

# **COUNT STATION INSTALLATION AND MAINTENANCE GUIDELINES**

*Electrical Engineering Centre/Engineering Branch*

Version 4.0  
January 2004

# **TABLE OF CONTENTS**

## **1.) TRAFFIC COUNT STATION INSTALLATION**

**1.1 Short count station installation**

**1.2 Permanent count station installation**

**1.3 Traffic Count Station Loop Installation Procedures**

## **2.) SHORT COUNT STATION CONDITION ASSESSMENT AND CORRECTIVE MAINTENANCE**

**2.1 Short count station condition assessment**

**2.2 Short count station corrective Maintenance**

## **APPENDIX A**

**1. Short Count Station Installation/Loopcutting Report (H-1085)**

**2. Short Count Station Maintenance Report (H-1086)**

**3. Permanent Count Station Installation/Loop Cutting Report (H-1087)**

**4. Permanent Count Station Maintenance Report (H-1088)**

# 1 TRAFFIC COUNT STATION INSTALLATION

## 1.1 SHORT COUNT STATION INSTALLATION

### 1.1.1 General

- .1 Standard Specifications for Highway Construction *Subsection 635.20, Traffic Counter Stations* is replaced with the following clauses.

### 1.1.2 Site Layout

- .1 The Contractor shall undertake the layout and installation of Short Count Stations in accordance with the general arrangement depicted in *Specification Drawing SP635-2.6.1* unless otherwise directed by the Ministry Representative. The Ministry Representative will provide the Contractor with descriptions, traffic measurement numbers, drawings if required, and markings at the roadway for each new station where required. Posts shall be installed on the northbound traffic side of a north/south road or on the eastbound traffic side of an east/west road wherever possible. Also, posts shall be installed approximately 300 mm behind sign posts, luminaires, concrete barriers, etc., wherever possible, for protection.

### 1.1.3 Supply of Posts

- .1 The Contractor shall supply the Short Count Station post and all related hardware, other than delineators, R.PVC boxes, and AMP connectors, as required, for the satisfactory installation of a Short Count Station, as per the specifications.
- .2 The Contractor shall note that existing sign posts are not to be used as Short Count Station posts.

### 1.1.4 Short Count Station Post Installation

- .1 The Contractor shall install the Short Count Station post in accordance with the general arrangement depicted in *Specification Drawing SP635-2.6.1* and approved manufacturer's specifications, unless otherwise directed by the Ministry Representative.

- .2 Posts shall be set solidly and firmly in place and be true and plumb to the roadway. Perforated square galvanized steel tubing shall be used for the post as indicated in *Specification Drawing SP635-2.6.1*. The Contractor shall use Richform instant road repair (or approved alternate) for post installation in asphalt.
- .3 Posts shall be embedded no less than 600 mm into the road grade and have no less than 900 mm of post protruding above the ground surface.
- .4 Two (2) sets of 300 mm spikes shall be installed through the steel tubing of the post, to act as anchors: one set shall be installed at the bottom of the embedded post and the other set installed approximately 200 mm below the finished grade as per *Specification Drawing SP635-2.6.1*. Only in areas where the specified embedment cannot be achieved, the post shall be imbedded and secured with a concrete collar created by filling a 300 mm diameter by 300 mm deep excavation with concrete and setting the post into the limit of depth. For those sites on insecure slopes or loose shoulders, the bottom of the embedded post will be set in a 100 mm square concrete base.
- .5 The Contractor shall note that certain sites may have conditions where it is impossible to install the posts exactly to specifications. In this case, the Contractor shall contact the Ministry Representative.
- .6 Two (2) W55-TCS delineators shall be installed on the post as per *Specification Drawing SP635-2.6.1* for each and every installation regardless of direction of traffic. All bolts, nuts and washers used to attach the delineators to the post shall be 18-8 stainless steel. The top of the delineators shall be installed just above the top of the post.
- .7 Where a nearby existing Short Count Station becomes redundant due to a new station installation, the Contractor shall remove the redundant station as directed by the Ministry Representative. This involves removal of the post, all conduit and fittings on or to the post, and junction box(es). The loop wire pairs shall be cut as close to the roadway edge as possible. The loop wires can remain in the pavement, however any exposed or raised wires shall be cut off at the roadway surface. The surface shall be restored to grade and grass seed applied if necessary.

### 1.1.5 Junction Box Installation

- .1 The Contractor shall install one, or more if required, Type 14 small round plastic junction box(es) (as per *Specification Drawings SP635-1.2.14 and SP635-1.2.15*) per station. Type 10 round plastic junction boxes (as per *Specification Drawings SP635-1.2.7 and SP635-1.2.11*) shall be installed at Short Count Stations only if specifically requested by the Ministry Representative. The installation of the junction boxes shall include excavation, setting of junction boxes and backfilling. The junction box lids shall be level with the ground surface, and be visible and accessible at all times. The Contractor shall supply the conductor support bar (1" conduit) inside the junction box near the top (as per *Specification Drawing SP635-1.2.14*), for the elevation of the loop wires.
- .2 The Contractor shall note that certain sites may have conditions where it is impossible to install the junction boxes exactly to specifications. In this case, the Contractor shall contact the Ministry Representative for direction.
- .3 The coiling of excessive loop wires in the junction box is not acceptable. Any excess lengths of loop wires in the junction box (not to exceed 450 mm in length excluding the height of the Type 14 junction box) shall be elevated and kept free of water and debris as per *Specification Drawing SP635-2.5.2*. There shall be enough loop wire slack in the junction box so that the loop wires will extend 300 mm out of the RPVC box that is attached to the Short Count Station post. Any excess loop wires shall not be coiled in the junction box, but rather neatly suspended, with approved ty-raps, from the conductor support bar in a nondescript shape. A ground plate is not required in junction boxes at Short Count Stations.
- .4 Each pair of loop wires shall be twisted (minimum 15 twists per metre) in all junction boxes installed and shall be legibly labelled with permanent writing markers using loop identification ty-raps (T&B TY5532 or approved alternate) according to the lane direction and traffic measurement number designated by the Ministry Representative
- .5 Splicing in the junction box for Short Count Station installations shall only be allowed at the discretion of the Ministry Representative. If splicing is required, the Contractor shall refer to *Specification Drawing SP635-2.8.6* for proper splicing procedures.
- .6 The Contractor shall ensure that all junction box lids are in place and secure after installation.

