

“Final”

**INTELLIGENT
TRANSPORTATION SYSTEMS
(ITS) INSPECTION AND
ACCEPTANCE MANUAL
(ITSIMM)**

Prepared by



**Rutgers Intelligent Transportation Systems
(RITS) Laboratory**

Rutgers University

December 2007

Table of Contents

Delivery Inspection (Acceptance)

Pre-Construction Inspection Checklist	7
Conduit Inspection Checklist.....	8
Junction (Pull) Box Inspection Checklist	11
Loop Detectors Inspection Checklist	13
Foundation Inspection Checklist.....	15
CCTV Pole Inspection Checklist.....	16
VMS Sign Supports/Sign Box Inspection Checklist	18
Preliminary Wiring Inspection Checklist.....	20
Fiber-Optic Cabling/Splicing Inspection Checklist	22
Grounding Inspection Checklist	25
Final Wiring Inspection Checklist	26
Wire Testing Inspection Checklist.....	27
Communication/Field Equipment Cabinet Inspection Checklist.....	28
Pre-Construction Electric Service Inspection Checklist.....	30
Service Poles and Electrical Feed Inspection Checklist	31
Load Center and Meter Inspection Checklist.....	32
Customer Service/Connection Box Inspection Checklist.....	33
Traffic Maintenance during Construction Checklist.....	34

Preventive Maintenance for Generic Components

Closed Circuit Television Systems Pole Checklist.....	37
Closed Circuit Television Systems Cabinet Checklist.....	38
Closed Circuit Television Systems Base and Meter Cabinet Checklist	39
Closed Circuit Television Conduit & Cables Checklist	40
Closed Circuit Television Checklist (At the Control Center).....	41
Variable Message Signs Sign Checklist	43
Variable Message Signs Cabinet Checklist	44
Variable Message Signs Base and Meter Cabinet Checklist	45
Variable Message Signs Conduit & Cables Checklist.....	46
Highway Advisory Radio General Checklist.....	48
Highway Advisory Radio Antenna Checklist.....	49
Highway Advisory Radio Sign & Meter Cabinet Checklist.....	50
Weather Station Checklist.....	51
Customer Service/Connection Box Checklist.....	52
Power Cables and Conduit Checklist.....	54
Communication Cables and Conduit Checklist	55
Power Distribution Unit Checklist.....	56
Interconnect Checklist	57

Communications Hub Checklist	58
Loop Detectors Checklist.....	60
Out-Pavement Detectors (RTMS) Checklist	61
Piezoelectric Detectors Checklist	62
Microwave Vehicle Detection Systems Checklist.....	63
Video Detection Systems Checklist.....	64

Preventive Maintenance for Brand Specific Components

Pelco ES30PC/ES31PC Esprit with Pressurized IOC Checklist	67
Daktronics VF-1420-3-7x60-18-A Sign Cabinet Checklist	69
Daktronics VF-1420-3-7x60-18-A Structural Checklist	69
Daktronics VF-1420-3-7x60-18-A	69
Temperature & Light Sensor Assembly Checklist	69
Daktronics VF-1420-3-7x60-18-A Face Panel Cleaning Checklist	70
Daktronics VF-1420-3-7x60-18-A LED Cleaning Checklist.....	70
Daktronics VF-1420-3-7x60-18-A Fans & Thermostat Checklist	70
Daktronics VF-1420-3-7x60-18-A	71
LED & Electronic Circuitry Checklist.....	71
Daktronics VF-1420-3-7x60-18-A	72
LED & Electronic Circuitry Checklist (continued)	72
Comlux Opt. Transmission Terminals – CL3683/CL3684 Checklist	74
Comlux Opt. Transmission Terminals – CL3683/CL3684 Checklist (continued) ..	75
Comlux Opt. Transmission Terminals – CL3803/CL3804 Checklist	76
Comlux Opt. Transmission Terminals – CL3803/CL3804 Checklist (continued) ..	77
Comlux Opt. Transmission Terminals – CL3687/CL3687E Checklist	78
Comlux Opt. Transmission Terminals – CL3687/CL3687E Checklist (continued) ..	79
EIS Remote Traffic Microwave Sensors (RTMS) Checklist.....	81

Preventive Maintenance for Common Components

Backup Battery Assemblies Checklist	83
Air Conditioning Unit Checklist.....	84
Generator Checklist	85

Troubleshooting for Generic Components

Closed Circuit Television Systems and Communications Hub	88
Variable Message Signs	91
Highway Advisory Radio	97
Weather Stations	98
Out Pavement Detectors	100

Troubleshooting for Brand Specific Components

Pelco ES30PC/ES31PC Esprit with Pressurized IOC	104
---	-----

Intelligent Transportation Systems Inspection and Acceptance Manual (ITSIMM)

Daktronics VMS VF-1420-3-7x60-18-A.....	107
Comlux Opt. Transmission Terminals – Models CL3683/CL3684.....	111
Comlux Optical Video Digital Codecs – Models CL3803/CL3804.....	113
Comlux Optical Regenerators – Models CL3687/CL3687E.....	116
EIS Remote Traffic Microwave Sensors (RTMS).....	119

INTELLIGENT TRANSPORTATION SYSTEMS (ITS) INSPECTION AND ACCEPTANCE MANUAL (ITSIMM)

INSPECTION/ACCEPTANCE CHECKLISTS

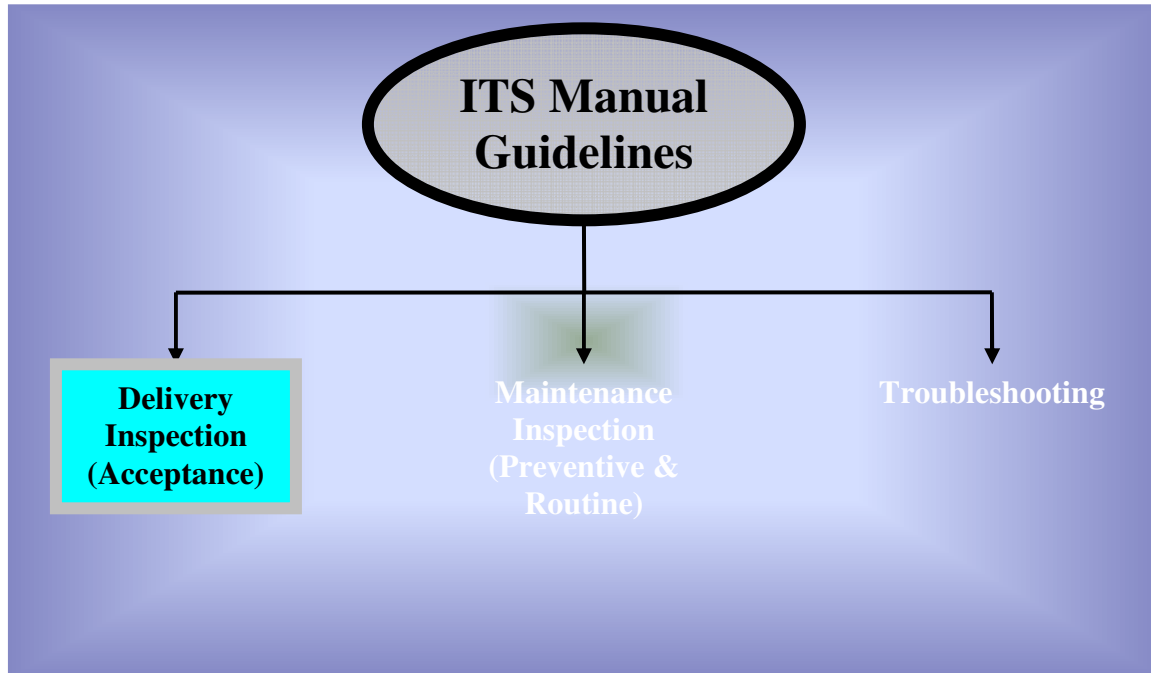
Prepared by



**Rutgers Intelligent Transportation Systems
(RITS) Laboratory**

Rutgers University

December 2007



Pre-Construction Inspection Checklist

	Pass	Fail	N/A
• Make sure that a constructability review for the design has been performed regarding these conditions on the site as per contract: ○ Ease of accessibility, ○ Leveling/level differences/slope, ○ Serviceability, ○ Power requirements, ○ Swelling/flood, ○ Access to wiring/fiber-optic lines, ○ Security requirements, ○ Safety requirements/human factors, ○ Right of way, ○ Utility mark-out, ○ Blind spots (PELCO), ○ Attachment of the lowering device.	☐	☐	☐

