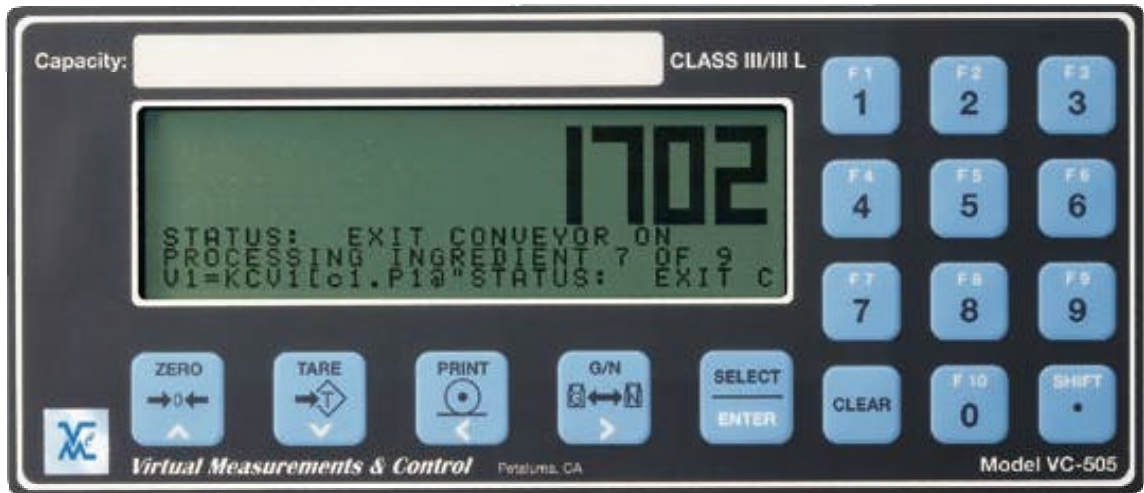


VC500 Series

USERS GUIDE



Virtual Measurements & Control, LLC

P/N 8701-000166-05

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It is important that Virtual Measurements & Control's equipment is installed and operated in such a way that all applicable safety requirements are met. It is your responsibility as a user to ensure that you identify the relevant standards and comply with them. Failure to do so may result in damages to equipment and personal injury. In particular, you should review the contents of the User Guide carefully before installing or operating the equipment.

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The VC-500 Series Indicators

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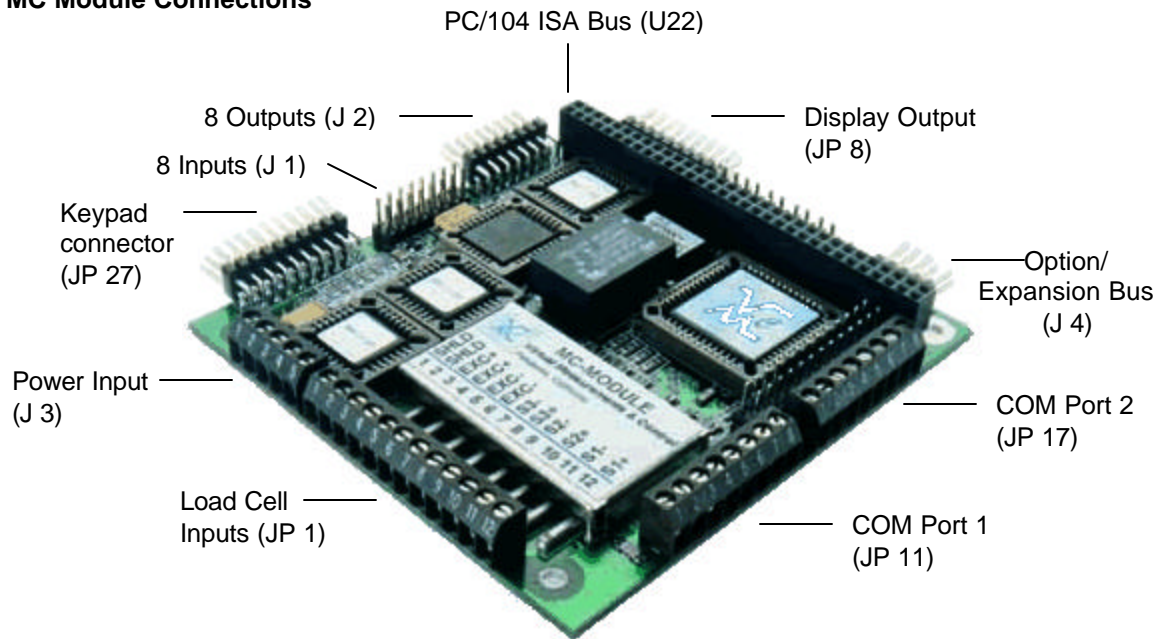
INTRODUCTION

VC-500 Specifications

Display	High-resolution LCD (64 x 240) Alphanumeric 1.25" x 5" display with 0.8" digits and 60 characters of text.
Keyboard	17 button (VC-505) or 5 button (VC-501) membrane keypad with tactile keys.
Multiple Scale Input	Three separate scale input channels
Internal Resolution	1,000,000 counts
Display Resolution	Selectable (1 part in 10,000 NTEP approved)
Conversion Rate	Selectable from 5 to 500 updates/sec
Excitation Voltage	+9 VDC, Powers up to (12) 350ohm load cells
Input Sensitivity	1uV/gradation typical
Auto Zero Tracking	Selectable to 3dd by 0.5dd
Motion Window	Selectable to 3dd by 0.25dd
Calibration Method	Software - Menu driven prompting
Units of Measure	Selectable lb/kg
RFI/EMI Protection	All signal and excitation lines filtered to -65db minimum @500MHz
Filtering	Selectable Low Pass Filter and adjustable Averaging queues
Display Modes	Selectable, Single/Multiple Scale and Totalizing
Display Increments	Selectable - x1, x2, x5, x10, x20, x50, ..., x500
Decimal Point Location	Selectable 0 - 7
COM Port 1	Full duplex, RS-232 or RS-485
COM Port 2	Simplex (output only), RS232, RS-485 and 20mA
PC/104 Bus	IEEE P996.1 Compliant, 8 bit PC/104 bus, I/O Mapped, Selectable Address 300 - 308
I/O	Programmable 8 Inputs & 8 Outputs Standard (expandable)
Set Point Types	Selectable (to specific scale) Static, Sequential and Check-weigh
Power	90 to 280 VAC auto sensing 50-60Hz
Operating Temperature	-10 degrees C to +40 degrees C
Dimensions	10.0 in.(254mm) W x 8.0 in.(203mm) H x 4.5 in.(114mm) D
Weight	Weight: 8.25lb (3.75kg)
Enclosure	NEMA 12 Mild Steel (optional NEMA 4X Fiberglass or Stainless Steel)
Warranty	One year limited warranty
Approvals	NTEP certified 10,000 Divisions, Class III/IIIL (#5010-00) Canadian Weights & Measures (Pending)

HARDWARE SETUP

MC Module Connections



Connector	Function	# of Connections	Page reference
J 3	Power Input Terminal	5	2
JP 1	Load cell connections	12	3
JP 11	COM port 1 (Bi-directional)	8	3
JP 17	COM port 2 (Output only)	8	3
J 4	Option/Expansion Bus	34	5
JP 8	Display Connector	20	5
U 22	PC/104 ISA Connector	64	5
J 2	Relay Outputs	8	6
J 1	Relay Inputs	8	6
JP 27	Keypad Connector	20	6

Power Input Terminal (J 3)

The VC-500 Series is shipped with a Universal Auto-Sensing Power Supply that can accept from 90 to 280VAC, 50 or 60Hz. The standard power cord may need to be altered (fitted with a different plug) in some applications.

The instrument is shipped from the factory with +5VDC (red), Ground (black), +12VDC (orange), and Ground (gray) connected from the power supply to the MC Module

The figure above shows the DC power input connections on J3 of the MC Module.

pin	J3 Connections		
1	+5V	RED	X
2	GND	BLK	X
3	+12V	ORA	X
4	GND	GRY	X
5	-12V	VIO	N/C

Load Cell Connections (JP 1)

The VC-500 series can accept up to 3 scales. Connecting more than 3 scales requires the addition of another MC Module (*consult factory*).

WARNING! Disconnect power before connecting load cell(s), failure may result in damage to the MC Module board.

Load cell excitation connections:

Terminal block JP1- pin 3 +Excitation
Terminal block JP1- pin 4 +Excitation (either or both pins may be used, they are equivalent)

Note: If 3 scales are being used, connect two positive leads to one of the pins, and one positive lead to the remaining pin.

Terminal block JP1- pin 5 - Excitation
Terminal block JP1- pin 6 - Excitation (either or both pins may be used, they are equivalent)

Note: If 3 scales are being used, connect two negative leads to one of the pins, and one negative lead to the remaining pin.

Channel 1

Terminal block JP1- pin 12 +Signal
Terminal block JP1- pin 11 -Signal

Channel 2

Terminal block JP1- pin 10 +Signal
Terminal block JP1- pin 9 - Signal

Channel 3

Terminal block JP1- pin 8 +Signal
Terminal block JP1- pin 7 - Signal

For systems using a slave MC Module to control additional scales, consult factory for master/slave documentation.

Terminal block JP1- pin 1 Shield This is an optional connection. If the load cell has a shield, connect it here.

Note: If multiple scales are being used, connect all shields to this pin.

Terminal Block JP1- pin 2 Do not use.

