PCMapII
Installation, Calibration, and Testing Procedures

1.0 Prior to installation

1. VERY IMPORTANT. If the board has not been calibrated before or you don't know the board's status, perform the following steps. Failure to do so may damage the board.

2. Install the following two-pin jumpers on the board. Figure 1.1 shows potentiometer and jumper header locations, ovals on jumper headers indicate two pin jumper orientation. See Figure 1.2 for jumper header pin designation. A white dot next to the jumper header on the board indicates pin one. If jumpers were installed during assembly verify position.

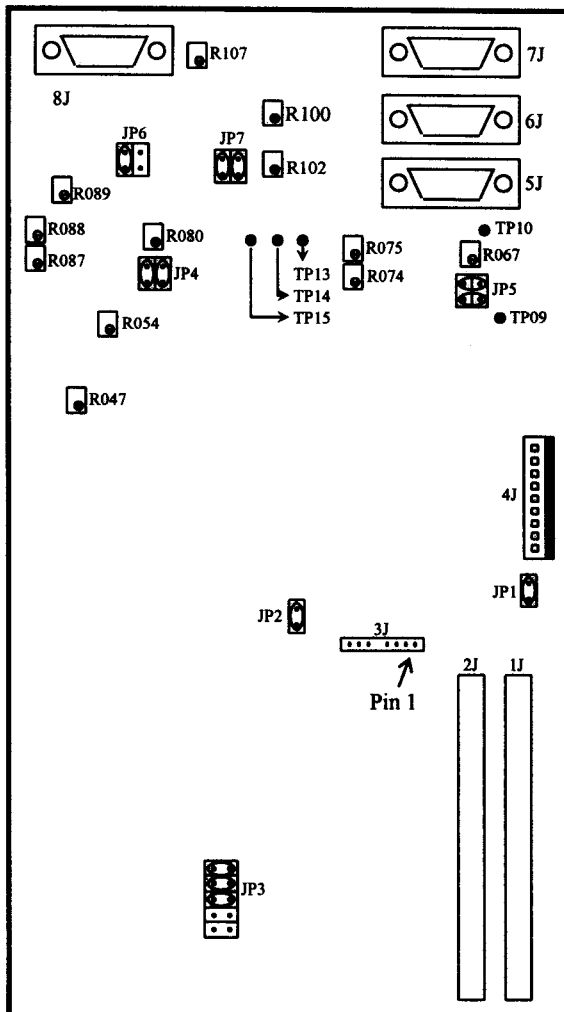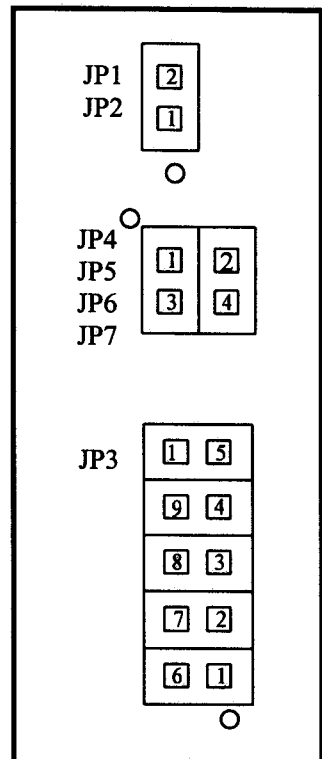| Jumper Header	JP1	JP2	JP3	JP4	JP5	JP6	JP7
Pins	1-2	1-2	3-8, 4-9, 5-10	1-3, 2-4	1-2, 3-4	1-3	1-3, 2-4

Figure 1.1

Figure 1.2

3. Turn potentiometers R067 and R080 counter clockwise 10 times.
4. If not already installed, install a terminator card in 1J.