Conduit Inspection Checklist

	Pass	Fail	N/A
All conduits should be of types approved for electrical use and should have the proper identification mark and customer identification numbers (NJDOT approved conduits). Installation should be made in conformance with minimum requirements of state Electrical Board (EE Number), National Electrical Code (NEC), and NJDOT standard specifications.	☐	☐	☐
Check that conduit is the proper size and type as detailed in the plans and specifications. All materials should be NJDOT approved materials.	☐	☐	☐
Verify that all subsurface utilities have been located (i.e. marked out) before excavation begins. NJDOT standard specifications require 1-800 ONE notification and separate notification to appropriate local NJDOT electrical and traffic operations maintenance units.	☐	☐	☐
Check excavation trench width and depth for compliance with plans and specifications.	☐	☐	☐
Check that conduit is placed at proper depth and slope. Conduit should drain into a junction box. Make sure that junction box is also drained.	☐	☐	☐
Check for proper spacer installation (multiple PVC conduit cross section only) and support “chairs”.	☐	☐	☐
Boring or jacking operations should not interfere with traffic operation and should not damage or weaken roadway structures or pavements. Tolerances should not exceed the plan or specifications. Any open cuts in the roadway pavement should be approved by the project engineer (NJDOT). Any misguided pipe should be removed or abandoned, if can not be removed.	☐	☐	☐

	Pass	Fail	N/A
As a general rule, the radius of the curve of the inner edge of any field bend shall not be less than the NJDOT and NEC (National Electrical Code) requirements. Number of bends in a single run of conduit shall not exceed NJDOT specifications and manufacturer's specifications.	☐	☐	☐
PVC conduits should be terminated flush with the top of concrete and the end of the conduits should be terminated according to NJDOT specifications and electrical construction details. End bell should be flush with the top of concrete.	☐	☐	☐
Metallic conduit should enter the junction boxes at right angles and extend 1.5 in. to 3 in. into the box. It should be terminated with proper (approved) bushing.	☐	☐	☐
Nonmetallic conduit should be terminated flush with the inside wall, and approved end bell shall be used.	☐	☐	☐
Rigid metal conduit should be cut square, threaded, and reamed on each end with good workmanship and joined using a threaded coupling or EB allowed bushing (with appropriate EE number). All threadless connectors should be approved and waterproofed.	☐	☐	☐
Use galvanized spray on all threaded sections and on any damaged galvanizing. If needed, replace the pipe with damaged galvanizing.	☐	☐	☐
PVC conduit ends should also be square and free of burrs and sharp edges. Joints should be made using a solvent-weld method (glue) in accordance with the conduit manufacturer's recommendations. Nonmetallic conduits should be cleaned before applying the solvent-weld method. Expansion fittings should be provided for expansion joints as shown in plans and/or as directed by the engineer.	☐	☐	☐

	Pass	Fail	N/A
• Check for installation of an expansion fitting at a bridge or other structure requiring an expansion fitting.	☐	☐	☐
• Check that all conduits are properly cleaned and ball gauged for 85% of internal diameter.	☐	☐	☐
• Check that pull wire/tape is properly installed in all conduits. Cap all stub or free ends. Check two readings from either end of the conduit (A tape reading has to be taken – true taping). The wires should be secured at both ends of the conduit. True tape or other materials which may deteriorate shall not be used or left in conduits.	☐	☐	☐
• Check backfill materials and proper compaction, including proper installation of correct warning tape. All trenches should be backfilled the same day. Restoration should be made to the grade line and in-kind conditions prior to excavation. Any concrete removed for bore pits or conduit placement should be replaced so as to blend in with existing concrete.	☐	☐	☐
• Check that all conduits are properly bonded and that the bond wire complies with the specifications and/or plans.	☐	☐	☐
• Carefully record the exact location of the conduit on as-built plan so that the conduit can be easily located for maintenance or modification. Maintain records for as-built purposes.	☐	☐	☐
• Make sure that all work is done in a professional manner.	☐	☐	☐

Junction (Pull) Box Inspection Checklist

	Pass	Fail	N/A
Check that boxes are of the type, size, and shape as specified in the plans. If not specified, the project engineer should approve the boxes to be used. Precast boxes should be approved in advance, including proper size and location of conduit openings. All materials should be NJDOT approved materials.	☐	☐	☐
Check excavation for proper depth and size of hole and proper compaction of bedding. Make sure that there is proper depth of stone under junction boxes for drainage.	☐	☐	☐
The box should be installed so that its top surface is level with the surrounding ground to prevent maintenance damage or hazard to pedestrians as per detail.	☐	☐	☐
A concrete vibrator should be used when pouring cast-in-place concrete boxes to avoid honeycombing. Check concrete and reinforcement bar materials and workmanship. Be sure that form work is plumb and level before pouring.	☐	☐	☐
Check that precast boxes are plumb, level, and secured from movement before backfilling and compaction.	☐	☐	☐
RMC and PVC conduits should enter the junction box, and be terminated with the approved bushing or end bell. The end of the conduits should be terminated according to NJDOT specifications and electrical construction details.	☐	☐	☐
Conduit entrances should be properly grouted inside as per NJDOT specifications.	☐	☐	☐

- | | | | |
|--|--------------------------|--------------------------|--------------------------|
| • Check that proper size ground rods are properly installed and that ground rod openings are properly located in precast boxes. Attach trace wires to grounding rod. | ☐ | ☐ | ☐ |
| • Trace/tone wires should be continuous from box to box or structure to structure. | ☐ | ☐ | ☐ |
| • Ensure that backfill is clean and properly compacted. Proper restoration should be made to match the existing grade around the job. | ☐ | ☐ | ☐ |
| • The depth of the box should not be larger than NJDOT specifications. | ☐ | ☐ | ☐ |
| • Check cable rack inserts and assemblies according to EB specifications (with the appropriate EE number). | ☐ | ☐ | ☐ |
| • Check that frames and covers are properly installed and that the cover fits correctly. Proper identification should be done on the cover (i.e. DOT Fiber). | ☐ | ☐ | ☐ |
| • Check lettering/tagging with conformance with details in plans. | ☐ | ☐ | ☐ |
| • Check that all litter or debris is cleaned out from the box. | ☐ | ☐ | ☐ |
| • Make sure that all work is done in a professional manner. | ☐ | ☐ | ☐ |

Loop Detectors Inspection Checklist

	Pass	Fail	N/A
• Check that the layout of the loops on the roadway conforms to the plans and standard details. If possible, install in milled or base course.	☐	☐	☐
• Identify any bad pavement sections in the marked layout area. Consideration should be given to minimize crossing pavement joints as much as possible in the layout of the loop and the lead-in-wire in the pavement.	☐	☐	☐
• Saw cuts should be made to the depth shown on the plans. Corners should be wet cut at an angle to avoid sharp bends in the loop wire.	☐	☐	☐
• Check the conduit from curb to junction box and the depth of installation according to NJDOT specifications. Check that it is properly sealed in roadway.	☐	☐	☐
• When drilling through a curb, use a rotary percussion drill only.	☐	☐	☐
• Check that the loop wire is installed in accordance with the plans and the number of turns according to specifications. Confirm the wire material type and verify that it conforms to the submittals. Record MH (Micro Henry) for inductance.	☐	☐	☐
• Special caution must be taken when placing the loop wire in the saw cut to avoid scrapping, cutting, or breaking the insulation. Sharp objects that could damage the installation should be removed from the saw cut. All saw cuts should be thoroughly cleaned of dirt and water with compressed air prior to installing loop wires. Wire should be installed into a saw cut with a dull, not pointed instrument.	☐	☐	☐
• Check that loop wire is secured within the saw cut, not exposed to traffic, and completely enclosed within approved sealant and without debris. Check that the sealant adheres properly to the pavement surface.	☐	☐	☐

