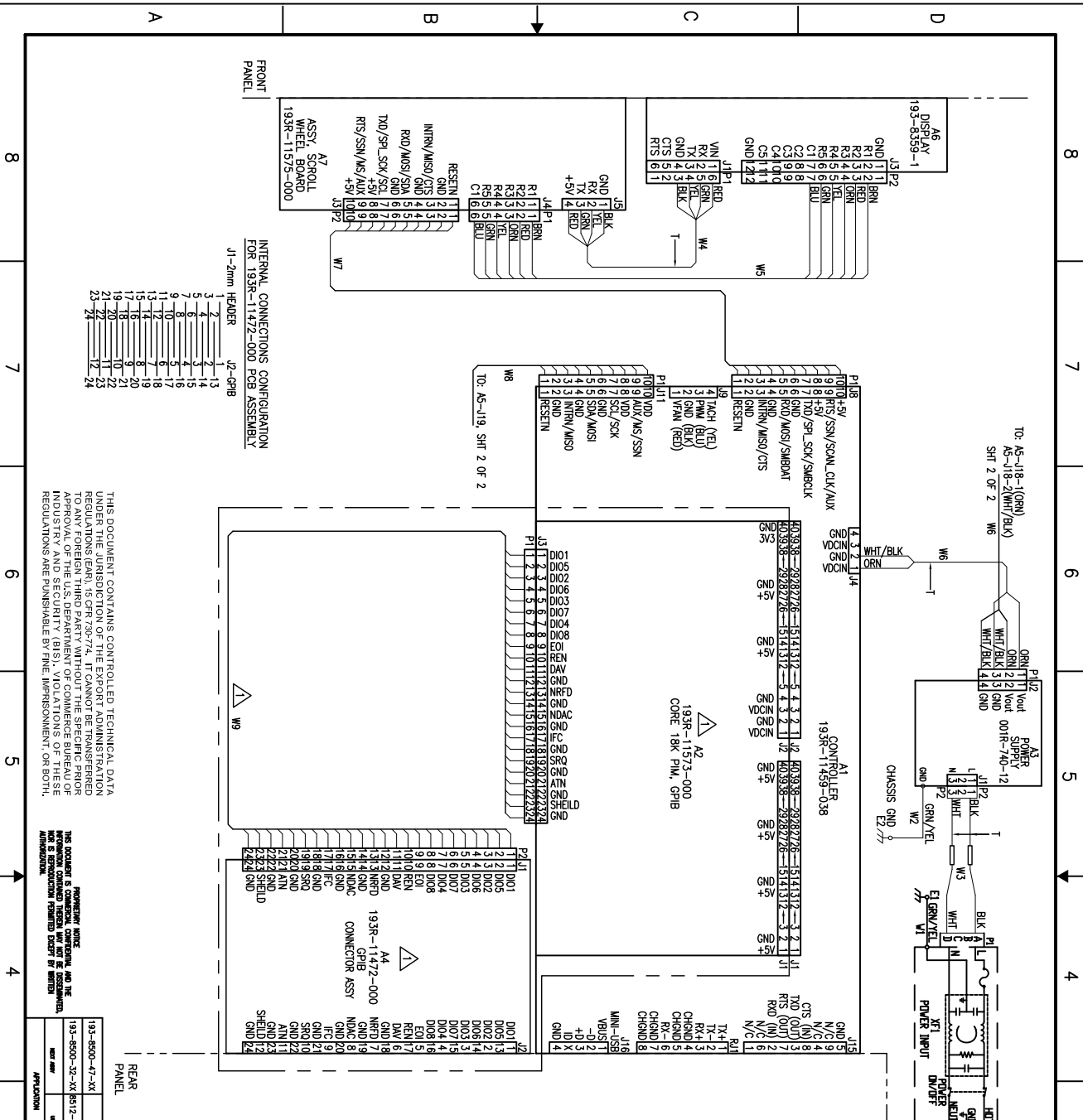
FOR PARTS LIST SEE PL193-8500-038-1 THRU -6

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UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE: FRACTIONS DECIMALS ANGLES =1/64 .XX ± .01 ± 1/2° .XXX ± .005		CONTRACT NO.		APPROVALS		DATE	
8512-C6-XX-F		DRAWN: V. BETSIS		2/10/2015		API Weinschel, Inc.	
NEXT ASSY USED ON		CHECKED: A. HOPKINS		2/10/2015		ASSY, SWITCH UNIT	
APPLICATION		ENGR: R. SINNO		2/10/2015		SIZE: D 93459	
DO NOT SCALE DRAWING		ISSUED		FSCM NO. 193-8500-038-1 THRU -6		DWG NO. 193-8500-038-1 THRU -6	
				SCALE 1:2		SHEET 1 OF 1	

REV	DATE	BY	CHKD	DESCRIPTION
1				ISSUED
2				REVISED
3				REVISED
4				REVISED
5				REVISED
6				REVISED
7				REVISED
8				REVISED
9				REVISED
10				REVISED
11				REVISED
12				REVISED
13				REVISED
14				REVISED
15				REVISED
16				REVISED
17				REVISED
18				REVISED
19				REVISED
20				REVISED
21				REVISED
22				REVISED
23				REVISED
24				REVISED



TERMINAL NO.	FUNCTION	WIRE COLOR	TERMINAL NO.	FUNCTION	WIRE COLOR
1	RES	RED	11	RES	RED
2	RES	RED	12	RES	RED
3	RES	RED	13	RES	RED
4	RES	RED	14	RES	RED
5	RES	RED	15	RES	RED
6	RES	RED	16	RES	RED
7	RES	RED	17	RES	RED
8	RES	RED	18	RES	RED
9	RES	RED	19	RES	RED
10	RES	RED	20	RES	RED
11	RES	RED	21	RES	RED
12	RES	RED	22	RES	RED
13	RES	RED	23	RES	RED
14	RES	RED	24	RES	RED
15	RES	RED			
16	RES	RED			
17	RES	RED			
18	RES	RED			
19	RES	RED			
20	RES	RED			
21	RES	RED			
22	RES	RED			
23	RES	RED			
24	RES	RED			

