



POWER DOWN TO PLUG AND UNPLUG, PLEASE!

Do not plug or unplug units under test into or out of the MTS-003 while the MTS-003 is powered on. This is hard on both the tester and the peripheral, and while you might "get away with it for awhile", it will cause arcing and pitting on connectors and reduce the life of the connectors in the process. We use premium phosphor bronze contacts where possible so that they will flex and last longer than the normal tin used in high volume manufacturing, please do your part and don't pit the premium connectors up needlessly or prematurely.

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Revision: A

The MTS-003 Vending Multitester.

Mathew Technical Services Incorporated
1900 North Second Street
St. Charles, MO. 63301
Tel. 636-723-3000

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Warranty

Mathews Technical Services Inc. warrants the MTS-003 tester to be free from defects in material and workmanship. Mathews Technical Services Inc. (MTS) will repair or replace (at its option) any part of the equipment which proves to be defective in materials or workmanship within a 90 day period from the date of purchase.

Other conditions applicable to this warranty are:

1. This warranty will not apply to any equipment which has been, in MTS' opinion, subjected to abuse, misuse, neglect, improper installation, vandalism, improper maintenance, or unauthorized repair, or is found to include parts other than original parts as supplied by MTS.
2. MTS will not be responsible for any expense incurred by the purchaser incidental to the repair or replacement of equipment covered by this warranty.
3. Freight charges to send the equipment to MTS or an MTS appointed repair center for warranty service will be the responsibility of the purchaser.
4. This warranty is in lieu of all other warranties oral or written, expressed or implied, including without limitation, warranties of merchantability, warranties of fitness of purpose, and all other obligations or liabilities of MTS. MTS neither assumes nor authorizes any person to assume for it, any other obligation or liability in connection with this warranty policy.
5. Liability to MTS is limited to the repair or replacement (at its option) of defective parts within the product and does not include incidental and consequential damages.

Effective 10/31/2002

The following are the most common reasons why testers are returned for repair:

- (1) Connecting 24 volt D.C. coin changer (dumb) to the tester when 115 volt D.C. is present on the 12 and 15 pin coin changer sockets!
- (2) Connecting old Mars MC5000 Series coin changer (dumb) operating at either 115 or 24 volt A.C. to your tester, without using a special interface harness. (Optional)
- (3) Connecting both 115 and 24 volt A.C. connectors of the special interface harness to the tester, when testing A.C. rated Mars coin changers.
- (4) Connecting coin changers or bill validators which are internally shorted.
- (5) Connecting coin changer or bill validator to your tester at the same time.

OPTIONAL HARNESSES

PART NUMBER	PART DESCRIPTION
100142	Harness, NBE-21 to MTS-001/002
100147	Harness, Low Voltage (MTS-001/002)
100148	Harness, High Voltage (MTS-001/002)
100149	Harness, Power (MTS-001/002)
100151	Harness, Mars VFM3 to MTS-001/002/003
100152	Harness, Mars 5000 Series to MTS-001/002/003
100251	Harness, Extension (MTS-003)
100257	Harness, BA30 to MTS-003
100265	Harness, Serial (MTS-003)

The MTS-003 is divided into 3 panels:

A) The top of the tester is for all coin changer connections with the exception of the MDB connection for MDB changers.

B) The (angled, vertical) middle of the tester is for the display, the user switches, and indicator lamps (LED type).

C) The Front bottom (vertical) area of the tester is for connections to bill validators including the MDB port that is used for both changers and validators. Also included in this area is the RS-232 port to allow data to be sent to a personal computer (9600,N,8,1 format) via the same standard cable you use for a computer to external modem connection. This is known as a 9M to 9F, pin to pin, extension cable and is common at Radio Shack and computer stores.

The following explanation is to inform the average user who desires general information to test vending equipment with the MTS-003 tester. It is not complete with timing or connector pinout details, and it purposefully avoids this and other subjects in order to maintain security, and in respect of each company's confidential information. It is assumed that the qualified service person will have access to this type of information from the manufacturer in the form of manuals and diagrams.

Basic Vending Interfaces: There are 5 basic styles that we will divide into 6 descriptions to follow. You will read how the Multiprice changer and the Serial Bill Validator really use the same basic

serial interface. This serial interface is slow (600 bits per second) and is ONE WAY only; from the validator or changer to the vending machine.

1. High Level Pulse for Changers and Validators.

This was made popular by the Single Price Changer for cold drink vending. In this system the Changer is also the vending machine controller and decides when to make change, enable a vend, or allow the use of the optional bill validator if the machine is so equipped. This uses a large 8 pin Jones connector for changers and 4, 6, and 9, and 12 pin nylon connectors depending on the make and model of a validator.

The single price cold drink machine Coin Changer and Validator use this interface to function as well as many, legacy applications of coin and bill accepting equipment. In essence high level pulse is accomplished via the closing of relay (or solid state relay or optocoupler) output when money is accepted.

2. Low Level Pulse for Validators

This uses a 9 pin nylon connector and the 18 pin connector also used for TTL and serial mode as described below.

This is very similar in nature to High Level Pulse with the provision that the signal level used is typically low DC voltage. Vend price is set by an external VMC or vending machine controller.

3. TTL interface for Validators

The TTL (TTL is digital logic popular in the 1970's.) interface is similar to the low level pulse operation with the exception that all signals are of 5VDC level, there are separate signals for \$1, \$2, and \$5 bills, and there are enable signals and provisions in some validators for escrow (hold the bill until vend is done so it can be returned if the user want their money back) also at the 5VDC signal level. In this scheme also the vend price and general operation is handled by an external VMC or vending machine controller.

4. Serial 18 pin validator interface. The 18 pin connector support enough signals for several modes of interface using this one connector scheme. Low Level, TTL, TTL plus Escrow, Slow serial (600 BPS), and finally Slow Serial plus Escrow. Use of the serial validator signals allow transfer of received money and status from the validator to the vending machine as computer data instead of pulses as used by interface types 1,2, and 3 above. The crucial data signals work in a set of 3. The first is a to send data to the vending machine, the second is a enable to allow the data to be sent from the vending machine, and the third is the data that is sent in one direction only, from the validator to the vending machine. These signals are ALLOC, SENT, DATA. In addition to these signals are a RESET and CAN ACCEPT pair of signals that are key. CAN ACCEPT is used to both enable the validator and for accomplishing ESCROW RETURN functions in Slow Serial mode of operation. *ESCROW CAN BE A CONFUSING THING TO TEST SINCE IT IS AVAILABLE IN BOTH TTL AND SERIAL MODES BUT IS IMPLEMENTED VIA TWO SEPARATE GROUPS OF SIGNALS ON THE 18 PIN INTERFACE. THE MTS-003 DOES NOT TEST TTL ESCROW.*

5. Multiprice for Coin Changers

This interface uses a 12 or 15 pin Jones connector for signals to the changer from the vending machine. The data for coins recognized and status from the changer to the vending machine is a Slow serial (600 BPS) format almost identical to the Slow serial format used on the type 4 validator interface'. The crucial data signals work in a set of 3. The first is a request to send data to the vending machine, the second is a enable to allow the data to be sent from the vending machine, and the third is the data that is sent in one direction only, from the changer to the vending machine. These signals are INT, SEND, DATA. In addition there are defined RESET and 3 or 4 COIN DISPENSE signals in order to payout change from tubes under control of the vending machine.

6. Multi Drop Bus interface.

This is the most modern scheme for interface. It consists of a piggyback power and signal scheme whereas all the peripherals hook to the vending machine control on a shared set of 5 wires. This is done with a 6 pin Nylon connector. In this scheme the vending machine is the Master and all the peripherals are slaves. The Master asks each slave for a report many times per second and then allows a short time for the slave to respond.

In this way an orderly interface is accomplished that allows Changers, Validators, Card Readers, and many more types of devices to share a communications channel to the vending control. The 6 pin connector provides power and common as well as a data signal from and one to the VMC or vending machine controller..

MTS-003 Core Capabilities:

Single Price, 120VAC changers via the top mounted, 8 pin Jones connector.