### 1.1.6 Loop Installation

- .1 All loop installations shall be undertaken in accordance with the specifications detailed in Section 1.3., **Traffic Count Station Loop Installation Procedures**. The Contractor shall install 1.8 m by 1.8 m square loops at all Short Count Stations, and/or 1.8 m by 4 m (or larger) rectangular loops in ramps or right turns at the Short Count Stations, as directed by the Ministry Representative
- .2 NOTE: The Contractor must seek pre-approval from Ministry Representative) to run wires or cables through existing electrical conduits. All correspondence (i.e., diagrams) shall be copied to the Ministry Representative.

### 1.1.7 Loop Termination at the Post

- .1 Each loop shall be brought to the Short Count Station post from the junction box using 1 1/4" RPVC conduit which is continuous to the conduit attached to the post. All conduit used shall comply with the specifications outlined in *Section 635.09, Conduits* of the Standard Specifications for Highway Construction. The conduit shall be brought up the post to a point 200 mm above the ground surface and shall be terminated with a "dead end" RPVC box with a removable/replaceable cover. The Contractor shall use a SCEPTER brand Type SE40S R.PVC box, as supplied by the Ministry Representative. A 20 mm x 25 mm "V" slot shall be cut into the lower corner of the side of the box that is on the downstream traffic side of the post to allow access for the loop connectors. Only brass screws shall be used to hold the cover onto the RPVC box.
- .2 The RPVC box shall be mounted to the post with one (1) non-corrosive 3/8" x 2 3/4" long 18-8 stainless steel bolt, nut, lockwasher and washers. The positioning of the RPVC box shall be as per *Specification Drawing SP635-2.6.1*. The conduit shall be secured to the post with two ultraviolet compatible ty-raps and any excess slack from these ty-raps shall be removed.
- .3 The Contractor shall always ensure the safety of the enumerator when positioning the RPVC box at a non-typical situation, such as medians or between ramps, so that the enumerator can face traffic when opening the cover of the RPVC box and hooking up the count equipment.

- .4 Each pair of loop wires shall be twisted (minimum 15 twists per metre) according to the loop arrangement from the curb or edge of pavement through to the connections in the RPVC box that is attached to the post and shall be individually taped for a length of 300 mm in the RPVC box. There shall be enough loop wire slack left in the junction box so that the loop wires extend 300 mm out of the RPVC box. If requested by the Ministry Representative, 'AMP' type Mate-n-lok connectors, supplied by the Ministry Representative, shall be used to terminate the loops as indicated in *Specification Drawing SP635-2.6.1* and the following table. The loops shall be grouped according to the Ministry assigned traffic measurement numbers indicated on the work plan or provided diagrams and will be legibly labelled with permanent writing markers using loop identification ty-raps (T&B TY5532 or approved alternate).
  
- .5 If requested by the Ministry Representative, the loops shall be connected in the 'AMP' type housings with the 'AMP' type Mate-n-lok 4-pin connector as shown in Table 5.

EG	LANE*	NORTH OR EAST DIRECTION			SOUTH OR WEST DIRECTION		
		SLOW	MIDDLE	FAST	SLOW	MIDDLE	FAST
1	LOOP**	16-001 N	16-001 N	16-001 N	16-001 S	16-001 S	16-001 S
	PINS	Pins 1,2 Housing 1	Pins 3,4 Housing 1	Pins 1,2 Housing 2	Pins 3,4 Housing 2	Pins 1,2 Housing 3	Pins 3,4 Housing 3
2	LOOP	16-001 N	16-001 N	16-001 N	16-001 S		16-001 S
	PINS	Pins 1,2 Housing 1	Pins 3,4 Housing 1	Pins 1,2 Housing 2	Pins 1,2 Housing 3		Pins 3,4 Housing 3
3	LOOP	16-001 N		16-001 N	16-001 S	16-001 S	16-001 S
	PINS	Pins 1,2 Housing 1		Pins 3,4 Housing 1	Pins 1,2 Housing 2	Pins 3,4 Housing 2	Pins 1,2 Housing 3
4	LOOP	16-001 N		16-001 N	16-001 S		16-001 S
	PINS	Pins 1,2 Housing 1		Pins 3,4 Housing 1	Pins 1,2 Housing 2		Pins 3,4 Housing 2
5	LOOP	16-001 N	-	-	16-001 S		16-001 S
	PINS	Pins 1,2 Housing 1	-	-	Pins 1,2 Housing 2		Pins 3,4 Housing 2
6	LOOP	16-001 N		16-001 N	16-001 S	-	-
	PINS	Pins 1,2 Housing 1		Pins 3,4 Housing 1	Pins 1,2 Housing 2	-	-
7	LOOP	16-001 N	-	-	16-001 S	-	-
	PINS	Pins 1,2 Housing 1	-	-	Pins 3,4 Housing 1	-	-

\* Contact the Ministry Representative if the lane configuration is different than shown.

\*\* Ministry assigned traffic measurement number - varies from station to station

Table 1, 4-Pin Connector Reference for Short Count Stations

- .6 The Contractor shall ensure that all connector pins are securely "clicked" into the connector housings.

### 1.1.8 Site Clean Up

- .1 The Contractor shall ensure that all debris and refuse resulting from the installation is removed from the site and that the site is left in a neat condition.
- .2 If trenching has taken place at the new installation, the top of the trench shall be restored to the original condition or better.



- .3 The Contractor shall ensure that all junction box lids are in place and secure after installation.