If you are using sense leads, remove jumper JP 50. Consult factory for additional wiring information.

Communications Connections

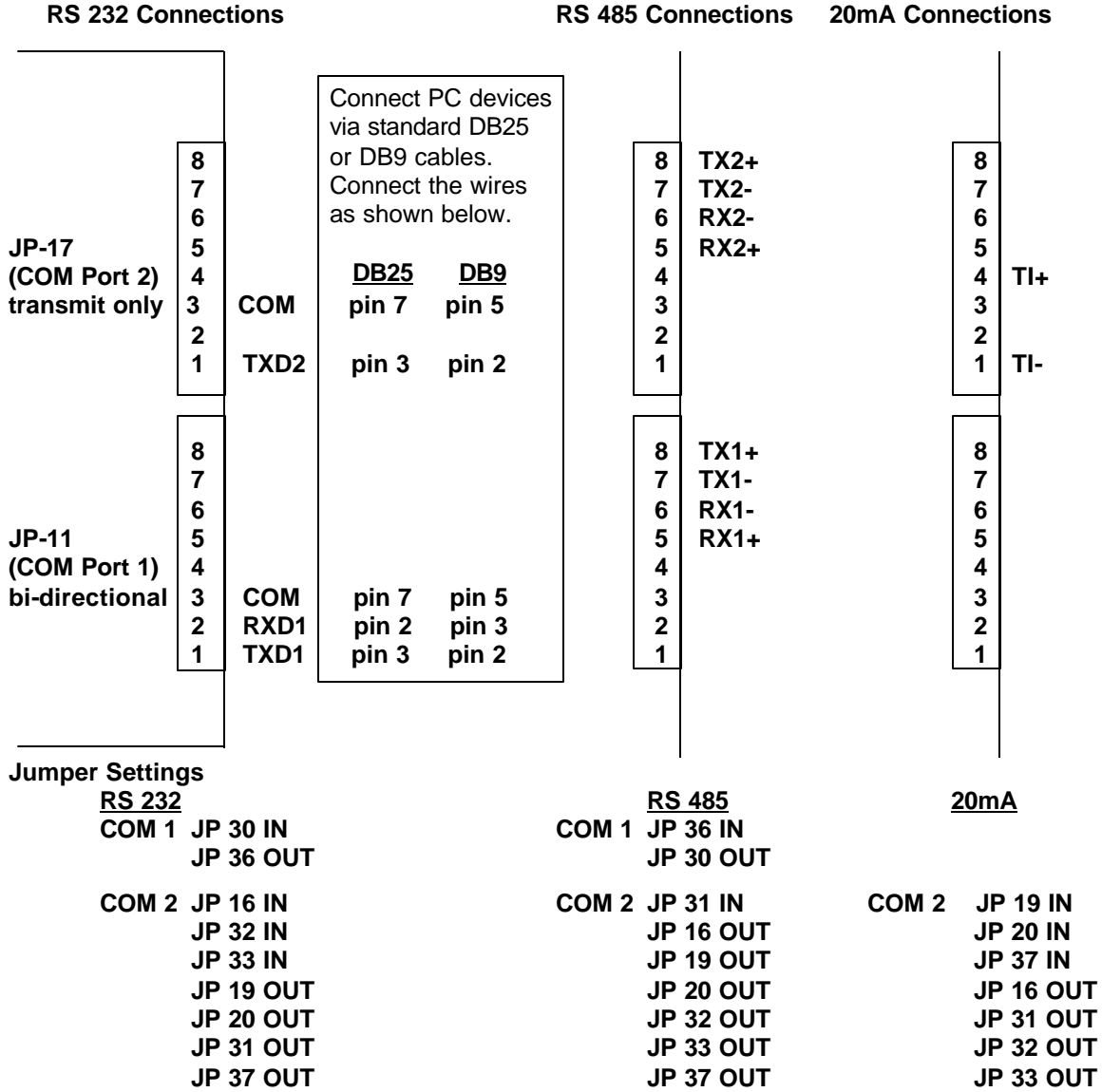
COM Port 1 (JP 11)

COM Port 2 (JP 17)

The VC-500 series is equipped with two serial communications ports. The first, COM Port 1, is bi-directional. It is the default port for communications devices (computers etc.). The second, COM Port 2, is unidirectional and is intended for terminal devices such as printers.

Both ports may be configured for RS-232 or RS-485. COM Port 2 may be configured for 20mA current loop.

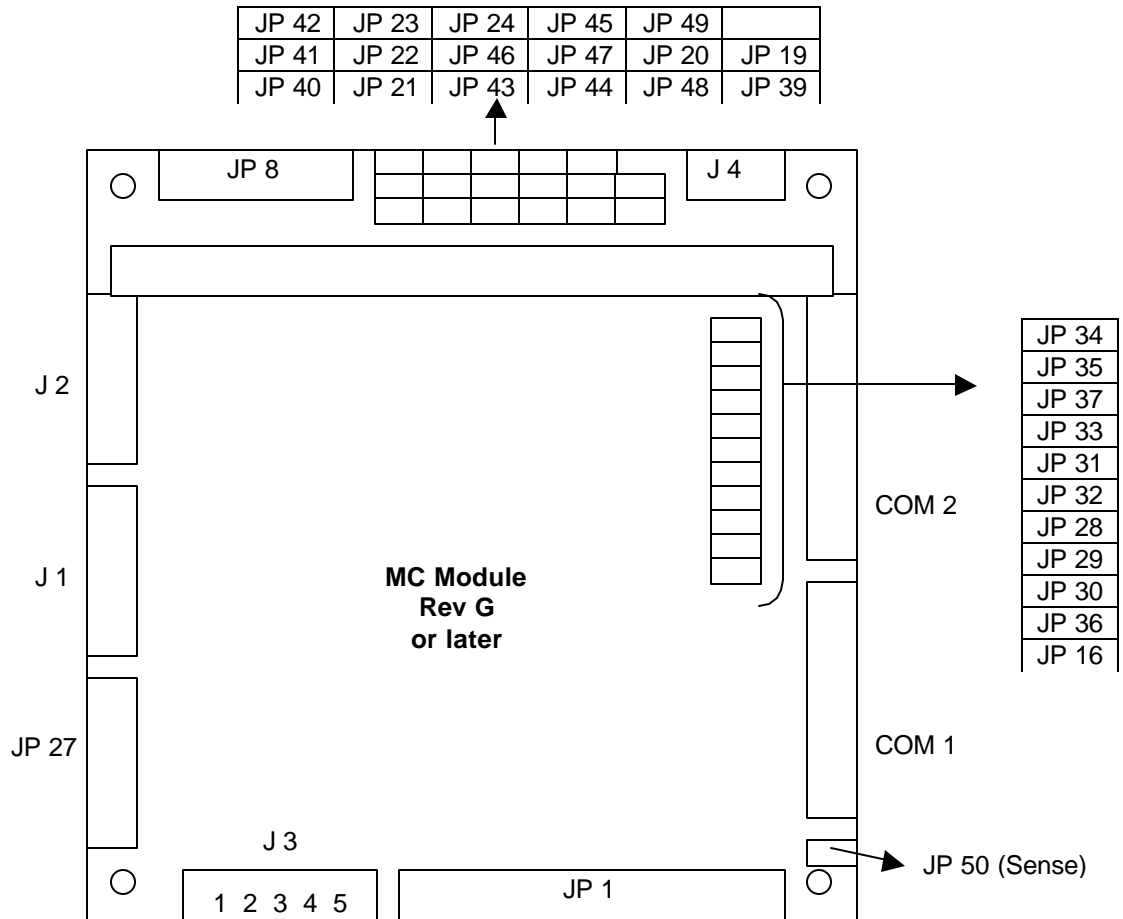
To connect your communications, with the power off, connect your wires according to the appropriate diagram below. If you are connecting multiple units via **RS-485**, daisy-chain the units. Continuing with the power off, adjust your jumpers to match the jumper settings shown below for the appropriate communications type. Additional setup is required. See software settings page 14.



Jumper Settings

<u>RS 232</u>	<u>RS 485</u>	<u>20mA</u>
COM 1 JP 30 IN JP 36 OUT	COM 1 JP 36 IN JP 30 OUT	
COM 2 JP 16 IN JP 32 IN JP 33 IN JP 19 OUT JP 20 OUT JP 31 OUT JP 37 OUT	COM 2 JP 31 IN JP 16 OUT JP 19 OUT JP 20 OUT JP 32 OUT JP 33 OUT JP 37 OUT	COM 2 JP 19 IN JP 20 IN JP 37 IN JP 16 OUT JP 31 OUT JP 32 OUT JP 33 OUT

Jumper Locations



Option/Expansion Bus (J 4)

The Option/Expansion Bus is used when two MC Modules are stacked in the Master/Slave configuration. Consult factory for further detail. The Option/Expansion Bus may also be used for other options, consult the factory for any special needs.

Display Connector (JP 8)

The display connector is used to connect the VC-500 Series display to the MC Module. A 20 pin ribbon cable connects the graphics display with the MC Module. When re-connecting, be sure pin 1 on the MC Module connects to pin 1 of the display. Be careful not invert the cable (so pin 1 connects to pin 20) or the display will not function.

PC/104 ISA Connector (U 22)

The PC/104 connector is used to add PC/104 options to the MC Module. Consult the factory before adding third party PC/104 Modules to the MC Module. See the technical reference section, page 22, for details on the PC/104 communications.