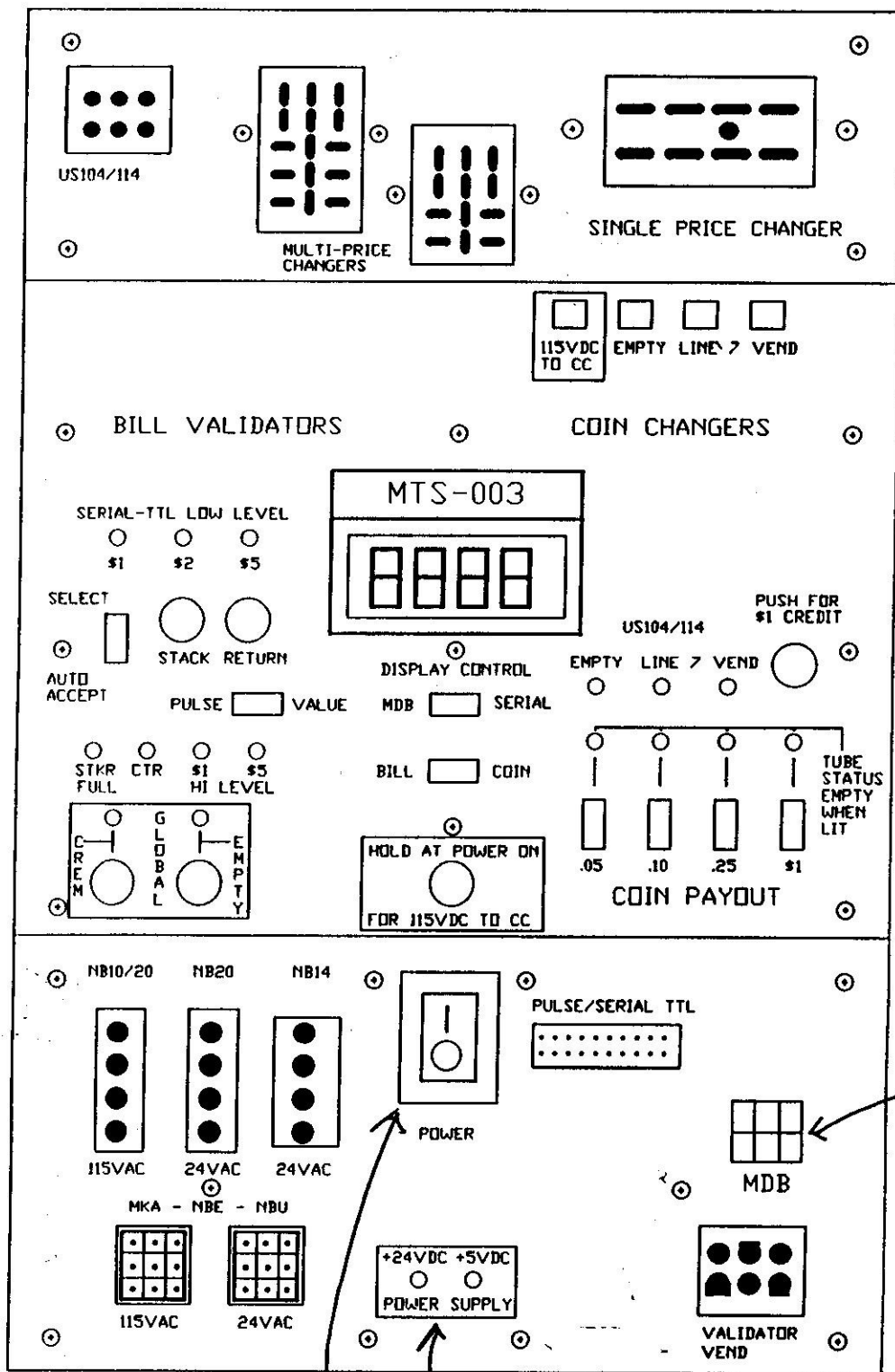
Multiprice changers - using the top mounted, 12 and 15 pin Jones connectors for 24VDC and 115VDC types, and using the P.N. 100152 harness for the 120VAC and 24VAC types offered by one manufacturer.

MDB type changers using the front panel mounted MDB connector.

Single bill type validator, 120VAC input, high level pulse.

Multiple bill type validators using 120VAC or 24VAC power input, and operating in low level pulse, TTL interface, and slow serial interface with or without Escrow feature. The low level, TTL, and slow serial types are all supported by the various signals on the 18 Pin interface cable that plugs into the front panel of the MTS-003.

MDB validators using the front panel mounted MDB connector.



CHANGER AREA

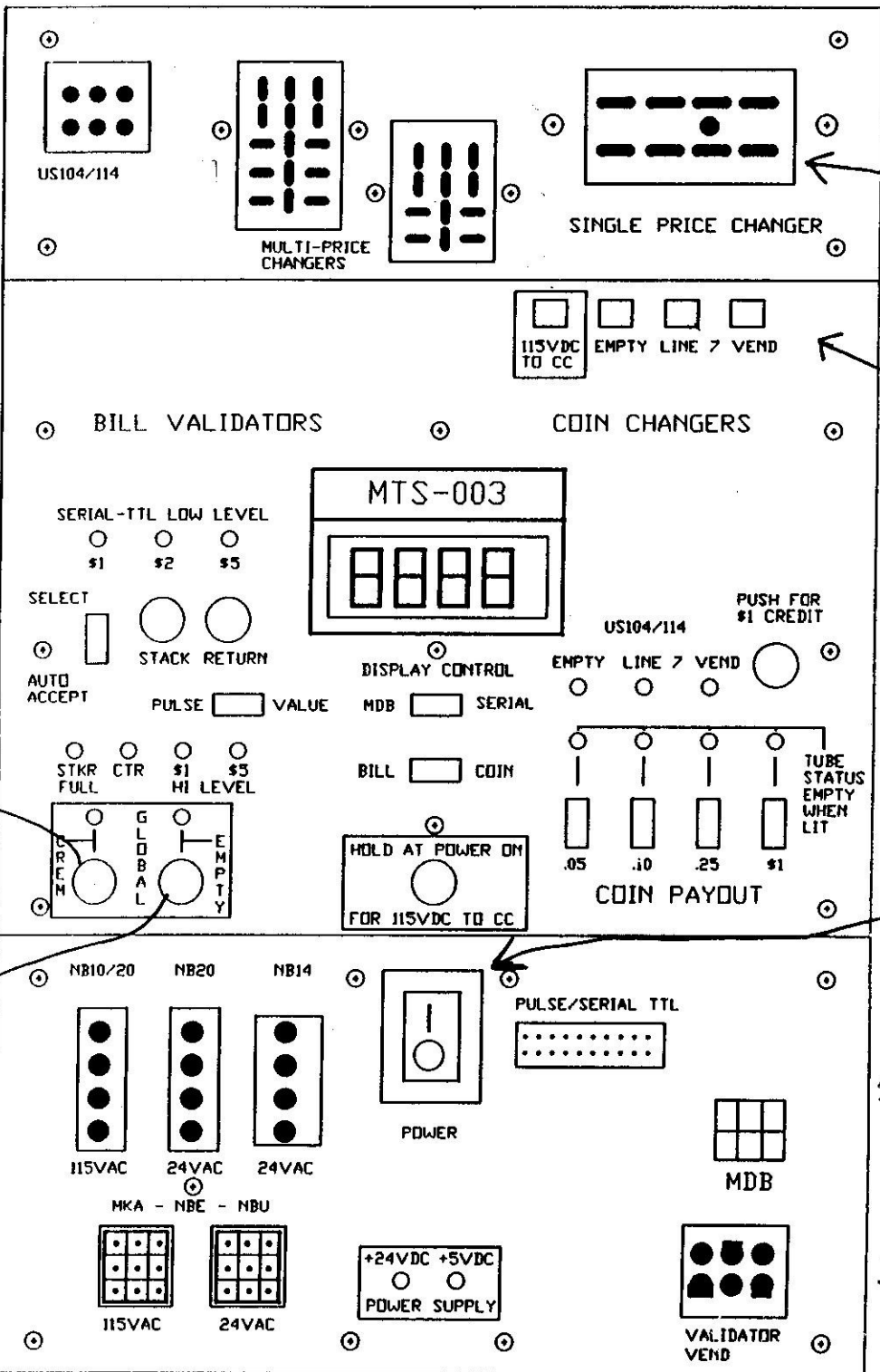
OPERATOR CONTROLS AND INDICATORS

VALIDATOR

CC + BV
MDB
PORT

ON/OFF SWITCH
D.C. INDICATOR

MTS-003
3 FUNCTIONAL SURFACES



PLUG IN HERE

3 SIGNAL INDICATORS

CREM INHIBIT

EMPTY INHIBIT

ON/OFF HERE

1. SET UNIT VEND AMOUNT

2. DROP
5¢
10¢
25¢

3. OBSERVE VEND INDICATOR

4. TEST CREM + EMPTY INHIBIT

SINGLE PRICE CHANGER
 SET VEND PRICE TO: 25¢ ON UNIT.
 CHECK - ACCEPTANCE, COIN PAYOUT,
 AND CREM AND EMPTY INHIBIT

or determine the proper dipswitch settings from checking a known good unit before testing a peripheral with these switches.