### **1.1.9 Reporting and Documentation**

- .1 The Contractor shall carry out initial loop inductance readings, resistance readings, and resistance to ground readings for each loop in the junction box, and in the RPVC box that is attached to the post, to ensure that the loops and connections have been correctly installed.
- .2 These readings shall be noted on the Short Count Station Installation/Loopcutting Report (*Appendix A*).
- .3 The Contractor shall note that all field reports shall be original, fully completed and accurate, and shall be submitted to the Ministry Representative with the invoice. An invoice will not be processed without a field report for each station on that invoice.
- .4 All cost for reporting and documentation will be included in the various pay items involved in the Agreement. No additional compensation will be made for the above item.

## **1.2 PERMANENT COUNT STATION INSTALLATION**

### **1.2.1 General**

- .1 Standard Specifications for Highway Construction *Subsection 635.20 Traffic Counter Stations* is replaced with the following Clauses.

### **1.2.2 Site Layout**

- .1 The Contractor shall undertake the layout and installation of Permanent Count Stations in accordance with the general arrangement depicted in *Specification Drawing SP635-2.6.2 and 2.6.3*, unless otherwise directed by the Ministry Representative. The Ministry Representative will provide the Contractor with descriptions, traffic measurement numbers, drawings, and markings at the roadway for each new Permanent Count Station that is installed.
- .2 Payment for the site layout shall be included in the various pay items of work associated with the Permanent Count Station installation and loops. No additional compensation will be made for site layout.

### **1.2.3 Supply of Cabinets and Poles**

- .1 The Ministry Representative shall supply the Permanent Count Station cabinet and pole for the satisfactory installation of a Permanent Count Station, as per the specifications.
- .2 The Contractor shall note that Permanent Count Station cabinets are not to be attached to existing luminaires, unless otherwise directed by the Ministry Representative.
- .3 For a cellular phone installation, the Ministry Representative shall supply the cellular antenna, the mounting plate, coax cable and the required connectors.

### **1.2.4 Permanent Count Station Cabinet Installation**

- .1 Installation of a Permanent Count Station shall consist of the equipment as shown on the *Specification Drawings SP635-2.6.2 and 2.6.3* in Appendix C. The Contractor shall install a Type 2 - 6.5 meter shaft and a Type B cabinet including supply and installation of power wiring from the service panel or the hand hole at the base of the shaft as per those drawings. The cabinet and pole shall be set solidly and firmly in place on a Type C concrete base and be true and plumb to the roadway, and the cabinet shall be oriented on the back side of the pole.
- .2 The Ministry Representative shall be responsible for investigating power and telephone availability, and will advise the Contractor as to the type of installation required.
- .3 If the Ministry Representative advises that the Permanent Count Station requires cellular telephone, the Contractor shall install a cellular phone antenna, mounting plate, connectors and cable to the Permanent Count Station as shown on the *Specification Drawings SP635.2.6.2 and 2.6.3*.

### **1.2.5 Junction Box Installation**

- .1 The Contractor shall install one, or more if required, Type 10 round plastic junction box(es) (as per *Specification Drawings SP635-1.2.7 and SP635-1.2.11*). The installation of the junction boxes shall include excavation, setting of junction boxes and backfilling. The junction box lids shall be level with the ground surface, and be visible and accessible at all times. The junction box lid shall be bonded.
- .2 The Contractor shall note that certain sites may have conditions where it is impossible to install the junction boxes exactly to specifications. In this case, the Contractor shall contact the Ministry Representative for direction.

- .3 Any excess lengths of loop wires in the junction box shall be elevated and kept free of water and debris as per *Specification Drawing SP635-2.5.2*. There shall be enough loop wire and shielded cabling slack in the junction box so that the shielded cabling will extend at least 600 mm from the pole into the cabinet. Any excess loop wires shall not be coiled in the junction box, but rather neatly suspended, with approved ty-raps, from the conductor support bar in a nondescript shape.
- .4 Each pair of loop wires shall be twisted (minimum 15 twists per metre) in all junction boxes installed, and spliced to Ministry approved shielded cabling in the junction box(es). The Contractor shall legibly label each pair of loop wires in the junction box(es) with permanent writing markers using loop identification ty-raps (T&B TY5532 or approved alternate) indicating the lane direction and traffic measurement number provided on the site diagram.
- 5 The Contractor shall refer to *Specification Drawing SP635-2.8.6* for proper splicing procedures.
- .6 The Contractor shall ensure that all junction box lids are in place and secure after installation.

### **1.2.6 Loop Installation**

- .1 Loop installation shall be undertaken in accordance with the specifications and procedures detailed in Sub-Section 4.3, Counter Station Loop Installation Procedures. All loop installations for Permanent Count Stations shall be square 1.8 m by 1.8 m or 1.8 m by 4 m (or larger), as directed by the Ministry Representative.

All correspondence (i.e., diagrams) shall be copied to the Ministry Representative..

### **1.2.7 Loop Termination at the Cabinet**

- .1 The shielded cabling for each loop shall be brought into the Permanent Count Station cabinet from the junction box(es). The shielded cabling shall be coiled neatly in the cabinet with at least 600 mm slack, for termination by the Ministry Representative.
- .2 Each loop pair shall be clearly identified in the cabinet with identification ty-raps (T&B TY5532 or approved alternate), indicating the lane direction and Ministry assigned traffic measurement numbers provided on the site diagram.

### **1.2.8 Site Clean Up**

- .1 The Contractor shall ensure that all debris and refuse resulting from the installation is removed from the site and that the site is left in a neat condition.

- .2 If trenching has taken place at the new installation, the top of the trench shall be restored to the original condition or better.
- .3 The Contractor shall ensure that all junction box lids are in place and secure after installation.

### **1.2.9 Reporting and Documentation**

- .1 The Contractor shall carry out initial loop inductance readings, resistance readings, and resistance to ground readings for each loop in the junction box(es), and in the cabinet. The Contractor shall note that 250 volts is the maximum that shall be used when applying the resistance tester (megger) to the loops when obtaining these readings. Weather conditions shall be noted on the field report when taking megger readings.
- .2 These readings shall be noted on the Permanent Count Station Installation/Maintenance Report (*Appendix A*).
- .3 The Contractor shall note that all field reports shall be original, fully completed and accurate, and shall be submitted to the Ministry Representative with the invoice.
- .4 All cost for reporting and documentation will be included in the various pay items involved in the Agreement. No additional compensation will be made for the above item.