NOTES:
 1. GPB CONNECTOR ASSEMBLY (PN 193R-11472-000), PLUG IN MODULE (PN 193R-11573-000) AND REBORN CABLE (REF. DESIGNATOR W9) INSTALLED ONLY ON UNITS WITH GPB OPTION (MODEL 8512-CX-XX-XG).
 2. SWITCHES SW1 THRU SW6 AND ASSOCIATED CABLES ARE INSTALLED AS REQUIRED AND CONNECT TO EITHER FRONT OR REAR PANEL AS REQUIRED BY UNIT CONFIGURATION.
 3. ALL MATERIALS AND PROCESSES ARE TO BE IN COMPLIANCE WITH THE EUROPEAN DIRECTIVE RESTRICTION OF HAZARDOUS SUBSTANCES (RoHS) (REF: WEINSCHTEL 080-639)

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REAR PANEL
 193-8500-47-XX
 193-8500-52-XX
 8512-CX-XX-XG
 N/A
 N/A
 R. SIMOND
 2/15
 2/15
 33459
 193-8501-032
 SCALE NONE
 SHEET 1 OF 2

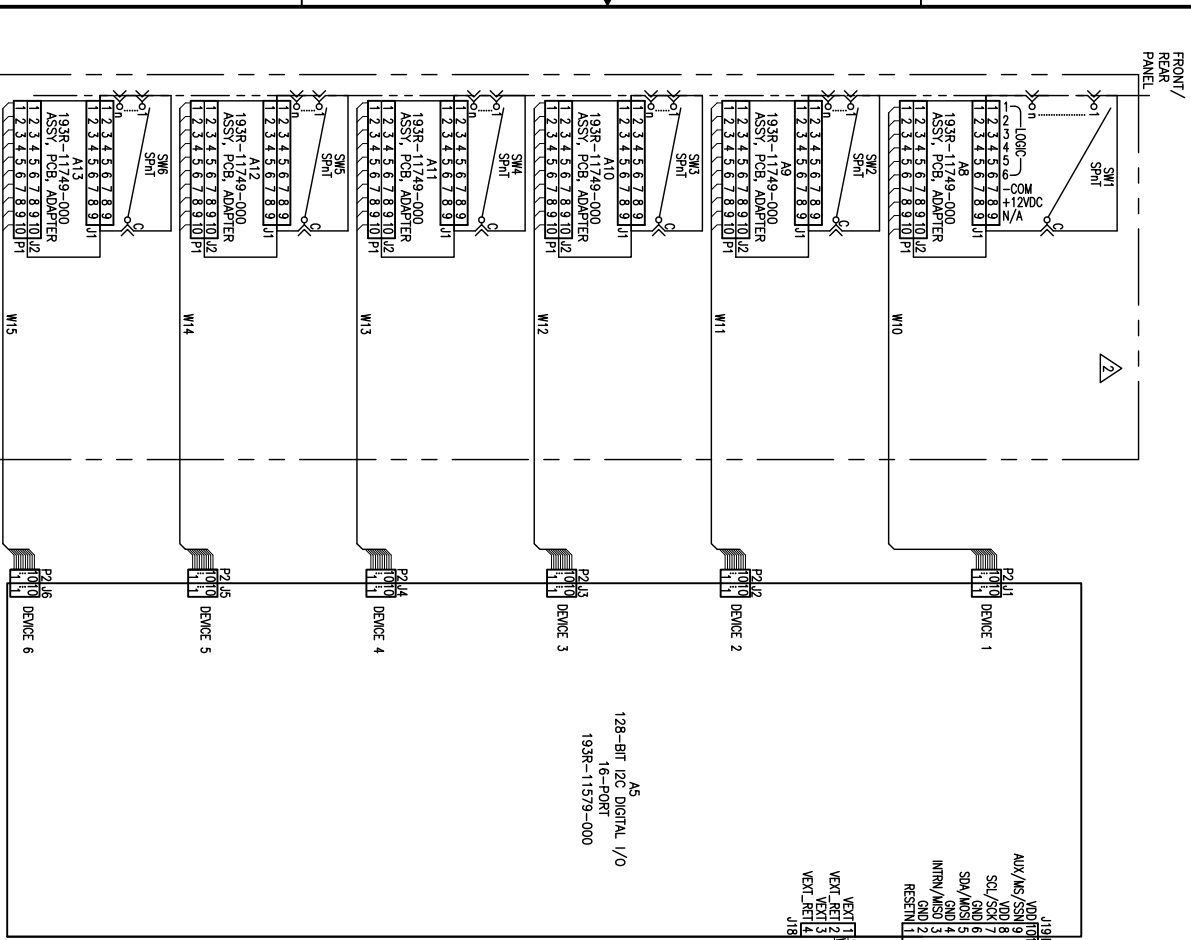
FRONT PANEL
 193-8500-1
 J3 P2
 GND 11 BRN
 R2 12 RED
 R3 13 GRN
 R4 14 YEL
 R5 15 BLK
 R6 16 GRN
 C1 17 BLU
 C2 18 BR
 C3 19 BR
 C4 20 GRN
 C5 21 BR
 GND 22
 J4 P1
 VIN 1 RED
 TX 2 YEL
 TX 3 YEL
 GND 4 BLK
 CTS 5 2
 RTS 6 1
 J5 P1
 GND 1 BLK
 RX 2 YEL
 TX 3 GRN
 +5V 4
 J6 P1
 GND 1 BLK
 RX 2 YEL
 TX 3 GRN
 +5V 4
 J7 P1
 R1 1 BRN
 R2 2 RED
 R3 3 GRN
 R4 4 YEL
 R5 5 BLK
 R6 6 GRN
 C1 7 BR
 C2 8 BR
 C3 9 BR
 C4 10 GRN
 C5 11 BR
 GND 12
 J8 P1
 GND 1 BRN
 RX 2 YEL
 TX 3 GRN
 +5V 4
 J9 P1
 GND 1 BRN
 RX 2 YEL
 TX 3 GRN
 +5V 4
 J10 P1
 GND 1 BRN
 RX 2 YEL
 TX 3 GRN
 +5V 4
 J11 P1
 GND 1 BRN
 RX 2 YEL
 TX 3 GRN
 +5V 4
 J12 P1
 GND 1 BRN
 RX 2 YEL
 TX 3 GRN
 +5V 4
 J13 P1
 GND 1 BRN
 RX 2 YEL
 TX 3 GRN
 +5V 4
 J14 P1
 GND 1 BRN
 RX 2 YEL
 TX 3 GRN
 +5V 4
 J15 P1
 GND 1 BRN
 RX 2 YEL
 TX 3 GRN
 +5V 4
 J16 P1
 GND 1 BRN
 RX 2 YEL
 TX 3 GRN
 +5V 4
 J17 P1
 GND 1 BRN
 RX 2 YEL
 TX 3 GRN
 +5V 4
 J18 P1
 GND 1 BRN
 RX 2 YEL
 TX 3 GRN
 +5V 4
 J19 P1
 GND 1 BRN
 RX 2 YEL
 TX 3 GRN
 +5V 4
 J20 P1
 GND 1 BRN
 RX 2 YEL
 TX 3 GRN
 +5V 4
 J21 P1
 GND 1 BRN
 RX 2 YEL
 TX 3 GRN
 +5V 4
 J22 P1
 GND 1 BRN
 RX 2 YEL
 TX 3 GRN
 +5V 4
 J23 P1
 GND 1 BRN
 RX 2 YEL
 TX 3 GRN
 +5V 4
 J24 P1
 GND 1 BRN
 RX 2 YEL
 TX 3 GRN
 +5V 4