Single Price High Level Changer Test procedure

This unit is perhaps the most difficult to set up for test because it is the changer and also the vending machine control (VMC) at the same time.

Always check operating voltage marked on the changer before beginning to test. There are few single price changers in the field that were made to run on 24VAC and will not work with the 8 pin Jones connector of the MTS-003.

1. Power off the tester.
2. Plug the changer into the 8 pin Jones plug on the top of the tester. The slide switches on the MTS-003 are not used for Single Price testing and can be left in any desired position.
3. Set the price on the changer to 25 cents. To set this price you will have to consult the manufacturer's manual to see where, and how (often a row of switches called a dipswitch) to accomplish this. You can leave this set to some other value (for example the going vend price) but the 25 cents setting is good to check the acceptance of nickel, dime, quarter insertions in a fast and easy manner.

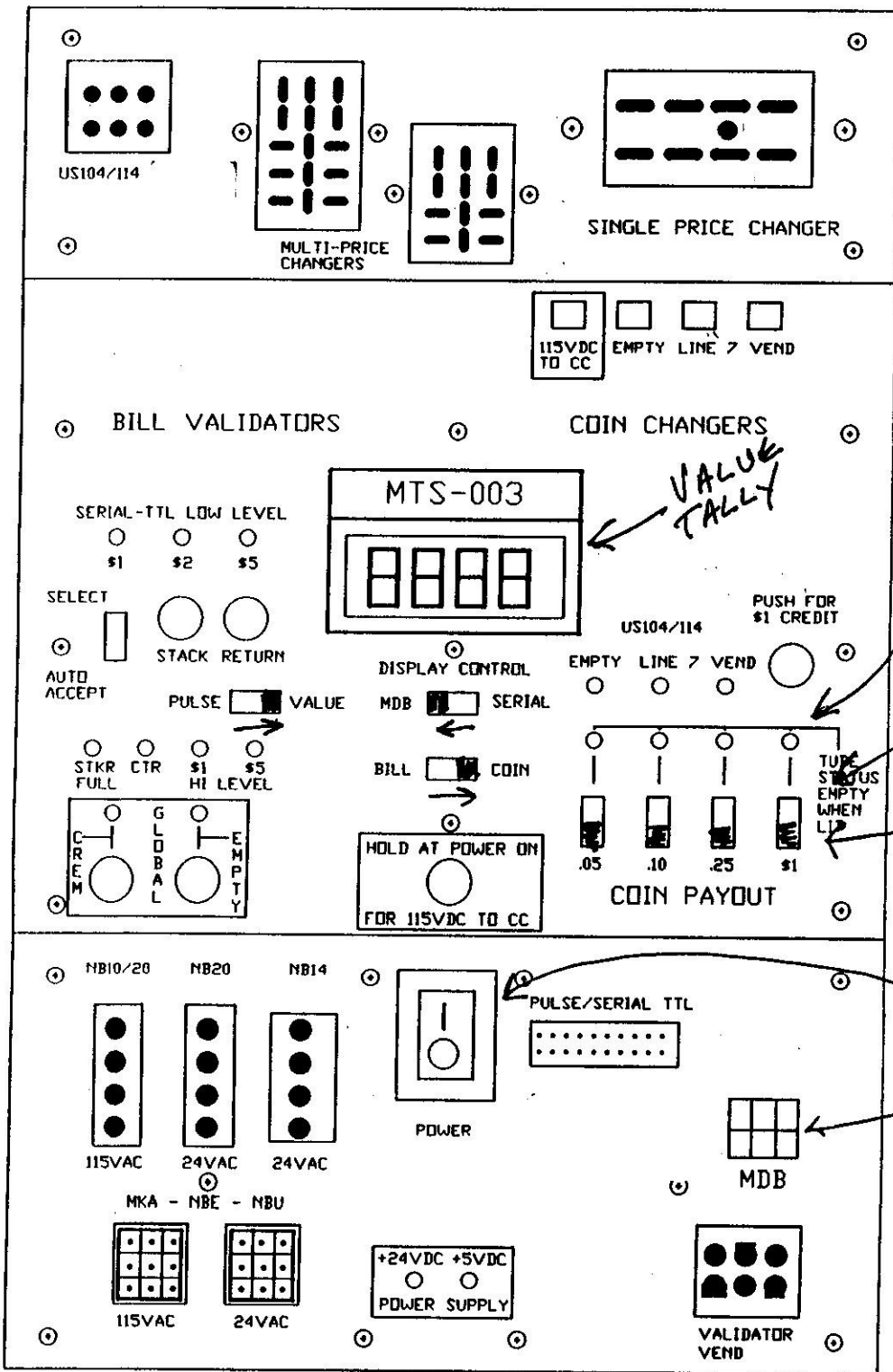
4. Power on the tester with the changer attached.
Observe Empty light and Line 7 light on the tester, they should light and stay on assuming changer is empty. If they do not come on suspect a changer failure.
5. Drop in a nickel. It should be accepted and routed to the coin tubes. Drop a dime then a quarter and these too should be accepted and routed to the coin tubes. As the quarter goes in the changer will see the accrued amount jump from 15 cents to 40 cents which exceeds vend price by 15 cent. The Yellow Vend lamp on the MTS-003 will flash to signal vend and the changer should return your nickel and dime to properly honor the 15 cents above the 25 cent vend price that was inserted by you previously.
6. Manually load a few of each coin type into the tubes of the changer. Actuate the manual payout switches on the changer and observe proper payout of each coin type until the changer tubes are all empty. To test lower tube sensors insert 30 of each coin type into the changer and observe that the tube empty lamp goes out. In addition this will give you a good idea of the tuning and coin acceptance condition of the changer. If the changer operates properly but rejects more than a handful of coins (8 out of 30 for example), tuning may need adjustment by you or a repair depot if you are not qualified to do so.

Note that early Conlux USL units and possibly others will insure that they can make change for the amount inserted versus the vend price. In these units be sure to cover the lower sensor in at least the nickel tube in order to provide adequate change and allow the changer to accept all coin types during test. (This is true when vend price is set below 25 cents.)