Relay Outputs (J 2)

The VC-500 Series indicators come with 8 outputs intended to be used with our solid state relay board (optional). Connect the output ribbon cable included with the relay board to this connector. Be careful not to invert the cable. Consult the factory for details on digital outputs. Note, a relay card may come with a split ribbon cable so inputs and outputs may use only one relay card. A wiring diagram will be included with the relay card.

Relay Inputs (J 1)

The VC-500 Series indicators come with 8 inputs intended to be used with our solid state relay board (optional). Connect the input ribbon cable included with the relay board to this connector. Be careful not to invert the cable. Consult the factory for details on digital inputs. Note, a relay card may come with a split ribbon cable so inputs and outputs may use only one relay card. A wiring diagram will be included with the relay card.

Keypad Connector (JP 27)

The keypad connector is used to connect the VC-505 or VC-501 keypad to the MC Module. Note, use only the top row of pins when connecting the keypad to the MC Module.

SOFTWARE NAVIGATION

Front Panel Controls

The model VC-500 series keypad includes five multiple function keys. The VC-505 keypad also includes a twelve key numeric array. The primary (normal operation) function of the key is printed on the upper region of the key (in black) along with a graphic representation printed in the middle of the key. The secondary functions are printed on the lower region of each key in white.

**Zero / ^**

- The primary function of this key is to re-establish zero. The instrument will retain zero weights separately for each calibrated scale. This key will affect the currently selected scale only.
- The secondary function of this key is used to modify (increase) numeric data while in the Edit mode.
- A third use for this key is as an Exit or Abort feature. The lower region of the display will prompt the user when this key can be used to abort a procedure.

**Tare / v**

- The primary function of this key is to remove container weights from displayed net weight(s). The instrument will retain tare weights separately for each calibrated scale. This key will affect only the currently selected scale.
- The secondary function of this key is used to modify (decrease) numeric data while in the Edit mode.

**Print / <**

- The primary function of this key is to invoke the data output function. See the communications section of this manual.
- The secondary function of this key is used to scroll (down or left) while in the Menu and Edit modes, respectively.

**GN / >**

- The primary function of this key is to toggle between Gross and Net display modes.
- The secondary function of this key is used to scroll (up or right) while in the Menu and Edit modes, respectively.

**Select / Enter**

- The primary function of this key is to gain entry to the Menu mode.
- The secondary function of this key is used to accept the current value or choice while in the Edit mode.

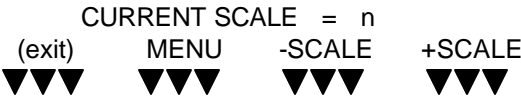
**Clear**

- The primary function of this key is to zero numeric entry during numeric edits (VC-505 only).





Menus

In the normal mode of operation all keys on the VC-500 series keypads assume their primary function. Once the Select/Enter key is pressed the menus can be accessed. The first (highest) level of the menu mode allows the user to switch the display between active scales.




Once the Select/Enter key is pressed, the following appears on the bottom of the display:




where n indicates the currently selected scale. The sets of triangles are used to point to the buttons used for the functions (the Zero, Tare, Print, and G/N keys).

- To change the displayed scale, use the  or  keys (pointed to by the -SCALE and +SCALE on the display).
- Press  to return to the normal display.
- Press the  key to enter the **Menu mode**. The following will appear on the display:

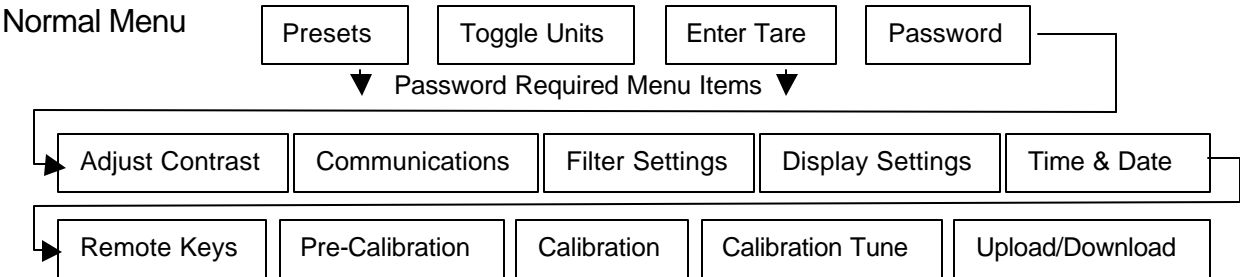
MENU: Presets
USE ARROW KEYS or PRESS ENTER

- Use the  or  keys to scroll through the menu selections.
- When the desired menu selection appears, press the  key.

(You may press the  to move up to the previous menu level, or to normal mode from the highest menu level.)

- Password protected menu items will not appear until the password has been entered or when the calibration jumper (JP 29) is installed upon power-up.

Menu Flow Diagram



Numeric Entry

VC-505 and VC-505S

For any numeric entry simply use the numeric keys 0-9 and clear. The select/enter key accepts the value entered.

VC-501

Use secondary function of the Zero, Tare, Print, G/N, and Select keys (white arrows) to edit the numbers.

- Use the up and down arrow keys to set your rightmost digit.
- Use the left arrow key to move one digit to the left.
- Again use the up and down arrow keys to set the value of this digit.
- Continue moving to the left until your entire number is entered.
- Press the select/enter key to accept the value entered.
- Note that once you have more than one digit displayed you may use the right arrow key to change any digit already entered.

Example: Entering the number 246 would require the following sequence:



NOTE: To exit numeric entry without changing the last setting it is necessary to enter and attempt to save an unreasonable value. For example, to discard modifications to a Preset value enter a number greater than the capacity of the selected scale. The entry will not be accepted as valid, it will be discarded, and the original value will be left intact.

Passwords and Access

There are ten menu items (this may vary depending on software version) associated with front panel control and configuration of the VC-500 Series. There are two levels of access into the menu system, normal operation and configuration/calibration (password required).

Normal access allows presets, tare, toggle units, and password entry.

Password access will allow functions that alter calibration or changes that may void approval in sealed applications. NOTE: for sealed applications an *Audit Trail Number* is maintained to track calibration. See the *Technical Reference* section page 21.

Once a password has been entered the access level will remain in effect until an invalid password is entered, or, instrument power is cycled.

MENUS and ACCESS	
MENU ITEM	PASSWORD
PRESETS	No
ENTER TARE	No
TOGGLE UNITS	No
PASSWORD	No
ADJUST CONTRAST	Yes
COMUNICATIONS	Yes
FILTER SETTINGS	Yes
DISPLAY SETTINGS	Yes
TIME & DATE	Yes
REMOTE KEYS	Yes
PRE-CALIBRATION	Yes
CALIBRATION	Yes

INSTRUMENT SETUP

To set up the instrument, the following actions must be performed in order:

- **Display Contrast Adjustment (if necessary)**
- **Pre-calibration (must be done separately for each scale connected)**
- **Filter Setting Adjustments**
- **Calibration**

Display Contrast Adjustment

(password required)

In the VC-500 series there are two methods for changing contrast. First, the **normal mode**, accessed via the menu, is for fine adjustment to contrast. The **recovery mode** is used in the event that a previously saved setting causes the display to appear black or invisible.

Normal Mode Adjustment

- Enter the menu mode and scroll to the 'Adjust Contrast' selection.
- Press the Select/Enter key. The display will show two lines of alphanumeric text and a line of menu items (Exit, Dec, Inc, Save) above the keypad.
- Press the Print key to decrease the setting (this will cause the display to appear lighter).
- Press G/N key to increase the setting (this will cause the display to appear darker).
- Press the Select/Enter key to save the present setting and exit the adjustment mode.

Recovery Mode

This feature is provided to restore readability to an unreadable display. The result of this procedure will rarely produce a perfect contrast setting and must be followed by the **normal mode adjustment** (above) for best results.

- Remove power from the instrument.
- Remove the keypad connector from the MC Module.
- Place a two point jumper across pins 10 and 12 of JP 27 (this would be the middle two pins on the back row of the keypad connector).
- Reconnect the keypad.
- Apply power to the instrument. A row of large 9's will appear with the message 'CONTRAST RECOVERY' on the display. The VC-500 series will auto-cycle through contrast setting causing the display to become darker. Upon reaching the darkest setting, the display will continue adjustment from the lightest setting. Press the Select/Enter key when the display appears readable.
- Remove power from the instrument and remove the jumper from JP 27.
- Reconnect the keypad and plug in the instrument. You should proceed to normal contrast adjustment if necessary. ****Note**** since you have cycled the power, you will need to reenter the password.

Pre-Calibration

(password required)

Pre-Calibration allows for configuration of scales (1-3) prior to calibration. The instrument must be configured prior to installation.

- Enter the menu mode and select Pre-Calibration. (Password or installation of jumper JP 29 is required for this menu option to appear.)
- At the prompt PRE-CALIBRATION MODE: Press Enter/Select.
- At the Select Action prompt Enter 1 for pre-calibration mode (selecting 0 will allow deletion of an existing configuration). Press the Enter/Select key.
- Select the scale to be calibrated from 1 to 3 (*1 to 6 if slave A/D option is installed*). The number is the scale's label for weight display. For a single scale system select 1. Press the Enter/Select key.
- Select the input channel(s) that the scale is connected to.
 - channel 1 = Pins 11 & 12 (JP 1)
 - channel 2 = Pins 9 & 10 (JP 1)
 - channel 3 = Pins 7 & 8 (JP 1)
 - *(If slave A/D is installed)*
 - channel 4 = Pins 11 & 12 (JP 1 on slave)
 - channel 5 = Pins 9 & 10 (JP 1 on slave)
 - channel 6 = Pins 7 & 8 (JP 1 on slave)

Press the Enter/Select key.