	Pass	Fail	N/A
At pavement joint or cracks, slack should be provided in the wiring to prevent future insulation breaks.	☐	☐	☐
Be aware of the temperature concerns for curing of epoxy.	☐	☐	☐
Loop wires must not be spliced except where connected to a shielded lead-in cable in a junction box or transformer base located adjacent to the roadways at the loop location. Such splices should be made waterproof with approved splice kits.	☐	☐	☐
The lead in-wire must be approved cable with existing approvals.	☐	☐	☐
All loop detectors should be identified on the junction box.	☐	☐	☐
Make sure that all work is done in a professional manner.	☐	☐	☐

Foundation Inspection Checklist

	Pass	Fail	N/A
• Check foundation excavation for proper size and depth as specified on the plans or as directed by the engineer. Excavation walls should be shored where necessary to prevent collapse. The floor excavation should be firm and dry.	☐	☐	☐
• Have the materials people check the concrete properties (i.e., slump, cylinder and air tests).	☐	☐	☐
• Check concrete form work for proper layout with/by a licensed surveyor.	☐	☐	☐
• Check type, gauge, number, and placement of steel reinforcement bars.	☐	☐	☐
• Check the foundation elevation and overhead conflicts prior to installation.	☐	☐	☐
• Check the location and orientation of conduit entry for compliance with plans and construction details. All anchor bolts and conduit should be held securely in place until the concrete in the foundation has set. Make sure that all anchor bolts are protected from any kind of damage (i.e., nutted bolts).	☐	☐	☐
• Check that the conduit is capped prior to pouring concrete.	☐	☐	☐
• The concrete should be properly vibrated to avoid honeycombing. Check that the finished top surface is level.	☐	☐	☐
• Check for proper backfill materials and compaction.	☐	☐	☐
• Check that all debris is properly removed and that the site is approximately restored to match the surrounding grade.	☐	☐	☐
• Verify proper cure time of concrete before mounting poles.	☐	☐	☐
• Make sure that all work is done in a professional manner.	☐	☐	☐

CCTV Pole Inspection Checklist

	Pass	Fail	N/A
Check the locations and sizes of all wire outlets on the vertical support. Make sure that all blank covers are in place.	☐	☐	☐
Verify prewiring of the vertical support. Verify the locations of “J” hooks and other strain relief devices.	☐	☐	☐
Check the orientation of anchor bolts and the installation of leveling nuts on the foundation according to manufacturer’s recommendations. Anything steel should be double nutted.	☐	☐	☐
Using the fabrication base plate template, verify the orientation of anchor bolts.	☐	☐	☐
Check the location and number of lifting lugs. Verify that the CCTV assembly is not installed prior to installing the pole itself.	☐	☐	☐
Right at the base of the pole, a steel mesh should be provided for animal filtration.	☐	☐	☐
Confirm sufficient overhead utility clearance exists. Clearances shall conform to the National Electrical Safety Code as well as the affected utility company’s requirements.	☐	☐	☐
Check and/or adjust the vertical support for plumb in accordance with manufacturer’s erection instructions, using the level nuts. Check for proper grouting of foundation to pole base if specified by design.	☐	☐	☐
Record the sequence of installation of tightening of the anchor bolts or nuts and record the value in foot-pounds from a torque wrench scale and check that value with specifications and standard values.	☐	☐	☐

	Pass	Fail	N/A
• Verify that grounding and lining of the pole is done according to specifications and plans. Take a grounding reading and check the resistance according to both NJDOT and manufacturer's recommendations.	☐	☐	☐
• Make sure that during the installation of the pole, the appropriate maintenance and protection of traffic devices are properly placed and any required traffic officers are also present.	☐	☐	☐
• Make sure that CCTV maintenance functions have been checked by the manufacturer according to field test procedures.	☐	☐	☐
• Make sure that CCTV is tested locally.	☐	☐	☐
• Make sure that CCTV is tested remotely at the control center.	☐	☐	☐
• Make sure that all work is done in a professional manner.	☐	☐	☐

VMS Sign Supports/Sign Box Inspection Checklist

	Pass	Fail	N/A
Check the locations and sizes of all wire outlets on the vertical and horizontal supports to ensure that sufficient conductor fill space is available. Make sure that all blank covers are in place.	☐	☐	☐
Verify prewiring of the supports. Verify the location of “J” hooks and other strain relief devices.	☐	☐	☐
Using the fabrication base plate template, verify the orientation of anchor bolts.	☐	☐	☐
Verify the plumbness/grade/coating of anchor bolts.	☐	☐	☐
Check the location and number of lifting nuts/lugs.	☐	☐	☐
Check for proper installation of the horizontal member.	☐	☐	☐
Confirm sufficient overhead utility clearance exists.	☐	☐	☐
Check that the sign case is correctly located and mounted on the horizontal member.	☐	☐	☐
Readjust the vertical support for plumb or rake as required to level the horizontal member.	☐	☐	☐
Check the orientation of the horizontal member and the height of the VMS over the roadway.	☐	☐	☐
Record the sequence of installation or readjust the anchor bolts or nuts and record the value in foot-pounds from a torque wrench scale and check that value with AASHTO standards.	☐	☐	☐

Intelligent Transportation Systems Inspection and Acceptance Manual (ITSIMM)

	Pass	Fail	N/A
• Make sure that VMS maintenance functions have been checked by the manufacturer according to field test procedures and that the installing contractor strictly follows the entire testing & startup procedures of the manufacturer.	☐	☐	☐
• Make sure that VMS is tested locally.	☐	☐	☐
• Make sure that VMS is tested remotely at the control center.	☐	☐	☐
• Make sure that all work is done in a professional manner.	☐	☐	☐

Preliminary Wiring Inspection Checklist

	Pass	Fail	N/A
• Check wire size, type, and manufacturer for compliance with the approved materials list and specifications.	☐	☐	☐
• Check that all wires are color-coded as required and that such coding is clearly distinguishable to facilitate installation and maintenance.	☐	☐	☐
• Check that conduit is thoroughly cleaned and that pull wire has been properly installed.	☐	☐	☐
• Install approved conduit bushing/end bell.	☐	☐	☐
• Ensure that all wiring is installed correctly and is not stretched, cut, or otherwise damaged. Wire lubricant should be applied to the cable before and during pulling. Pulling the wire into the conduit should be done carefully by hand or mechanically using an approved wire puller.	☐	☐	☐
• Check that proper compression connectors and crimping tools are used for all splices.	☐	☐	☐
• Check that proper materials and workmanship are used in all splices. Recommended splicing methods include use of an approved epoxy watertight kit.	☐	☐	☐
• Loop wire on cable racks in the junction boxes and in the bases of the vertical supports. The proper amount of slack should be provided at these locations according to NJDOT specifications. Grab the wires and shake them to make sure that wires are tight.	☐	☐	☐
• All circuit should be properly identified and tagged in easily accessible locations as per detail.	☐	☐	☐

	Pass	Fail	N/A
• All plans and wiring diagrams should be revised, if necessary, to record any wiring changes made due to prevailing field conditions.	☐	☐	☐
• Check the insulation resistance of the complete system with a MEGGER meter and verify that it meets the requirements according to NJDOT specifications.	☐	☐	☐
• Make sure that all wiring is done in a professional manner.	☐	☐	☐

Fiber-Optic Cabling/Splicing Inspection Checklist

	Pass	Fail	N/A
Review the fiber-optic approved pulling plan. As a minimum, the plan should specify the pulling/blowing equipment, lubrication/cooling, minimum bend radius, splice locations (connectors/in-line splices), length of all runs, splicing equipment, pulling locations and staff certification for installation and splicing.	☐	☐	☐
Check the fiber type (i.e., multi- or single-mode) if it is approved by specifications and if it is approved material. Verify that it meets the requirements. Check factory fiber-optic and make sure that spool ODTR test results meet the requirements.	☐	☐	☐
If required by the cable manufacturer so as not to void fiber optic warranty, confirm that the installation contractor has a manufacturer certified fiber-optic technician (installer) on site. Are certifications current and applicable to your installation?	☐	☐	☐
Check that all cables are color-coded or tagged and that such coding is clearly distinguishable to facilitate installation and maintenance.	☐	☐	☐
Check that conduit is thoroughly cleaned and airtight and that a pull/drag line has been properly installed.	☐	☐	☐
Install conduit bushing/end bell with pulling rings to prevent chafing.	☐	☐	☐
Monitor pulling (with a strain gauge) and blowing of cable in accordance with manufacturer's specifications. If it is a mechanical installation, it should have the proper wheel radius.	☐	☐	☐
Maintain proper bending radius as per manufacturer's and NJDOT specifications.	☐	☐	☐