INTERNAL CONNECTIONS CONFIGURATION FOR 193R-11472-000 PCB ASSEMBLY
 J1-2mm HEADER J2-GPB
 1-13
 2-14
 3-15
 4-16
 5-17
 6-18
 7-19
 8-20
 9-21
 10-22
 11-23
 12-24

193R-11573-000
 CONTROLLER
 193R-11459-038
 GPB CONNECTOR ASSEMBLY
 193R-11472-000
 GPB CONNECTOR ASSEMBLY

API Weinschel, Inc.
 WIRING DIAGRAM
 MODEL 8512-CX-XX-X
 DIGITAL CONNECTIONS
 193-8501-032

REV	DATE	BY	CHKD	APPV
1				



A5
128-BIT I2C DIGITAL I/O
16-PORT
193R-11579-000

INTERNAL CONNECTIONS CONFIGURATION
FOR 193R-11749-000 PCB ASSEMBLY

J1-9 PWR D 12-10 PIN HEADER

1	2	3	4	5	6	7	8
2	1	3	4	5	6	7	8
3	4	5	6	7	8	9	10
4	5	6	7	8	9	10	11
5	6	7	8	9	10	11	12
6	7	8	9	10	11	12	13
7	8	9	10	11	12	13	14
8	9	10	11	12	13	14	15
9	10	11	12	13	14	15	16

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PROBABLE NOTICE

193-8500-47-XX	193-8500-52-XX	8512-CX-X-X
REV	REV	REV
APPROVAL	APPROVAL	APPROVAL

API Weinschel, Inc.

WIRING DIAGRAM,
MODEL 8512-CX-X-X
DIGITAL CONNECTIONS

DATE: 03/26/89
SCALE: 1:1

REV: 1
REV: 2
REV: 3

DATE: 03/26/89
DATE: 03/26/89
DATE: 03/26/89

SCALE: 1:1

SHEET 2 OF 2

NOTES: UNLESS OTHERWISE SPECIFIED

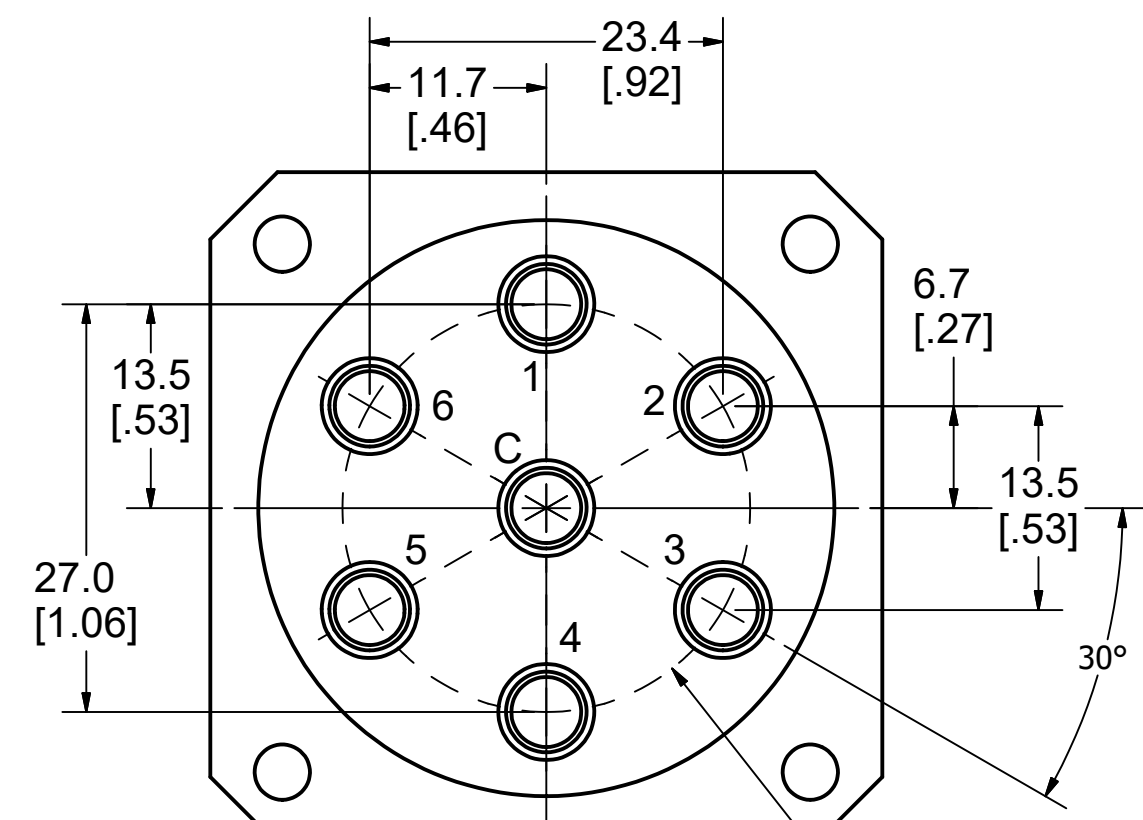
1. ALL DIMENSIONS ARE GIVEN MM[INCH]