2.0 Installation
1. Place the PCMapII card into the 147 chassis between the power supply and the 147 motherboard. The (2) 64 pin connectors (1J, 2J) go towards the front of the chassis, see Figure 2.1.
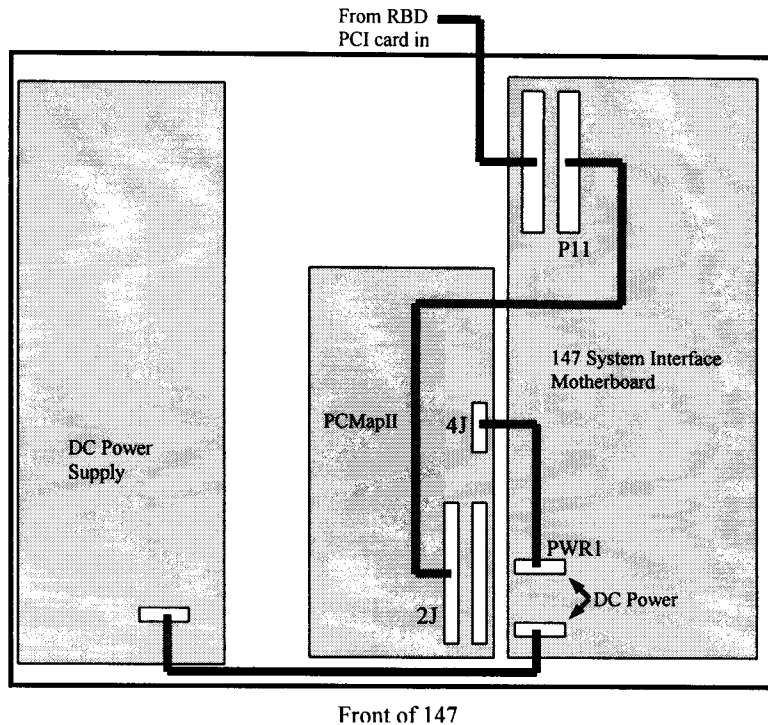

Figure 2.1

2. Use six 6-32 X ¼" screws to secure the PCMapII card to the chassis.
3. Connect the 8 wire power jumper cable from PWR1 on the 147 to 4J on the PCMapII card.
4. Connect the 1.5 foot long 64 pin ribbon cable form P11 on the 147 to 2J on the PCMapII card.

3.0 Calibration
1. VERY IMPORTANT. Before turning on power verify all steps in section 1.0 have been completed.
2. On older boards equipped with the V/F circuit adjust R107 counter clockwise 10 times. If this is not done noise will be introduced back into the PCMapII.

3.1 Load ISP
1. Cut pin 5 off of header 3J on the PCMapII board. See Figure 1.1 for location of pin 1 on header 3J. Pin 5 may have already been removed during manufacturing.
2. Connect ISP download cable to the LPT1 (printer) port on the PC.
3. Connect small end of ISP download cable to PCMapII-3J.
4. Turn on computer.
5. Turn on 147 and make sure that green LED turns on.
6. Run the ISP Daisy Chain Download (ispVM V10 or higher) program.
7. In the File Menu open "pcmapii".
8. Click Run Turbo Download button.
9. Verify that under status you see three PASS indicators on the right side and that there are no errors in the "Messages" window.
10. Close ISP Daisy Chain Download program.
11. Turn off 147.
12. Disconnect ISP download cable from PCMapII.

NOTE: Using PCMapII Diagnostic Program
1. Open the PCMapII diagnostics program "PCM2 Test.exe".
2. In the diagnostics program there is a section labeled PCMap2 Diagnostics. In this section there are three data fields (Base Address, Register, and Data) and two buttons (write and read).
3. Enter 60 into the field for the base address. This will remain the same for all calibration and testing.
4. The Register field is a pull down menu giving the options of Control, XPos, YPos, XScan, and YScan. Control sets how the device will operate. XPos and YPos set the position of the X and Y waveforms. XScan and YScan set the amplitude of the X and Y waveforms.
5. The Data field is for the data that will be sent to the selected Register in step 4.
6. The Read and Write buttons will write or read data to the Register selected. When data is written to the PCMapII board the Card Active LED (D1), located next to the 64 pin ribbon cable connectors, will briefly light.
7. While testing there is no need to shut down the diagnostics program.