## **1.3 TRAFFIC COUNT STATION LOOP INSTALLATION PROCEDURES**

### **1.3.1 General**

- .1 The Contractor shall install loops in accordance with the Standard Specification for Highway Construction *Subsection 635.22, Detector Loops, Specification Drawings SP635-2.8.7 and SP635-2.8.8*, and the following additional requirements.

### 1.3.2 Layout of Loops and Loop Tails

- .1 Loops shall be laid out by the Contractor. Contrary to *Specification Drawing SP635-2.8.2*, all 1.8 m by 1.8 loops shall be parallel to the centreline of the road (i.e., square, not diamond). The Contractor shall note that diamond loops are not acceptable for classification or speed loop configurations. On tangential sections, the loops shall be centred in the lane; on curvilinear roads (such as ramps); the loops shall be located, shaped, and sized to best reflect vehicle travel paths and to optimize sensor efficiency as per *Specification Drawing SP635-2.8.13*. All ramps shall have rectangular loops (1.8 m x 4 m, or larger, as directed by the Ministry Representative as per *Specification Drawing SP635-2.6.3 and SP635-2.8.3*.
- .2 Unless otherwise directed by the Ministry Representative, classification loops (two per lane) shall be installed with a 4.5 metre distance from the leading edge of the leading loop to the leading edge of the trailing loop in each lane (therefore will be 2.7 metres apart). The loops shall be centred in the lanes. The first loop that vehicles pass over when travelling in the lane is identified as the leading loop, and the second loop that vehicles pass over in that same lane is identified as the trailing loop. Once the slots are cut for the loops, the Contractor shall accurately measure each loop size, and the loop separations in each lane (in cm), and shall indicate these measurements on the field report.
- .3 The Contractor shall note that when re-installing existing inoperable loops in one or more lanes at existing classification-capable Traffic Count Stations, the size of the new loop(s), and the distance between the two new classification loops in the lane(s), shall be determined by the Ministry Representative. The loops shall not necessarily be installed to the dimensions that were there previously.

### 1.3.3 Cutting of Asphalt

- .1 Loops and home run slots shall be cut with a power saw as shown on *Specification Drawing SP635-2.8.4*.
- .2 Diagonal cuts shall be made across all corners to prevent sharp bends in the wire as per *Specification Drawing SP635-2.8.4*. All cuts including the corner cuts for an installation shall be of the same depth. At no time shall cuts go all the way through the pavement into the gravel base. The loop tail shall be cut to the edge of the asphalt and then brought to the nearest junction box assembly via 1" conduit by one of the methods described below.
- .3 At any site where it is impossible to get the required saw cut depth without going through the pavement into the base gravel, the Ministry Representative or its designate shall be contacted for direction.

### 1.3.4 Installation of Loops to Pavement Edge

- .1 The Contractor shall install all loops according to the colour coding shown on *Specification Drawing SP635-2.8.5*. With regards to classification loop installations, the leading loop in the lane shall be the solid colour and the trailing loop in that lane shall be that same colour with white tracer tape. The colour-coding scheme shall start at the lane closest to the cabinet or post and go outwards from there.
- .2 For loop re-installations, the Contractor shall follow the loop colour coding as closely as possible without duplicating a colour already in use at the station.
- .3 The loop wire shall be installed starting at the junction box (with enough excess length to run through the conduit into the Permanent Count Station cabinet or Short Count Station RPVC box), through 1" diameter conduit and then tightly wound around the loop for the specified number of turns required to be within the range of the manufacturer's specified inductance for the equipment used (70-400 micro henrys), taking into consideration the length of the loop lead-in, and back to the junction box. The Contractor shall note on the relevant field report the number of turns per loop used for each lane and the size of the loop installed. The loop wire shall be pushed into the bottom of the slot with the use of a tool that shall not cause damage to the wire insulation. Ministry approved foam backer rod of 75 mm long strips shall be installed in the loop slot and spaced every 600 mm, to ensure the wires are held tightly in the bottom of the slot. The Contractor shall note that the backer rod shall be tightly compressed into the slot as far as possible. The foam backer rod material shall melt after the installation of hot sealant to minimize voids between the tar and wires.
- .4 Each pair of loop wires shall be twisted (15 twists per metre) from the loop through to the termination of the wires at the Short Count Station post or to the shielded cables that run into the Permanent Count Station cabinet.
- .5 The Contractor shall note that under no circumstances are two or more loops to be installed into one lead-in slot, unless otherwise directed by the Ministry Representative.
- .6 NOTE: The Contractor shall note that only one (1) continuous wire shall be installed in each loop and lead-in slot. The Contractor shall not splice the loop wire over its entire length of run, except in the junction box where individually shielded cable (Belden 9318, or approved alternate) may be spliced to the loop lead-in wires for the run between the junction box and the Short Count Station post, or the Permanent Count Station cabinet, only if approved by the Ministry Representative.

### 1.3.5 Sealing

- .1 Loop wires shall be sealed in the slot with loop sealant ELSRO 1190 hot pour crack filler or approved alternate. The sealant shall be applied in accordance with the manufacturer's instructions and neatly applied using a funnel with a narrow spout.
- .2 The sealant shall be carefully poured into the slot to ensure that the sealant has totally covered the loop wire and the slot. The sealant shall be installed to ensure that the top of the cured sealant is flush with the top of the pavement. Any excess sealant on the road surface shall be removed. If any subsidence occurs, a subsequent application of sealant shall be applied to raise the sealant to the pavement grade prior to the addition of any product to prevent tracking and prior to allowing traffic to pass over the sealed slot. Once the sealing of the slot has been properly completed, an approved dust such as Portland cement or fine sand shall be sprinkled onto the sealant to prevent tracking by roadway traffic. Any excess dust shall be swept off the roadway prior to allowing traffic to pass over sealed slot.
- .3 The Contractor shall ensure that the sealant is poured fully into the crack where the loop wires enter the conduit at the edge of pavement.
- .4 NOTE: The Contractor shall seal pavement cuts as soon as possible after the pavement cuts are made. Sealing shall not be carried out in wet weather.