2. RF SWITCHES AND SWITCH PLATES INSTALLED AS REQUIRED AND DETERMINED BY UNIT CONFIGURATION. 6 SWITCH UNIT CONFIGURATION SHOWN.

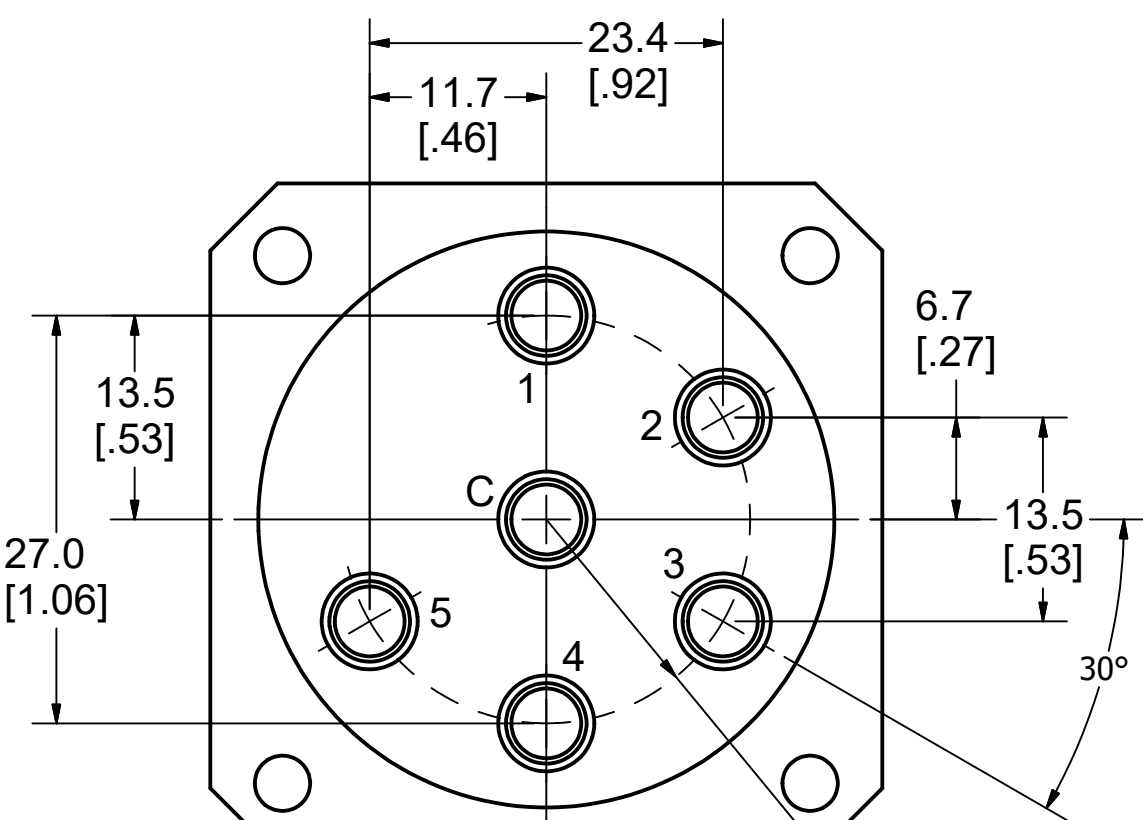
3. SEE AWW DRAWING PN 089-4557 FOR ELECTRICAL SPECIFICATIONS.

4. ALL MATERIALS AND PROCESSES ARE TO BE IN COMPLIANCE WITH THE EUROPEAN DIRECTIVE RESTRICTION OF HAZARDOUS MATERIALS (RoHS) (REF: WEINSCHTEL 080-638)