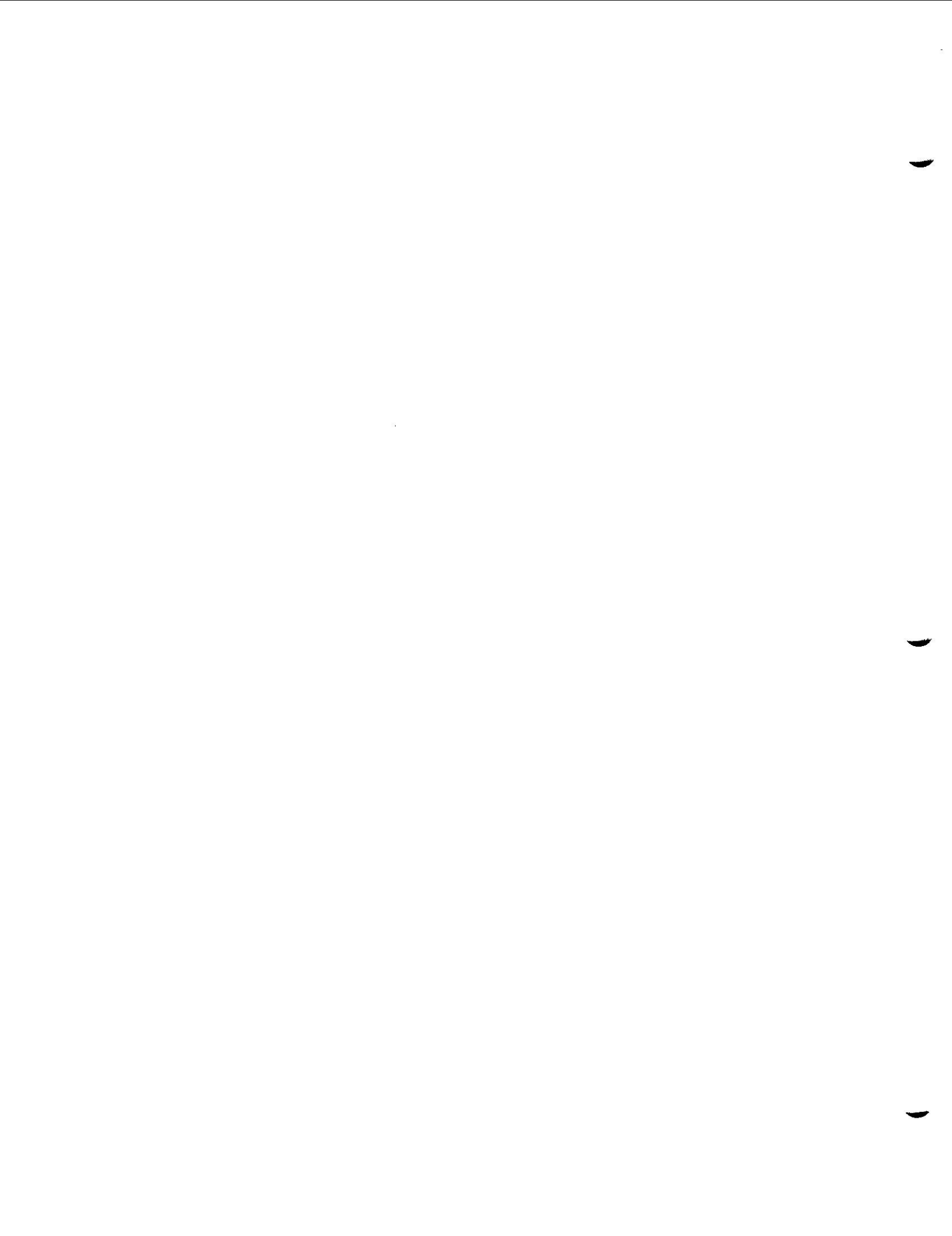
7. Now depress the Global CREM pushbutton on the MTS-003 front panel and while keeping it pushed, drop coins into the

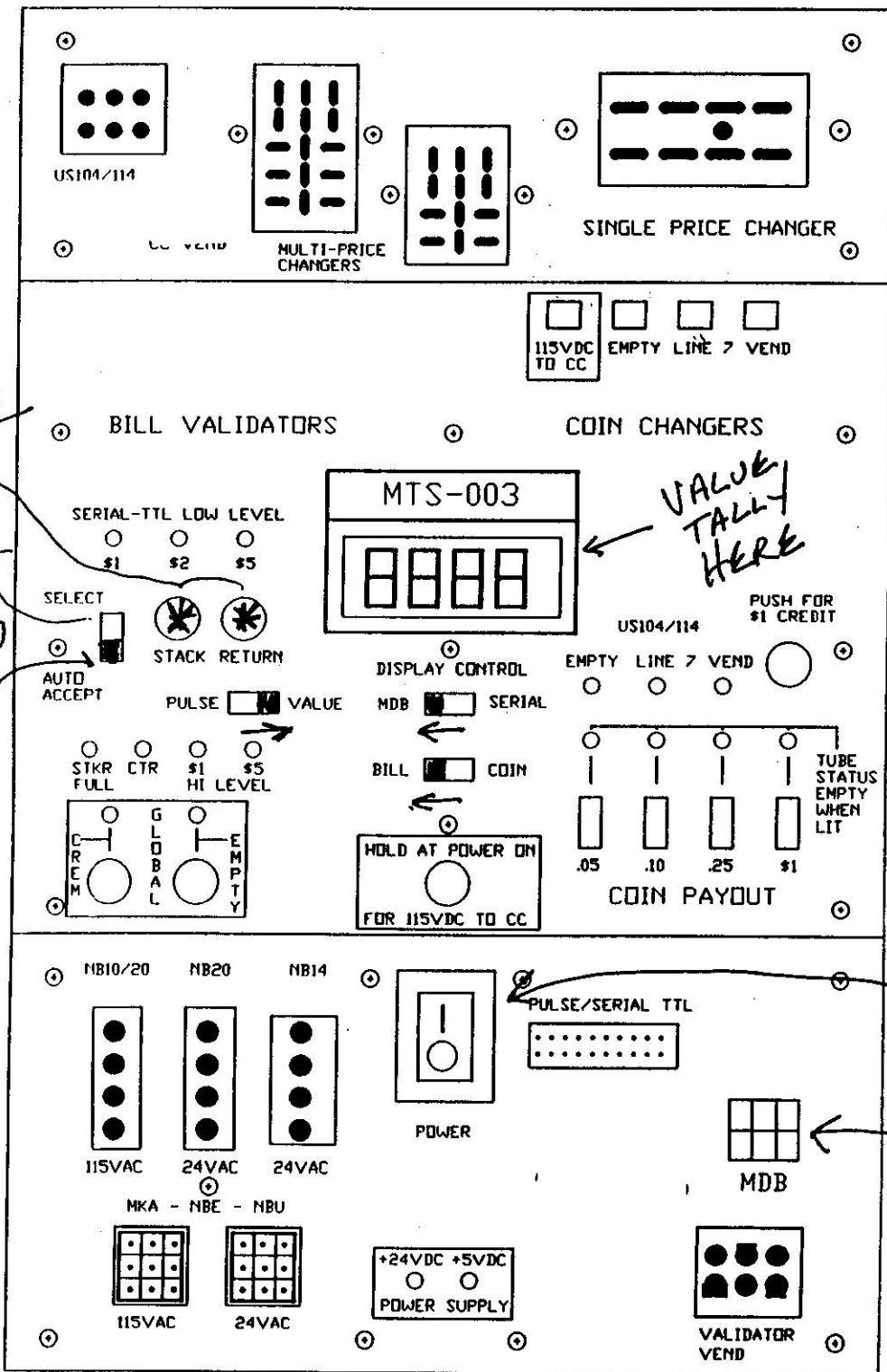
changer under test. The coins should come back out the coin return path of the changer and not go to tubes or to the cash box path. Release Global CREM and press Global Empty. While pressing Global Empty all inserted coins should also be returned.

8. Checking sensors. This insures the unit will perform in the field as the tubes fill and empty with usage. There are two sets of sensors in each tube. A lower sensor that says there is a minimum amount of coins in the tube and an upper one that says a tube is full and routes additional coins of the same type to the cash box path of the changer when they are inserted. The type and test method for tube sensors also varies by both changer make and changer model.

