g GE Energy	**Functional Testing Specification**
Parts & Repair Services ***Louisville, KY***	**LOU-GENEVA-IS200VSVO**

Test Procedure for an IS200VSVO ME MK VI card.

DOCUMENT REVISION STATUS: Determined by the last entry in the "REV" and "DATE" column

REV.	DESCRIPTION	SIGNATURE	REV. DATE
A	Initial release	John Madden	06/02/08
B	Spelling corrections	John Madden	11/10/2008
C	Added TRLY card to this document	John Madden	02/09/09
D	Removed comments on VCRC fixture not working, added list of all current V fixtures for the Geneva	D. Johnson	6/16/2009
E	Transferred procedure from a general group to a specific single document. Also added asset numbers to section 5.	J. Francis	7/6/2010

PREPARED BY	REVIEWED BY	REVIEWED BY	QUALITY APPROVAL
John Madden	D. Johnson	J. Francis	Charlie Wade
DATE	**DATE**	**DATE**	**DATE**
6/2/2008	6/16/2009	7/6/2010	6/3/2008

1. SCOPE

1.1 This is a functional testing procedure for a IS200VSVO card tested in a VME MK VI rack and on the "Geneva" automated test system

2. STANDARDS OF QUALITY

2.1 Refer to the current revision of the IPC-A-610 standard for workmanship standards.

3. APPLICABLE DOCUMENTS

3.1 The following document(s) shall form part of this specification to the extent specified herein. Unless otherwise indicated, the latest issue shall apply.
- **3.1.1 N:\Design Folders\IS2\IS200V**
- **3.1.2 Blue folders located near the Geneva system**

4. ENGINEERING REQUIREMENTS

4.1 Equipment Cleaning
- **4.1.1** Equipment should be clean and free of debris prior to applying power unless performing an initial check. Refer to site specific SRA's for cleaning guidelines.

4.2 Equipment Inspection
- **4.2.1** Equipment should be visually inspected for any defects prior to applying power. This inspection should include the following as a minimum:
  - **4.2.1.1** Wires - broken, cracked, or loosely connected
  - **4.2.1.2** Terminal strips / connectors - broken or cracked
  - **4.2.1.3** Components - visually damaged
  - **4.2.1.4** Capacitors - bloated or leaking
  - **4.2.1.5** Solder joints - damaged or cold
  - **4.2.1.6** Circuit board - burned or de-laminated
  - **4.2.1.7** Printed wire runs / Traces - burned or damaged

5. EQUIPMENT REQUIRED

5.1 The following equipment is required to perform the process requirements. Equipment may be substituted provided that all accuracy's and test ratios are equivalent or better.

Qty	Reference #	Description
1		Fluke 87 DMM (or Equivalent)
1		Mark VI test rack Sim70
1	H188912	GenRad GR2000 "Geneva" system
1		ID chip programmer PC
1	H188743	VSVO#G22 Test Fixture

6. TESTING PROCESS

6.1 Setup

6.1.1 Setup is called out in each step. This test is organized into several generic test procedures, used on nearly all the cards we test. Refer to step 6.2.7 later on in this procedure to see which cards have deviations from the rest.

Note: What is called out for in this procedure is the basic minimum test requirements for the Vxxx series cards. There may be a few exceptions, and these will be called out where pertinent. Read through the entire procedure prior to performing testing in order to familiarize yourself with the overall process. A certain expectation of prior knowledge of the pertinent software is assumed for full testing and troubleshooting capabilities. Windows XP, GE Control System Solutions Toolbox, Hyperterminal, Windows Command Prompt (MS-DOS), and Encompass are used in the testing of these cards. Some basic working knowledge of these systems is required, but someone experienced in testing the IS200Vxxx series cards can usually train the new technician on the spot.

Special Note: If you find any Burr-Brown ADS78050 chips on the card, replace them with either an Analog Devices or TI chip. Chips were used on IS200CGEN, VSVO & VSVA cards between Aug 1 2005 thru Aug 31 2006. For more information see TIL 1623 in the above cards directory.

