

Reproduction Reference
DD4680832—C28870
Preliminary Field Test Procedure for Each HCMS Site

- 1) This page is for reproduction reference only and will not be included in the manual.
- 2) This manual is to be copied on front and back pages using 8 1/2 x 11 paper.

Note: The first page uses the front of the page (blank on back). Section heading pages always start on a new page; they never start on the back of another page.

- 3) Staple pages together.
- 4) Please direct questions and suggestions to Transportation Admin.
- 5) **Application Information:** This FTP applies to C28870 New Jersey Turnpike Authority VF-2369 series Hybrid Changeable Messages.

**Preliminary
Field Test Procedure Hybrid
Changeable Message Signs**

DD4680832

Rev 1—30 April 2020

DAKTRONICS

DD4680832
Contract C28870
Rev 1—30 April 2020

DAKTRONICS, INC.

Copyright © 2020

All rights reserved. While every precaution has been taken in the preparation of this manual, the publisher assumes no responsibility for errors or omissions. No part of this book covered by the copyrights hereon may be reproduced or copied in any form or by any means—graphic, electronic, or mechanical, including photocopying, taping, or information storage and retrieval systems—without written permission of the publisher.

Vanguard® is a registered trademark of Daktronics, Inc. All other trademarks are property of their respective companies.

Table of Contents

Section 1:	Introduction	1
Section 2:	Test Procedure	3
2.1	Site Information	3
2.2	Systems Control Cabinet Inspection.....	4
2.3	Systems Control Cabinet Power Test	5
2.4	VFC Functional Test	7
2.5	Sign Exterior Inspection	7
2.6	Power Connection Inspection for VMS.....	7
2.7	Sign Interior Inspection.....	8
2.8	Sign Power Test	8
2.9	VMS Functional Test	8
2.10	CMS Inspection.....	10
2.11	CMS Calibration and Test.....	11
2.12	HCMS Systems Control Cabinet.....	12
2.13	Final Details.....	13
2.14	Test Results.....	14
2.15	Punch List Items and Signatures.....	14

Section 1: Introduction

This test procedure describes the preliminary field tests for a HCMS sign site for this project. The purpose of this test is:

1. To check that the sign and all related power and communications equipment necessary to make the sign locally operable, has been installed properly.
2. To check that all sign and related power and communications equipment is functioning. Special emphasis is placed on items that, if bad, are not expected to show up as being bad during normal operation. Example: earth grounding not connected.
3. To put the sign into the state needed so that it is ready for normal operation without the need for an additional visit before beginning normal operation.
4. As a record that all tests and setup tasks have been performed at each particular site so that it will not be necessary to re-visit sites later because of not being sure whether or not certain tests or setup items have been done. To check that the sign and related power and communication equipment have been configured and installed to properly communicate over the communications equipment supplied and installed by others.

Note that this is not a test of all software functions or hardware design limits; this would be very time consuming, and would be redundant, as those tests need to be done only once.

This test should be performed for every sign site at the completion of installation and activation of the communications equipment at a particular site.

The test messages to be used should be the test messages approved by the NJTA that will not misdirect or distract traffic.

This test requires the cooperation of an operator at the central controller with personnel at the sign site.

Test equipment required:

Boom truck, or whatever is required to get up to the sign

Digital multimeter

Laptop computer, with central controller software, miscellaneous software, and null modem cable.

Common hand tools

Walkie-Talkies or cellular telephones for communication between personnel up at the sign and those down at the controller cabinet, if necessary

Cellular telephone or other means of communication with the Traffic Management Center operator