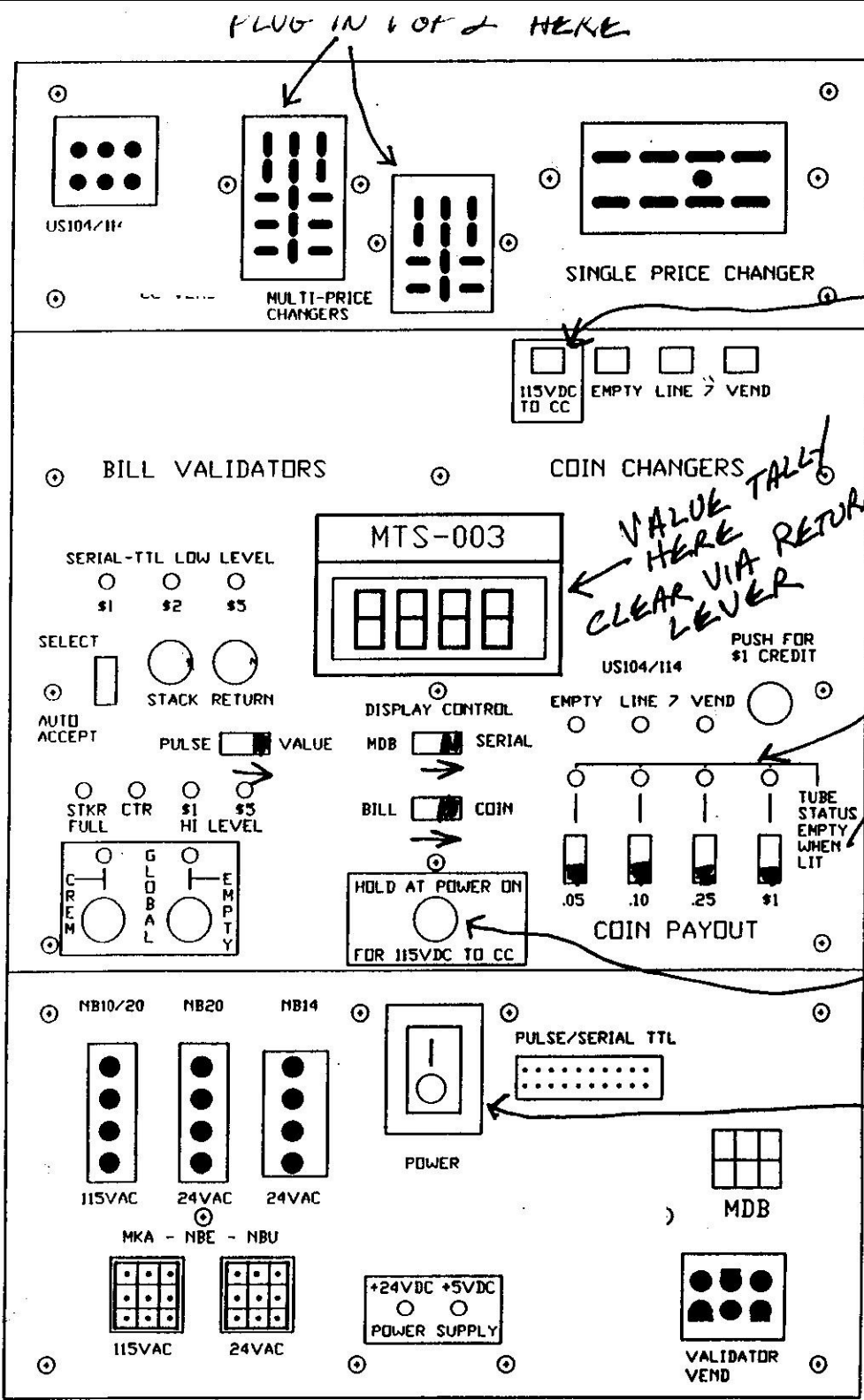


MDB CHANGER
 DROP COINS OF EACH TYPE.
 DISPLAY SHOWS SUM OF COINS.
 CLEAR DISPLAY WITH RETURN LEVER.
 TEST UPPER + LOWER TUBE SENSORS.

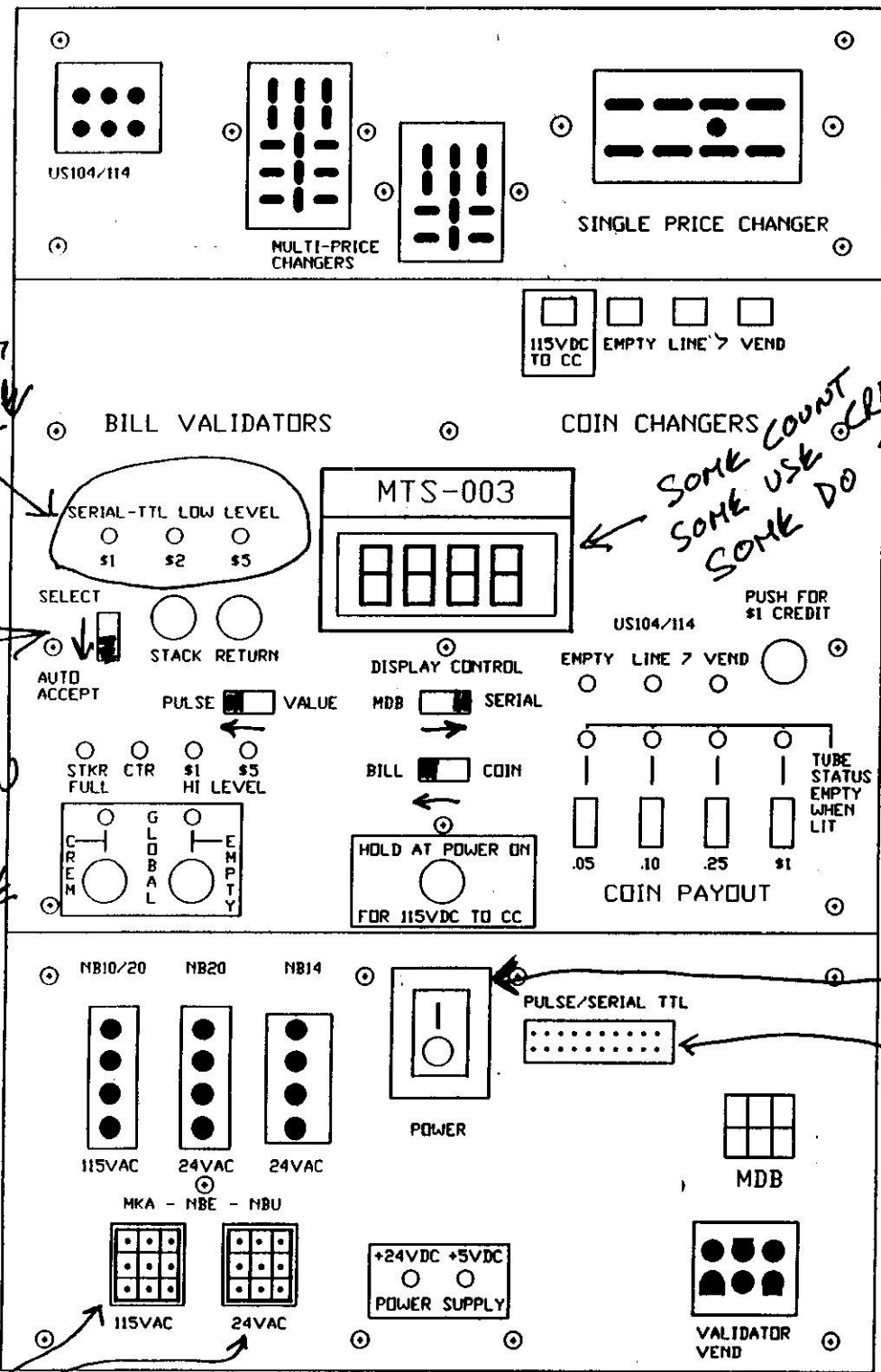




MDB VALIDATOR
 INSERT BILLS AND TEST FOR PROPER
 ACCEPTANCE + STACKING



MULTIPRICE CHANGER
 INSERT MANY OF EACH COIN TYPE.
 TEST ALL TUBE DISPENSE ACTION.
 TEST ALL UPPER + LOWER TUBE SENSORS.



