

Section 675 Controllers and Detectors

675.1 Description

- (1) This section describes installing department-furnished controllers for ramp meters, detector processor assemblies, and microwave detectors.

675.2 Materials

- (1) The department will furnish controllers as specified in the contract special provisions.

675.3 Construction

- (1) Perform a series resistance test and resistance to ground test at each loop/lead-in circuit before starting any work as specified in [670](#).
- (2) For new loop/lead-in circuits, perform a series resistance test and resistance to ground test. Ensure that the series resistance of each circuit is less than 5 ohms. Ensure that the insulation resistance of loop conductors to ground, and between adjacent loops/lead-in circuit is greater than 500 mega ohms as measured with a 500 volt megger test meter.
- (3) If any work proceeds at a location without completion of the loop detector testing, assume responsibility for the ultimate correct operation of the loop/lead-in.
- (4) Secure ramp meter processor assembly cabinets on new, modified, or existing concrete bases at locations the plans show. Provide bolted stainless steel connections with lock washers, locking nuts, or other engineer-approved means to prevent the connection nuts from backing off. Isolate dissimilar materials from one another by stainless steel fittings.
- (5) Make power connections to the processor assembly cabinet as specified in [656](#).
- (6) Make detector cable and communications cable connections to the processor assembly cabinet to provide the required operation.
- (7) Make traffic signal cable connections and electrical wire connections to the processor assembly cabinet as specified in [676](#).
- (8) Terminate signal current carrying neutral conductors on a neutral strip mounted in the cabinet. Isolate the neutral bus from the cabinet and equipment ground. Terminate the neutral bus at the neutral lug ultimately attached in the meter pedestal.
- (9) Ground all cable grounding shields and any spare or unused conductors in the ramp meter processor assembly cabinet to the equipment-grounding terminal strip.
- (10) Isolate the equipment-grounding strip from the cabinet and current carrying neutral. Terminate the cabinet current carrying neutral at the current carrying neutral ground lug in the meter pedestal or breaker disconnect box.
- (11) Reuse existing wiring to the existing, modified, or new concrete control cabinet base unless the engineer directs otherwise. Wiring includes bonding wire, conductors and loop detector lead-in cable, and loop detector wire.
- (12) Make connections among the processor assembly, multipoint device interface units, and telephone interface modems at locations the plans show.
- (13) The department will provide processor assembly firmware. The department will install the processor firmware on contractor-supplied EPROM's. Pick up the EPROM's with firmware from the department, and install it into each controller before installation.
- (14) Upon completing installation work at a location, before detector verification and conducting the testing procedure, perform the new loop/lead-in circuit series resistance test and resistance to ground test. Ensure that the series resistance of each circuit is less than 5 ohms. Ensure that the insulation resistance of loop conductors to ground, and between adjacent loop/lead-in circuit, is greater than 500 mega ohms as measured with a 500 volt megger test meter. Document the test results, and submit them to the engineer as part of the set up to begin the testing procedure.
- (15) Demonstrate the functionality and accuracy of the vehicle detectors connected to each location. Verify that the traffic flow information obtained from each detector is within +/- 5 percent of each of two 10-minute manual data periods.
- (16) After installing the processor assembly; installing other ramp control signal assembly hardware, detection hardware, communications hardware, power supply, and connecting cabling; and successfully completing, documenting and presenting, to the engineer, testing and verification, the field system integrator, following the contractor-submitted and engineer-approved testing procedure, shall successfully conducted a field test for each processor assembly. The test is designed to demonstrate that hardware,

cable, and connections furnished and installed by the contractor operates correctly and that all functions are in conformance with the specifications. It is not necessary to test all locations concurrently.

- (17) Do not begin ramp meter processor assembly test until the following have been accomplished:
 - Testing of new and existing loop detectors.
 - Testing of ramp control signal wiring.
 - Submission of documented results to the engineer.
 - Installation of ramp signing and pavement marking, including HOV and trailblazing.
- (18) The contractor may conduct the test within 48 hours after the field system integrator advises the engineer that it is ready to begin the test, the processor is communicating to central, and documentation has been presented. Begin the test once the field system integrator has satisfied itself that work has been completed at each processor assembly location. After the processor assembly has been placed in operation, the field system integrator shall demonstrate that equipment furnished and installed by the contractor operates as specified.
- (19) After successful completion of the test procedure, test each processor assembly for proper operation for 30 consecutive days. During the testing period, ensure that contractor-provided equipment at the assembly location operates without failures of any type. If any component malfunctions or fails to provide the specified capabilities, during the 30-day test period, the field system integrator shall replace or repair the defective equipment within 48 hours of the engineer's notification.
- (20) After the component malfunction has been corrected to the satisfaction of the engineer, begin a new 30-day test period. The 30-day test applies only to contractor-furnished hardware. In the event of a failure of hardware furnished by others that prevents the 30-day test from continuing, the engineer will suspend the 30-day test until the other hardware failures are corrected, at which time the test will resume.

675.4 Measurement

- (1) The department will measure the bid items under this section as each individual assembly acceptably completed.

675.5 Payment

- (1) The department will pay for measured quantities at the contract unit price under the following bid items:

<u>ITEM NUMBER</u>	<u>DESCRIPTION</u>	<u>UNIT</u>
675.0100	Install Controller Ramp Meter Processor Assembly	EACH
675.0200	Install Controller Detector Processor Assembly	EACH
675.0300	Install Mounted Controller Microwave Detector Assembly	EACH

- (2) Payment for Install Controller Ramp Meter Processor Assembly and Install Controller Detector Processor Assembly is full compensation for installing the processor assembly, for making connections, and for testing.
- (3) Payment for Install Mounted Controller Microwave Detector Assembly is full compensation for installing the mounting brackets on poles, for installing the microwave detector on the bracket, for making connections, for positioning the detector to provide the optimum field of view, for setting up and programming the detector, and for testing.
- (4) The department will not pay for correcting the loop/lead-in or for correcting component malfunctions exposed during the 30-day testing period. The department will not make complete payment under a bid item in this section until each processor assembly completes a successful test over 30 consecutive days without interruption by any contractor-furnished component malfunction.