Intelligent Transportation Systems Inspection and Acceptance Manual (ITSIMM)

	Pass	Fail	N/A
• Using an OTDR, measure the reflectivity factor of the glass and compare to the measurement on the spool before the installation.	☐	☐	☐
• Using an OTDR, again measure the reflectivity after the installation but before splicing and compare.	☐	☐	☐
• Review fiber-optic splicing personnel certifications. Are certifications current and applicable to your installation?	☐	☐	☐
• Use proper fiber optic lubricant (not wire lubricant) if necessary.	☐	☐	☐
• Test the quality of fiber-optic splicing. Maximum dB losses should not exceed the NJDOT and manufacturer's requirements. Only fusion splicing (machines) will be permitted (i.e, no mechanical splices).	☐	☐	☐
• Loss Budget Analysis shall be conducted/formulated for the conduit run/splice constructions.	☐	☐	☐
• Check that proper materials are used in all splices. Use approved splice enclosure.	☐	☐	☐
• Loop cable on racks in junction boxes and attach it to support hooks/strain reliefs in the vertical support. The proper amount of slack as per specifications should be provided at these locations.	☐	☐	☐
• All fiber terminations should be properly identified and tagged in easily accessible locations.	☐	☐	☐
• All plans and cable diagrams should be revised, if necessary, to record any cabling changes made due to prevailing conditions.	☐	☐	☐
• All fiber-optic should be properly installed and stored to avoid micro bending.	☐	☐	☐

Pass **Fail** **N/A**

- Armored fiber-optic cable must be grounded as per NJDOT specifications and NEC requirements.

☐	☐	☐
--------------------------	--------------------------	--------------------------

- Make sure that all wiring is done in a professional manner.

☐	☐	☐
--------------------------	--------------------------	--------------------------

Grounding Inspection Checklist

	Pass	Fail	N/A
• Check that the approved clamps and/or exothermic welds are installed on all ground rods and below grade ground connections. On metallic conduit, install bonding bushing to the end of the conduit.	☐	☐	☐
• Check that the ground wire (wrench-tight approved) is properly installed and connected to the ground rod and/or conduit.	☐	☐	☐
• Check to ensure that equipment grounding conductors have been sized properly according to NEC requirements. Make sure that they have been increased in size where circuit conductors are increased for voltage drop.	☐	☐	☐
• Check that poles are properly connected to the ground wire clamp with ground wire.	☐	☐	☐
• Check that the electronic equipment and cabinet are properly connected to the ground clamp with ground wire.	☐	☐	☐
• Make sure that all work is done in a professional manner.	☐	☐	☐

Final Wiring Inspection Checklist

	Pass	Fail	N/A
• Check that the external wiring is shaped to provide a drip loop at each device and vertical support entry wire outlets.	☐	☐	☐
• Check that the wiring to the terminal of the device has been properly connected.	☐	☐	☐
• Check that the home run detector wire has been properly connected to the loop using an approved epoxy splice kit.	☐	☐	☐
• Properly identify all circuits with approved tags.	☐	☐	☐
• Make sure that all wiring is done in a professional manner.	☐	☐	☐

Wire Testing Inspection Checklist

	Pass	Fail	N/A
• Test all circuit conductors as a complete system for electrical leaks using a megger (a type of insulation tester that generates a voltage and gives a reading of leakage to ground in megohms of resistance) in accordance with the manufacturer's test procedures.	☐	☐	☐
• Test the loop detector, loop detector home run wire, and loop amplifier using a loop analyzer in accordance with the manufacturer's test procedure.	☐	☐	☐
• Test for the continuity of all wires using a volt ohmmeter (VOM).	☐	☐	☐
• Make sure that all work is done in a professional manner.	☐	☐	☐

Communication/Field Equipment Cabinet Inspection Checklist

	Pass	Fail	N/A
• Check that the cabinet is properly centered and installed on the foundation or pole. Check that the conduit/raceway entering the cabinet (should be from the bottom) is sealed properly with duct sealant and that the power distribution and communication cables are properly coiled/terminated.	☐	☐	☐
• Check that the following equipment is properly installed in accordance with the plans and specifications and at the designated locations: ○ high-speed communication, ○ Multiplexers (MUX), ○ CODEX, ○ modems (data, video, voice), ○ modem rack/power supply, ○ fiber-optic patch panel/fan out kit, ○ cabinet security devices.	☐	☐	☐
• Check that the following peripheral equipment is properly installed in accordance with standard details: <i>Equipment</i> ○ air conditioning, ○ heater, ○ fans, ○ lightning protection, ○ 19 in. / 23 in. EIA rack, ○ air filtration, ○ UPS (batteries) protection, ○ Lighting/door switches, ○ Ground fault circuit interrupter.	☐	☐	☐

- Check that the following environmental controls are properly installed in accordance with standard details:

☐ ☐ ☐
Environmental Controls

- thermostat for A/C,
 - humidstat for A/C,
 - thermostat for heater,
 - thermostat for fan.
- Check the connection of the communication cable to the devices and patch panels (RS232, RS422, coaxial, single-/multi-mode fiber-optic cable) in accordance with cabling diagrams and standard details.
- Make sure that connectors and covers are properly installed. Make sure that connectors are tight.
- Test the operation of the communication equipment by passing an output (both video and data) from the field device to the traffic operations center (TOC) through the equipment.
- Test the HVAC equipment/environmental controls by visually verifying operation by overriding the controls.
- Ensure the equipment installation prints, plans and settings have been placed in a waterproof pouch in the cabinet. Make sure that a separate identical set is provided for office records, both as hardcopy and electronically. Any field changes or changes on plan should be included.
- Check that the cabinet is grounded to the ground rod.
- Make sure that all work and wiring is done in a professional manner.
- Make sure that cables/wiring are not behind any equipment/shelves.

☐ ☐ ☐
☐ ☐ ☐
☐ ☐ ☐
☐ ☐ ☐
☐ ☐ ☐
☐ ☐ ☐
☐ ☐ ☐
☐ ☐ ☐

Pre-Construction Electric Service Inspection Checklist

	Pass	Fail	N/A
• Confirm the location.	☐	☐	☐
• Verify the direction of feed.	☐	☐	☐
• Verify whether the feed is from an above-ground (pole) or underground (manhole) source.	☐	☐	☐
• Confirm whether the type of service is metered or unmetered.	☐	☐	☐
• Make sure that the breakers are marked and properly sized.	☐	☐	☐
• The cabinet should be marked for proper voltage on the service panel and handles should be free from obstruction.	☐	☐	☐
• Designer should establish ESI or “R” number with electrical utility or phone services.	☐	☐	☐
• Make sure that all work is done in a professional manner.	☐	☐	☐

Service Poles and Electrical Feed Inspection Checklist

	Pass	Fail	N/A
• Verify the source of power.	☐	☐	☐
• Check the location and height of the meter and/or load center making sure that all the utility company requirements are met.	☐	☐	☐
• Check the conduit type (rigid metallic or PVC), installation practices, and direction of feed with the utility company requirements.	☐	☐	☐
• Make sure that approved materials are used. Make sure that all equipment and wiring methods conform to NEC, NJDOT standard specifications, and utility company requirements.	☐	☐	☐
• Make sure that all work is done in a professional manner.	☐	☐	☐