On VSVO cards Roger found capacitors C11, C12, C17, & C18 (.0047uf 50V) failed causing board to fail the 10Khz & 12KHz tests on the Geneva, replaced with (.0047uf 100V)

6.2 Testing Procedure

6.2.1 **Initial visual inspection of card:** Look the card over very closely. These cards can arrive in the full range of conditions, from clean and excellent to filthy and corroded. Some even have physical damage from burns and/or impacts with other objects. Some will be missing components, oftentimes the faceplate. An area of particular concern is P1 and P2. The pins of these edge connectors can sustain damage and if this is missed and the technician attempts to plug this card into the rack, or worse yet chuck it up into a Geneva fixture, it's anybody's guess as to how much damage can be done either to the card or the test system when power is applied. Give P1 and P2 a thorough examination before attempting to install the card into a device.

6.2.2 **Verification of ID Chip (Hyperterminal):** When you visually inspected the card, you should also have taken note of the complete model and serial numbers on the card. It's a good thing to write them down, especially when you have multiple cards to test. With the MK VI (Sim70) rack powered down, remove the shop test card that has the same mnemonic title as the one you're testing (ex: VAIC shop card comes out so that the

customer's VAIC card can go into it's slot). If you're working on an H1A version of the card, then you'll have to set the slot ID jumpers correctly for the slot number you intend to install the card into. See photo 8.2 for data on this setting. Once you have the card installed into the rack, call up the program on the PC's desktop titled Serial_port.ht. It's got an icon of the GE meatball with an old rotary dial phone inset in the lower right corner of it. This is actually the Hyperterminal program that's been specifically set up for talking to the VCMI card in our Sim70 rack. Do not use the icon labeled "Hyperterminal", because that hasn't been customized for our needs. Make sure the serial cable with the yellow electrical tape is plugged into Sim70's VCMI serial port on the VCMI's faceplate or you'll get nothing when you power up the rack. Now, power up the rack by flipping the switch on the RKPS just to the right of the rack. You should hear the UCVD let out a series of beeps and see the screen on the PC start scrolling until reaches the "RAM test (1MB):\" prompt. Quickly type the letter "b" so you won't have to sit through 5 minutes of boot tests (see photo 8.5). Within 10-30 seconds, the screen will scroll again, this time with a list of cards, their slots, model numbers, and serial numbers that the VCMI read as it booted up and took a roll call of the rack (see photo 8.6). Find the line associated with your card and verify that the information contained there is correct with what you wrote down. If it matches, then you're ready to go on to the next step. If not, then you'll need to determine what's going on. If it's simply a matter of the ID chip not being programmed from the factory, as we've seen on multiple occasions, then the system will error out and say that the chip is blank or hasn't been programmed, and you'll need to take the card over to the Chip ID programmer PC and call up the Main Menu, then select ID Prom Programmer, then go through the menus until you find the one for your card. Follow the directions it gives you. NOW, if it didn't error out by saying the ID chip appears blank, and the entire line has garbage for data, then this means bigger problems that will need further troubleshooting. Examine the lights of the cards in the rack. Do the status lights on the UCVD cycle in a counterclockwise pattern? Are the other lights on the rest of the cards going from red to green and/or yellow? If not then the card could be shorted or otherwise compromised and need more in-depth troubleshooting that we have space to cover in this procedure. For now we'll proceed as though the card passes the id test.

6.2.3 GE Control System Solutions Toolbox: This is the main test program you'll use for just about all the Vxxx cards. Double click on the Control System Toolbox icon and it should bring up the program. Click on the folder in the upper left corner of the screen, and a box should appear. Find Sim70_UCVD.m6b, right click on it, go to Properties,