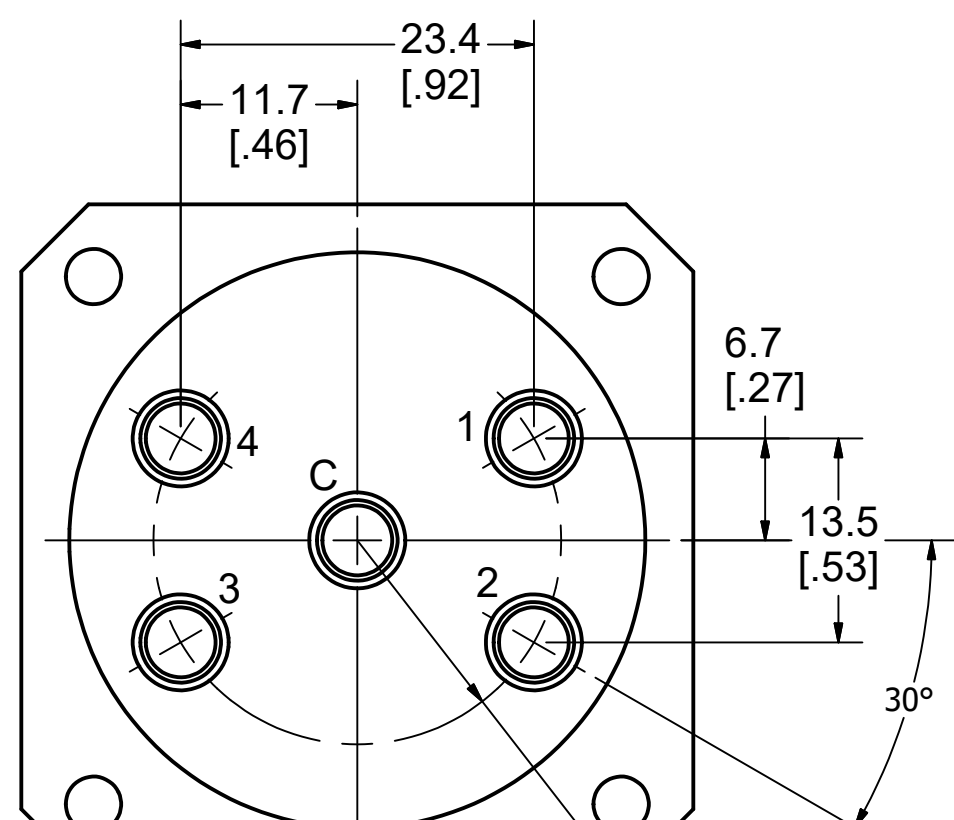
REVISION HISTORY				
ZONE	REV	DESCRIPTION	DATE	APPROVED
	A	ERN 15-002 VB.	01/15	
	B	ECN 15-048 VB.	2/15	
	C	ECN 18-207 VB.	1/2019	



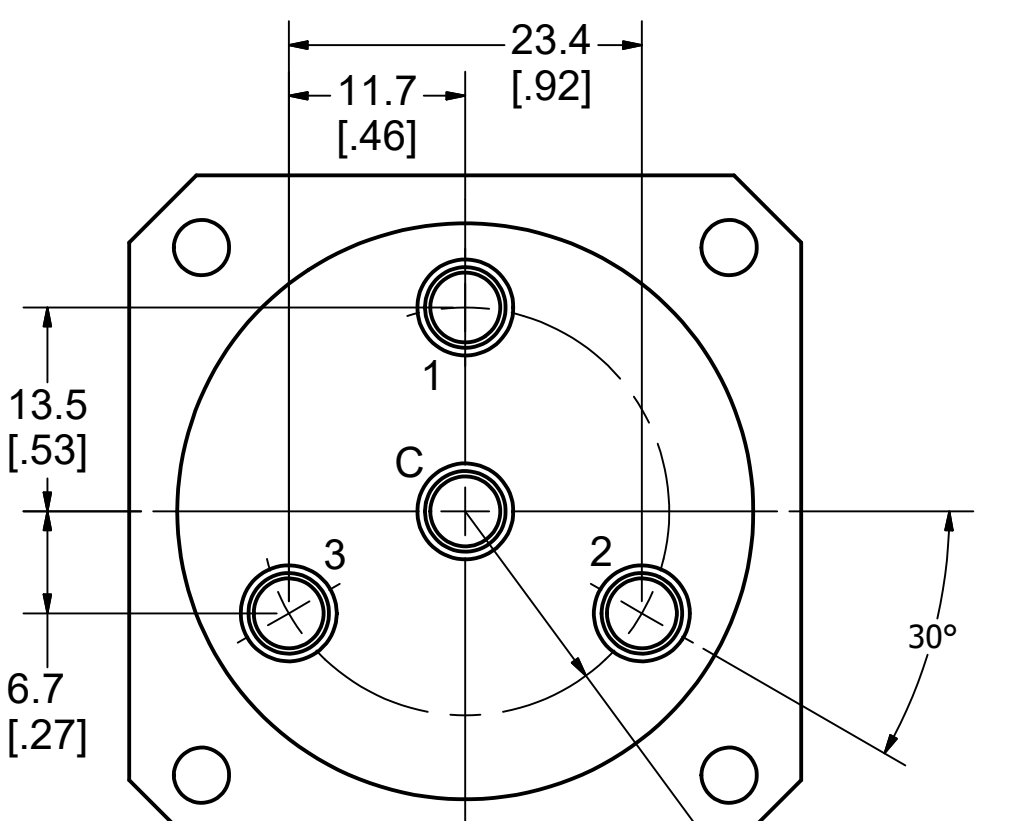
SP6T, SWITCH PORTS
DETAIL A
SCALE 2 : 1
ROTATED 90°