Load Center and Meter Inspection Checklist

	Pass	Fail	N/A
• Check the load center and meter equipment against the approvals, shop drawings, details, and specifications.	☐	☐	☐
• Check that the load center is properly grounded and that the electrical equipment is properly bonded.	☐	☐	☐
• Identify the circuit locations on the load center door.	☐	☐	☐
• The cabinet should be marked for proper voltage on the service panel.	☐	☐	☐
• Handles should be free from obstruction.	☐	☐	☐
• Confirm that the load center foundation is as per specifications.	☐	☐	☐
• Check that strip heaters are mounted on standoffs and that proper hi-temp wire is used for circuit conductors.	☐	☐	☐
• Check all electrical (lugs) and mechanical connections on the load center equipment to be sure that they are secure.	☐	☐	☐
• See that the cabinet and enclosure doors can be fully opened without encroachment onto Non-DOT row and that voltage warning signs are installed.	☐	☐	☐
• Make sure that all work is done in a professional manner.	☐	☐	☐

Customer Service/Connection Box Inspection Checklist

	Pass	Fail	N/A
• Make sure that connections for the customer service box are done properly.	☐	☐	☐
• Make sure that the phone service is checked and cleaned.	☐	☐	☐
• Designer should establish ESI or “R” number with phone services.	☐	☐	☐
• Make sure that all work is done in a professional manner.	☐	☐	☐

Traffic Maintenance during Construction Checklist

	Pass	Fail	N/A
• Check that all signs reflect actual prevailing conditions in the work zone. Signs should not be prematurely installed. Remove them promptly after the completion of work activities. Warning signs should be properly covered, removed, relocated, or otherwise made inoperative during periods that the contractor is not working. All the safety material should be clean and in good condition.	☐	☐	☐
• Check that all existing signs or pavement markings that conflict with the traffic control plan are removed or covered up.	☐	☐	☐
• Conduct regular inspections of all signs, pavement markings, and other devices to ensure that they remain in good condition and that all electrical or mechanical devices are operating satisfactorily. In particular, the work zone should be inspected at night to ensure that all lighted and/or reflecting signs and devices are clearly visible and functioning properly.	☐	☐	☐
• The closing should be done according to MUTCD (Manual on Uniform Traffic Control Devices) guidelines. Before closing, there should be a pre-site inspection by the participation of resident engineer, police and traffic coordinator of the contractor. After closing is erected, a drive-thru of the work site should be conducted to ensure proper setup of the closure and ease of navigation through the work zone by motorists.	☐	☐	☐
• Make sure that all work is done in a professional manner.	☐	☐	☐

INTELLIGENT TRANSPORTATION SYSTEMS (ITS) INSPECTION AND ACCEPTANCE MANUAL (ITSIMM)

PREVENTIVE/ROUTINE MAINTENANCE GENERIC CHECKLISTS

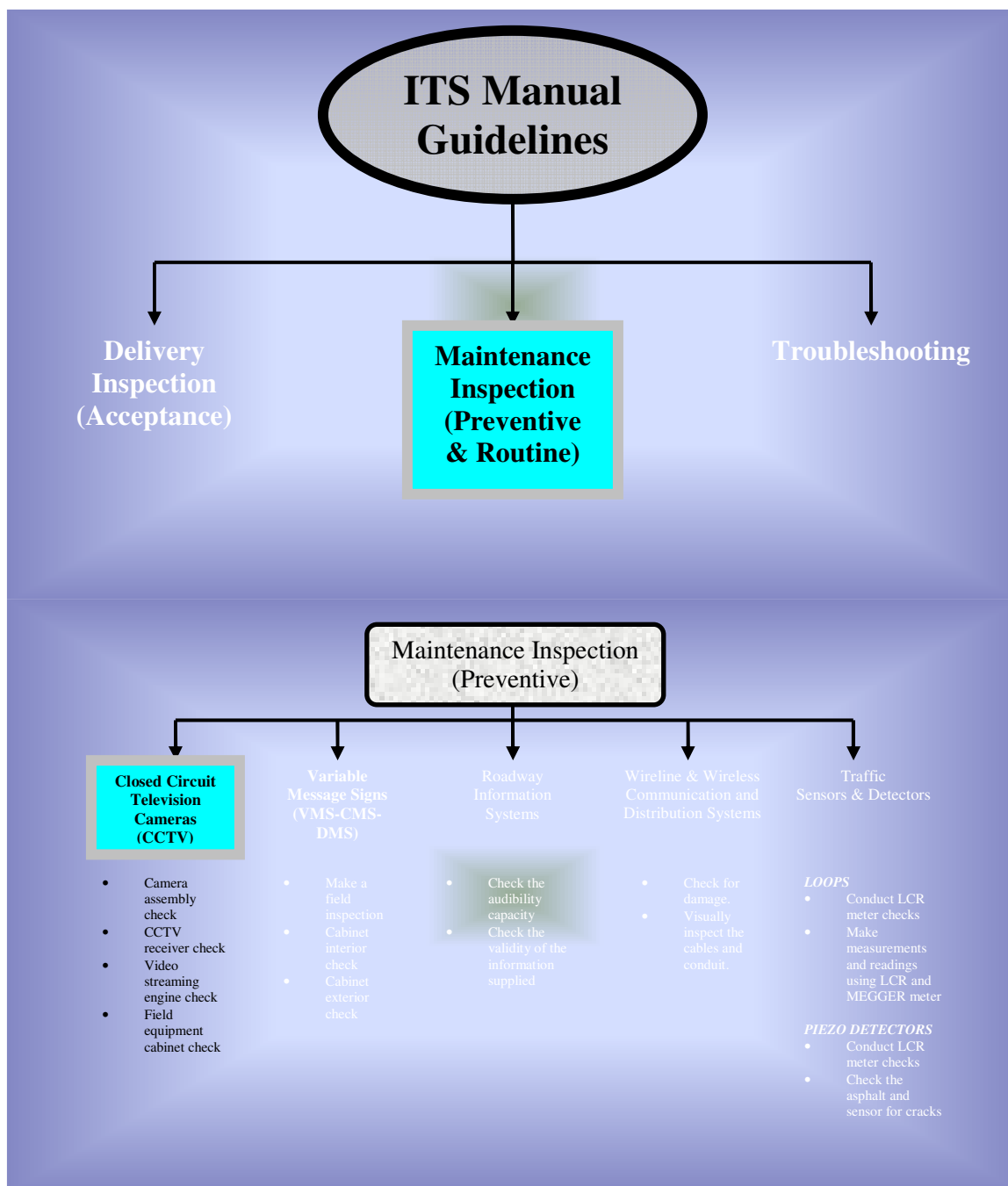
Prepared by



**Rutgers Intelligent Transportation Systems
(RITS) Laboratory**

Rutgers University

December 2007



Closed Circuit Television Systems Pole Checklist

Task	Completed (Circle One)	Condition (Shade one)			
		Excellent	Good	Fair	Bad
➤ Check CCTV pole and foundations for damage (lightning, leaning, car impacts, vandalism, corrosion, etc.).	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check for corrosion of terminal inside housing and mounting.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check for proper clearance of tree branches or brush; schedule any required trim work. Remove any bird nest around the camera housing following approval from the Environmental Department.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Visually inspect camera housing. Check and inspect camera.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check and inspect enclosure window and lens. Clean glass with suitable glass cleaning agent in/out.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check and inspect pan/tilt unit. Inspect pan and tilt mechanism and adjust limit switches where applicable.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check operation of thermostat inside camera housing.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check camera humidity indicator (if applicable) for change in internal humidity.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check and inspect the integrity of all harnesses and interconnecting cables, tighten connectors, and remove rust if required. Replace defective item where applicable.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check externally and vacuum interior of environmental enclosure.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check integrity of surge protector. Replace where applicable.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check and inspect transmission/receiver hardware.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check wiper blades and wiper assembly unit. Replace defective units.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check and replace any failed bulbs, disks, LEDs, and air filters. Filters should be changed frequently.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check all equipment grounding conductors and connections.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check the bolts/tightening equipments if necessary.	Yes/No /NA	Excellent	Good	Fair*	Bad*