make sure Read-Only hasn't been check marked. If it has, un-check it and click Apply. Refer to the screen prints below for guidance if you aren't that familiar with Toolbox. Now open Sim70_UCVD. At the bottom where it says "Privilege Level: 0", double click on that box and select "4: Change All Macros." Click the + sign right next to **Hardware and I/O Definitions**, then the one below that labeled **Mark VI I/O**, then the one labeled **Rack 0 Channel R (SIMPLEX).** This will bring up a listing of all cards in the rack. Now, if rack has been powered up long enough to complete it's boot cycle, you should be able to go online from Toolbox. Do this by clicking the Online/Offline button, the one with a picture of two plugs mating together at the right side of the upper toolbar. If online connection is good, then right click on the left side of the screen, on the Vxxx designation associated with your card under **Mark VI I/O**. This will bring up a box that will allow you to do certain maintenance tasks with the individual card. Among them are downloading firmware and configuration & clearing and reading faults. These are the functions we are concerned with. Most of the time you should have a green and/or yellow led lit on the card you are testing. If this is the case, then go ahead and select Download from the options in the box that came up when you right clicked on your card's name. Select Firmware, and click OK. *One or two more boxes will pop up, one warning you that you shut down the particular operation that card is performing, just click ok. Another may or may not pop up, stating that the card in question appears to have the same firmware as what you plan to give it, just click Ok again.* If successful, you should see the yellow and green led's alternately flash while downloading, then as it resets, the red will come on for a few seconds. Afterwards, the card will go back to its normal status of green and/or yellow. Now right click again on the card's name, and this time select Download and then Configuration, and click OK. If the card configured successfully, then Right click once again on the card's name, and select View Diagnostic Alarms. This will bring up a box showing any faults that the card or the system has found. *The trick here is, sometimes the card doesn't have everything hooked up like the configuration that's in it calls for, because we've never fully completed the buildout process for this test station. That's ok.* But it will cause certain faults to appear if it's looking for a connection that isn't there. Just click on Reset Faults, then click Refresh List, and assuming everything's hooked up like it's supposed to be, then you should get a clear list and the yellow light should go out on the card. If not, then that's ok, too, because you're still going to test the card on the Geneva, which will cover any I/O that got missed in the rack. This tells you that the card is performing its diagnostics like it's supposed to. *If, before you*

downloaded firmware, the card sat there with a red light from the time you booted it up, then it likely has a fatal error that will require more troubleshooting. Some of this is covered under FM_UDP, while other parts of it are too lengthy to cover in this test procedure. Make sure if it has a red light that when you tried downloading firmware it didn't shift the id over and program the card next to it unintentionally.

6.2.4 FM_UDP (DOS prompt or Command prompt, if needed): This test is an optional one, more useful for troubleshooting or overwriting a particularly pesky corrupted flash. To use it, call up the Hyperterminal program again (Serial_port.ht) and cycle power to the rack. This time, instead of typing "b" at the "RAM test (1MB):\" prompt, type a "p" to put the rack into program mode. Then go to the Command Prompt icon on the desktop, and when it comes up you need to give the rack a minute or two to finish booting up. Once this is done, refer to photo 8.4 for the commands to enter. Now if you look closely, the last command is card specific. In the example I used, it has a VTUR at the end of the "fm_udp r0 a" command. You will substitute the letters for whichever card you're working on. If all goes well, then it will scroll through and give you a statement saying it was successful. If not, then it will likely say it couldn't find the card, or download was unsuccessful. This will require much more troubleshooting than we have space to cover in this procedure. If however you were successful in flashing the card, go back to Toolbox and see if you have any luck working with it there.

6.2.5 Geneva Testing: Now we get to test the I/O portion of the card. *There is a reason we try to flash the card in the rack before testing on the Geneva: the Geneva is probably the most fragile piece of equipment in the Louisville Repair Center. If there is a problem with a card that could short out a power supply or fry a scanner channel on the Geneva, then it's better to blow out the rack that is easily replaceable rather than to discover this on the much more expensive and harder to repair Geneva. GenRad and Salem developed this machine for production testing at the factory, not for troubleshooting in a repair shop, so it's not the user-friendliest system, either. You'll come to hate it like so many others have. But, that aside, it is the factory standard that we must use to validate performance for Mark VI cards. Actual maintenance of the Geneva, such as rebooting, locking up, vacuum or network problems would take up too much space to cover in this procedure*, so we'll start with the assumption that you have a freshly rebooted and logged in Geneva PC, and all power switches are on and set correctly, and that the vacuum system is working properly. First go over to the shelves depicted in the last photo of this test and select the proper fixture for your card. Set it on the table of the Geneva, making sure