3.2 XPos and XScan Calibration
1. Connect the oscilloscope to TP10 referenced to TP9.
2. Turn on the 147 and open PCMapII diagnostic program.
3. Using the diagnostic program enter 60 for the Base Address and write 3340 to the Control Register, 8000 to XPos, and 8000 to XScan.
4. On the oscilloscope verify that the waveform shape resembles the waveform in Figure 3.1.
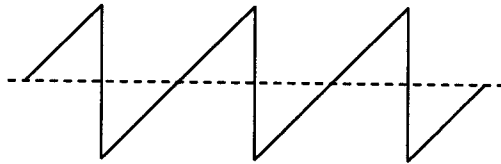
Figure 3.1

5. Write 0000 to XScan. This should produce a flatline on the oscilloscope.
6. Adjust R075 (XPos coarse offset) and R074 (XPos fine offset) to remove any DC offset from the flatline on the oscilloscope. To exactly adjust for a zero offset it will be necessary to adjust the oscilloscope to 20mv/division.
7. Write FFFF to XScan.
8. Adjust R067 on the PCMapII to get an 8.0V peak to peak waveform on the oscilloscope.
9. Verify on the oscilloscope that the waveform has a smooth and linear increase when going from negative to positive. If this is not the case there is probably a problem with the board.
10. Write 0000 to XScan.
11. Write 0000 to XPos. This should produce a flatline with a -4V offset on the oscilloscope.
12. Write FFFF to XPos. This should produce a flatline with a 4V offset on the oscilloscope.
13. Write each of the following bytes to XPos, check to see that the line on the oscilloscope changes with each change in the position.

0000	8000	8008	8080	8800
1000	8001	8010	8100	
2000	8002	8020	8200	
4000	8004	8040	8400	

14. Write 8000 to XPos.
15. Write each of the following bytes to XScan, check to see that the sawtooth pattern increases in size with each new byte.

0000	0008	0080	0800	8000
0001	0010	0100	1000	
0002	0020	0200	2000	
0004	0040	0400	4000	

16. Turn off the 147 and remove the oscilloscope probe.

3.3 YPos and YScan Calibration
1. Connect the oscilloscope to TP14 referenced to TP9.
2. Turn on the 147.
3. Using the diagnostic program enter 60 for the Base Address and write 3340 to the Control Register, 8000 to YPos, and 8000 to YScan.
4. On the oscilloscope verify that the waveform shape resembles the waveform in Figure 3.1.
5. Write 0000 to YScan. This should produce a flatline on the oscilloscope.

6. Adjust R088 (YPos coarse offset) and R087 (YPos fine offset) to remove any DC offset from the flatline on the oscilloscope. To exactly adjust for a zero offset it will be necessary to adjust the oscilloscope to 20mv/division.
7. Write FFFF to YScan.
8. Adjust R080 on the PCMapII to get a 6.65V peak to peak waveform on the oscilloscope.
9. Verify on the oscilloscope that the waveform has a smooth and linear increase when going from negative to positive. If this is not the case there is probably a problem with the board.
10. Write 0000 to YScan
11. Write 0000 to YPos. This should produce a flatline with a 3.25V offset on the oscilloscope.
12. Write FFFF to YPos. This should produce a flatline with a -3.25V offset on the oscilloscope.
13. Write each of the following bytes to YPos, check to see that the line on the oscilloscope changes with each change in the position.

0000	8000	8008	8080	8800
1000	8001	8010	8100	
2000	8002	8020	8200	
4000	8004	8040	8400	

14. Write 8000 to YPos.
15. Write each of the following bytes to YScan, check to see that the sawtooth pattern increases in size with each new byte.

0000	0008	0080	0800	8000
0001	0010	0100	1000	
0002	0020	0200	2000	
0004	0040	0400	4000	

16. Turn off the 147 and remove the oscilloscope probe.

3.4 Frequency Calibration

1. Connect the 9 pin male d-sub end of the J6 test cable to 6J of the PCMapII and connect the BNC end labeled X Command to EXT COUNTER on the function generator.
2. Turn on the function generator and push in the EXT button. This will allow the function generator to act as a frequency counter.
3. Turn on the 147.
4. In the diagnostic program set the base address to 60 and write out the following data:

Control	3340
XPos	8000
YPos	8000
XScan	8000
YScan	8000

5. Select the 1K decade on the function generator and adjust R047 on the PCMapII for a frequency of 15.75Khz
6. Turn off the 147.