Portable generator and generator cord

Section 2: Test Procedure

2.1 Site Information

Daktronics Representative: _____

Contract number and name: _____

Field test procedure addendum ED number, if any ("NA" not applicable): _____

Mile Post (XXX:XX) _____

Roadway: _____

Sign model no.: CMS-L: _____
Sign model no.: CMS-R: _____

Sign model no.: VMS-L: _____
Sign model no.: VMS-R: _____

Sign assembly no.: CMS-L: _____
Sign assembly no.: CMS-R: _____

Sign assembly no.: VMS-L: _____
Sign assembly no.: VMS-R: _____

Sign serial no.: CMS-L: _____
Sign serial no.: CMS-R: _____

Sign serial no.: VMS-L: _____
Sign serial no.: VMS-R: _____

Traffic cabinet assembly no.: _____

Traffic cabinet serial no.: _____

Field controller S/N: HMS: _____

Field controller S/N: VMS-L: _____

Field controller address no.: HCMS: _____

Field controller S/N: VMS-R: _____

Site IP address: _____

Important: Make sure that the firmware listed below is the most current version, if not make sure to download the latest version of the firmware.

Firmware:

HCMS Version number:

- | | |
|-----------------------------|-------|
| 1) VFC | _____ |
| 2) Video Processor | _____ |
| 3) Display Firmware package | _____ |
| 4) Display Module micro | _____ |
| 5) Display Module EPLD | _____ |
| 6) Display interface micro | _____ |
| 7) Display interface EPLD | _____ |

2.2 Systems Control Cabinet Inspection

- a. Turn off the power to the systems control cabinet. _____
- b. Inspect the interior and exterior of the systems control cabinet for damage, checking for loose parts and/or connections. Verify the nuts are installed on the anchor bolts (if this is a ground mounted systems control cabinet). _____
- c. Check that earth grounding wires are secured to earth ground rod(s) at the display(s), cabinet and/or power source.
Note: Earth ground wire must be a different wire than the power ground _____
- e. Remove the panelboard cover. Check that the 2 hot wires, neutral, and earth ground wires from the 120/240 VAC power source are connected into the panelboard main breaker terminals, neutral bus, and earth ground bus, respectively. _____
- f. Visually inspect the outside of the sign controller(s) for damage, check that all necessary connectors are plugged into the outside of the sign controller, and check that the connector screws (if any) are tight. _____
- g. Inspect the communication interface panel for loose parts or wiring, and check that the wiring or fiber(s) for the communication system is terminated properly. _____
- h. Check that all UPS equipment has been installed and connected properly.
 - a. Check that the AC input and AC output wires are connected into the UPS properly.
 - b. Inspect the batteries and battery connections at the batteries and UPS.
 - c. Check that the RS232 cable is connected between the UPS and J10 of the sign controller.
 - d. Check that the battery temp sensor is taped to one of the batteries, and that the cable is plugged into the UPS. The sensor should be taped onto the inside side (e.g., the right side of the left battery) of one of the batteries, as this is expected to be the warmest location. _____
- i. Check that the AC input and AC output wires are connected into the UPS/Generator Transfer Switch properly. _____

2.3 Systems Control Cabinet Power Test

- a. Check that all systems control cabinet utility panelboard and UPS panelboard circuit breakers are off, except for the "Panelboard Surge Suppressor" breaker, which should be on. Apply power to the systems control cabinet **only**. _____
- b. Using a safe procedure, measure the AC voltage from the panelboard main breaker input lugs to neutral; it should measure between 105 and 125 VAC. Also, check the voltage from neutral to earth ground. It should measure less than 2 VAC. (This is a no-load test of the input voltage.) Record below.
L1 to neutral: _____ L2 to neutral: _____ L1 to L2: _____
Neutral to earth ground: _____ _____
- c. Check that all control equipment, including communication equipment for use between the sign site and the central controller, is plugged into the control equipment outlet strip. **Note:** This outlet strip is powered from the UPS, so other equipment must not be plugged in, because that may overload the UPS or shorten the amount of time that the UPS will operate from batteries. _____
- d. Check that the control equipment outlet strip is plugged into the surge protected AC outlet labeled "For Control Equipment Outlet Strip Only". **Note:** This outlet strip is powered from the UPS, so other equipment must not be plugged in, because that may overload the UPS or shorten the amount of time that the UPS will operate from batteries. _____
- e. Check that all control equipment inside the systems control cabinet is switched OFF, and turn ON the "Main" circuit breaker and "Lights & GFCI outlet" circuit breaker in the utility panelboard. Check that the systems control cabinet light is ON and that the "Utility" AC outlet inside the systems control cabinet is live. ("Control Equipment" outlet should not yet be ON, and will be checked later.) Close the door that is currently open and open the other door, and check that the systems control cabinet light is ON. _____
- f. Turn ON the "UPS, Control Equip" breaker in the utility panelboard. Turn ON the UPS by turning ON the AC "Input Circuit Breaker" and the DC "Battery Breaker" on the UPS. The UPS should go into "line", "buck", or "boost" mode. Check that the "Control Equipment" AC outlet inside the systems control cabinet is now live by using a multimeter, the outlet should measure between 105 and 125 VAC. _____
- g. Turn on battery breaker. Verify UPS is in "Standby" mode. Set sense type to Generator. Turn on AC input breaker. Verify UPS in "Line" mode. Measure AC voltages in UPS panel with circuit breakers off.
L1 to neutral: _____ Neutral to earth ground: _____ _____

- h. Confirm the UPS has been configured properly (settings found on bottom of UPS):

Inverter: (UPS factory default – Enabled.)
Inverter: off
Bypass: (UPS factory default – off.)
Battery Test: off
BT TS DOD: 20%
Auto test: (UPS factory default – off.)
Shutdown: (UPS factory default – off.)
○ Shutdown AC: off
○ Shutdown DC: off
Sense type: Generator.
Function mode: Automatic Voltage Regulation (AVR)
Voltage: (UPS factory default – 120 VAC.)
Frequency: (UPS factory default – 60 Hz.)
Temp. Display: F
Daylight: On
Date Format: (MM/DD/YYYY)
Clock Format: 24H
Inv. Record: (Any setting; has no effect on operation.)
Qual time: 3 seconds.
Charger: Standard
Battery Float: Auto
Battery comp: 2.7 mV/°F/Cell (or 5 mV/°C)
Charge Current: 10 A.

- i. Turn on “Exhaust fan and Control Equipment Outlet” circuit breaker in UPS panel. _____

- j. Turn the adjustable thermostat down below the ambient air temperature; the fans should turn on. Check that air blows out of the exterior roof vents. Turn the thermostat up above the ambient air temperature; the fans should turn off. Set the thermostat to 90°F. _____

Note: If the ambient air temperature is below the lowest setting on the thermostat, warm the thermostat with a heat gun or hair dryer. _____

- k. Press the fan override switch and verify the fans turn on. Release it and the fans should turn off. _____

- l. Traffic cabinet door detection switches. **Note:** Operate the doors, not just the switches, to be sure that the switches adjustments are correct. It may take up to 10 seconds after the door position is changed to indicate the change. _____

Display the View Peripheral Menu on the controller. Close both systems control cabinet doors, and check that the controller indicates that the doors are closed.

Open the one door, and check that the controller indicates that the door is open.

Open the other door, and check that the controller indicates that the door is open. _____

- m. UPS communication with sign controller.
 - Display the View Peripherals Menu on the controller, and check that the UPS entry indicates "AC line".
 - Turn off the "UPS & CNTRL Equip" circuit breaker. Check that the UPS entry changes to "Battery". It may take a few seconds for the entry to change.
 - Turn on the "UPS & CNTRL Equip" circuit breaker. Check that the UPS entry changes to "AC line".
 - Connect the UPS Ethernet port to a laptop and verify proper operation of the on-board UPS software and Ethernet communication settings.
 - Change the Amp hour capacity to 38 amp/hour.
- n. Reinstall the panelboard cover. _____

2.4 VFC Functional Test

- | | <u>VMS-L</u> | <u>VMS-R</u> |
|--|--------------|--------------|
| a. Turn on the sign controller(s) power switch(es), check that the power indicator LED is on. | _____ | _____ |
| b. If necessary: Configure the controller for sign control; address, module type, sign height, sign width, sign type, access type, and peripherals. See contract site config sheet for details. | _____ | _____ |
| c. Set NTP Interface to Enabled and enter the local network switch address as the NTP Server IP address. Set the correct time zone and daylight savings. | _____ | |

2.5 Sign Exterior Inspection

- | | | |
|---|-------|-------|
| a. Visually inspect the outside of the sign for damage. | _____ | _____ |
| b. Check that the light sensors are unobstructed. | _____ | _____ |

2.6 Power Connection Inspection for VMS

- | | | |
|---|-------|-------|
| a. Turn off the power to the sign, from outside the sign. | _____ | _____ |
|---|-------|-------|

- b. Check that the two hot wires, neutral, and earth ground wires from the 120/240 VAC power source are connected into the panelboard main breaker terminals, neutral bus, and earth ground bus, respectively. _____
- c. Check that the earth grounding wire is secure from the case of the sign (inside or outside) to the earth ground rod(s) near the base of the sign. _____
- d. Check that all panelboard circuit breakers are off, except for the "Panelboard Surge Suppressor" breaker, which should be on. Apply power to the sign. _____
- e. Using a safe procedure, measure the AC voltage from the panelboard main breaker input lugs to neutral; it should measure between 105 and 125 VAC. Also, check the voltage from neutral to earth ground; should be less than 20 VAC. (This is a no-load test of the input voltage.) Record below. _____

VMS-L: L1 to neutral: _____ L2 to neutral: _____ L1 to L2: _____
 Neutral to earth ground: _____
 VMS-R: L1 to neutral: _____ L2 to neutral: _____ L1 to L2: _____
 Neutral to earth ground: _____

2.7 Sign Interior Inspection

- a. Make sure the Site Information for the sign is filled out: sign serial number, sign model number, sign assembly number, etc. _____
- b. Inspect the inside of the sign for damage. Check for loose parts, connections and wiring, inside of the sign including. Also, verify that the fiber-optic cables is connected to the proper location(s) on the PLR boards. _____

2.8 Sign Power Test

- a. Turn on all circuit breakers. _____

2.9 VMS Functional Test

- a. Enter in all peripheral equipment into the sign controller(s). _____
- b. Check that all LED power supplies indicate "PASS". _____

- c. Check that the value indicated by each of the light sensors appears reasonable for the current ambient lighting conditions. Record below:
 Date: _____ Time: _____ Sky conditions _____
 VMS-L: 1: _____ 2: _____ 3: _____
 VMS-R: 1: _____ 2: _____ 3: _____
- d. Check that the Module and external temperatures appear correct, and record below: _____
 Module temperature, degrees F.: _____
 External temperature, degrees F.: _____
- e. Run the following Test pattern and verify that all the test patterns display properly: _____
 a. Alphabet pattern.
 b. Line numbers
 c. Auto test pattern. _____
- f. Set to “None” and exit the test pattern mode. _____
- g. Display signal testing using the VIP diagnostics tool to test signal connections. _____
 a. Using the VIP diagnostics tool to test module signal connections
[DD2699549 /support/kb/Pages/DD2699549.aspx](http://DD2699549/support/kb/Pages/DD2699549.aspx).
 b. Display alphabet test pattern then disconnect fiber port B from VFC.
 • Check the signal loss value on the controller under configuration/system/optional/signal loss.
 • Leave the test pattern running for a minimum of 60 seconds longer than the signal loss setting.
 • If test pattern goes off, then troubleshoot fiber connections.
 • Plug fiber port B back in and repeat test with fiber port A unplugged. _____
- h. Display a message (not a test pattern) that will not misdirect traffic and that has characters that butt up to the top, bottom, left, and right edges of the sign and verify that it displays correctly. This verifies proper message display capability for this sign size. _____
- i. **When Load test during Daytime:** Run the “All On 100% Burn” test pattern and leave the brightness set to 100%.
When Load testing during Nighttime: Select test patterns and select “all on red 10%”. Turn-on fans log into controller, select sign 1, (2) diagnostics, down arrow to (2) run fans and heaters, select option from list and then (1) turn on. Return to normal operation when testing is done.
 L1 to neutral: _____ L2 to neutral: _____ L1 and L2: _____
 Neutral to earth ground: _____
- j. Perform a pixel test and verify that all pixels are reported as good. _____

- k. RPM Sensors with electronically controlled fans.
 - a. **Daytime testing:** Run the "All On 100% Burn" Test pattern. Verify the fans turn on and the RPM sensors indicate pass. When done turn test patterns to none.
 - b. **Nighttime testing:** Turn-on fans log into controller, select sign 1, (2) diagnostics, down arrow to (2) run fans and heaters, select option from list and then (1) turn on. Verify the fans turn on and the RPM sensors indicate pass. Return to normal operation when testing is done.

- l. Sign door signal switches. **Note:** It may take up to 10 seconds after the door position is changed to indicate the change.
 - a. Display the View Peripherals Menu on the controller. Close all sign doors, and check that the LCD indicates that the doors are closed.

- m. Parallel surge suppressor with remote reporting:

Display the "View Peripherals" screen on the controller, and check that the Surge Suppressor entry indicates "Pass".

- n. Reinstall all enclosure covers.

2.10 CMS Inspection

- a. Inspect face of display. The paint should be free of blemishes, all Faces panels and reflective tape are in place and not damaged.

- b. Using a safe procedure, measure the AC voltage inside the drum display from L1 and L2 to Neutral, it should measure between 105 and 125 VAC. Also, check the voltage from neutral to earth ground. It should measure less than 2 VAC. (This is a no-load test of the input voltage.) Record below.

VMS-L: L1 to neutral: _____ L2 to neutral: _____ L1 to L2: _____

Neutral to earth ground: _____

VMS-R: L1 to neutral: _____ L2 to neutral: _____ L1 to L2: _____

Neutral to earth ground: _____

- c. Turn on UPS subpanel breaker in cabinet and behind door of VMS

- d. Open back doors and remove / verify shipping rotor blocks are removed.

- e. **Check the following safety points:**
 1. Sharp edges and other safety hazards
 2. Check the Photo Cell is installed and connected
 3. Verify the conduit connections are secure and sealed.

2.11 CMS Calibration and Test

- a. Hook up laptop and verify encoder readings. _____
- b. **Calibrate Drum**
1. Manually rotate the drum to position 1. Verify the position is within 1 deg of sign face. (Using the Jog switch with the Mode Switch in the manual position.)
 2. Connect SET 1 pin to +5v pin with a jumper wire or jump pin 1 to pin 8. This calibrates the display.
 3. Move the face Select Switch to 2 and the mode switch to manual. Verify the face moves to position 2 and is within tolerance.
 4. Repeat Steps 1 and 3 for all drums as required. Record all encoder values. _____
- c. **Configuration**
- If necessary; Enter all the necessary data into the CMS controller(s) and update firmware. _____
- d. **Drum Rotation Test**
1. On the motor control board, set the rotary switch to position 1. Hold down the Auto/Manual switch and door switch until the drum rotates, and verify the drum stops in position 1.
 2. Repeat for positions 2-4.
 3. Repeat Steps 1 and 2 for drum 2.
- | <u>Encoder Values</u> | Drum 1 _____ | Drum 2 _____ |
|----------------------------|--------------|--------------|
| Deg. Count (±10 counts) | | |
| 0° 0 | | |
| 90° 1024 | | |
| 180° 2048 | | |
| 270° 3072 | | |
- e. **Heat Tape Test**
1. Verify the heat tape is off. The heat tape is safe to touch, even when warmed.
 2. Increase the setting on the thermostat to higher than the current ambient temperature.
 3. Verify the heat tape turns on by touching it.
 4. Reset the thermostat to the original setting (35°F). Verify the heat tape turns off. _____
- f. **Fans and Fan Test**
1. Using a hair dryer, heat up the U14 sensor on the MCB to 120°F.
 2. Verify the fans activate. _____
- g. **Light Test**
- Turn on the timer to verify that the Panel lights are operational _____
- h. **Power Supply Error Reporting**
1. Remove the AC power connector from the power supply's #1 connector. Wait 15 seconds and get status from Sign control panel, and verify a short error status.
 2. Activate a message on the CMS. Verify the drum rotates.
 3. Reconnect the power connector removed in Step 1 and get status with Vanguard Central
 4. Repeat Steps 1 through 3 for other power supplies in the CMS. _____

i. **Door Open Detection Sensors**

1. Close all doors equipped with sensors. Get status with Vanguard Central.
2. Open the control cabinet sign door. Get status with Vanguard Central to verify door reports open.