### 1.3.6 Installation of Loops from Pavement Edge to Junction Box

- .1 Once the loop wire is installed to the pavement edge, the Contractor shall properly (i.e. by hand) twist the loop wire pairs (minimum of 15 twists per metre) and run the wire pairs through 1" RPVC conduit to the junction box. The Contractor shall follow *Specification Drawings SP635-2.8.1, SP635-1.6.1 and SP635-1.6.2*, and Standard Specifications for Highway Construction *Section 635.09, Conduits* for conduit installation from the pavement edge to the junction box. One conduit per lane shall be used for the loop wires from the roadway edge to the junction box. The Contractor shall ensure that all conduit entering the junction box shall be sloped downward for proper drainage.
- .2 For installations where no conduit exists for the loops, and where a sidewalk and/or concrete curb exists, the Contractor shall install a 1" RPVC conduit under the sidewalk and curb from the junction box assembly to the edge of curb as per *Standard Drawing SP635-1.6.1*. Where it is not feasible to install the conduit under the curb and sidewalk, the Contractor shall contact the Ministry Representative for direction.

- .3 For installations where no conduit exists for the loops, and where an asphalt curb exists or where there is no curb at all, the Contractor shall install a 1” RPVC conduit from the nearest junction box to the edge of asphalt as per *Standard Drawing SP635-1.6.2* except that the saw cut shall be sloped to the gravel and a 1” RPVC elbow installed to provide a continuous conduit run from the asphalt edge to the junction box. The Contractor shall seal the end of the 1”RPVC elbow with duct seal.
- .4 For installations where conduit already exists for the loops and where a sidewalk and/or curb exists, the Contractor shall remove the existing loop wiring in the conduit and shall excavate a small hole (0.3 m x 0.3 m) in the asphalt where the conduit stub ends. The Contractor shall be careful not to damage any existing loops entering the same conduit. If the Contractor makes a loop unusable, the Contractor shall repair such loop at the Contractor's expense. The Contractor shall repave the asphalt opening once the new loop wires have been installed.
- .5 For installations where conduit already exists for the loops and where an asphalt curb exists or where there is no curb at all, the Contractor shall remove the existing loop wiring in the conduit and shall reuse the conduit for the new loop wires. The Contractor shall be careful not to damage any existing loops entering the same conduit.
- .6 NOTE: The Contractor must seek pre-approval from the Ministry Representative to run wires or cables through existing electrical conduits. All correspondence (i.e. diagrams) shall be copied to the Ministry Representative..



## **2 SHORT COUNT STATION CONDITION ASSESSMENT AND CORRECTIVE MAINTENANCE**

### **2.1 SHORT COUNT STATION CONDITION ASSESSMENT**

#### **2.1.1 General**

- .1 The Contractor will undertake short count condition assessments at the locations identified by the Ministry Representative.

#### **2.1.2 Description of Work**

##### **The Contractor will;**

- .1 Undertake the condition assessment (inspection) as outlined on the Short Count Station Maintenance Report Sheet using appropriate megger and RLC meters (same meters for all tests) Standard Specification drawings SP635-2.6.1 and 2.6.3 shall be used as reference drawings for short count stations.
- .2 Supply and install Amp type mate-n-lock connectors, pin housing No. 1-480-426-0 and pin no. 60620-1 on all loop wire pairs that have meter results that don't fall within into the following ranges:

Megger – over 1 M ohm

Resistance – 1 to 5 ohms

Inductance – will vary, but generally in range of 110 to 130 Micro Henries for 1.8 m X 1.8 m – 4 turn loops and 90 to 110 Micro Henries for 1.8 X 4.0 m – 3 turn loops. For either size of loops, the approximate expected inductance can be determined from the formula given on Standard Specification Drawing SP635-2.8.2

- .3 Test the site with a short count station unit to ensure detection and counting for all loops.

- .4 Identify any corrective maintenance work that is required by completing the Short Count Maintenance Report form and return to the Ministry Representative. Examples of corrective maintenance work required may be, but not limited to the following:
- loop damaged or destroyed (identify loop by letter and on supplied sketch), assume that if pin replacement does not bring loop to specification that the loop is damaged
  - loop or loop lead requires resealing (identify loop by letter and on supplied sketch)
  - junction box is damaged
  - counter post is missing, damaged, or not perpendicular
  - RPVC fitting on counter post is damaged or missing

## **2.2 SHORT COUNT STATION CORRECTIVE MAINTENANCE**

### **2.2.1 General**

- .1 The Contractor will undertake short count corrective maintenance as the locations identified by the Ministry Representative. The short count station configuration will be provided in sketch form.

### **2.2.2 Description of Work**

#### **The Contractor will;**

- .1 Reinstall detector loops.
- .2 Repair and install counter posts and delineators.

- .3 Repair and install junction boxes.
- .4 Repair and install PVC boxes, fittings and conduit in the vicinity of counter posts.

The Contractor will supply all PVC fittings (condulets) and amphenol connectors..

The Contractor will adhere to all applicable Sections of the latest edition of the Ministry Standard Specifications for Highway Construction, and specifically, to Standard Specification Drawings SP 635-2.6.1 and 2.6.3.

1.) Reinstall detector loops

All loops will be laid out under the direction of the Ministry Representative. Loops will be generally 1.8 m by 1.8 m, 4 turn loops as per Standard Specification dwg SP 635-2.8.1 to 2.8.10. All ramps will have rectangular loops (1.8 X 4.0 m, 3 turns) as per Standard Specification dwg SP 635-2.8.1 to 2.8.10.