*** CONTACT INTEGRATOR AND REPORT**

Recommendation / Comments

Closed Circuit Television Systems Cabinet Checklist

Task	Completed (Circle One)	Condition (Shade one)			
		Excellent	Good	Fair	Bad
➤ Check the condition of surface and general cabinet appearance for damage (paint, damage, and graffiti).	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check for animal filtration.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check cabinet door and locking mechanism for proper closure. Adjust/repair if needed. Lubricate hinges/lock.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Clean and vacuum inside of cabinet and equipments to remove dust.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Inspect and change filters where applicable.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check weatherproof seal (gasket).	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check anchor bolts for tightness and corrosion.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check for water infiltration accumulations/duct sealant.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check light bulb and replace where applicable.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check operation of fan/air conditioner unit and heater and replace where applicable.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check and inspect equipment racks/shelves.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check thermostat for proper function.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check ground rod clamp and wire.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check wiring schematics, plans and records.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check environmental systems.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check circuit breaker/fuses.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check ground fault receptacle.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check integrity of all cables and connectors.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check video quality with portable monitor. Adjust per specifications in camera manual.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check integrity of surge protectors.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check and ensure that all relays are firmly seated on the control board.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check operation of auto-iris and adjust for correct operation per operational and maintenance manual.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check circuit box at the base of the camera pole to ensure that the terminal strips are corrosion free.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check incoming power for proper voltage and correct if not within tolerances.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check and record current being drawn.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check communications cabling (Fiber, T-1, voice grade, etc.) visually and test communications circuit for proper operation back to communications node or central.	Yes/No /NA	Excellent	Good	Fair*	Bad*

*** CONTACT INTEGRATOR AND REPORT**

Recommendation / Comments

Closed Circuit Television Systems Base and Meter Cabinet Checklist

Task	Completed (Circle One)	Condition (Shade one)			
		Excellent	Good	Fair*	Bad*
➤ Check cabinet/pole/pedestal for damage (lightning, leaning, car, vandalism, corrosion, etc).	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check pole base. Replace base cover and clean out if necessary.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check mounting hardware. Replace bolt cover and tighten if necessary.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check pole base splices for damage, water infiltration and rodent damage.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check grounding system for damage, or corrosion. Repair if necessary.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check the meter socket and disconnect for damage, vandalism, and missing hardware.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check anchor bolts for tightness and corrosion.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check breakers.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check meter cabinet for damage.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check meter cabinet locking mechanism. Adjust or repair if needed.	Yes/No /NA	Excellent	Good	Fair*	Bad*

* CONTACT INTEGRATOR AND REPORT

Recommendation / Comments

Closed Circuit Television Systems Conduit & Cables Checklist

Task	Completed (Circle One)	Condition (Shade one)			
		Excellent	Good	Fair*	Bad*
➤ Pump junction box dry if water is present remove.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Visually inspect splice kit for water infiltration.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check conduit runs for settling of trench.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Clean garbage from junction box.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Visually inspect lugs for burning corrosion, water infiltration and rodent damage.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Visually inspect cable tags. Replace or reattach if needed.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Visually inspect bushings for rust or damage.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Inspect all equipment grounding conductors and connections for integrity.	Yes/No /NA	Excellent	Good	Fair*	Bad*

*** CONTACT INTEGRATOR AND REPORT**

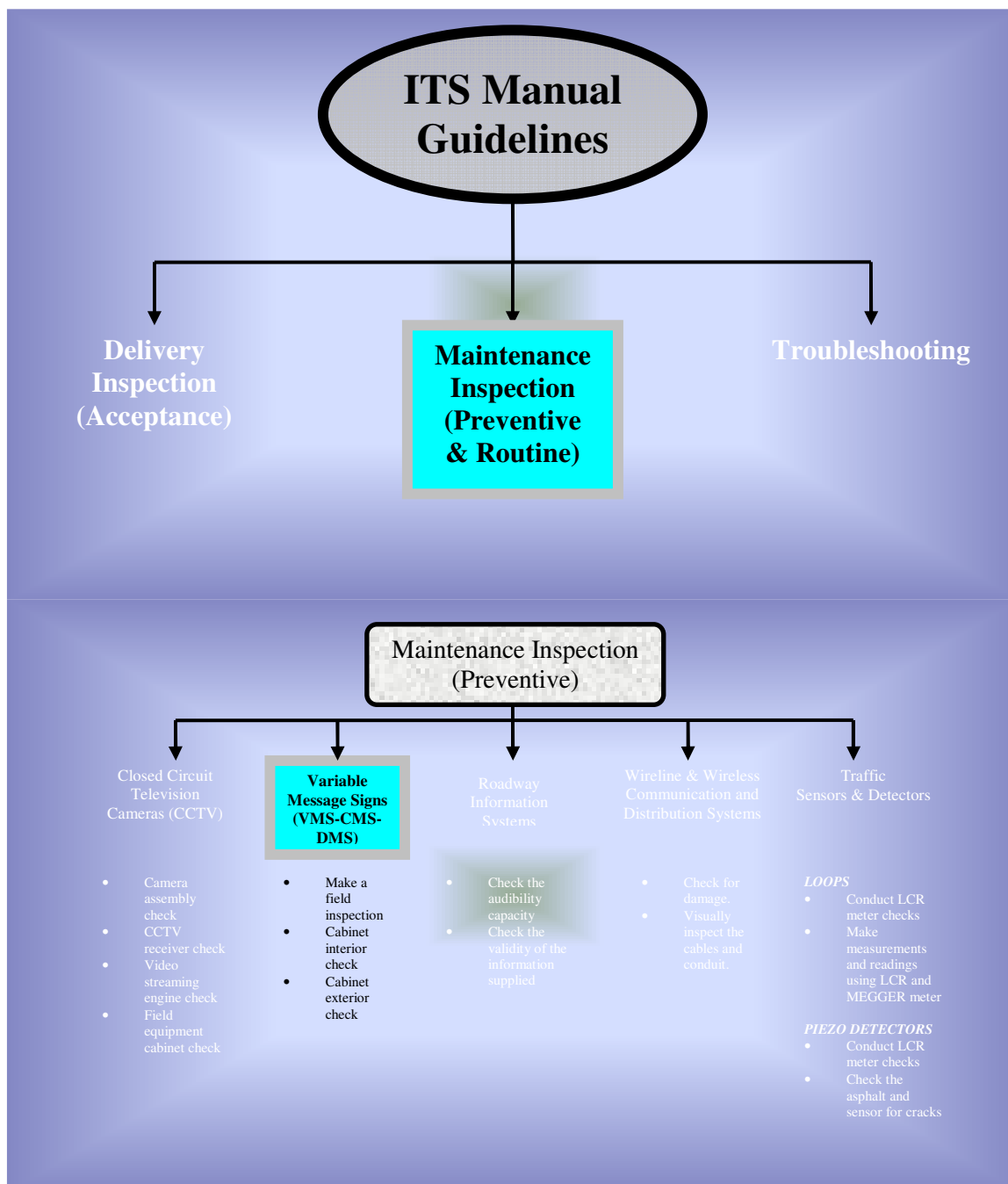
Recommendation / Comments

Closed Circuit Television Systems Checklist (At the Control Center)

Task	Completed (Circle One)	Condition (Shade one)			
		Excellent	Good	Fair	Bad
➤ Using the waveform monitor, perform the following measurements and ensure that the results are within manufacturers specifications. Document the results.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check raw video.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Measure peak white.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Measure color burst.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Measure synch pulse.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check integrity of all connectors.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check all camera video at night to determine which cameras need back focusing.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Operate PTZ(Pan-Tilt-Zoom) for all functions to their extreme limits to ensure full operation and proper focus/zoom functions.	Yes/No /NA	Excellent	Good	Fair*	Bad*

* CONTACT INTEGRATOR AND REPORT

Recommendation / Comments



Variable Message Signs Sign Checklist

Task	Completed (Circle One)	Condition (Shade one)			
		Excellent	Good	Fair	Bad
➤ Check sign structure and foundations for damage (lightning, leaning, car impacts, vandalism, corrosion, etc).	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check anchor bolts and tighten if necessary.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check to be sure handhold covers are secure.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check for proper clearance of tree branches or brush. Inform appropriate agency if attention required.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check interconnect cable connections.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Clean ventilation filters.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Test LED for failures and replace LEDS if needed.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check pull boxes (damage, covers missing or damaged).	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check and inspect maintenance walkway/mounting hardware, if applicable (tighten hardware, if necessary).	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check DMS enclosure for damage (lightning, leaning, car impacts, vandalism, corruption, etc).	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Inspect and vacuum the interior of the DMS enclosure.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check for tightness of all internal hardware.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check and inspect air vents and weep holes.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check HVAC and controls.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check and inspect controller. Run and save controller diagnostics.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check and inspect modem.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check and inspect all wiring harnesses and interconnecting cable assemblies/connectors for tightness and corrosion. Correct as required.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check and replace any failed bulbs, disks, LEDs, air filters.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check and inspect power distribution unit.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check all equipment grounding conductors and connections.	Yes/No /NA	Excellent	Good	Fair*	Bad*