****Note**** for a scale using multiple channels, enter 12 for channel 1 and 2, 13 for 1 and 3, and 123 for all channels. **Channel 1 should always be used.** If channel 1 is already being used for another scale, you may use channels 2 and 3 for a second two-channel scale (enter 23).

- Select the units of measure the unit is to be calibrated in. 0 for pounds and 1 for kilograms. Press the Enter/Select key.
- Select the metrology mode 0 for USA or 1 for OIML. Press the Enter/Select key.
- Select the number of places to the right of the decimal point that you require for display and printing (ie: 0 sets the scale to the ones place, 1 for tenths, 2 for hundredths, etc.). Press the Enter/Select key.
- Enter the scale capacity. Press the Enter/Select key.
- Enter the scale count by, a multiple of 1, 2, or 5. Press the Enter/Select key.
- Enter the gain selection method. Enter 0 for manual entry or 1 for automatic calculation. Press the Enter/Select key.

For **Manual Gain Selection** enter 8, 16, 32, 64 or 128. The amplified full-scale load cell output cannot exceed 1.6 volts. The optimum gain setting is the one that gets you closest to 1.6 volts with out going over. The full-scale output of a 2-millivolt load cell with 9.6-volt excitation will be 19.2 millivolts. 19.2 millivolts multiplied by a gain of 64 will be 1.23 volts. This would be an acceptable gain factor.

For **Automatic Gain Selection** the instrument will prompt 'REFERENCE CALIBRATION'. This reference reading will usually be zero or no load. However, in applications such as Tank Scales, where a gross weight is already present the reference reading will be used only as a starting point for comparison to the following gain sample weight to establish gain. It is not necessary to enter a value, press Enter/Select key. Wait for the indicator to establish reference. The instrument will prompt for a Gain Sample Weight. Place the weight on the scale, use the full scale capacity if possible. Enter the amount of weight to be used for the sample and Press the Enter/Select key.

- The display will prompt for the desired TARE configuration.
Pushbutton tare enables the use of the tare button to tare any weight on the scale.
Keyboard tare allows entry of any number from the keypad to use as a tare weight. Under normal operation press any number, then press the tare key and the value entered will be the tare weight. Recall tare allows the use of lists of previously input values for the tare weights. See page 20 for further explanation of recall tare.

Entering a “0” will disable all Tare functions. A setting of “1” will enable pushbutton tare and keyboard (digital) tare. A setting of “2” will enable pushbutton tare only. A setting of “3” will enable Keyboard Tare only. Finally, a “4” will enable recall tare only.
- The display will prompt for Units Switching (Lb/kg) enabled or disabled.
- The display will prompt ‘Zero Tracking 1 = 1/8 divisions’. Enter the setting for the maximum allowable displayed counts to track at Zero. Note that this setting is in increments of ½ displayed digits. The maximum entry is ‘8’ or 4 displayed digits.
- The display will prompt ‘Select Break 1=1 division’. Enter a number from 0-3. The larger the number the more motion required to break out of averaging. Averaging stabilizes the weight in a noisy environment but will slow the indicator’s response to a weight change. If you use 0 for the break point, no filtering will occur no matter what is set in filter settings. This applies to static filtering only.
- To save the previously entered setup information, press the Enter/Select key. To leave the pre-calibration setup without saving, press the Zero key.
- Press the Zero key to back out of the menu mode when setups are completed.

Filter Settings

(Password required, perform for each scale)

- Enter the menu mode. Scroll to the ‘Filter Settings’ selection.
- Press the Enter/Select key.
- Enter the desired A/D update rate. This value is factory set to 20.00 corresponding to 20 A/D samples taken per second. This satisfies the speed and stability requirements for most applications.
 - In applications requiring slower A/D response, to eliminate spurious weight changes due to wind or vibration, this setting can be lowered to a minimum of 5.00 (5 A/D samples per second).
 - In applications requiring faster A/D response, to detect quick weight changes, this setting can be raised to 60 (60 A/D samples per second).

Tune this value as necessary for the fastest response providing a stable weight reading.

- Enter the desired filter setting. This setting provides for weight averaging. Entering a 1 provides the least averaging of weight samples yielding the quickest response. Entering an 8 provides the most averaging, yielding the most stable weight. The factory default is 3.
- Enter the filter queue type. This setting provides for two types of filter management, static and dynamic.

- The static filter implementation should be used where items are being weighted statically as in a shipping scale application. The weight will respond quickly to weight changes exceeding the break point setting (found in pre-calibration) then enter a heavy filtering mode to prevent further weight fluctuations. Because of the filters initial quick response to the weight low update rates and maximum filter settings can be used without compromising speed providing an extremely fast and stable displayed weight.
- The dynamic filter implementation should be used where smooth constant weight changes are required such as in filling operations. In this implementation the filter responds at the same rate for all weight changes.
- Enter the 'Motion Window'. A maximum setting of '19' is allowed. The setting represents the allowable number of 1/4 digits of motion allowed to satisfy stability for zeroing, taring and printing. A setting of '10' will accept '4' (1/4 x 10) digits of motion as stable for printing.
- Press the Enter/Select key. The display will prompt 'Motion Settle'. This defines the amount of time (in 0.1 sec.) that the instrument must remain within the above motion window before stability is acquired.

Calibration

(Password required, perform for each scale)

- Enter the menu mode (**Password must be enabled**). Scroll to the 'Calibration' selection. Press the Enter/Select key.
- At the prompt CALIBRATION MODE: Press the Enter/Select key.
- Enter the identification number (selected in pre-calibration) of the scale to be calibrated. On a single scale system this should be 1. Press the Enter/Select key.
- The instrument will prompt "Use Previous Zero 0=No 1=Yes". This allows re-calibration without re-establishing zero. Enter '0' when calibrating for the first time. Entering a "1" will cause the next step to be skipped.
- The instrument will prompt for the reference weight on the scale at this time. This will usually be 0. Enter the current weight and press the Enter/Select key.
- The scale will prompt for the calibration weight to be used. This will usually be full scale, however, under most circumstances as little as 2% of full scale capacity will be sufficient. Place the weight on the scale and press the Enter/Select key.
- The scale will prompt 'Enter sample weight'. Enter the weight and press the Enter/Select key. This set may take some time.
- To save the calibration information, press the Enter/Select key. To leave the calibration setup without saving, press the Zero key.
- Press the Zero key twice to return to normal mode when setups are completed.

Time and Date

(password required)

The VC-500 series instruments include automatic time and date. It should be noted that although the time must be set as a 24hr (Military Time), the user has the ability to have the hours printed in 12 hr format.

- Enter the menu mode and scroll to the 'Time & Date' selection.
- Press the Enter/Select key. The display will prompt 'Edit: Current hour' while the current hour setting is displayed. Enter the current hour in 24 hr format and Press Enter/Setup.
- Repeat the entries (as above) as prompted for minutes, seconds, month, day, and, year.
- The display will prompt 'PRINT: 0=no T/D, 1=12hr, 2=24hr'. Press 0 if you do not wish the time and date to be printed, 1 for it to be printed in 12 hr format (using am and pm), or 2 for it to be printed in military time. Press the Enter/Select key.

Communications Settings

(password required)

The VC-500 series has two separate configurable communications (serial) ports. Serial port 1 is intended for bi-directional communications and Serial Port 2 is intended for use with terminal devices such as printers. Please refer to the Communications Connections section (page 3) for configuration of hardware.

- Enter the menu mode and scroll to the 'Communications' selection.
- Press the Enter/Select key. The display will prompt 'SERIAL SETUP MENU'. Press Enter/Select.
- Select '1' for COM Port 1 (unidirectional), or '2' for COM Port 2 (bi-directional). Press Enter/Select.
- Select the appropriate baud rate for the device connected, 1= 1200 baud, 2= 2400, 3=4800, 4= 9600, 5=19200.
- Select the appropriate parity for the device connected, 1= none, 2= even, 3= odd.
- Select the appropriate communications type for the device connected, 1= printer, 2= serial. Make sure that you do not select 2 (serial) if you are using COM port 2.

For Serial Connections (**COM port 1 only**)

Bi-directional communication is available on port 1. Use this setting when connecting the instrument to Computers, Multi-Drop or Factory Networks.

- The prompt 'Instrument Address' will appear. For **RS-232** enter 0. If the instrument is being used in a Multi-Drop application, **RS-485**, where several devices are sharing communications cables, enter the desired device address from 1 to 32. Make sure to give each instrument a different address number. Press Enter/Select.
- The display will prompt 'TO SAVE INFORMATION..'. Press Enter/Select to save the new settings, or, press ZERO to discard the changes.

For Printer Connections

- If Printer output is selected the prompt will request 'Print Format'. Below are the format selections. Make your selection and press Enter/Select.

Printer Output Formats	
1	Net Weight
2	Gross, Tare, Net of Selected Scale*
3	Displayed Weight
4	GTN of All Scales
5	Custom (see Technical Reference)
6	Continuous Weight terminated with a carriage return
7	Continuous Weight Justified in a field 6 terminated with a carriage return

Note: If the display mode is 'Summing' the GTN of all scales and the total will be printed.