Loops on main lines shall generally have a pitch (distance from leading edge to leading edge) of 4.5 m., however if a site with operable 5.0m pitch is encountered, this will be maintained at the direction of the Ministry Representative.

Existing inoperable loops will have two slots cut through edge side of the loop to ensure the existing conductors are severed.

<b>Loop</b>	<b>Colour</b>
1 (A)	Blue
2 (B)	Yellow
3 (C)	Red.
4 (D)	Brown
5 (E)	Orange
6 (F)	Blue (White tape tracer)
7 (G)	Yellow (White tape tracer)
8 (H)	Red (White tape tracer)
9 (I)	Not used
10 (J)	Note used

**TABLE 1 – LOOP CONDUCTOR COLOUR CODE**

The contractor will follow the above colour coding (Table 1) as closely as possible without duplicating a colour code already in use at the station..

Amp type mate-n-lock connectors will be used to terminate the loops as indicated on dwg SP 635-2.1 and the following table (Table 2) adhered to, for connections, unless otherwise directed by the Ministry Representative. The loops will be grouped according to the traffic counter channel requirements.

<b>Loop</b>	<b>Pins</b>
A	(1,2) of 1st connector
B	(3,4) of 1st connector
C	(1,2) of 2 <sup>nd</sup> connector
D	(3,4) of 2 <sup>nd</sup> connector
E	(1,2) of 3 <sup>rd</sup> connector
F	(3,4) of 3 <sup>rd</sup> connector

**TABLE 2 – LOOP “AMP” CONNECTOR ORIENTATION**

The Contractor will measure resistance to ground (megger), resistance and inductance values for each recut loop and record the readings on Loop Check Sheet form (dwg SP635-2.8.10)

2.) Install Counter Posts, PVC Condulets, RPVC and Delineators

The Contractor will install counter posts in accordance with Standard Specification dwg SP635-2.6.1, but contrary to the above noted drawing,, will supply all materials necessary for the complete installation, including the supply and installation of the ‘Amp’ connectors, but with the exception of the W55TCS signs, which will be supplied by the Ministry.

3) Install type 10 and 14 Junction Boxes

The Contractor will install type 10 and type 14 junction boxes in accordance with Standard Specification dwgs SP635—1.2.7 to 1.2.15.

4.) Miscellaneous Corrective Maintenance Work

The Contractor will undertake miscellaneous corrective maintenance work as identified by the Ministry Representative.

Examples of such work are, but not limited to:

- straightening, realigning or otherwise adjusting counter posts and delineators
- checking and replacing, if necessary existing pin connection in RPVC fittings
- repairing/installing PVC boxes, fittings and conduit
- repairing type 10 and type 14 junction boxes

## 6.) Supply of Miscellaneous Materials

The Contractor will supply miscellaneous materials above and beyond those required for the above noted 5 items.

Some examples of miscellaneous materials;

- brass screws, PVC fittings, stainless steel nuts, bolts, and washers, tyrap, connector pins and housings, station identification tags.

NEW INSTALLATION:  RE-INSTALLATION:  CLASSIFICATION CAPABLE:

DATE: \_\_\_\_\_ STATION No.: \_\_\_\_\_ TR. MEASUREMENT No.: \_\_\_\_\_ I/C NAME: \_\_\_\_\_

LOCATION: \_\_\_\_\_

IF NEW STATION: Posted speed (km/h): \_\_\_\_\_ Post side: \_\_\_\_\_

Ministry Use: LKI SEGMENT: \_\_\_\_\_ SEGMENT TOTAL DIST.: \_\_\_\_\_ COUNT STATION DIST: \_\_\_\_\_ REGION: \_\_\_\_\_ DISTRICT: \_\_\_\_\_

**POST INSTALLATION:**

- Height 1200mm above grade?  Bottom of PVC box 200mm above grade?
- Post straight/plumb/firmly in place?  Slot cut in PVC box?
- Stainless steel nuts/bolts used?  Brass screws used on PVC box cover?
- Conduit continuous from JB to PVC box?  Loop wires twisted (15 twists/metre) in PVC box?
- Conduit/PVC box bolted to post?  Loop wires identified in PVC box?

**JUNCTION BOX INSTALLATION:**

- JB(s) Type: \_\_\_\_\_ No of JB's. used: \_\_\_\_\_
- Loop wires twisted (15 twists/metre) in JB?  Loop wires identified in JB?  JB lid bolted?
  - JB lid flush with surface and accessible?  Conduit continuous from roadway edge to JB?

**LOOP INSTALLATION:** Weather conditions (temp., prec.): \_\_\_\_\_ Pavement condition at loops: \_\_\_\_\_

LOOP	1	2	3	4	5	6	7	8
Tr. Measurement No.								
Direction								
Lane (i.e. slow, fast)								
Class I.D. (i.e. lead, trail)								
Wire Colour								
Inductance (microhenrys)								
Resistance (ohms)								
No. of Turns								
Loop Size (cm)(i.e.180x180)								
Loop Separation (cm)								
Tail Length (m)								
Trench Length (m)								
Lane Closure req'd?	<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	<input type="checkbox"/> Yes
Barrier Removal req'd?	<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	<input type="checkbox"/> Yes
Curb?	<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	<input type="checkbox"/> Yes
Sidewalk?	<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	<input type="checkbox"/> Yes

DHM notified?  Yes  No Site left in clean condition?  Yes

**ADDITIONAL COMMENTS/WORK:**

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

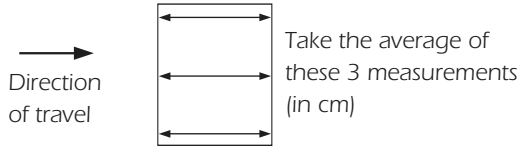
**NOTE: This form must be accompanied by a detailed diagram (see back).**  
**For interchanges, use MoT supplied diagrams and make any necessary revisions directly on them.**