CREDIT + STATUS HERE

NO ESCROW TEST POSSIBLE

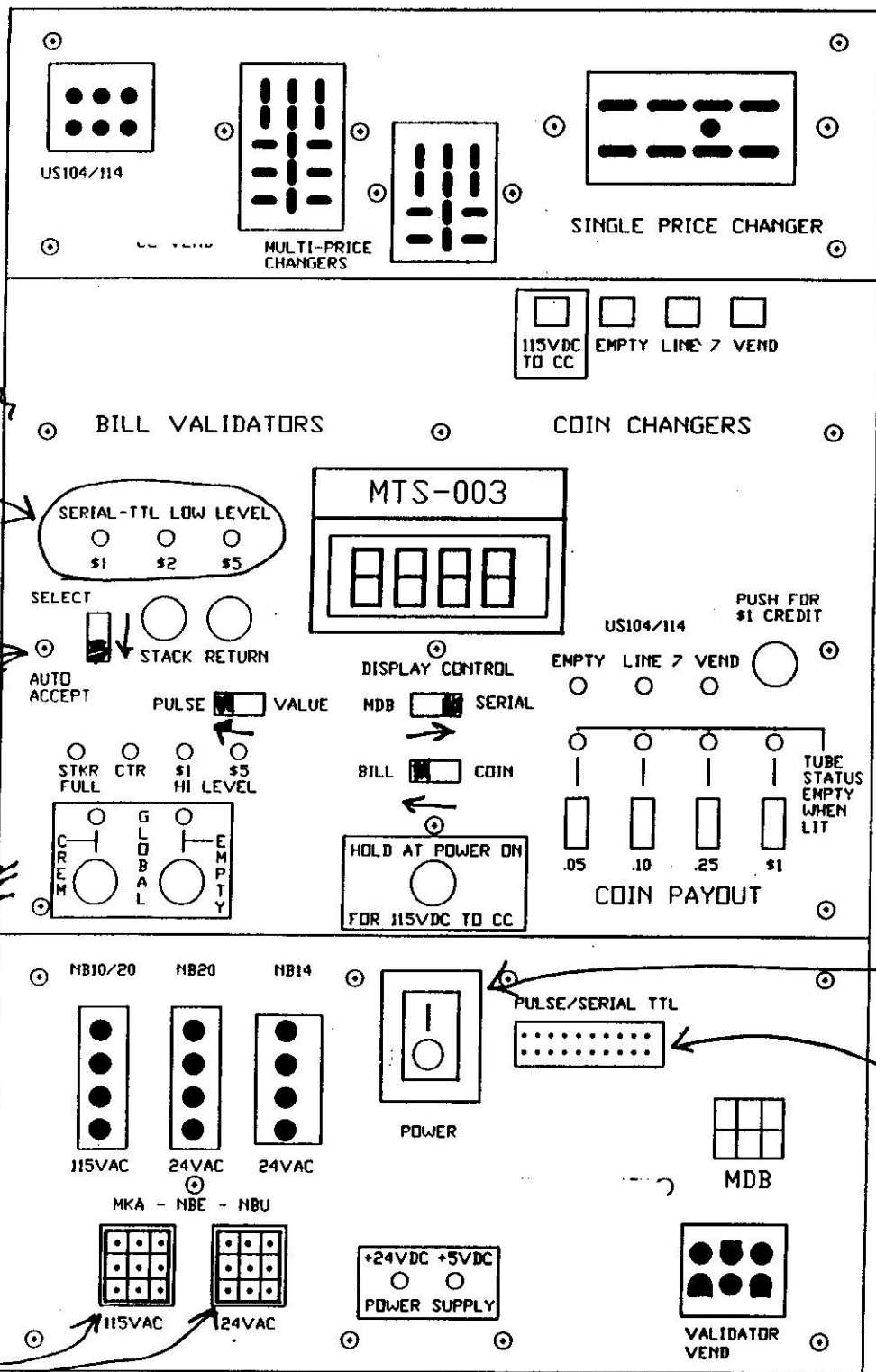
SOME COUNT SOME USE CREDIT LIGHT SOME DO BOTH