- The next prompt allows selection of 'Auto Print', 1= no 2= yes, if 'No' is selected the communications setup is complete. Press Enter/Select at the next prompt to save your settings.
- The display will prompt 'Auto Re-arm'. This setting specifies how near to Zero the instrument must return (following an automatic print) for the system to Re-arm the auto print mechanism. A setting of '1000' will allow the system to re-arm once the instrument returns to within 1000 times the least significant digit, of zero.
Example: A scale set to display to the hundredths place (0.01), at a auto re-arm setting of 100 will rearm when the scale is within 1 lb/kg of zero.
- The display will prompt 'TO SAVE INFORMATION..'. Press Enter/Select to save the new settings, or press ZERO to discard the changes.

Presets

(Password required for configuration only, Not active in VC-505S)

The VC-501 and VC-505 have three configurable preset operational modes with eight programmable preset settings. Each of the eight presets may be assigned to an individual scale in multiple scale applications. The presets are used to trigger relays on the optional relay card, or to control other output devices. **The checkweigh operational mode can be used without a relay card installed.**

Configuring Presets

(Password required)

- Enter the menu mode and scroll to the 'Presets' selection.
- Press the Enter/Select key. The display will prompt 'Select Preset (0=CONFIG)'. Select 0 and Press Enter/Setup.
- Select 0, 1, 2, or 3 (see table below) and press Enter/Setup.

Preset Configurations		
0	Static/Parallel	All outputs are active if weight < preset value
1	Sequential	Only first output is on initially, output must hit preset value to turn itself off and turn on the next output
2	Checkweigh	Outputs 1-3 are on for under, outputs 4-6 are on for OK, and outputs 7-8 are on for over
3	Zero-interlock	Weight must go below this value to re-arm presets
4	Disabled	

Preset Configuration Examples:

If you set your first 4 presets to: 100 lbs, 200 lbs, 300 lbs, and 400 lbs.

In **static/parallel mode**, all of the outputs will be on initially. As you reach 100 lbs the first output would turn off. As you reach 200 lbs the second output will turn off. As you reach 300 lbs, the third output will turn off. As you reach 400 lbs, the fourth output will turn off.

In **sequential mode**, the first output will be on initially. As you reach 100 lbs the first output would turn off and the second would turn on. As you reach 200 lbs the second output will turn off and the third would turn on. As you reach 300 lbs, the third output will turn off and the fourth will turn on. As you reach 400 lbs, the fourth output will turn off.

For **checkweighing**, the presets are set differently:

- Preset 1 = Zero Interlock
- Preset 2 = Top of UNDER region
- Preset 3 = Top of OK region

In this case if you set the presets at 10 lbs, 100 lbs, and 200 lbs, no outputs would be active with less than 10 lbs on the scale. When the weight is between 10 and 100 lbs, the first 3 outputs would be active, and under will appear on the screen. When the

weight is between 100 and 200 lbs, outputs 4-6 would be active, and accept will appear on the screen. When the weight is over 200 lbs, outputs 7-8 would be active, and over will appear on the screen.

The scale must go below the **zero interlock** value to re-arm the preset values. For example if your outputs are controlling a filling machine, you would not want the system to start filling again while your container is being lifted off the scale, but you would like it to wait for an empty container. If you set a zero-interlock it gives your system a weight that it must go below before it can start again. Note that for checkweighing the zero interlock is preset 1, it is not set from the preset menu.

Preset/Scale Assignment

(password required)

- Enter the menu mode and scroll to the 'Presets' selection.
- Press the Enter/Select key. The display will prompt 'Select Preset (0=CONFIG)'. Select 1 thru 8 and Press Enter/Setup.
- The display will prompt 'Assign preset to scale 1, 2 ...'. Select the scale that you would like this preset to apply to and press Enter/Setup.
- The display will prompt 'EDIT: edit Preset'. Enter the desired target number and press Enter/Setup.
- Repeat as required for presets 1 thru 8. (only use presets 1-3 for checkweighing)

Entering Presets

- Enter the menu mode and scroll to the 'Presets' selection.
- Press the Enter/Select key. The display will prompt 'Select Preset (0=EXIT)'. Select 1 through 8 and Press Enter/Setup.
- The display will prompt 'Edit: Edit Preset' while displaying the selected Preset's current setting. Enter the appropriate settings for the selected preset. Press Select/Enter.
- Repeat for Presets 1 through 8. (only use presets 1-3 for checkweighing)

Remote Inputs

(password required)

The model VC-505 has remote input capabilities to emulate the five function buttons ZERO, TARE, PRINT, G/N, and ENTER. Consult factory for information on connection of additional hardware.

- Enter the menu mode and scroll to the 'Remote Keys' selection.
- Press the Enter/Select key. The display will prompt 'Remote off = 0 Remote on=1'. Select 0 to disable remote keys or 1 to enable remote keys, and Press Enter/Setup.

Toggle Units

(This must be enabled during pre-calibration)

- Enter the menu mode and scroll to the 'Toggle Units' selection.

- Press the Enter/Select key. This will immediately change the units from lbs to kg or kg to lbs and return you to normal operation.

Display Settings

(Password Required)

The VC-500 series indicators can be configured to monitor up to three independent scales. The display settings menu selection allows the user to select which scale or scales will be present on the display in the normal mode of operation.

DISPLAY SETTINGS		
Selection	Mode	Function
0	Normal	Single display, current scale
1	ID	Normal with scale ID
2	All	Display all scales, selected scale occupies large display
3	Sum	Total weight of all configured scales

- Enter the menu mode and scroll to the 'Display Settings' selection.
- Press the Enter/Select key. The display will prompt 'DISP: 0=Norm 1=Id 2=All 3=Sum.' Enter the number representing your desired selection and press Enter/Select. Any number greater than 3 will force the display mode to 0.
- The display will prompt 'DISP: 0=Decimal Point 1=Comma'. Select 1 if a comma is desired in place of a decimal point. Press Enter/Select.

Note that the **ID mode will not work with the presets in checkweigh mode** because the same line of the display is used for the scale ID as for the over, accept, and under in the checkweigh mode.

Calibration Tune

(Password Required)

Calibration Tune allows for a quick tweak to a scale's span. For example if you have a 10,000 lb scale that counts by 1 lb increments and you have one 10,000 lb weight on it, but the display reads 10,003 lbs you could use this menu function. This should not be used in place of the initial calibration.

- Enter the menu mode and scroll to the 'Calibration Tune' selection.
- Press Enter/Select
- Enter the number of divisions that the scale is off by (3 in the example above) and press Enter/Select.
- Select the tune direction 0=down, 1=up (0 for the example above) and press Enter/Select.

Upload/Download

(Password Required)

The VC-500 Series supports saving and restoring calibration information via the serial communications port using the VBcal software (download from www.virtualmc.com).

Saving Calibration Information

- Calibrate the instrument using the standard calibration methods.
- Connect the instruments serial interface channel 1 to a computer with the Vbcal software utility installed.
- Run the VBcal utility.
- Use standard methods to set the instrument communication parameters for channel 1 to 9600 baud, no parity.
- Place the instrument in the 'Upload/Download' mode found in the password protected menu.
- Click 'Serial Com Set' and select the appropriate communications port.
- If the COM port is available an online condition will be displayed
- Enter a file name in the 'File Name' text box. The 'Browse' feature may be used to select directories, disk drives or existing filenames.
- Click 'Upload Calibration from VC-505'.

Restoring Calibration Information

- Connect the instruments serial interface to a computer with the calibration software utility installed (VBcal).
- Perform an instrument cold start by entering the password 57914. (Note: A restart may also be performed by shorting pins 8 and 12 on the master keyboard connector and performing a power cycle).
- Use standard methods to set the instrument communication parameters for channel 1 to 9600 baud, no parity.
- Place the instrument in the 'Upload/Download' mode found in the password protected menu.
- Run the VBcal utility.
- Click 'Serial Com Set' and select the appropriate communications port.
- If the COM port is available an online condition will be displayed
- Enter the name of the previously saved calibration file in the 'File Name' text box. The 'Browse' feature may be used to select directories, disk drives or filenames.
- Click 'Download Calibration To VC-505'.
- The download control buttons on the VBcal utility will disable during the download procedure and re-enable when calibration is complete.
- When the download is complete cycle power on the instrument.

100 Tare Register Set-Up / Recall

The Model VC-505 provides 100 Tare registers that can be recalled while in the normal mode. When the Password is enabled the tare register values may be entered. Tare Type 4 must be selected during 'Pre-Calibration'.

As the VC-505 is capable of managing multiple scales **each tare register will be assigned to the specific scale that is displayed in large text when the menu mode is entered.** Once recalled in the normal mode, the selected register's value will affect its associated scale.

For example, assume that the VC-505 is displaying three scales. Scale #1 is selected as the scale displayed in the large display. (This is the scale whose tare register would be edited through the menu mode.) Scales #2 and #3 appear on the 1st text line. The operator recalls a tare register, which has been assigned to scale #2. The value will affect only scale #2's display on the 1st text line.

Tare Register Set-Up

(Password required)

- Enter the menu mode and scroll to the 'Enter Tare' selection.

- Press the Enter/Select key. The display will Prompt 'Select Tare. Enter the desired Register Number (1 - 100 or 0 to Exit). Press Enter/Select.
- The current setting for the selected register will be displayed. Enter the desired setting and press Enter/Select. The VC-505 will automatically increment to the next tare register, i.e., if you just set up register 3 the display will prompt for the setup of register 4.
- Pressing the Enter/Select key repeatedly will allow you to step through, and view all tare registers. This will continue to be the case until you enter a 0 for the selected register.