* CONTACT INTEGRATOR AND REPORT

Recommendation / Comments

Variable Message Signs Cabinet Checklist

Task	Completed (Circle One)	Condition (Shade one)			
		Excellent	Good	Fair*	Bad*
➤ Check the condition of surface and general cabinet appearance for damage (paint, damage, and graffiti).	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check cabinet door and locking mechanism for proper closure. Adjust or repair if needed. Lubricate hinges and lock.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Clean and vacuum inside of cabinet and equipments to remove dust.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Inspect and change filters where applicable.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check weatherproof seal (gasket).	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check anchor bolts for tightness and corrosion.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check for water infiltration accumulations and duct sealant.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check light bulbs and replace where applicable.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check operation of fan/air conditioner unit and heater, and replace where applicable.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check and inspect equipment racks/shelves (tighten any lose hardware).	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check thermostat for proper function.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check ground rod clamp and wire.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check wiring schematics, plans and records.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check environmental systems.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check circuit breaker/fuses.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check ground fault receptacle.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check integrity of all cables and connectors.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check the controller and associated units, indicator lights.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check function and communications (modem).	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check that cables are not stressed.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Clean dimming sensor.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Test (diagnostic) according to manufacturer's specifications.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Have a message displayed remotely from the Traffic Operations Center.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check and ensure that all relays are firmly seated on the control board.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check incoming power for proper voltage and correct if not within tolerances.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check and record current being drawn.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Make sure that cat walk/railing is secured. Check connections.	Yes/No /NA	Excellent	Good	Fair*	Bad*

*** CONTACT INTEGRATOR AND REPORT**

Recommendation / Comments

Variable Message Signs Base and Meter Cabinet Checklist

Task	Completed (Circle One)	Condition (Shade one)			
		Excellent	Good	Fair*	Bad*
➤ Check cabinet/pole/pedestal for damage (lightning, leaning, car, vandalism, corrosion, etc).	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check pole base. Replace base cover and clean out if necessary.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check mounting hardware. Replace bolt cover and tighten if necessary.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check pole base splices for damage, water infiltration and rodent damage.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check grounding system for damage, or corrosion. Repair if necessary.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check and tighten the underground feed conduit as required.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check the meter socket and disconnect for damage, vandalism, and missing hardware.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check anchor bolts for tightness and corrosion.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check breakers.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check meter cabinet for damage.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check meter cabinet locking mechanism. Adjust or repair if needed.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Make sure that cat walk/railing is secured. Check connections.	Yes/No /NA	Excellent	Good	Fair*	Bad*

* CONTACT INTEGRATOR AND REPORT

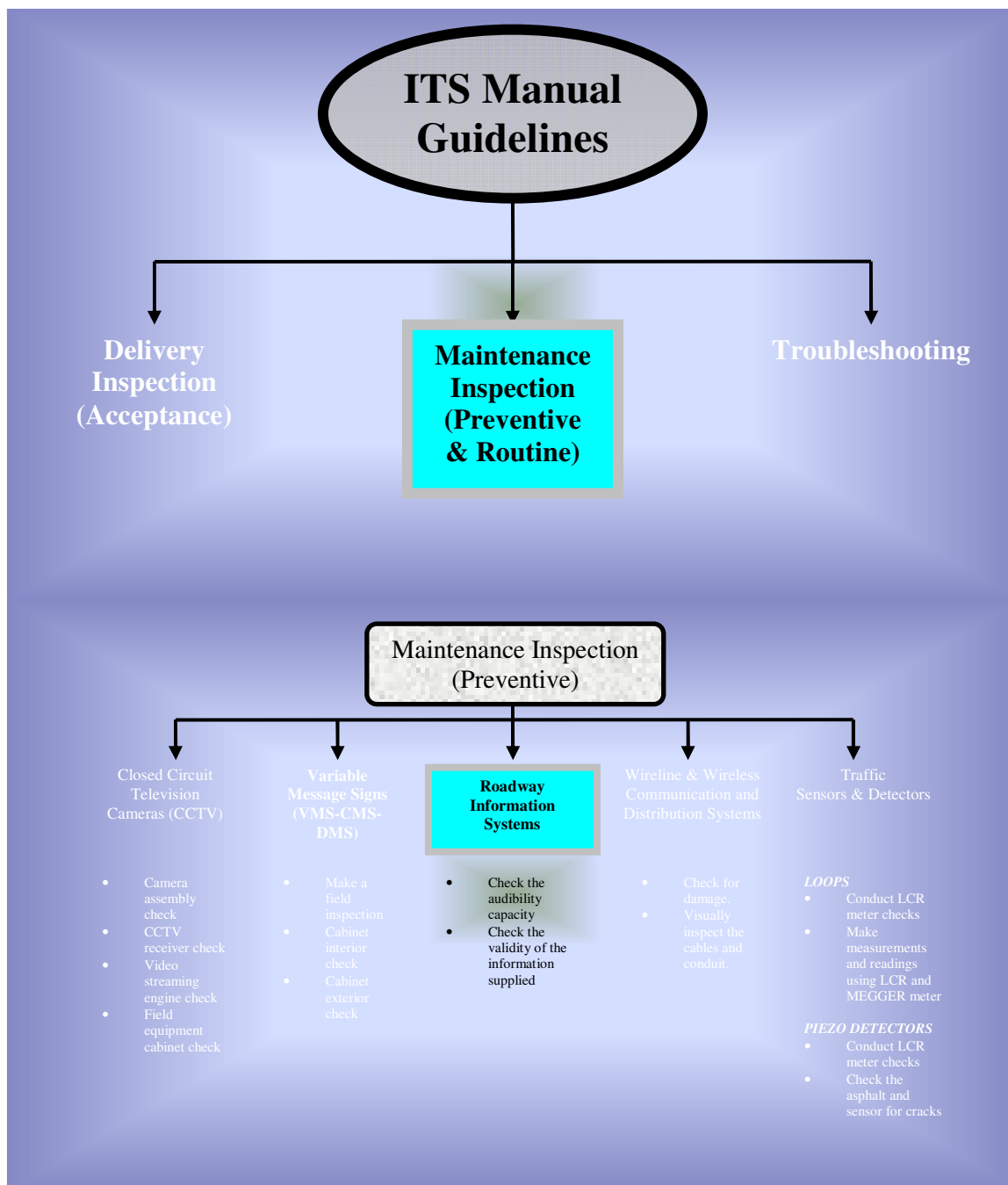
Recommendation / Comments

Variable Message Signs Conduit & Cables Checklist

Task	Completed (Circle One)	Condition (Shade one)			
		Excellent	Good	Fair*	Bad*
➤ Check conduit runs for settling of trench.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Visually inspect splice kit for water infiltration.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Pump junction box dry if water is present remove.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Clean garbage from junction box.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Visually inspect lugs for burning corrosion, water infiltration and rodent damage.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Visually inspect cable tags. Replace or reattach if needed.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Visually inspect bushings for rust or damage.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Inspect all equipment grounding conductors and connections for integrity.	Yes/No /NA	Excellent	Good	Fair*	Bad*

* CONTACT INTEGRATOR AND REPORT

Recommendation / Comments



Highway Advisory Radio General Checklist

Task	Completed (Circle One)	Condition (Shade one)			
		Excellent	Good	Fair	Bad
➤ Check sign structure and foundations for damage (lightning, leaning, car impacts, vandalism, corrosion, etc.).	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check for proper clearance of tree branches or brush; schedule any required trim work.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check and inspect antenna support structure and foundations for damage (lightning, leaning, car impacts, vandalism, corrosion, etc.).	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check all mounting bolts for tightness and corrosion.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Replace/tune antennas as required.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check and replace cable/connectors as required.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check and inspect coaxial cable for damage (lightning, leaning, car impacts, vandalism, corrosion, etc.).	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check and inspect antenna tuning unit.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check and inspect digital recorder and interconnecting tables.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check and inspect transmitter and interconnecting cables per manufacturer's procedures.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check and inspect NOAA weather band receiver and interconnecting tables.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check and inspect station real-time monitor and interconnecting tables.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check HAR meter cabinet.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check and inspect battery, and perform load test.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Inspect ground plane system and ensure ground rods are not exposed.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check solar system/panel and battery (if applicable).	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check HAR conduit runs.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check HAR power distribution unit.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check all equipment grounding conductors and connections.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Have a message recorded locally and remotely from the Traffic Operations Center according to manufacturer's recommendations.	Yes/No /NA	Excellent	Good	Fair*	Bad*