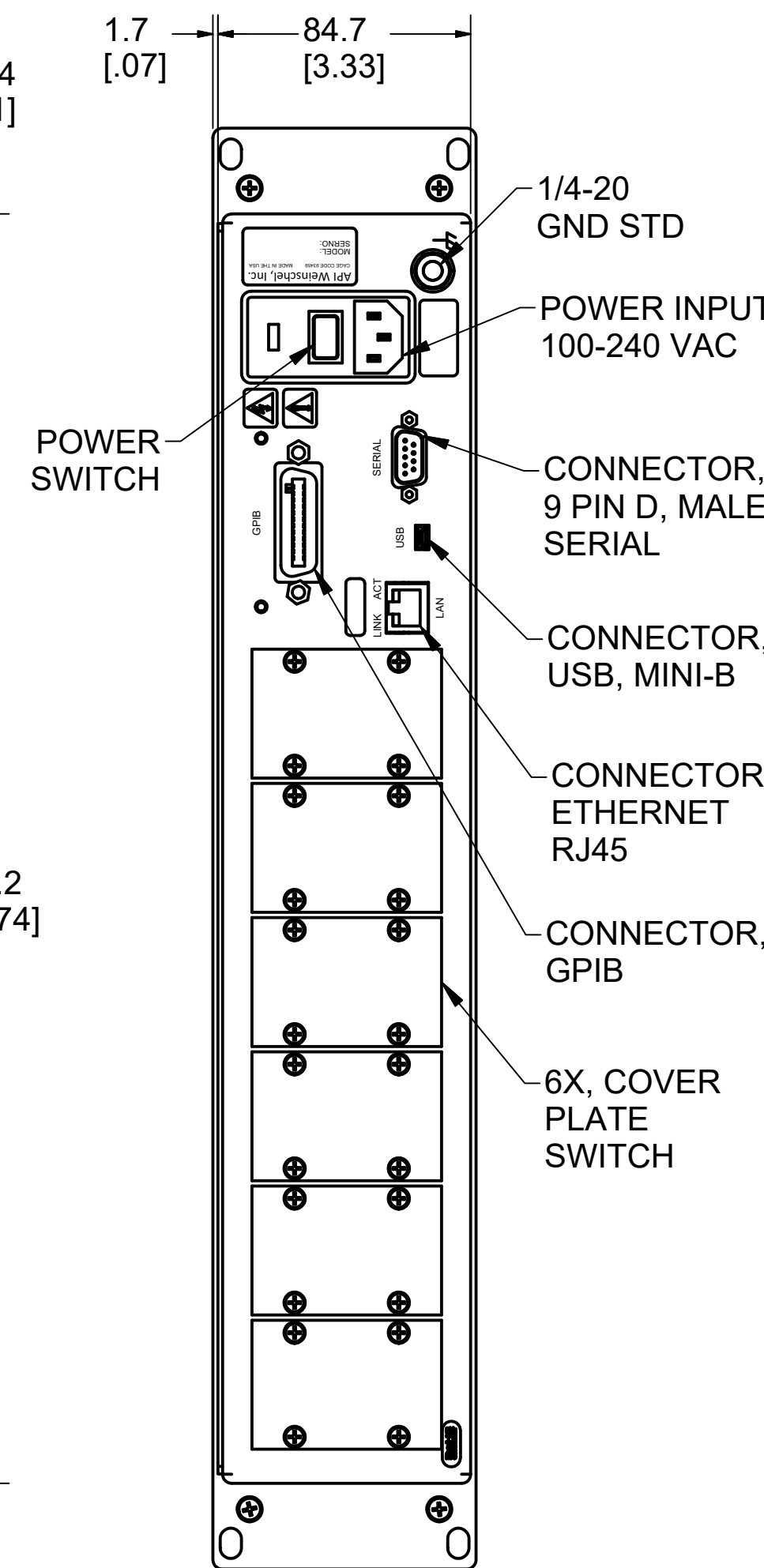
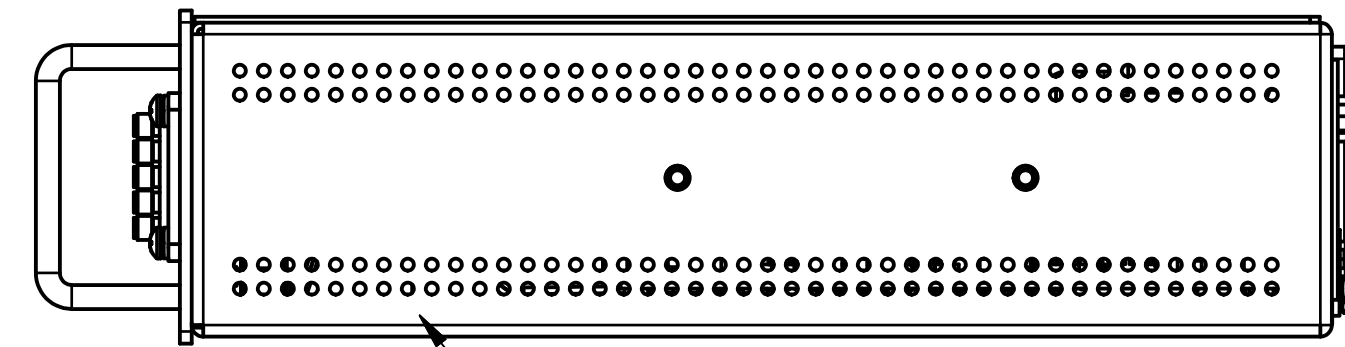
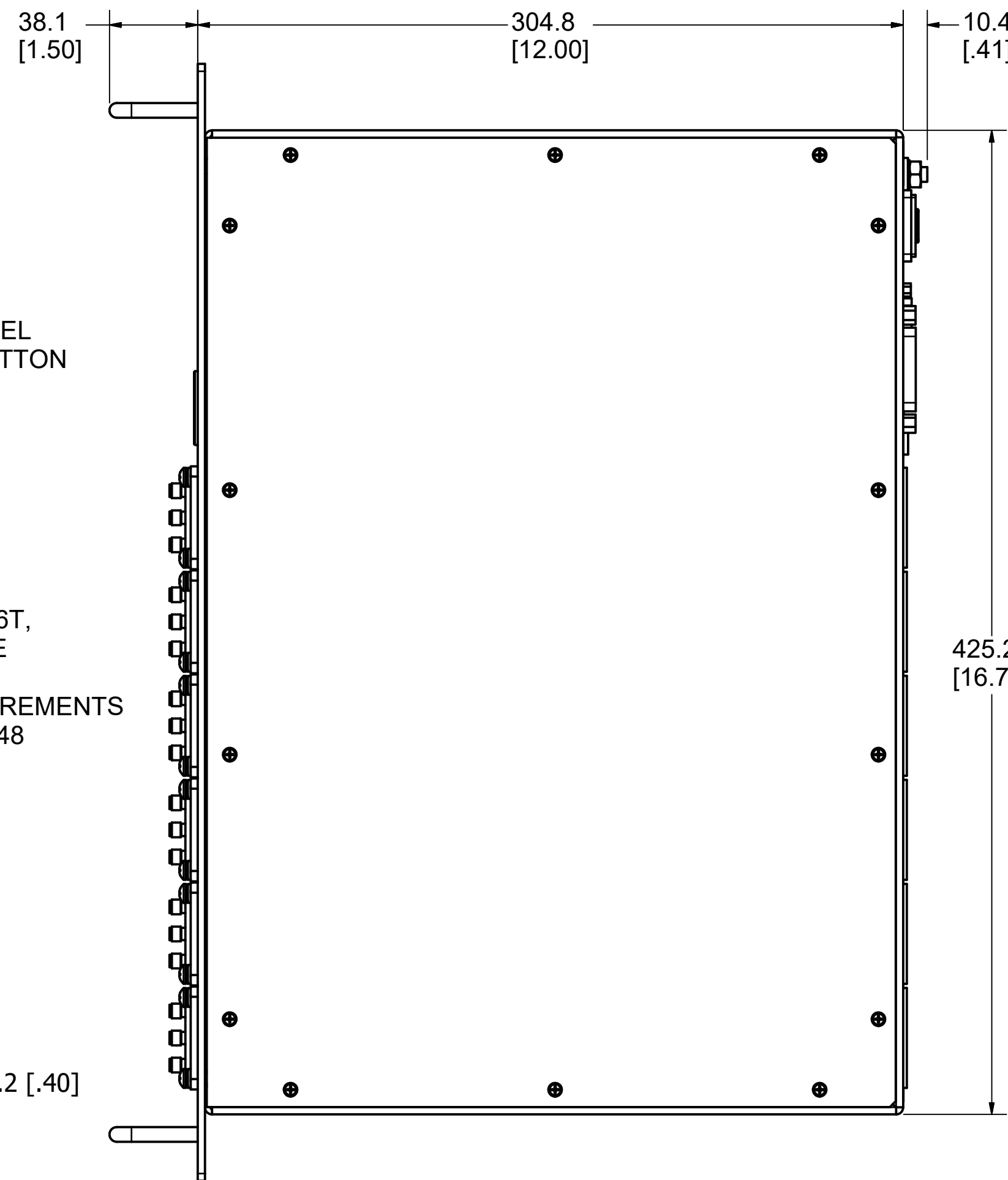