NOTE: When '0' (Exit) is entered the display will prompt "ZERO INTERLOCK 0=NO, 1=YES". If YES is selected Tare Recall (see below) will be allowed only if the scale is at zero.

Tare Register Recall

(you must not be in password mode)

- Pressing any numeric key will begin the 'Recall Tare' selection.
- Enter the desired Tare Register ID number (1-100 or 0 to Clear) and press Enter.

The selected tare will become the active tare value for the scale assigned to that Tare Register. Entering a 0 will clear tare from the scale displayed in large numbers. Pressing 'Clear' then 'Enter' will do the same.

TECHNICAL REFERENCE

Calibration and the Audit Trail Number

Calibration Tracking

The VC-500 series indicators keep a record of changes to the instrument's Calibration and settings that alter performance or weight display. This *Audit Tracking Number* is retained in non-volatile (E²) memory, and cannot be preset or changed. It is incremented and stored each time a tracked action is performed.

NOTE: The following actions will alter the Audit Tracking Number, requiring re-certification in sealed applications:

- Changing the instrument's '**Display Settings**'
- Changing the instrument's '**Filter Settings**'
- Completing *and saving* a '**Pre-Calibration**' or '**Calibration**'
- Changing '**Baud Rate**' for electronic data transfer.

Viewing the Calibration Audit Tracking Number

Spot checks may be performed periodically by certifying agency personnel. To view the Audit Tracking number do the following.

- Enter the menu mode and scroll to the 'Password' selection.
- Press the Enter/Select key. The display will prompt you to 'Enter Password' with the *Audit Tracking Number* displayed on the lower part of the display.
- It is not necessary to enter a Password at this time. Press Enter to exit

MC Module Communications

The following defines the serial and PC/104 bus **communication protocol**.

Character Definitions:

Control Characters:

STX	Start Message	02 hex
ACK	Acknowledged good	06 hex
NAK	Acknowledged bad	15 hex
ETX	End Message	03 hex
LF	linefeed	0A hex
CR	carriage return	0D hex

Data Characters:

DDD.DD	Weight Data	'0-9' and '.'
S	Status Character	(see Status)
AAA	Bus or Multi-drop Address	(see Addressing)
SS	Scale Select	(see Addressing)
T	Variable ASCII Text	
SC	Smarts Control.	

SC = 'M' more to follow.
 SC = 'S' save smarts download.
 SC = 'C' cancel download.

Addressing:

An MC module in a standalone configuration will have an address (AA) of 0 and a load cell selection (SS) from 1 to 10. If only one load cell is present the 'single cell' requests may be used.

MC modules connected to a multi-drop will have an address selection (AA) from 1 to 32 and a load cell selection (SS) from 1 to 10. The multiple module/load cell commands must be used.

MC modules on a PC/104 bus will occupy two contiguous I/O bus addresses (AAA) from 300H to 30FH (optionally 310 to 31F). The first address (base address) is the command port and the second is the response port. The load cell addresses (SS) are from 1 to 5. The multiple module/load cell commands must be used.

Status:

The status information is formatted in printable ASCII characters to avoid conflicts with control characters. Each status byte will be in the range 30H to 3FH, four status bits per byte. There will be multiple status bytes sent defined as follows.

<u>Status</u>	<u>Byte</u>	<u>Bit</u>	<u>Definition</u>
At Zero	1	1	The scale is at zero.
Stable	1	2	The scale is stable.
Over Capacity	1	4	The scale is over capacity
Tare Active	1	8	There is an active tare value.
Cal. Error	2	1	There is a calibration error (no calibration)

Ram Error	2	2	The ram integrity test failed
Zero Req. Act	3	1	A zero request is being processed
Tare Req. Act	3	2	A tare request is being processed
UOM	3	4	Unit of measure 0=lb 1=kg
Smarts Active	3	8	A Smarts program is running

Example:

The following is an example of status byte 1 indicating the scale is at zero and stable.

Hex	Binary	ASCII
33H	00110011B	'3'

Rules:

- All requests and response begin with an <STX> and end with an <ETX>.
- The <CR> character is used as the delimiter between fields.
- The fields may be of varying character lengths as required.
- Leading spaces may appear in the weight field.
- Multiple requests are not allowed. The requestor must wait for a response before additional requests are made. The exception will be retrying after a time out error.

Print Formatting: (Serial interface only)

The following commands are used to create custom print formats. These commands are placed in the 'TTTT' field of the 'F' command.

Text:

Text to be printed is identified by surrounding the text with “ ”.
Example: “This will be printed as text”

Carriage Returns, Linefeeds, and Control Characters:

Carriage returns and line feeds are placed in text field with the following escape sequences. \r for carriage return and \n for line feed.
Example: “This will be printed as text followed by a line feed\n”.

Weight Fields:

The 'W' command will insert the selected weight field. This command has three variable components that must be provided. They are the scale number to be printed, the weight type (net=0, gross=1 or tare=2), and the field size for the weight. These fields are separated by ‘.’

W(scale number).(weight type).(field size)
Example: W1.0.8 (This will print the net weight from scale one right justified in a field of eight.)

Delimiters:

The print format information will be surrounded by @@.

A Sample Print Format:

<STX>'F'<CR>@"Scale 1 Tare Weight"\r\nW1.2.8" lb.\r\n"@<ETX>

This will print:

Scale 1 Tare Weight
123.4 lb.

Commands/Responses:

Note: Where ASCII characters are intended they will be in single quotes. For example the ASCII character W will be written as 'W'. Control characters will be written with <> around them. For example CR (carriage return) will be written as <CR>.

Request the net weight from a single scale system:

Command: <STX>'M'<CR><ETX>
Response: <STX>DDD.DDD<CR>SSS<CR><ETX>

Request the net weight from a multiple module or multiple scale system.

Command: <STX>'M'<CR>AA<CR>SS<ETX>
Response: <STX> DDD.DDD<CR>SSS<CR><ETX>

Request the gross weight from a single scale system:

Command: <STX>'B'<CR><ETX>
Response: <STX>DDD.DDD<CR>SSS<CR><ETX>

Request the gross weight from a multiple module or multiple scale system.

Command: <STX>'B'<CR>AA<CR>SS<ETX>
Response: <STX> DDD.DDD<CR>SSS<CR><ETX>

Set the print format for a single scale system. See print formatting for print format details.

Command: <STX>'F'<CR>@TTTTT@<ETX>
Response: <STX><ACK><CR><ETX>
<NAK>

Set the print format for a multiple module or multiple scale system. . See print formatting for print format details.

Command: <STX>'F'<CR>AA<CR>SS<CR>@TTTTT@<ETX>
Response: <STX><ACK><CR><ETX>
<NAK>

Request a print from a single scale system:

Command: <STX>'O'<CR><ETX>
Response: <STX>SSS<CR><ETX>

Request a print from a multiple module or multiple scale system.

Command: <STX>'O'<CR>AA<CR>SS<ETX>
Response: <STX> SSS<CR><ETX>

Request the tare weight from a single scale system:

Command: <STX>'R'<CR><ETX>
Response: <STX>DDD.DDD<CR>SSS<CR><ETX>

Request the tare weight from a multiple module or multiple scale system.

Command: <STX>'R'<CR>AA<CR>SS<ETX>
Response: <STX> DDD.DDD<CR>SSS<CR><ETX>

Request the gross tare and net weights from a single scale system:

Command: <STX>'A'<CR><ETX>
Response: <STX>DDD.DDD<CR>SSS<CR><ETX>

Request the gross tare and net weights from a multiple module or multiple scale system.

Command: <STX>'A'<CR>AA<CR>SS<ETX>
Response: <STX> DDD.DDD<CR>SSS<CR><ETX>

Request the status from a single scale system:

Command: <STX>'S'<CR><ETX>
Response: <STX> SSS<CR><ETX>

Request the status from a multiple module or multiple scale system.

Command: <STX>'S'<CR>AA<CR>SS<ETX>
Response: <STX> >SSS<CR><ETX>

Request zero on a single scale system:

Command: <STX>'Z'<CR><ETX>
Response: <STX> SSS<CR><ETX>

Request zero on a multiple module or multiple scale system.

Command: <STX>'Z'<CR>AA<CR>SS<ETX>
Response: <STX>SSS<CR><ETX>

Request tare on a single scale system:

Command: <STX>'T'<CR><ETX>
Response: <STX> SSS<CR><ETX>

Request tare on a multiple module, or a multiple scale system:

Command: <STX>'T'<CR>AA<CR>SS<ETX>
Response: <STX>SSS<CR><ETX>

Toggle the units on single scale system:

Command: <STX>'U'<CR><ETX>
Response: <STX> SSS<CR><ETX>

Toggle the units on a multiple module or multiple scale system.

Command: <STX>'U'<CR>AA<CR>SS<ETX>
Response: <STX> SSS<CR><ETX>

Error response, unrecognized command or data error:

<STX>'!' <CR><ETX>

The 'p' command selects which predefined preset to use. 'TTT' is a number between 1 and 999.

Select preset on a multiple module or multiple scale system.

Command: <STX>'p'<CR>AA<CR>SS<CR>TTT<ETX>
Response: <STX><ACK><CR><ETX>
<NAK>

Master/Slave Configuration

The following describes the hardware configuration and pre-calibration channel identification when implementing the slave A/D option.