7. Remove the BNC cable from the function generator and attach the BNC end of the J6 test cable labeled Y Command.
8. Turn on the 147.
9. Select the 10 decade on the function generator and adjust R054 on the PCMapII for a frequency of 60Hz.
10. Turn off the 147.
11. Remove the Y command cable from the function generator and attach the X Command cable again.
12. Turn on the 147 and verify that the frequency is still 15.75KHz. If it has changed repeat steps 4 through 11.
13. Turn off the 147 and function generator.

3.5 X-Y Raster Activity Disable

1. Write 3340 to the control register.
2. Write 8000 to XPos, YPos, XScan, and YScan.
3. Using the J6 cable display both the X and Y on the oscilloscope.
4. Write 2340 to the control register. The X waveform should go to a flatline.
5. Write 0340 to the control register. The Y waveform should go to a flatline.

3.6 Video Buffer Calibration

1. Connect the Output of the function generator to the oscilloscope. Turn on the function generator and calibrate it for a 1KHz, 2V peak to peak square wave with zero offset. Turn off the function generator.
2. Connect the 9 pin d-sub female connector of the J8 test cable to 8J on the PCMapII board and connect the BNC end to the Output of the function generator.
3. Connect the 9 pin d-sub male connector of the J7 test cable to 8J on the PCMapII board and connect the BNC end to the oscilloscope.
4. Turn on the 147 and function generator.
5. Adjust R100 (gain) and R102 (offset) on the PCMapII board to obtain a 1KHz, 2V peak to peak square wave with zero offset waveform on the oscilloscope.
6. Turn off the 147 and function generator. Disconnect all cables.

4.0 Horizontal Sync Test

1. Connect the 9 pin, male d-sub connector of the J5 test cable to 5J on the PCMapII board and connect the BNC end of the cable labeled Horz Sync to the oscilloscope.
2. Turn on the 147
3. In the diagnostic program set the base address to 60 and write 3340 to the Control Register, 8000 to XPos, and FFFF to XScan.
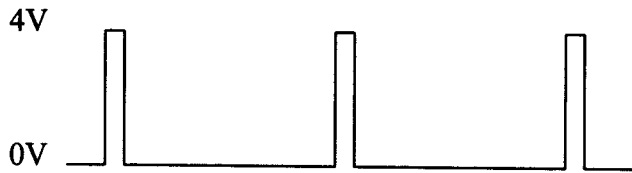4. On the oscilloscope there should be a waveform similar to Figure 4.1 with a frequency of 15.75KHz

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4V  ┌─┐        ┌─┐           ┌─┐
    │ │        │ │           │ │
0V ─┘ └────────┘ └───────────┘ └──
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Figure 4.1

5. Turn off the 147.

4.1 Vertical Sync Test

1. Remove the BNC end labeled Horz Sync of the J5 test cable from the oscilloscope and connect the BNC end labeled Vert Sync, of the J5 Test Cable, to the oscilloscope.
2. Turn on the 147.
3. In the diagnostic program set the base address to 60 and write 3340 to the Control Register, 8000 to YPos, and FFFF to YScan.
4. On the oscilloscope there should be a waveform similar to Figure 4.1 with a frequency of 60Hz.
5. Turn off the 147 and remove the test cable.

5.0 Final Steps

1. Place a green dot on the top of the PCMapII board.
2. Place a serial number sticker on the board and record that number in the log located on Bachelor.
3. If the PCMapII board is shipping with 147 System Interface used to test it the calibration and testing is complete. Stop here.
4. Remove the 64 pin ribbon cable from 2J and the power cable from 4J of the PCMapII board
5. Remove the 6 screws used to hold the board in place.
6. Place the PCMapII board in an antistatic bag and place a green dot on the outside of the bag.