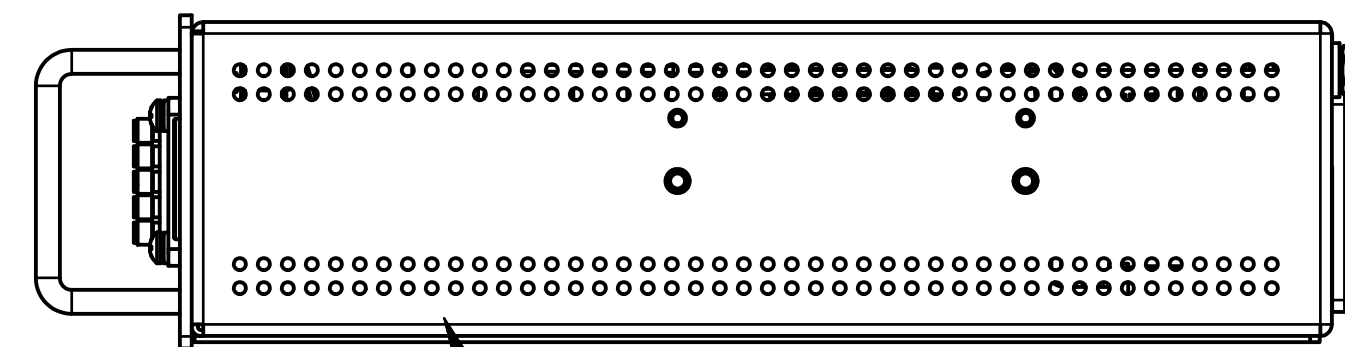
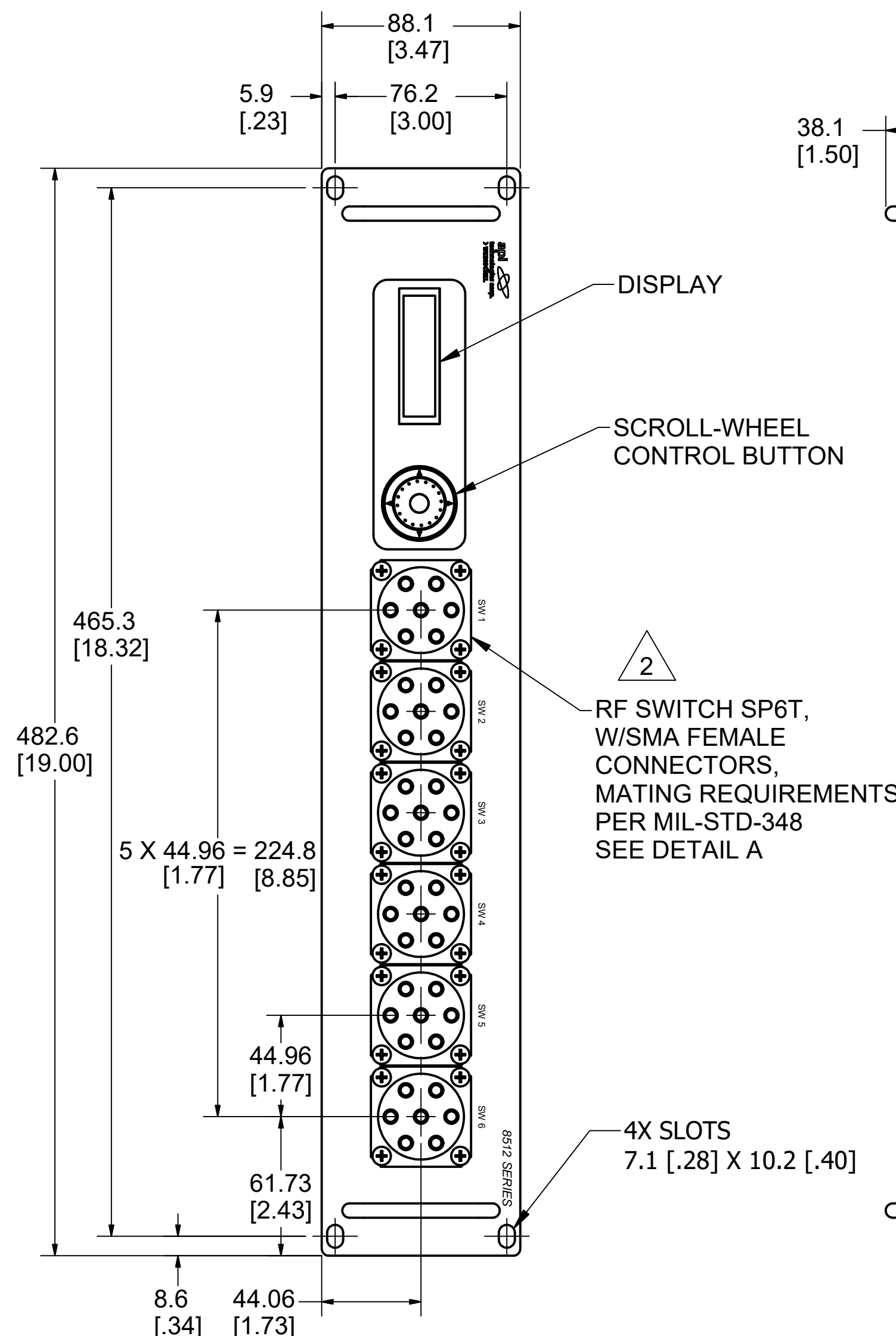
SP5T, SWITCH PORTS