\_\_\_\_\_, by its authorized agent, \_\_\_\_\_  
Company Name Name Signature

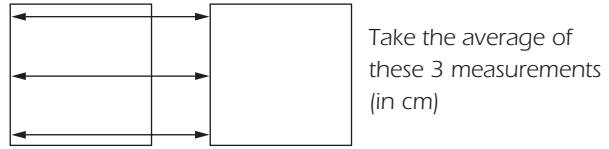
Ministry use: Invoice # \_\_\_\_\_ Invoice Date: \_\_\_\_\_ Amount: \_\_\_\_\_

- 
- DIAGRAM MUST INCLUDE:**
- Roadway configuration (**oriented to North up**)
  - Road name(s)
  - Loop locations and layout (identified with MoTH traffic measurement numbers)
  - Post location(s) and associated station number(s)
  - Junction Box(es) location(s)
  - Trenching and conduit run lengths (if any) including distances (in metric units)
  - Relevant sidewalks, curbs, concrete barriers, etc. (if any)
  - Underground obstructions (if any)
  - Significant landmarks
- 

**FOR LOOP SIZE:**



**FOR LOOP SEPARATION (IF CLASSIFICATION STATION):**



DATE: \_\_\_\_\_ STATION No.: \_\_\_\_\_ TR. MEASUREMENT No.: \_\_\_\_\_ I/C NAME: \_\_\_\_\_

STATION REMOVED

MOT INSPECTION

**STEEL POST CONDITION:**
**COMMENTS/REPAIRS:**

- ✓ Ensure post straight
- ✓ Ensure post firmly in ground
- ✓ Check height (should be 1200 mm above grade)
- ✓ Check delineators/clean if necessary
- ✓ Check that stainless steel nuts/bolts are used/replace if damaged or rusted
- ✓ Remove grass and debris from around post

All OK

**PVC BOX/CONDUIT (JB TO POST) CONDITION:**
**COMMENTS/REPAIRS:**

- ✓ Ensure PVC box bolted to post
- ✓ Ensure PVC box adhered to conduit
- ✓ Ensure conduit continuous from JB to PVC box
- ✓ Check height of PVC box (bottom should be 200 mm above grade)
- ✓ Check brass screws on PVC box cover
- ✓ Ensure slot is cut in PVC box
- ✓ Ensure loop wires identified
- ✓ Is PVC box tagged with MoTH Station #?  Yes  No (if not, no action necessary)

All OK

**JUNCTION BOX (JB) ASSEMBLY CONDITION:**
**COMMENTS/REPAIRS:**

- ✓ Ensure JB is level/flush at grade
- ✓ Ensure lid fully visible and accessible
- ✓ Remove grass and debris from around JB
- ✓ Ensure adequate drainage
- ✓ Ensure loop wires identified
- ✓ Ensure loop wires twisted (15 twists/metre)
- ✓ Ensure loop wires elevated
- ✓ Check splices

All OK

**LOOP CONDITION:**
**COMMENTS/REPAIRS:**

- Check trenching
- Check wiring and conduit at curb or pavement edge

LOOP	1	2	3	4	5	6	7	8
Tr. Measurement No.								
Direction								
Lane (i.e. slow, fast)								
Class Loop I.D. (i.e. lead, trail)								
Wire Colour								
Inductance (microhenrys)								
Resistance (ohms)								
AMP Pin Connections	<input type="checkbox"/> OK <input type="checkbox"/> Repl'd	<input type="checkbox"/> OK <input type="checkbox"/> Repl'd	<input type="checkbox"/> OK <input type="checkbox"/> Repl'd	<input type="checkbox"/> OK <input type="checkbox"/> Repl'd	<input type="checkbox"/> OK <input type="checkbox"/> Repl'd	<input type="checkbox"/> OK <input type="checkbox"/> Repl'd	<input type="checkbox"/> OK <input type="checkbox"/> Repl'd	<input type="checkbox"/> OK <input type="checkbox"/> Repl'd
Sealant OK?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No

**ADDITIONAL COMMENTS/WORK:**

\_\_\_\_\_

\_\_\_\_\_



**NEW INSTALLATION:**      
 **RE-INSTALLATION:**      
 **CLASSIFICATION CAPABLE:**

DATE: \_\_\_\_\_ **STATION No.:** \_\_\_\_\_ **SITE No.:** \_\_\_\_\_ **STATION NAME:** \_\_\_\_\_

LOCATION: \_\_\_\_\_ **DRAWING No.:** \_\_\_\_\_

**IF NEW STATION:** Posted speed (km/h): \_\_\_\_\_ Cabinet side: \_\_\_\_\_

Ministry Use:	LKI SEGMENT:	SEGMENT TOTAL DIST.:	COUNT STATION DIST.:	REGION:	DISTRICT:
---------------	--------------	----------------------	----------------------	---------	-----------

BC Hydro Service Type:     Overhead     Underground     MoT Service  
 BC Tel Service Type:         Overhead     Underground     Cell      Hydro Pole No. (if new installation): \_\_\_\_\_

**COMPONENTS OF CABINET (Ministry Use Only):**

Counter Type: \_\_\_\_\_ Baud Rate(s) Capable: \_\_\_\_\_  
 Counter No.: \_\_\_\_\_ Serial No.: \_\_\_\_\_ Voltage: \_\_\_\_\_ Config: \_\_\_\_\_  
 Modem Type: \_\_\_\_\_ Max. Baud Rate: \_\_\_\_\_ Modem Serial No.: \_\_\_\_\_  
 Charger Type: \_\_\_\_\_ Modem-Loop Connector Box Type: \_\_\_\_\_ MLCB MoT No.: \_\_\_\_\_