that the latches on either side are properly connected, and then pull the bar under the table towards you until it locks into place. You should hear a very audible “clack”, which is louder than a “click”, to tell you that the fixture is properly locked into the table. If this is your first time doing this, get a more senior technician to assist you. Now look to the left of the fixture and look to see which serial cable is called for (if it has a connector for one), either 2 or 7, and find that particular cable hanging on the right side of the cabinet and connect it to the fixture. The fixture should have a test card situated in it. If so, you’ll want to run that one first to verify the test is working. *MOST* of these test cards are indeed fully functioning and should pass on the first try... most of them, I say. If the fixture has a hinged cross bar on top of it, then gently pull it towards you, looking to make sure that all of the spring loaded pins connect properly with the pins of P1 & P2 (hence the earlier verification that all of P1 & P2’s pins are straight). There is a box mounted on the right side of the cabinet that controls the vacuum system. Turn the vacuum on, and you should hear the hissing and see the table and card suck down. Sometimes there’s a residual hissing that can be removed by pressing down on the corners and edges of the card under test, but sometimes this will not help. As long as the top of the fixture pulled down, you’re ok. **NOW** you’re ready to get into the most cantankerous part of the system, the Encompass software. Depending on who’s logged on to the pc, there may or may not be an Encompass icon on the desktop. If so, use it. If not, you’ll need to get there through the Start button in the lower left corner. Once it comes up, it’ll prompt you for a password. Type “genrad” in lower case. Then, the next window that will eventually come up will have six icons to chose from, select Development. After a minute or two, the main test window will appear. There is a picture of an open folder in the upper left corner, click it. The window that pops up will have a menu on the left side from which you will chose the file you want to use. Find the one that has your card’s name in it, hopefully with a “_Louisville” suffix on the end to denote that it has been de-bugged by our local test development staff. Some tests we use don’t have this, and that’s ok. Look for it first, though. Give the system a minute, and it will eventually call up the test you want. Wait for the ID bar at the top of the window to finally turn blue, other wise clicking on anything will either do nothing or worse, send you into Encompass la-la land from which there is no return. Often the only way out of Encompass la-la land is through the flaming “Blue Screen of Death”, which means a hard reboot of the pc. This software of this system is as delicate as the hardware, so follow these instructions carefully. Enlist a senior technician with

experience to guide you if this is your first time. Once the title bar turns blue, you can click the run button (the one near the middle of the upper toolbar that has a blue arrow that runs up the left side and turns back down to point to a black triangular shaped pointer). Another window will pop up to finish loading the program, but this only happens when you run it the first time. Successive runs will not re-load the existing program. Once the program finishes loading, and the upper title bar turns blue again, click the run button *again*. This time, it'll prompt you for the last few letters of the revision. Enter them, and hit Enter. It should begin running the test. Follow any instructions it gives you. **ONE THING TO REMEMBER**: DONOT EVER, I MEAN *EVER*, TRY TO STOP THE TEST BEFORE IT'S RUN ITS COURSE. You will send it into Encompass la-la land, and quite possibly force yourself to reboot the pc. Let it run until it finishes. Now, if you must run another card of slightly different revision, you can call up the Run-load button, which looks like an arrow pointing into the bed of a little black pickup truck. This allows you to re-enter the last few letters of the revision. Only use this if you're working on multiple boards with more than one revision. Any failures found on the Geneva can be troubleshot using the blue binder books on the shelves where the fixtures were found. Some test programs are better than others about giving you failure information depending on who wrote the program, so it's helpful to click on the individual circuits that failed in the left Encompass window, and then using the Verbose Results window to the right scroll down to the specific failures to see what the Geneva found. You may wish to use the Screen Print key on the keyboard to copy a picture of the failure for pasting into a Word document that you can printout and save for later troubleshooting. This is especially helpful if you have multiple failures on a board and don't have the time to sit there troubleshooting on the Geneva, tying it up all day.