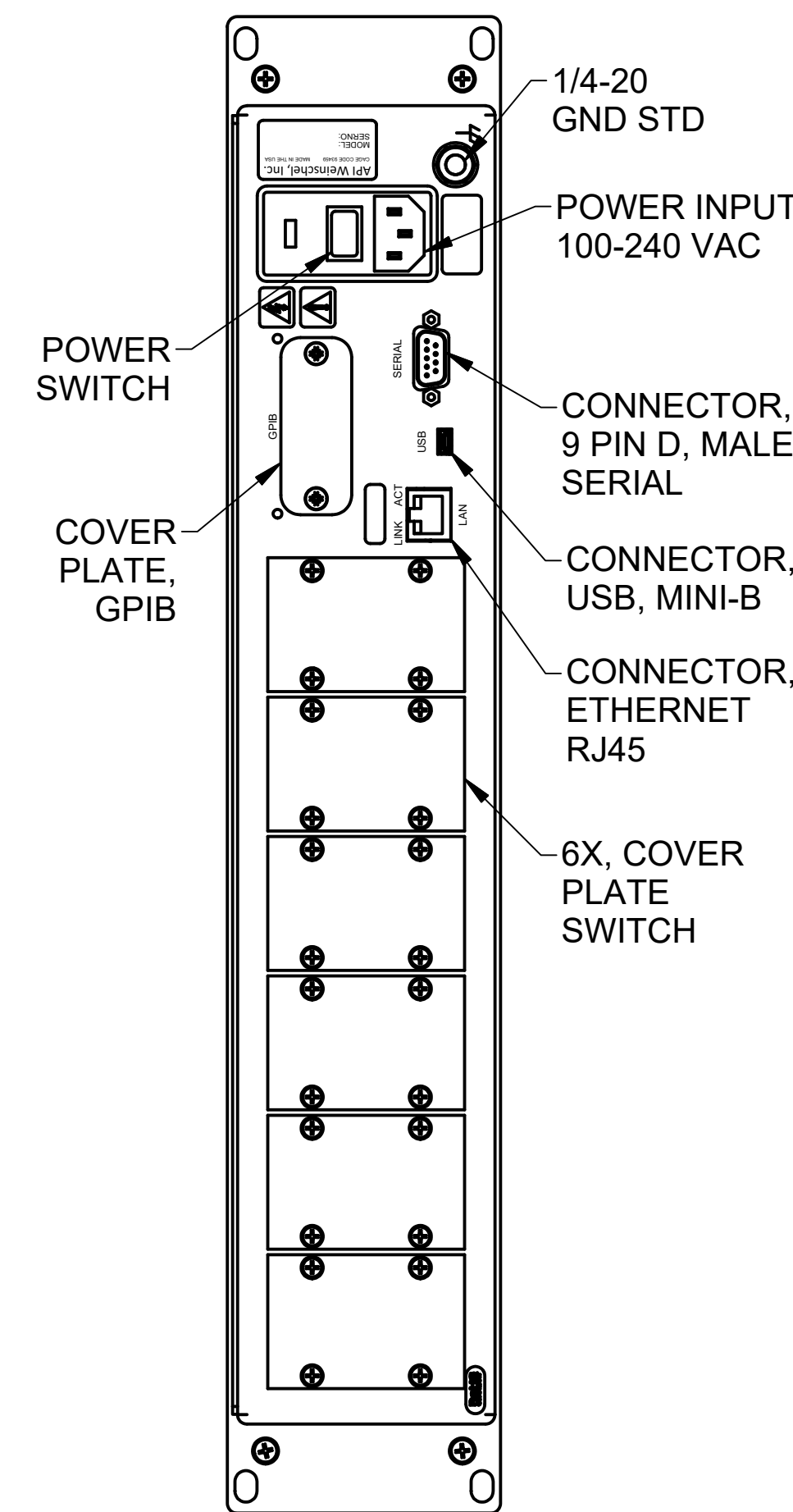
SP4T, SWITCH PORTS



SP3T, SWITCH PORTS



WITH GPIB OPTION



WITHOUT GPIB OPTION

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193-8500-XXX-X	8512-CX-XX-XX			V. BETSIS		1/8/2015		ICD, SWITCH UNIT MECHANICAL OUTLINE (MODEL 8512-CX-XX-XX)	
NEXT ASSY	USED ON			A. HOPKINS		2/5/2013		SIZE D	FSCM NO. 93459
APPLICATION	DO NOT SCALE DRAWING			R. SINNO		1/8/2015		DWG NO. 089-4573	REV C
								SCALE 1:2	SHEET 1 OF 1

INTERFACE CONTROL DRAWING