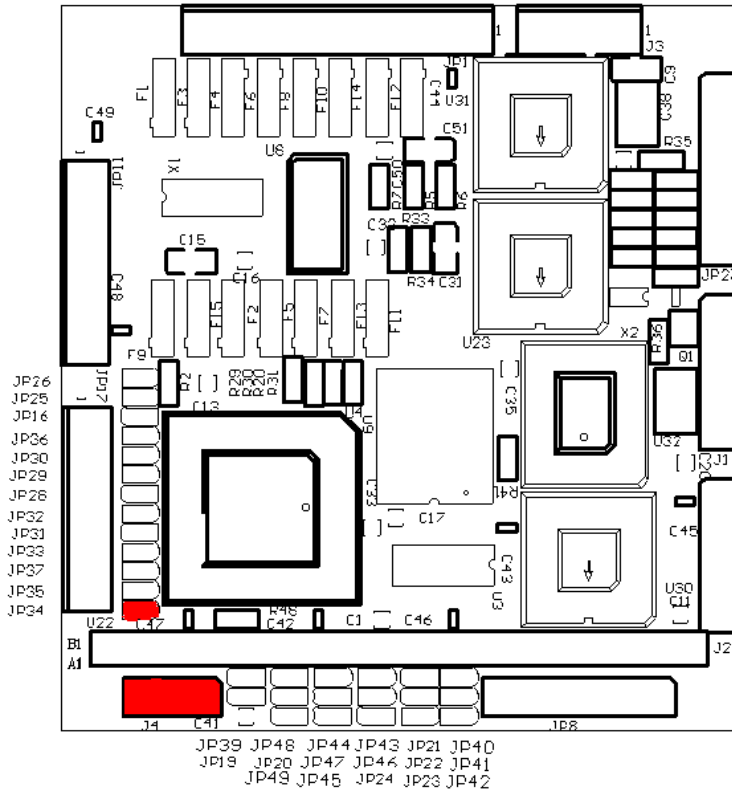
Channel Selection:

- 1) Channel Identification.
 - a) When connecting multiple inputs begin with channel 1. The remaining channel may be assigned to scales at random.
 - b) Main Board
 - i) Inputs on JP1-12+ JP1-11- Identify as channel 1 in pre-calibration
 - ii) Inputs on JP1-10+ JP1-9- Identify as channel 2 in pre-calibration
 - iii) Inputs on JP1-8+ JP1-7- Identify as channel 3 in pre-calibration
 - c) Slave Board
 - i) Inputs on JP1-12+ JP1-11- Identify as channel 4 in pre-calibration
 - ii) Inputs on JP1-10+ JP1-9- Identify as channel 5 in pre-calibration
 - iii) Inputs on JP1-8+ JP1-7- Identify as channel 6 in pre-calibration

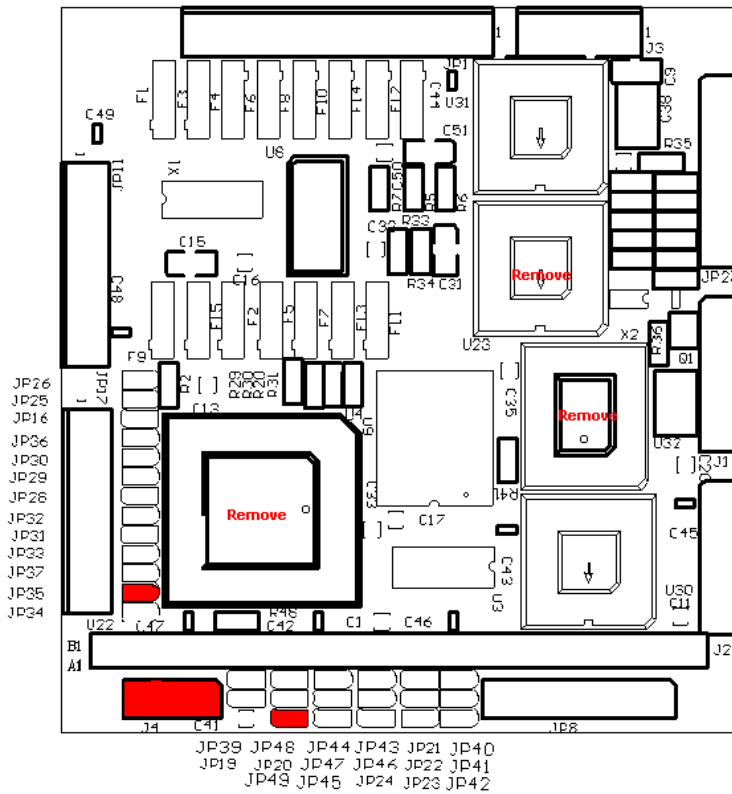
Jumpers:

- 1) Master
 - a) Program
 - i) Standard 501/505 887dd or newer.
 - ii) SMARTS 505S 868kd or newer
 - b) Install
 - i) JP34
- 2) Slave
 - a) Remove the microprocessor.
 - b) Remove the U32 program.
 - c) Remove U23 peel
 - d) Install
 - i) JP35
 - ii) JP49
- 3) Connect ribbon cable between the J4 connectors on the Master and Slave modules. This is a 1 to 1 interconnect.
- 4) Stack the MC modules using the PC104 connector J2.