ON/OFF HERE

18 PIN INTERFACE SIGNAL CABLE

POWER

18 PIN INTERFACE
 LOW LEVEL PULSE VALIDATOR
 INSERT MANY BILLS AND TEST
 CREDIT AND RELIABILITY.



CREDIT INDICATORS

NO ESCROW TEST POSSIBLE

ON/OFF HERE

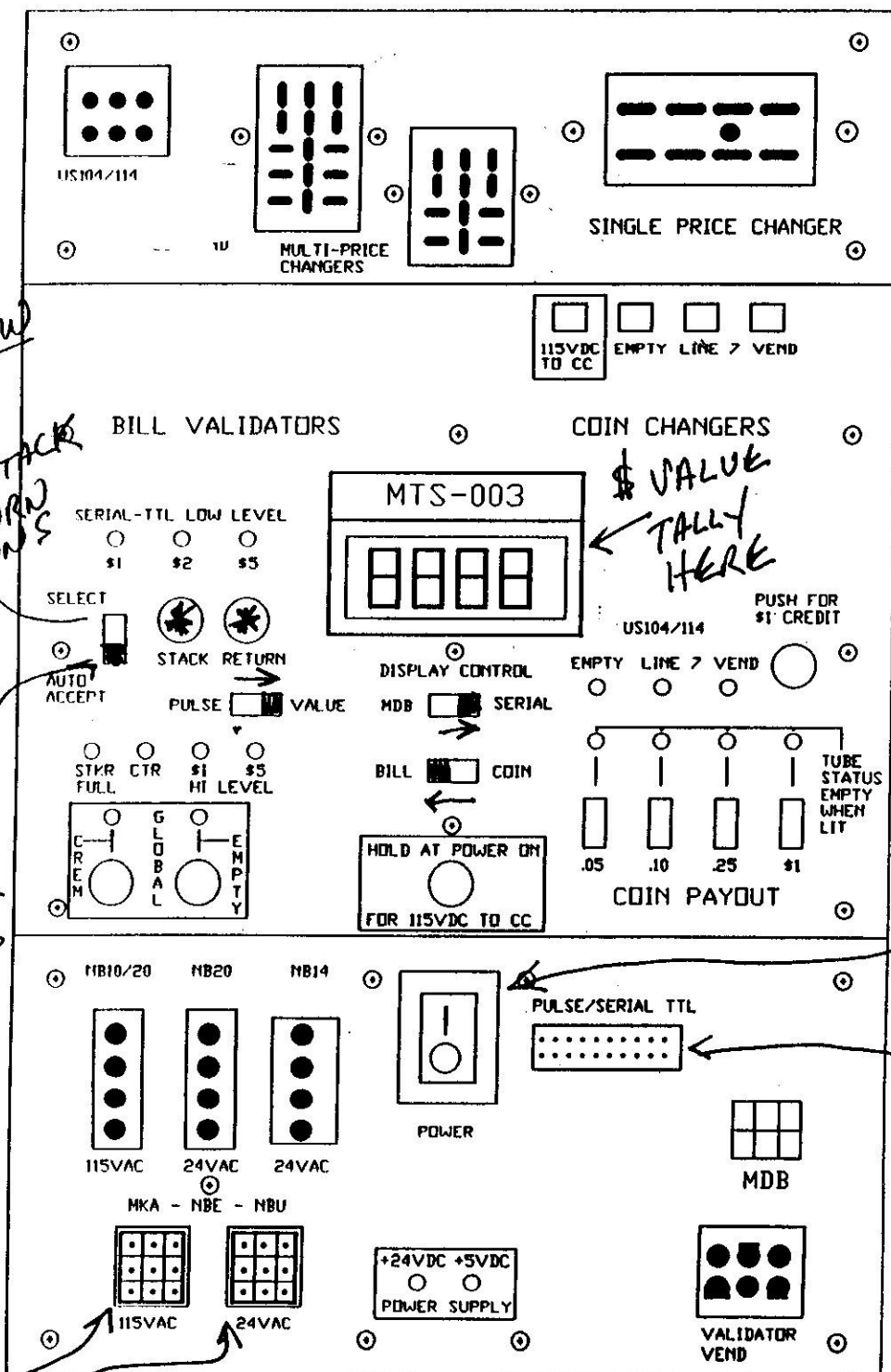
18 PIN SIGNAL CABLE TO VALIDATOR

POWER TO VALIDATOR HERE

18 PIN TTL VALIDATOR
 INSERT MANY BILLS -
 OBSERVE STATUS ON CREDIT INDICATORS

ESCROW
UP TO USE STACK + RETURN BUTTONS

DOWN TO AUTO STACK BILLS



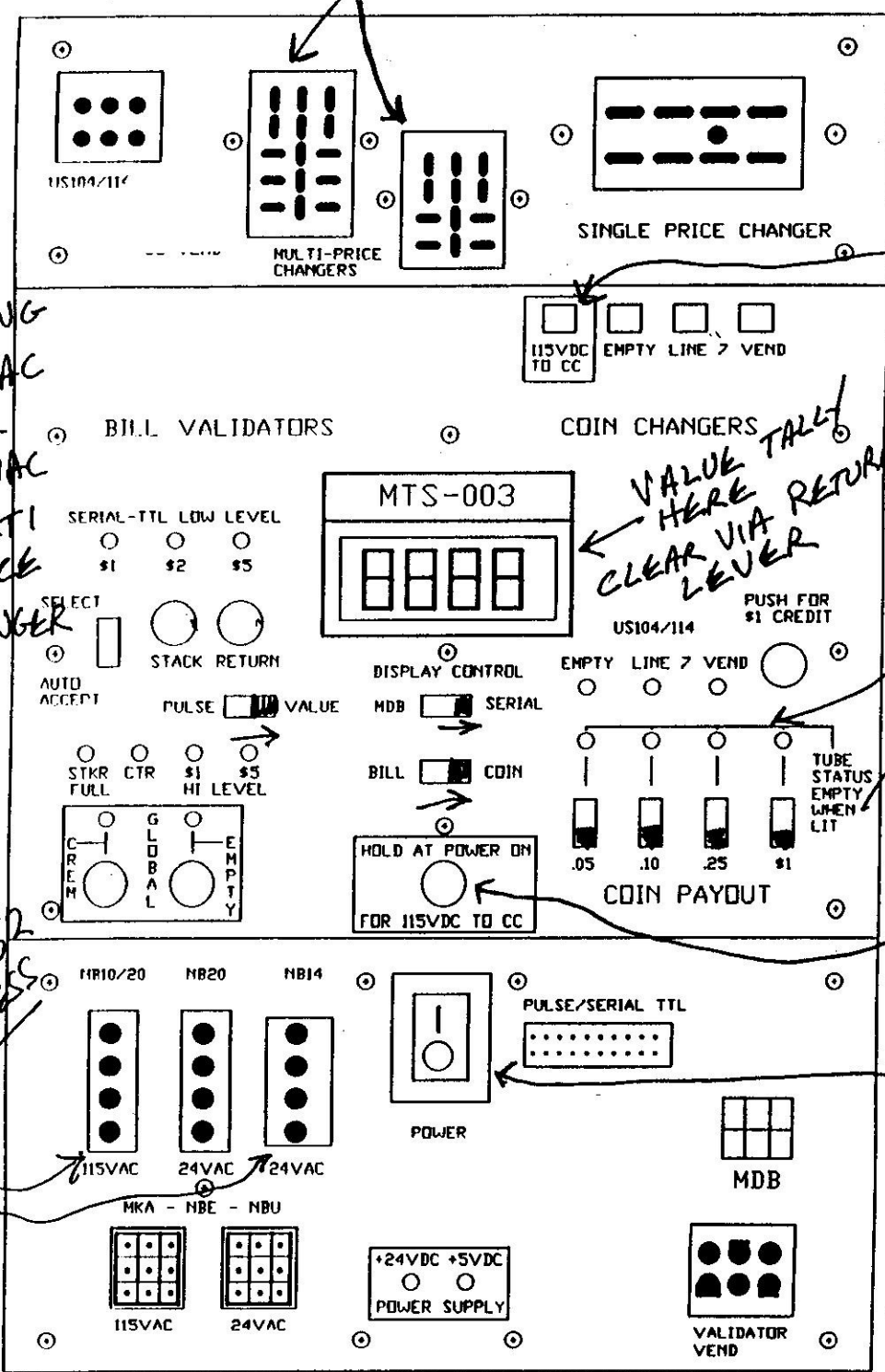
ON/OFF HERE

SIGNAL CABLE TO VALIDATOR

POWER CABLE TO VALIDATOR

18 PIN SERIAL INTERFACE VALIDATOR

RUN MANY BILLS - CHECK FEED, ACCEPT, STACK, AND RETURN IF ESCROW TYPE UNIT.



IF TESTING 24VAC OR 120VAC MULTI PRICE CHANGER

ON IF 115VDC POWER ENABLED

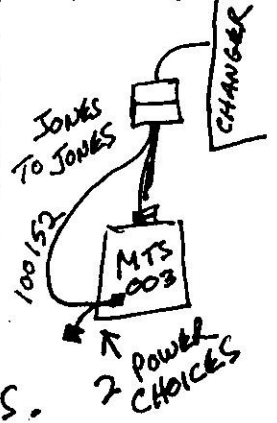
VALUE TALL CLEAR VIA LEVER

TUBE STATUS ALL DOWN TO RUN UP TO TEST PAYOUT

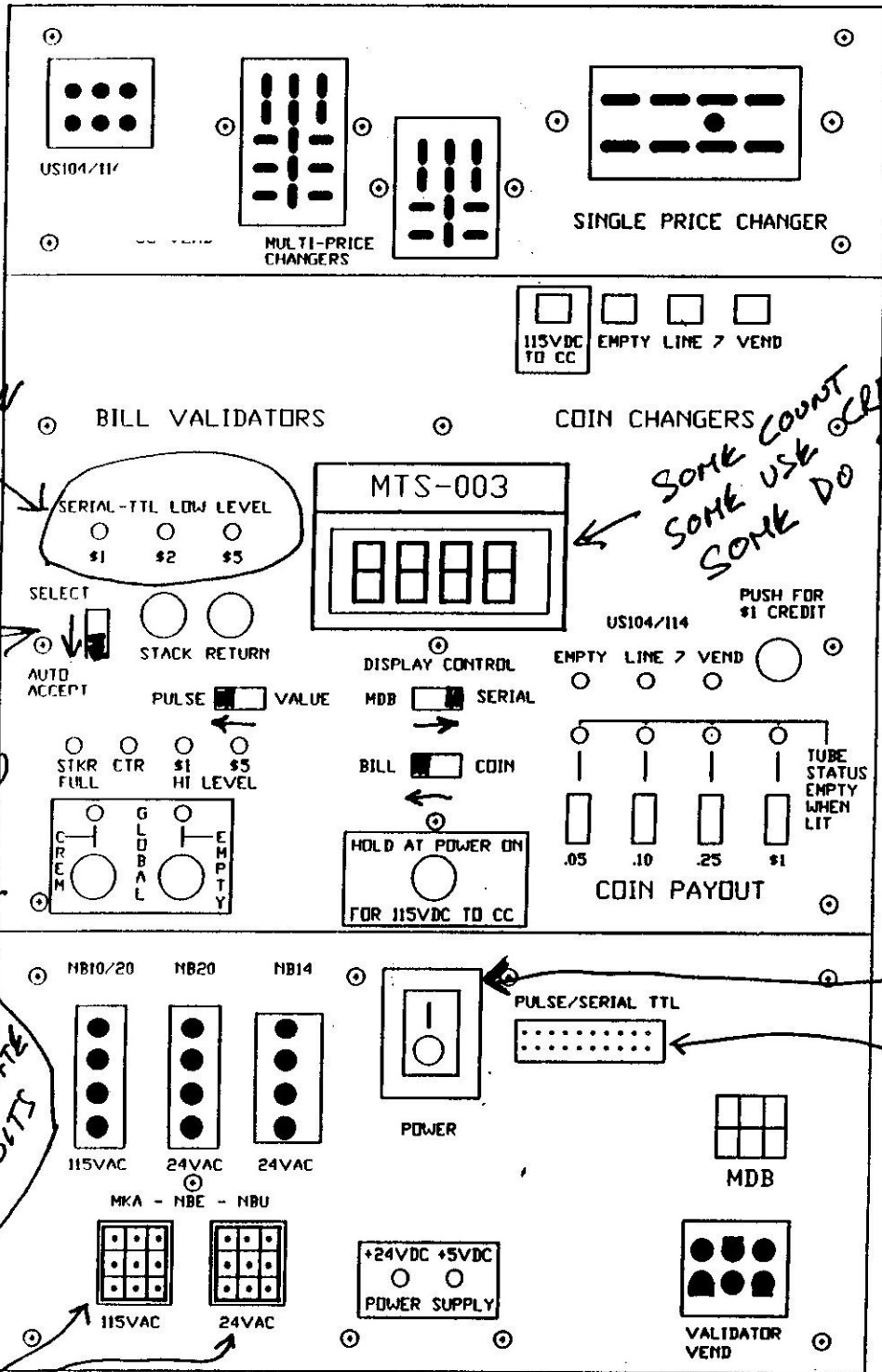
ONLY IF 115VDC UNIT HOLD AT POWER ON + COUNTDOWN

ON/OFF HERE

PN100152 HARNESS 1 of 2 POWER CHOICES



MULTIPRICE CHANGER
 INSERT MANY OF EACH COIN TYPE.
 TEST ALL TUBE DISPENSE ACTION.
 TEST ALL UPPER + LOWER TUBE SENSORS.



CREDIT + STATUS HERE

NO ESCROW TEST POSSIBLE

100151 HARNESS TO ISOLATE INHIBITS

SOME COUNT SOME USE SOME DO BOTH

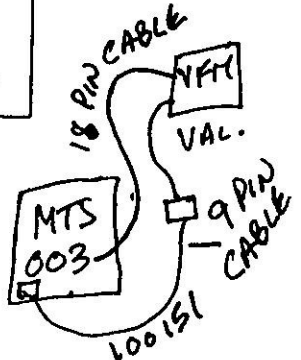
ON/OFF HERE

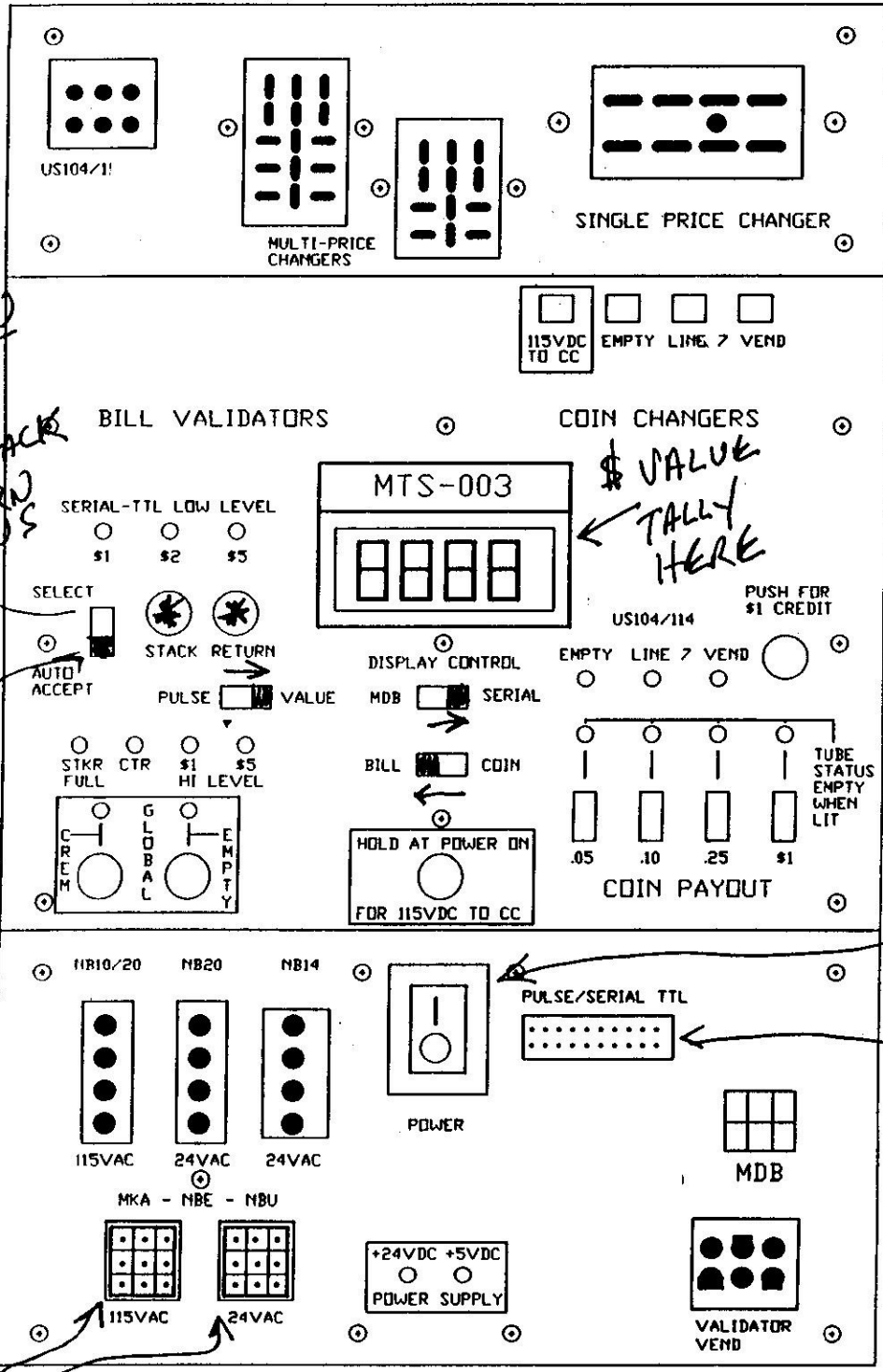
18 PIN INTERFACE SIGNAL CABLE

POWER

PLUG IN HERE

18 PIN INTERFACE
 LOW LEVEL PULSE VALIDATOR
 INSERT MANY BILLS AND TEST
 CREDIT AND RELIABILITY.





ESCROW
UP TO USE STACK + RETURN BUTTONS

DOWN TO AUTO STACK BILLS

\$ VALUE TALLY HERE

SPECIAL CABLE TO TEST 18P SERIAL VALIDATOR THAT AUTODETECT 18P MODE OF OPERATION

ON/OFF HERE

SIGNAL CABLE TO VALIDATOR
USE 10015T CABLE FOR BA30 ETC.

POWER CABLE TO VALIDATOR

18 PIN SERIAL INTERFACE VALIDATOR

RUN MANY BILLS - CHECK FEED, ACCEPT, STACK, AND RETURN IF ESCROW TYPE UNIT.

Adapter Harnesses available with the MTS-003.

There are several harnesses produced to date for specific testing modes.

1. The Mars test cable P.N. 100152 is for testing of Mars MC-5000, MC-5010 changers This is because Mars does the standard 115VDC, 24VDC, as well as 120VAC or 24VAC power within it's product line.
2. When testing the Mars VFM-3 validator use harness P/N 100151. This provides the 115VAC required by the validator to operate in addition to the interface signals.
3. When testing 18 Pin serial Coinco BA-30 and some other auto interface capable units the P.N. 100157 Harness is required to isolate unused 18P interface signals.
4. There is an optional extension cable set which is PN 100251. This is used for extending validator power cords so that it is easier to separate the validator and tester to enhance ease of test.

Care and maintenance of the MTS-003.

Inspect the MTS-003 before each use to be sure that all connectors and parts are undamaged.

If cleaning is required do not use solvents or harsh cleaners. A slightly damp cloth, moistened with a water and household cleaner (409 or similar) should be used. Be sure to allow the unit to dry completely before returning to service.

The circuit breaker on the MTS-003 is a premium magnetic breaker rather than the inexpensive thermal types commonly used in the majority of applications. This breaker will trip within 100 milliseconds when subjected to overload. This is to minimize damage to the tester when "dead shorted" peripherals are tested. The vast majority of reported over current peripherals have been 115VDC and 120VAC Multiprice changers with solenoid type payout systems that are failed, or else the 120VAC attempting to be tested without the special harness required. This 115VDC applied to the 120VAC changer scenario pulls a huge surge of current from the tester.