6.2.6 Card Specific Testing: The **VSVO** card has an interrupt placed in the Geneva test so that it can be troubleshot when problems arise. When the C-code window pops up during the Encompass test, simply click the green Go button up top six times, and then click anywhere on the Encompass screen directly behind it to observe the rest of the test.

6.3 Post Testing Burn-in Required ___ Yes ___ No

Note: The technician, lead tech, or MSO determines burn-in requirement on an as-needed basis, or per customer request.

6.4 ***TEST COMPLETE ***

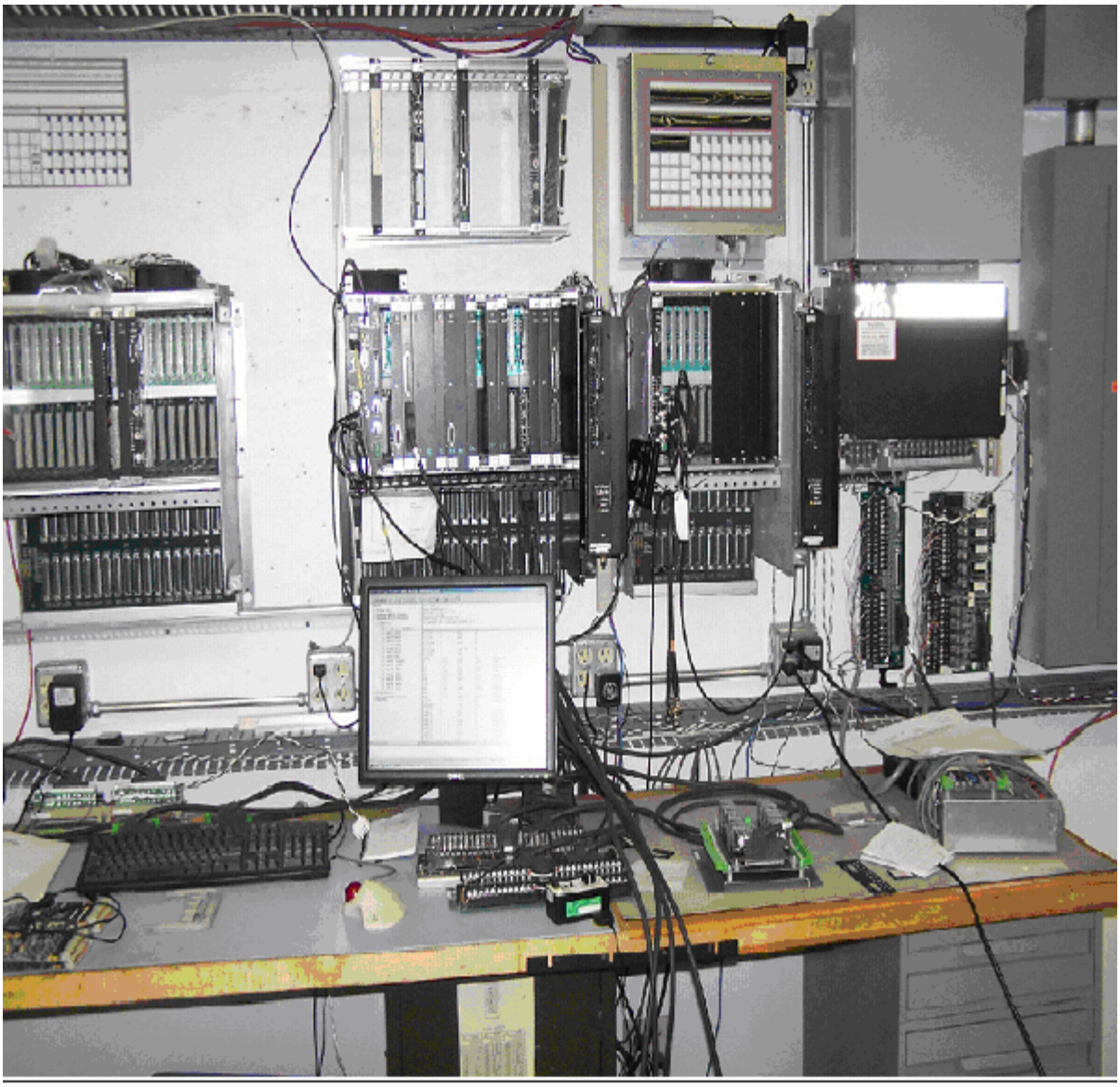
7. NOTES

7.1 On VSVO cards Roger found capacitors C11, C12, C17, & C18 (.0047uf 50V) failed causing board to fail the 10Khz & 12KHz tests on the Geneva, replaced with (.0047uf 100V) and units passed.

8. ATTACHMENTS

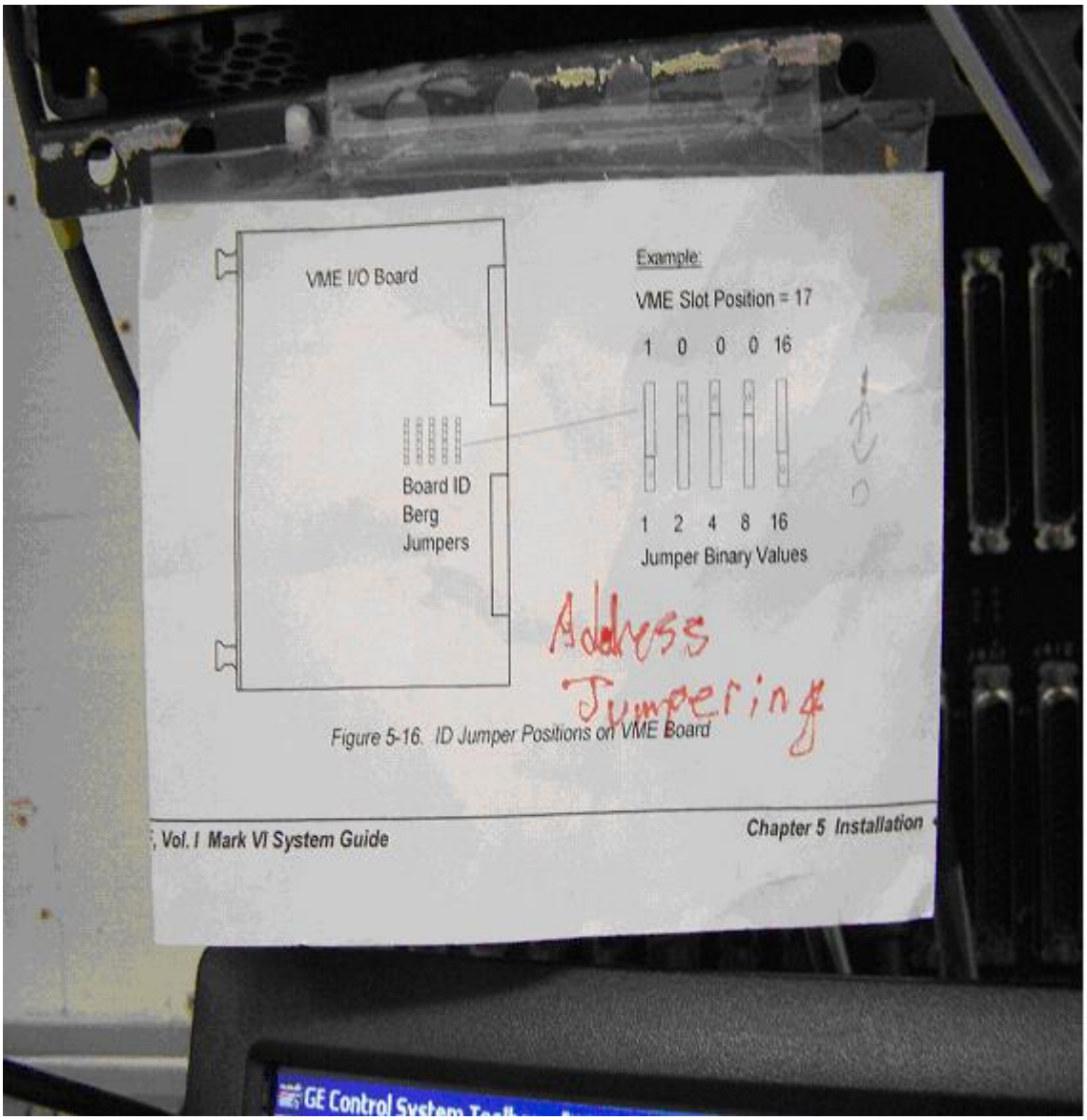
8.1 Below are some pictures of test stations, and screen prints of various software programs used in testing IS200Vxxx cards:

8.2

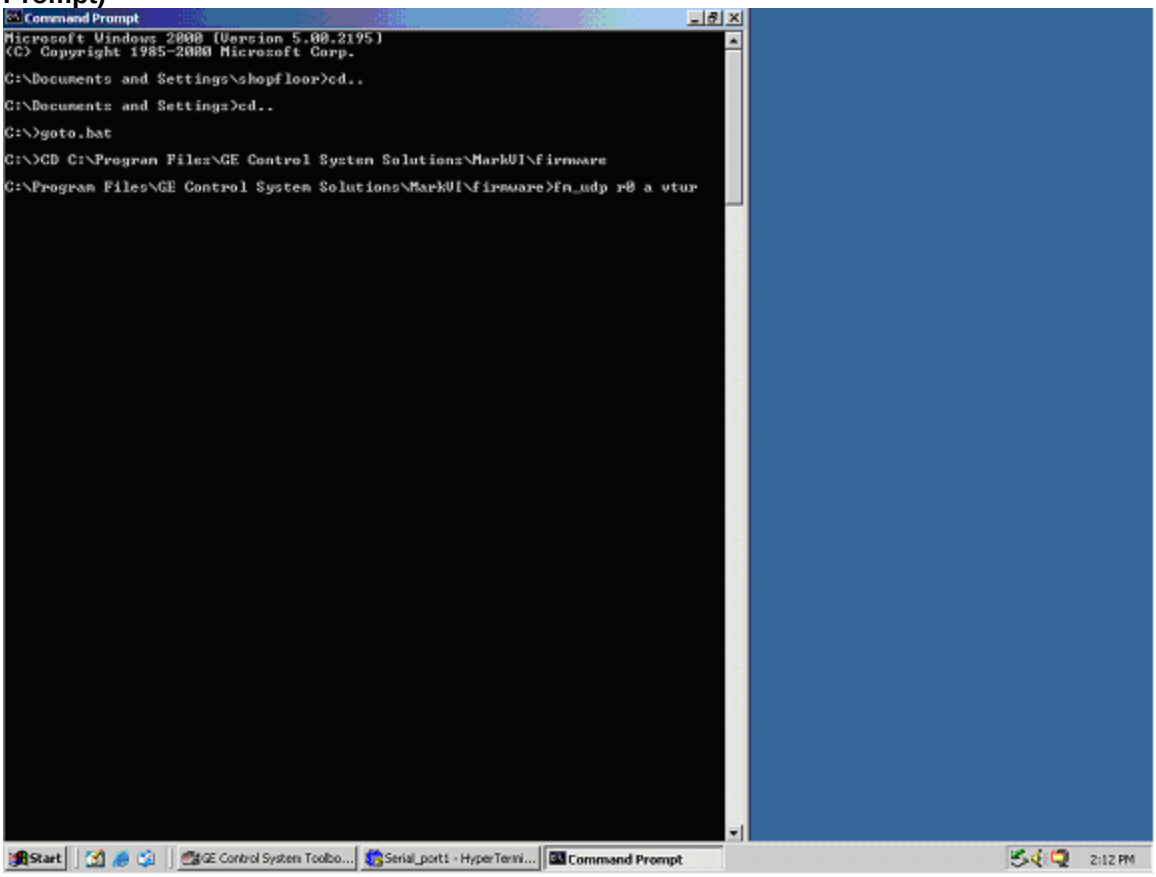


8.3 H1A Address Jumpers for correct slot ID reference

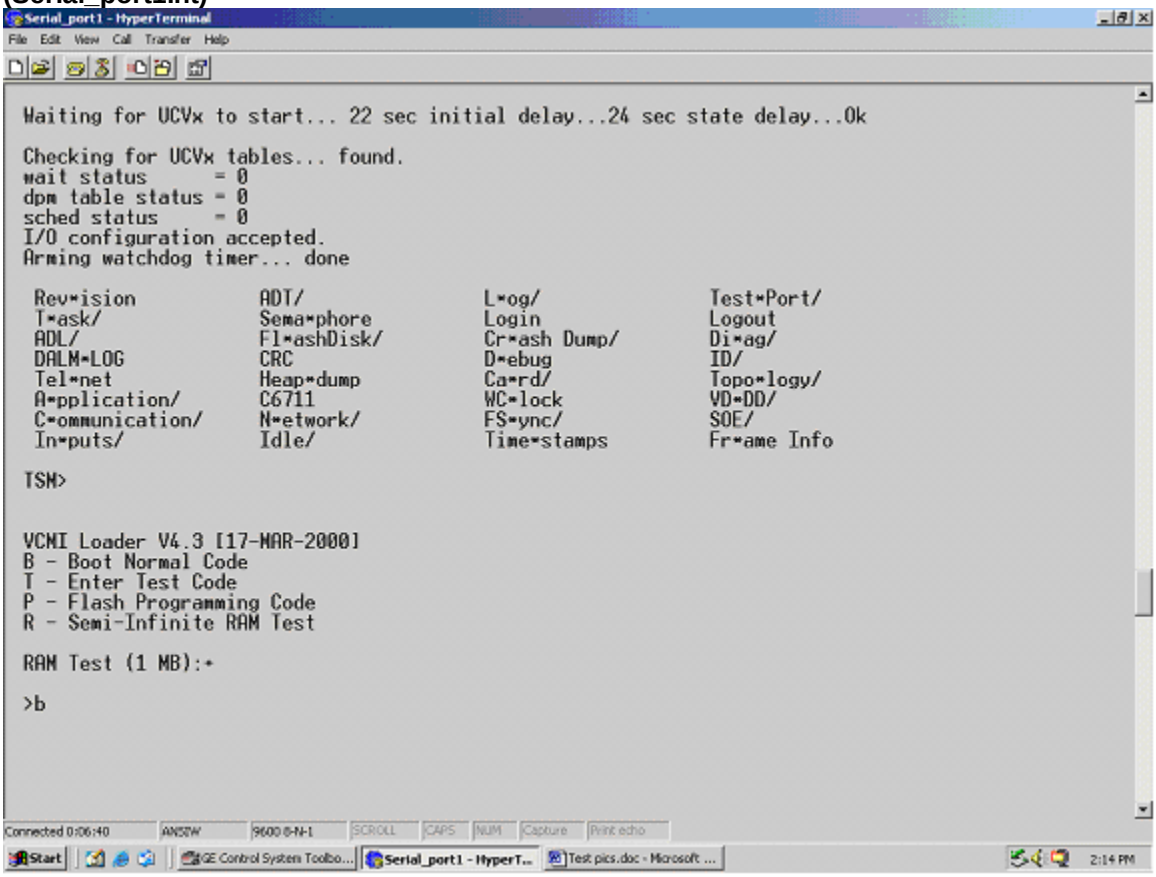
8.4



8.5 FM_UDP (Command Prompt)



8.6 Hyperterminal (Serial_port1.ht)



8.7 Hyperterminal (Chip ID test)