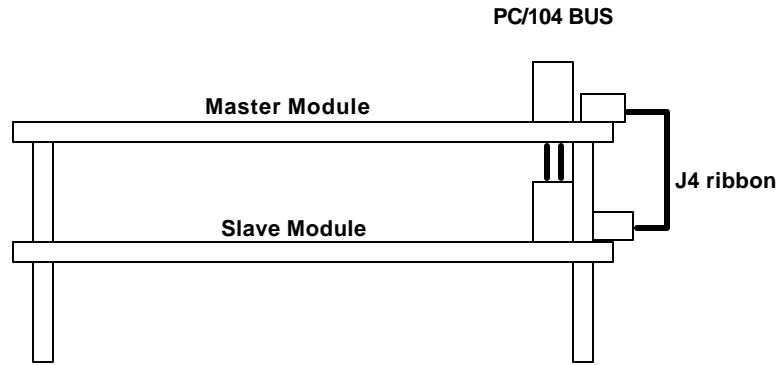
Master



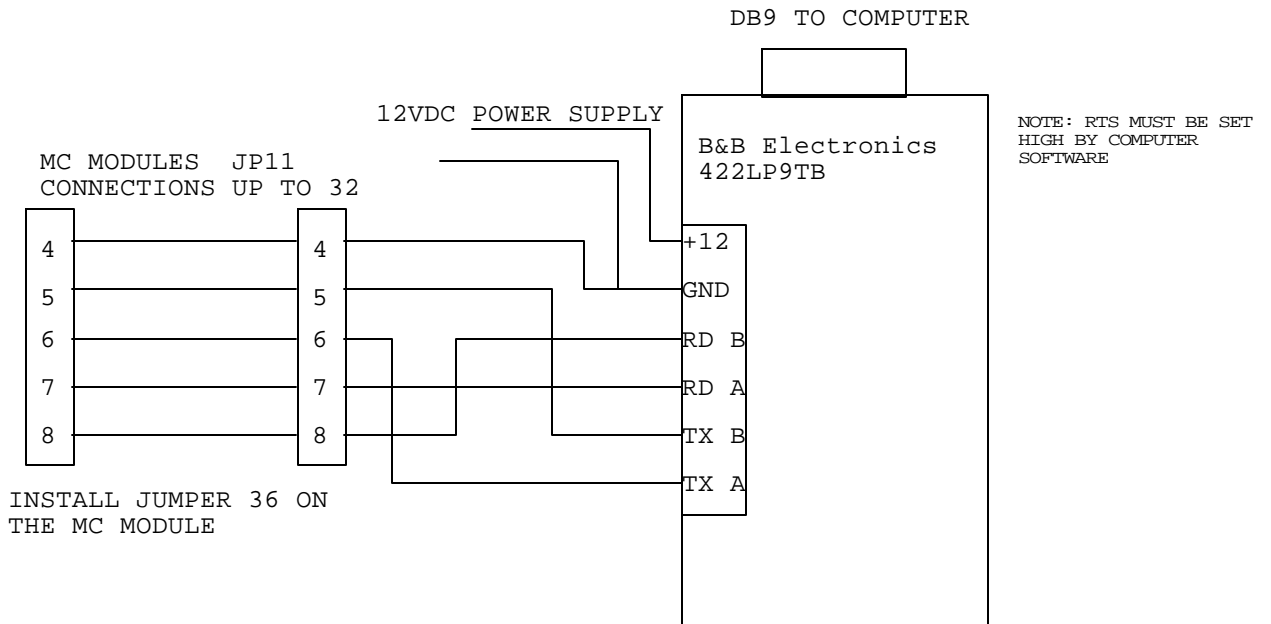
Slave



Stacking

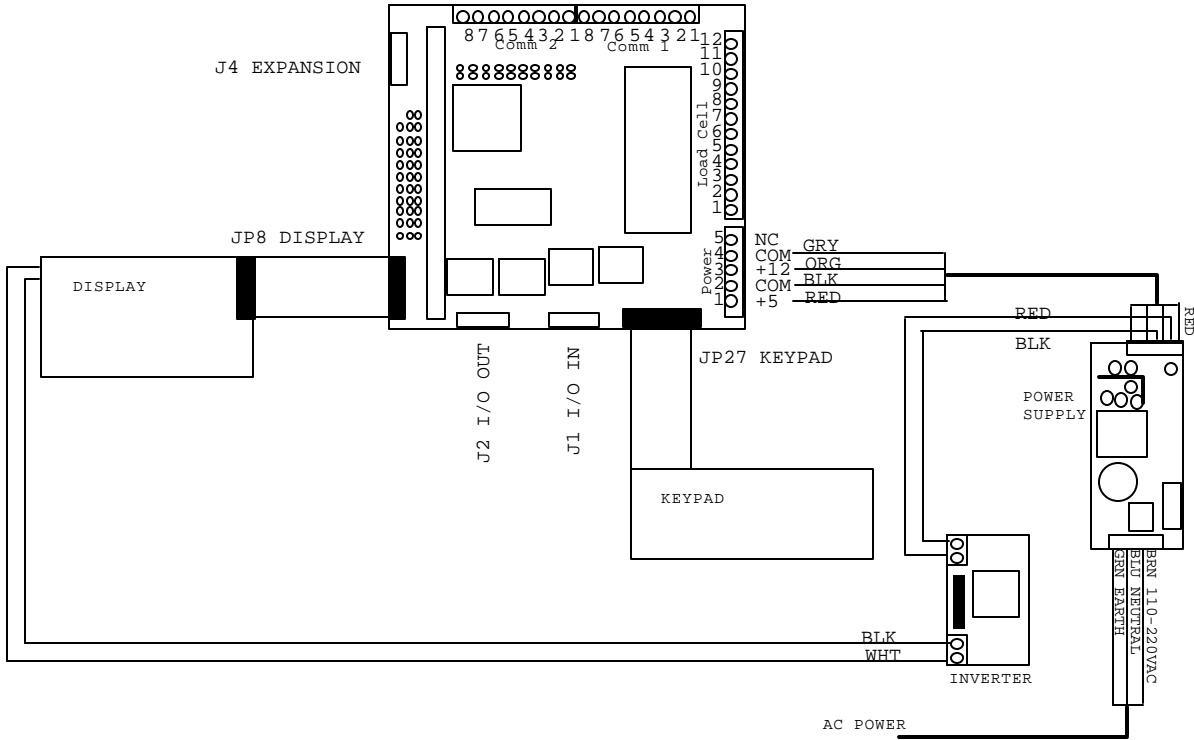


Connecting RS-485 to a PC

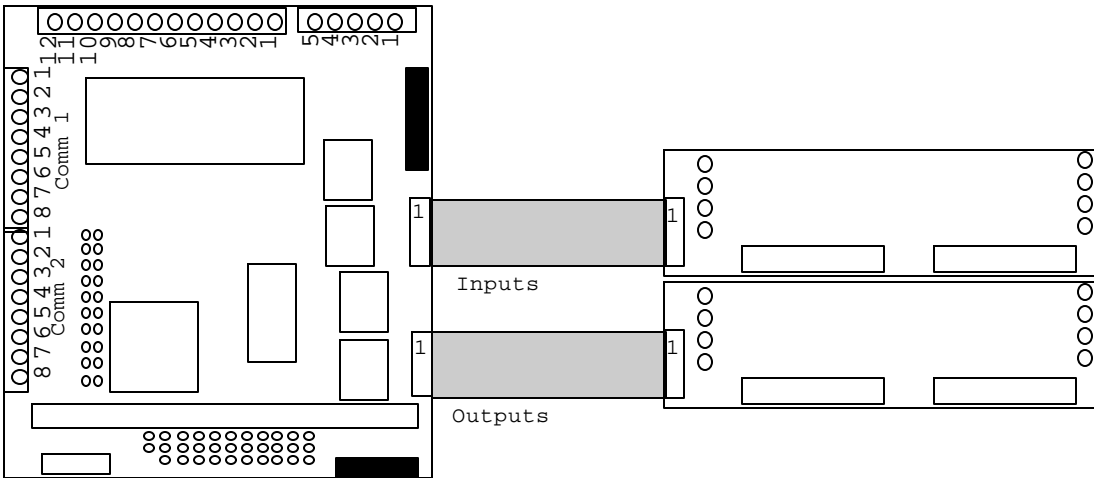


Note: Connecting RS-485 to a PC requires optional hardware (422LP9TB). The above diagram shows how to connect this optional hardware.

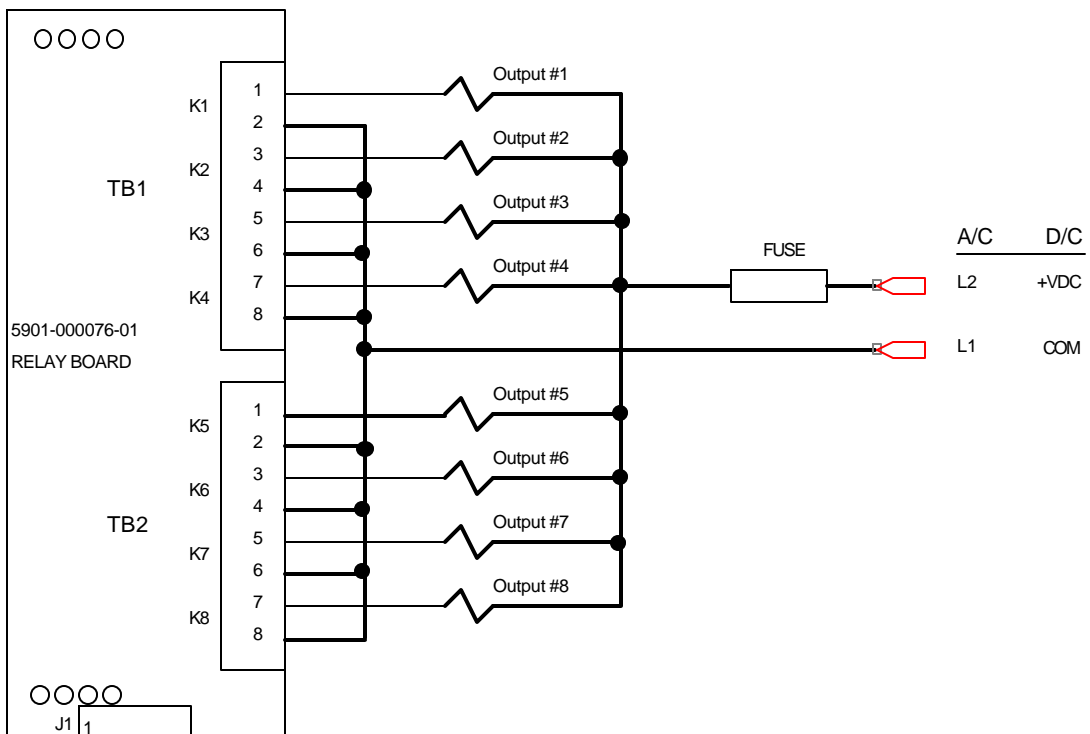
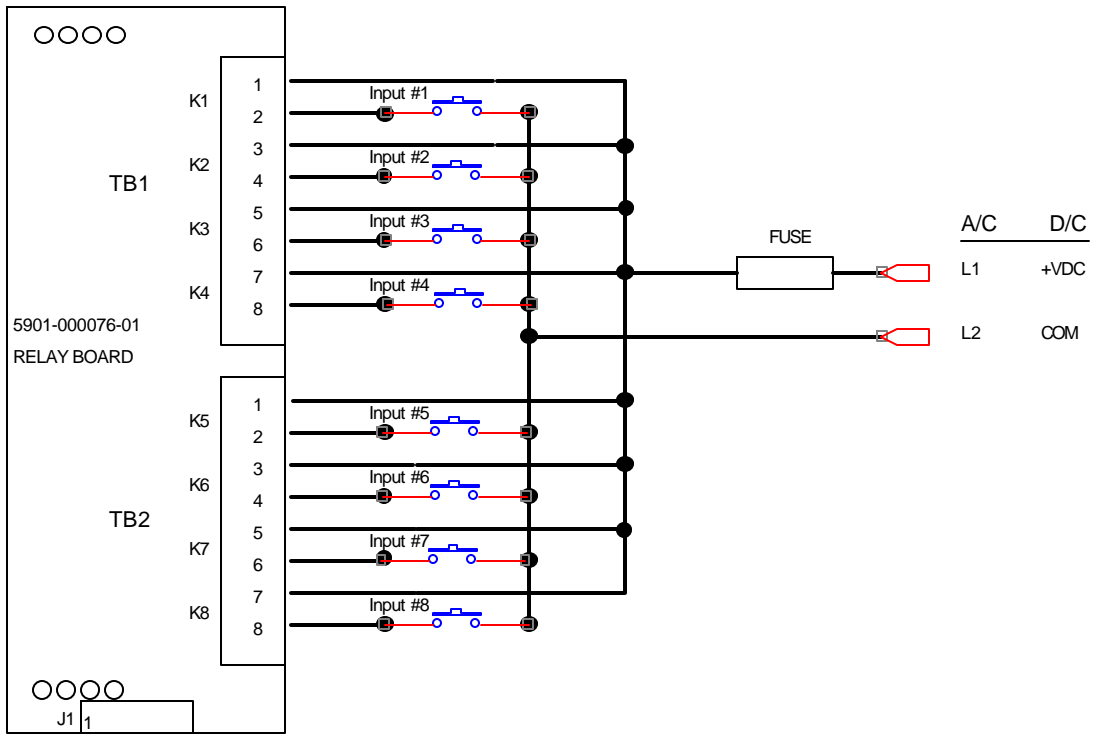
VC-500 Series Internal Wiring Diagram



Relay Board Wiring Diagrams



The diagram above shows the location of pin 1 on the ribbon cables that connect to the relay cards.



Notes: