IX. TTMS/PTMS Field Inspection and Inventory

Process Overview

Video 32 Process Overview

Introduction

This chapter details the procedures and equipment used in the field when inspecting new and existing traffic monitoring sites. Throughout this handbook we have referenced the various types of Traffic Monitoring Sites (TMS) that make up the over 5,000 locations statewide where traffic data is collected on a regular basis. Two categories of traffic monitoring sites have permanent equipment physically located in the roadway. They are the backbone of the traffic count program administered by the Florida Department of Transportation Central and District offices. Specifically, the 300 Telemetered Traffic Monitoring Sites (TTMS) are the locations that are polled via modem daily by the TranStat Central Office Computers. They record and transmit every day of the year and provide the data used for adjusting short-term traffic counts to Annual Average Daily Traffic (AADT). The second member of the permanent count family is the Portable Traffic Monitoring Sites (PTMS). These locations are usually installed on high volume urban arterials where rubber hose counts or other equipment are difficult to install and maintain. The permanent parts of the installation are the in-pavement sensors (loops and/or piezos) and the traffic cabinet. Greater reliability and accuracy are the reason loops are preferred to hose counts. A traffic counter is normally placed in the cabinet and attached to the wire harness for a short period (3-7 days) either annually or quarterly then moved from one site to another, hence the term portable traffic monitoring site. Some locations are in rural or urban fringe areas that are located for coverage counts on roads that have the potential for significant increases in traffic as development and new traffic patterns evolve. Others are located for safety reasons as the difficulty in installing temporary equipment is dangerous due either to high travel speeds and/or roadway volumes.

Background

The State Road Department started collecting data at ten locations back in 1936. As the state grew both in population and number of lane miles, the need to expand traffic data collection was obvious. The value of good data became apparent early on in the evolution of the national Department of Transportation (DOT) and eventually the Federal Highway Administration (FHWA). This data translated into revenue allocations for the state and federal highway programs. A significant portion (approximately 25%) of TTMS locations is on the Interstate Highway and Florida Turnpike. The remainder are located on US Highways and major state roads.

The data collected at these sites may include: volume, speed, vehicle class and weight. Some sites collect only volume or speed

while others collect combinations of all categories. The type of equipment installed and the programs set-up in the equipment determine how the site functions. The purpose of all the sites is to provide the Department with a basis to meet the reporting requirements of the FHWA for sustaining the funding of federal transportation programs and to provide critical data required for engineering analysis of existing facilities and to identify the need for expansion in the roadway network.

Installation and Maintenance Responsibility

FDOT Central or District Offices determine when and where new sites are required. Often times when major highway construction projects are undertaken, a count site will be included in the design plans at the request of the Statistics Department. Normally, 3-4 new sites are installed each year and several others receive equipment upgrades. The type of equipment installed is determined by the type of data desired. As stated previously, the TTMS locations come under the control of the Central Office Statistics Department while the PTMS sites are the responsibility of each District Office. The customary procedure is to provide the site location and equipment information in the design plans as specified in the Roadway Design Plans Standard Index 17781 through 17900. Each set-up has a list of pay items and details of how the installation must be constructed in order to function properly. The acceptance of the installation by the Department is determined after field inspection and inventory by a qualified technician completing the procedures outlined in this chapter. The next sections of this chapter detail the field inspection and inventory requirements of TTMS and PTMS sites.

Field Inspections of Traffic Monitoring Sites

The process begins with a request or work order from the Central Office (TTMS) or District Office (PTMS) for a field inspection and inventory of equipment at a new or existing site. Once the work order is initiated, a trained service technician makes a visit to the site to ensure the correct equipment is installed and working as specified by the design request of the District or Central Office. The following steps outline the recommended process that should be used by all technicians when inspecting and inventorying a TTMS or PTMS site. The significant difference between TTMS and PTMS sites is the telephone connection with modem required for transmitting the data daily and the solar panel that supplies power to the battery. PTMS sites may have the same cabinet, counter harness, loop diagrams and internal panels as a TTMS site, but does not have the need for continuous power or communications.

Two forms are required by the Department to be completed at each installation by the field technician to update the count site database. They are: TTMS Inspection Sheet and TTMS Inventory log (copies attached). We will step through the process of completing each of these reports and provide both video and still photo examples of the procedures and equipment used and installed at the sites.

At the Site

Upon arriving at the field site, the technician should follow the standard procedures described earlier in this handbook for exiting the roadway safely by activating turn signals and flashers in advance of the site and pulling completely off the road and whenever possible providing the maximum amount of separation from the travel lanes

and clear zones of the roadway. The technician should have an orange safety vest on prior to or immediately after exiting the vehicle. It is important to always proceed slowly and cautiously when working at any location adjacent to the highway. This is especially true when working alone, as in the case with most field inspections at TTMS or PTMS sites. Try to always face oncoming traffic whenever making field measurements and checking in-road devices or those adjacent to the travel lanes. Be Alert.

The procedures provided here require operating knowledge of oscilloscopes, volt-ohm meters, telephone connections and basic wiring. Voltages are low and therefore electrical shock is not a concern, however, damage to components from improper use or incorrect connection of testing equipment should be considered at all times. Examples of some of the equipment used in testing the equipment are provided here. They may have appeared in other areas of this document, as they are common to the technician and his tasks. Photos or videos of most of the equipment types and procedures used are provided to assist in identifying components and safe practices. All models or manufacturers may not be represented in the samples provided as some are being phased out as newer and more efficient replacements become available.

Sensor Configurations

Check condition

VIDEO

Video 33 Check Conditions

Visually inspect loops and piezos for rutting & cracking, or breaks. If cracks allow water to surround the leads, it may interfere with the operation of the sensors. When checking the depth of cracks or missing sealant, don't use a sharp object like a screwdriver or pocketknife to probe as it may result in equipment damage.

Check Layout

Loops should be centered in the lane and perpendicular to lane stripes. The piezo sensor should be located between the loops. It is positioned to cover only a single wheel path.

Measure Spacing

With a wheel or tape measure, check loops to ensure that spacing is 16 feet from leading edge to leading edge. Each loop should measure 6 feet. The piezo should be 1 foot after the trailing edge of the first loop.

Always wear a safety vest, and follow safety precautions when working on or near the roadway. Never turn your back to traffic.

Check Sealant & Grout

Check that the loop slot is filled with sealant. The piezo grout should be smooth. The peizo grout should be even with or slightly higher than the pavement surface. If the peizo grout is concave, the sensors will not record correctly. G100 Epoxy is not allowed for piezos installed in asphalt.

Check Pullbox

VIDEO

Video 34 Check Pullbox

Check the pullbox for correct installation. The pullbox should be located a minimum of 8 feet from the edge of the pavement. Lids should be level with the surrounding surface. Inspect the concrete box for cracks to ensure it is intact. A pull box should be sitting on a 12 to 15 inch gravel base to allow proper drainage. This pullbox should be replaced. The loop wires should be spliced. The stranded 12 gauge wires should be spliced by soldering or crimping to a 12 gauge home run cable that is grounded in the cabinet. The peizo wires should not be spliced but simply passed through directly to the cabinet. They should all be encased in water seals.

Cabinet Inspection

Take photo

VIDEO

Video 35 Cabinet Inspection

Take photos of the site to indicate the type of cabinet and how it is mounted. The photos are a visual record of the condition of the cabinet and current inventory.

334.psd

Steel Railroad.psd

Type 3.psd

Type 4.psd

Type 5.psd

Check fasteners

Check that the cabinet is securely fastened and that it is good and tight. There should not be any rust on bolts, nuts or brackets.

Breakaway Pole.psd

High Base.psd

Low Base.psd

Pole Mount.psd

Check height

The center of a pole mounted or break-away pedestal cabinet should be 4-feet above the ground. A low based mounted cabinet sits on a 3.5 inch concrete platform.

Check seals

Ensure that all entry holes are sealed against water and insect intrusion.

Measure ground rod

Measure and record ground rod resistance using an earth megger–

VIDEO

Video 36 Measure Ground Rod

Clip the leads to the two ground rods and push the rods into the ground as far as they will go. The two ground rods are connected to the earth megger, and the red wire is connected to the cabinet ground. A good reading is less than 25 ohms. However, state specifications only require a 50' ground rod. Older PTMS sites may not have ground rods to measure.

Care must be exercised in using the earth megger because it outputs up to 500 volts which may damage components within the cabinet. It may also give you quite a jolt.

Check wiring harness

Check that the wiring harness is installed.

Control Specialist FDOT Walton PAT Peek

Tomlison

Locate diagram

Locate and verify that the sensor wiring diagram was left by the contractor in the cabinet. Be sure the diagram is written directly on the cabinet door.

Record GPS

VIDEO

Video 37 Record GPS

If GPS coordinates have not been recorded for a site, Measure and record them. The GPS coordinates will help technicians locate the cabinet and ensure that the GIS maps are accurate. Once the GPS unit has a signal from all four satellites, it displays the Latitudinal and Longitudinal coordinates. Output should be expressed in degrees with five decimal places to be consistent with the database.

Check Loops

Video 38 Check Loops

Label leads

Make sure that all loop and piezo leads are clearly labeled. The leads are labeled here by the number of yellow bands wrapped around the cable.

Measure loop resistance

To test the series resistance of a loop, hook the Inductive loop analyzer across the loop itself. Remove the loop from the terminal strip to measure. State specifications require less than 10 ohms, but a good loop measures less than 3 ohms.

Measure loop inductance

The meter also measures the inductance, which should be a minimum 100 microhenries.

Measure loop leakage

To measure the loop leakage to ground, disconnect both leads of the loop from the terminal strip. Connect one of leads of the megger to the loop wire and the other lead connected to ground.

When you push the meg button, the meter should read greater than 100 megaohms.

Remember to reattach and securely tighten the leads to the terminal strip after testing.

Check Piezos

Video 39 Check Piezos

Measure voltage output

Remove the piezo coax cable from the terminal strip. The ground side of the coax cable is wrapped around the center conductor. Connect the center conductor to the probe side and the ground side to the ground side of the oscilloscope. The oscilloscope amplitude is set to 100 millivolts per division on the front of the scope. The trigger is set to 100 miliseconds and is set to trigger on the leading edge of the pulse.

Measure voltage output on the oscilloscope – The pulse should be greater than 100 millivolts for a car.

Measure capacitance

Run a meg test for capacitance and resistance. Set the megger at 500 volts. The piezo should read more than 20 megaohms. If the resistance is less than 20 megaohms, the peizo should be replaced. The capacitance of a newly installed piezo should be within plus or minus 20% of the factory certified measurement. If needed, the capacitance can be estimated based on the length of the piezo and cable.

Check Communications (TTMS Sites Only)

Video 40 Check Communications

Check Phone

Check the phone line by unplugging the modem and plugging a test phone into the telephone suppressor. Listen for a dial tone. There should be no noise or static on the line. Press any number key. It will break the dial tone. Listen for a quiet line.

(Measure and record voltage – 48 volts DC.) To check the polarity, plug the tester into the phone suppressor. If light number 3 lights, then the polarity is OK. If no other leds light, then there is no AC on the line.

Check Modem

Check the modem. The modem is connected to the counter by this cable. Record equipment type and serial number. Check power and ground.

Connect the modem to a laptop using a modem cable. The software tests the modem to verify that it is properly working. When you press enter, it flashes that the modem is OK, and then clears.

Check the modem connections to both the phone lines and the counter. Use a cell phone to call the modem and check for a response.

Remember to plug the modem back in when finished. It may save you a return trip!

Check Power

VIDEO

Video 41 Check Power

Solar Panel

Use a compass to ensure that the solar panel points south or southwest.

The proper angle for the solar panel is latitude plus 10 degrees.

Visually inspect overhead lines, cables and trees. They should not shade the surface area of the solar panel.

Disconnect the solar panel from the regulator and verify that it produces 18-20 volts DC.

Connect the regulator and verify that the output voltage reads 13.5 – 14.1 volts DC on a sunny day.

Check Battery

Check the battery to be sure that is providing power. Testing this battery under load shows a reading of about 14.1 volts.

Measure and record type and amperage. 100 amp/hr is required.

Verify that the voltage doesn't drop below 12 volts DC when placed under a 3.5 amp load. Here we connect a light for 60 seconds. The voltage dropped from 13.35 to an acceptable 12.95. Within a minute the voltage had returned to 13.3. This is a good battery.

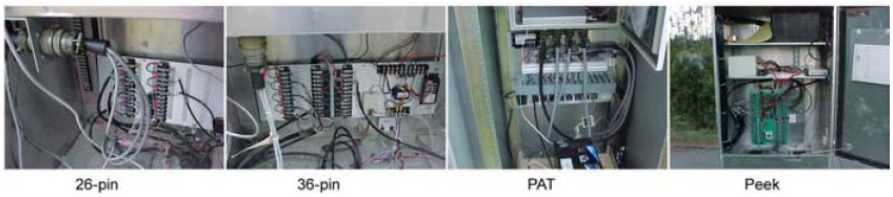
Backplane

VIDEO

Video 42 Check Wiring Harness

The wiring harness connects to the terminal strips that connect to the loops and peizos. The harness ends in a 26 pin connector which is connected to the counter.

Wiring harness – 26 pin, PAT (WIM), or PEEK.



Surge Suppressors – Tomlinson, Edco, PEEK, none.

Check Counter

VIDEO

Video 43 Check Counter

Diamond = TrafMan
Peek = TDP/TOPS
PAT = PAT RDC

Record the equipment type, NH number, and serial number of the counter.

Connect the laptop to the counter by disconnecting the cable connected to the modem and connecting it to the laptop. Run the compatible software program for the equipment typed. After it begins to communicate with the counter you will be prompted to enter the password. Check that the information coming from the counter is correct.

Set time for correct time zone and count interval (15 or 60 minute).

Check each lane for accurate class, speed and count data. Test sensors to see that the loops and peizos are sending signals. Monitor Traffic Data for 30 to 45 minutes to visually verify that the data being collected seems reasonable. This program displays the lane number, the exact time the vehicle is counted, the speed, number of axles, length Axle bin, speed bin, and the length between axles.

The Distance between the back axles of a semi-trailer are typically 3.9 to 4.1 feet.

Call the Tallahassee Springhill Facility for on-line testing. at 850-414-4776. The technician will replicate an on-line dial-up and verify that a signal is transmitting the data.

Peek 241 A


Diamond



Peek ADR3000


MetroCount

Jamar


Final Re-Check

VIDEO

Video 44 Final Re-Check

Prior to closing the cabinet, check that all tools and test equipment have been removed and all cables and connections are secure. It may save you the inconvenience of coming back to simply plug a modem back in.

Ensure that all paper work for the site is in the plastic bag or pocket attached to panel door.

Be sure that all fields are completed and proper equipment type is circled on both forms.

Take digital photos of installation, location, cabinet mounting and signage. Submit the photos with completed paper work to the FDOT Springhill facility for database updating.

Return all tools and test equipment to your vehicle and secure them for safety while your vehicle is in motion. Tag any equipment that is faulty for return to FDOT Springhill Road facility. Be sure that flashers and turn signals are used to safely re-enter the traffic stream when traffic permits.

Future Additions

Future additions to this document will include trouble-shooting basics when a site has problems. As each occurrence may be something unique, standard procedures based on documented service reports will provide the background to suggested service routines and best practices.