**INTERIOR OF CABINET (Ministry Use Only):**

Cabinet No. (if marked): \_\_\_\_\_ Inspection No.: \_\_\_\_\_ Cabinet Type: \_\_\_\_\_  
 Cabinet Identification on Inside Door?  Yes    Station Ph. Number: (        ) \_\_\_\_\_ Maint. Log in Cabinet?  Yes  
 Cabinet Insulated?  Yes     No                      Timer Installed?  Yes     No  
 Telephone Line/Modem Surge Suppression Installed?  Yes    Type: \_\_\_\_\_  
 Loop-Counter Surge Suppression Installed?  Yes    Type: \_\_\_\_\_  
 Door Filter?  Yes      Door Filter Adapter Installed?  Yes     No  
 Fan:    Type: \_\_\_\_\_                      Initial Setting: \_\_\_\_\_ °F °C    (set at 75°F or 24°C)  
 Heater: Type: \_\_\_\_\_                      Initial Setting: \_\_\_\_\_ °F °C    (set at 55°F or 13°C)

**JUNCTION BOX INSTALLATION:**

JB(s) Type: \_\_\_\_\_                      No of JB's. used: \_\_\_\_\_  
 Loop wires twisted (15 twists/metre) in JB?                       Loop wires identified in JB?                       JB lid bolted?  
 JB lid flush with surface and accessible?                       Conduit continuous from roadway edge to JB?

**LOOP INSTALLATION:** Weather conditions (temp., prec.): \_\_\_\_\_ Pavement condition at loops: \_\_\_\_\_

LOOP	1	2	3	4	5	6	7	8	9	10	11	12
Tr. Measurement No.												
Direction												
Lane (i.e. slow, fast)												
Class I.D. (i.e lead, trail)												
Wire Colour (in JB)												
Inductance (microhenrys)	@ JB											
	@ CAB											
Resist. to Ground (megohms)	@ JB											
	@ CAB											
Resistance (ohms)	@ JB											
	@ CAB											
No. of Turns												
Loop Size (cm) (i.e. 180x180)												
Loop Separation (cm)												
Tail Length (m)												
Trench Length (m)												
Lane Closure req'd?	<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	<input type="checkbox"/> Yes
Barrier Removal req'd?	<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	<input type="checkbox"/> Yes
Curb?	<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	<input type="checkbox"/> Yes
Sidewalk?	<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	<input type="checkbox"/> Yes

DHM notified?  Yes     No                      Site left in clean condition?  Yes                      Time of work (use 24 hr clock): \_\_\_\_\_ : \_\_\_\_\_

**NOTE: This form must be accompanied by a detailed diagram (see back).  
For interchanges, use MoT supplied diagrams and make any necessary revisions directly on them.**

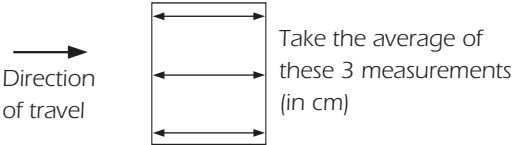
\_\_\_\_\_, by its authorized agent, \_\_\_\_\_ Name \_\_\_\_\_ Signature \_\_\_\_\_

Ministry use: Invoice # \_\_\_\_\_ Invoice Date: \_\_\_\_\_ Amount: \_\_\_\_\_

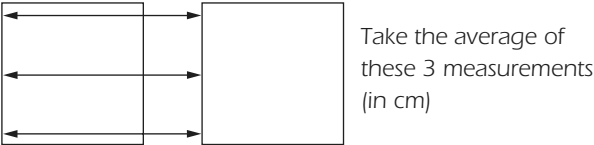
**ADDITIONAL COMMENTS/WORK:**

- DIAGRAM MUST INCLUDE:**
- Roadway configuration (**oriented to North up**)
  - Road name(s)
  - Loop locations and layout (identified with MoTH traffic measurement numbers)
  - Post location(s) and associated station number(s)
  - Junction Box(es) location(s)
  - Trenching and conduit run lengths (if any) including distances (in metric units)
  - Relevant sidewalks, curbs, concrete barriers, etc. (if any)
  - Underground obstructions (if any)
  - Significant landmarks

**FOR LOOP SIZE:**



**FOR LOOP SEPARATION (IF CLASSIFICATION STATION):**



# PERMANENT COUNT STATION MAINTENANCE REPORT

**DATE:** \_\_\_\_\_ **SITE No. (including ctr no.):** \_\_\_\_\_ **STATION NAME:** \_\_\_\_\_

**CABINET CONDITION:**
**COMMENTS/REPAIRS:**

- Inspect exterior of cabinet for damage, leaks, rust
- Inspect pole and pedestal/ensure straight
- Inspect pole nuts and bolts for tightness
- Inspect mounting hardware
- Remove grass and debris from around pole
- Inspect overhead wiring
- Check door latch operation/lubricate
- Check MoT secondary padlock/lubricate
- Inspect cabinet seals for wear
- Inspect/lubricate all hinges
- Check lightbulb
- Replace door filter
- Check fan/replace if necessary (set at 75°F or 24°C)
- Check heater/replace if necessary (set at 55°F or 13°C)
- Clean out any debris/dust and vacuum
- Check loop opening in cabinet/ensure well-sealed
- Check telephone line surge suppression
- Check counter battery voltage (10 min off charge)

**JUNCTION BOX(ES) CONDITION:**
**COMMENTS/REPAIRS:**

- Ensure JB is level/flush at grade
- Ensure lid is fully visible and accessible
- Remove grass and debris in and around JB
- Ensure adequate drainage
- Ensure loop wires identified
- Ensure loop wires elevated
- Check splices

**LOOP CONDITION:**
**COMMENTS/REPAIRS:**

- Check trenching
- Check wiring and conduit at curb or pavement edge

LOOP	1	2	3	4	5	6	7	8	9	10	11	12
Tr. Measurement No.												
Direction												
Lane (i.e. slow, fast)												
Class I.D. (i.e. lead, trail)												
Check/tighten Connections	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Check Surge Suppression	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Inductance (microhenrys)												
Resist. to Ground (megohms)												
Resistance (ohms)												
Sealant OK?	<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/> Y <input type="checkbox"/> N

**ADDITIONAL COMMENTS/WORK:**


---



---



---

Time of Maintenance: \_\_\_\_\_:\_\_\_\_\_ (use 24 hr clock)      Completed by: \_\_\_\_\_