j. **In-Sign Control panel test**

1. From the MCB, select permanent message #1 and display while pressing and holding the door switch. Get the status with Vanguard Central to confirm display feedback, and verify face rotary position (in degrees).
2. Repeat for all permanent messages.

k. **Restore sign from Cabinet test**

1. Place the Auto switch to Auto position
2. Close all doors Equipment and AC cabinet

2.12 HCMS Systems Control Cabinet

a. **Changeable Message Push Button Interface Test Procedure**

1. Push and hold the Master switch on the push button interface, then press and hold the Message 1 button.
2. After two seconds, release the buttons. Verify the correct message displays on the HCMS and is reported by Vanguard.
3. Repeat for all remaining buttons.

b. **Generator Back Up Test Procedure**

1. Turn off the main breaker in the utility panelboard and connect power to the generator plug.
 2. Set the switch on the generator transfer switch to "Gen."
 3. Set the switch on the UPS bypass to "Bypass."
 4. Verify the equipment plugged into the control equipment outlet still functions.
 5. Verify the CMS display can still rotate.
 6. Turn on the main breaker.
 7. Set the generator transfer switch to "Line."
 8. Set the UPS bypass switch to "UPS."
- Remove power from the generator plug.

c. **UPS Backup Test Procedure**

1. Confirm that the batteries are fully charged. Measure and record the voltage of each battery before and after the 1 hour test

Before

Battery #1 _____ #2 _____ #3 _____ #4 _____

After

Battery #1 _____ #2 _____ #3 _____ #4 _____

2. Double-check that no additional loads have been plugged into the control equipment outlets inside the systems control cabinet. The only items that should be plugged into the control equipment outlets in the systems control cabinet are the sign controller(s), and communication equipment used between the sign controller(s) and the central controller.
3. Note the time and turn OFF the utility power to the systems control cabinet via turning OFF the UPS circuit breaker in the Utility panel board.
4. Verify the CMS can complete two turns and the Sign controller(s) are operational for 60 minutes with the main panel breaker in the off position. Turn ON the utility power to the systems control cabinet via turning on the UPS circuit breaker in the Utility panel board.

2.13 Final Details

- a. Confirm that all sign and systems control cabinet equipment covers (if any) are installed.
- b. Verify the VMS is blank and the drum is in position 1.
- c. Verify that any test messages you created have been removed from the sign controller(s).
- d. Record if main breaker is left on or off: On: ____ Off: ____
Date: _____

Note: The UPS must be turned OFF by turning OFF the AC "Input Circuit Breaker" and the DC "Battery Breaker" on the UPS if utility power is to be left OFF at the site.

- e. Make sure the Site Information is filled out: serial numbers, site location, phone number, sign dimension, firmware versions, etc.

2.14 Test Results

Turnpike/Parkway

Milepost

Roadway

Circle the appropriate result at the completion of the test.

Pass

Conditional Pass (See Punch List)

Fail

2.15 Punch List Items and Signatures

Punch List Item*

Technician
(Initials)

Customer
(Initials)

_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

* Include only items that failed testing or require re-testing. The Construction Punch List will be developed separately. Notify Authority and Resident Engineer upon completion of punch list to arrange for re-testing if required.

Daktronics Technician

Printed Name

Signature

Date

NJ Turnpike Authority

Printed Name

Signature

Date

DAKTRONICS PERSONNEL MUST RETURN THIS COMPLETED DOCUMENT TO THE DAKTRONICS CONTRACT PROJECT MANAGER.