* CONTACT INTEGRATOR AND REPORT

Recommendation / Comments

Highway Advisory Radio Antenna Checklist

Task	Completed (Circle One)	Condition (Shade one)			
		Excellent	Good	Fair	Bad
➤ Check and inspect antenna support structure and foundations for damage (lightning, leaning, car impacts, vandalism, corrosion, etc.).	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check all mounting hardware/anchor bolts for tightness and corrosion.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check monopoles for damage (lightning, leaning, car impacts, vandalism, corrosion, etc.).	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check and inspect the associated backup power supplies following manufacturer's preventive maintenance procedures.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check for proper clearance of tree branches or brush.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Replace antennas as required.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check and replace cable/connectors as required.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check and replace lights/beacons as required.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check and inspect coaxial cable for damage (lightning, leaning, car impacts, vandalism, corrosion, etc.).	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check VSWR (Virtual Standing Wave Ratio) of antenna to ensure proper match to transmitter. Re-tune antenna match as necessary.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check and inspect the ground plane.	Yes/No /NA	Excellent	Good	Fair*	Bad*

* CONTACT INTEGRATOR AND REPORT

Recommendation / Comments

Highway Advisory Radio Sign & Meter Cabinet Checklist

Task	Completed (Circle One)	Condition (Shade one)			
		Excellent	Good	Fair*	Bad*
➤ Check sign and support structure for damage (lightning, leaning, car impacts, vandalism, corrosion, etc.).	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check for proper clearance of tree branches or brush; schedule any required trim work.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Clean fixed message static sign.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Remove any graffiti as required.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Clean flasher fixtures.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Replace all damaged and/or blown bulbs.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check meter cabinet for damage (lightning, leaning, car, vandalism, corrosion, etc).	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check meter cabinet locking mechanism. Adjust or repair if needed.	Yes/No /NA	Excellent	Good	Fair*	Bad*

* CONTACT INTEGRATOR AND REPORT

Recommendation / Comments

Weather Station Checklist

Task	Completed (Circle One)	Condition (Shade one)			
		Excellent	Good	Fair	Bad
➤ Check weather tower, weather tower support facility, and foundations for damage (lightning, leaning, car impacts, vandalism, corrosion, etc).	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check all tower and support facility hardware; tighten as required.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check pole/pedestal and foundations for damage (lightning, leaning, car impacts, vandalism, corrosion, etc).	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check for proper clearance of tree branches or brush to allow normal system operation.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check and inspect all sensor installation and mounting hardware.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check and inspect cabinet.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check and inspect utility pole/pedestal and meter cabinet.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check and inspect conduit runs.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check detector power distribution unit.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check and inspect pavement conditions at each road surface sensor(s); look for puck to be level with the road, as asphalt cracking or potholes.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check and inspect pavement conditions at each subsurface sensor(s); look for cracked pavement, loose/missing joint filler, or any pavement deterioration.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check and inspect wind speed/direction sensor(s).	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check and inspect visibility sensor(s).	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check and inspect the precipitation sensor.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check and inspect anometer.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Visually inspect remote processing unit (RPU) in cabinet.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Calibrate all sensors according to manufacturer's specifications.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Initiate and run RPU diagnostic program per manufacturer's specifications.	Yes/No /NA	Excellent	Good	Fair*	Bad*

* CONTACT INTEGRATOR AND REPORT

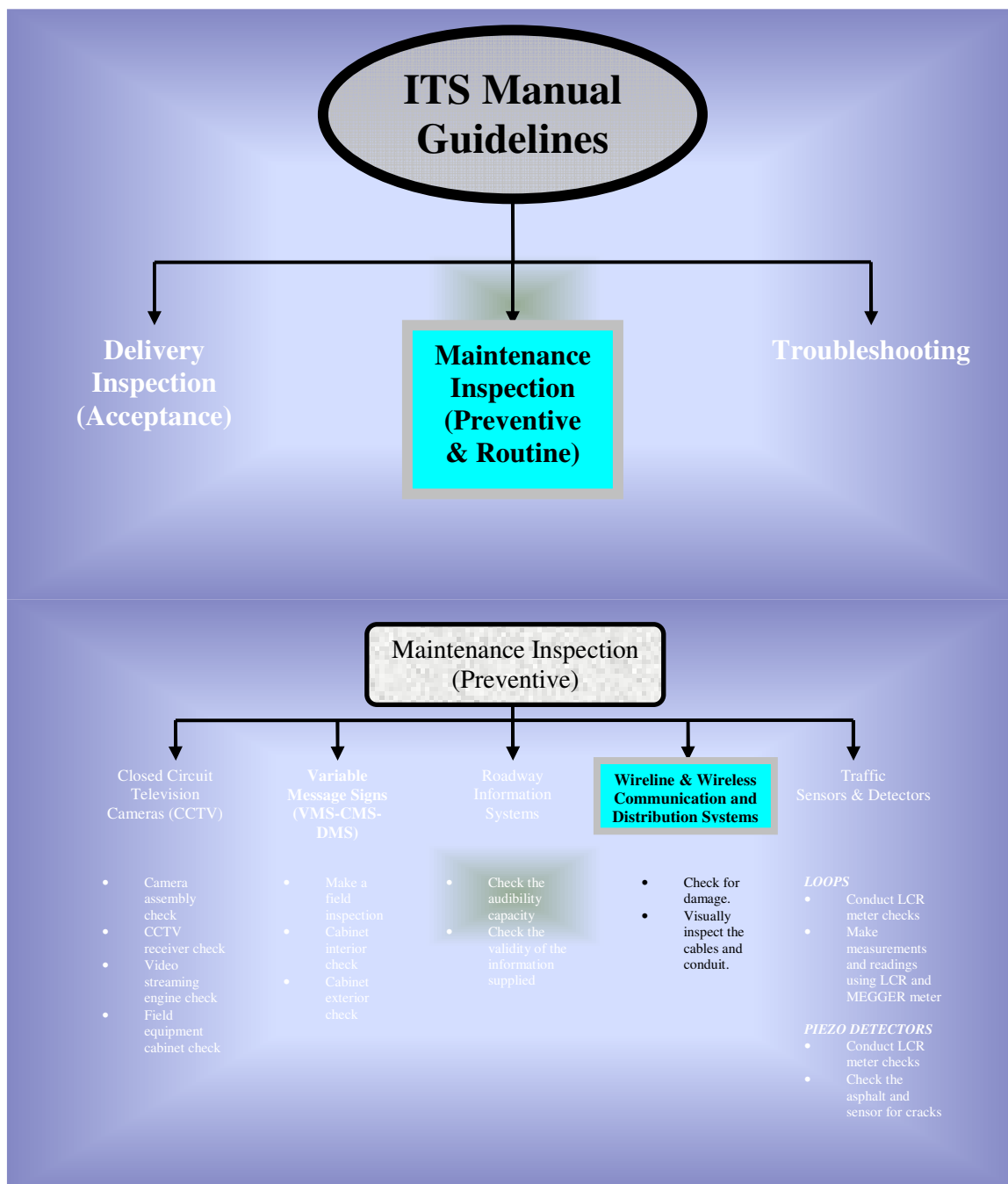
Recommendation / Comments

Customer Service/Connection Box Checklist

Task	Completed (Circle One)	Condition (Shade one)			
		Excellent	Good	Fair	Bad
➤ Check the connection box for damage (lightning, leaning, car impacts, vandalism, corrosion, etc).	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check all mounting hardware/anchor bolts/connectors for tightness and corrosion.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Remove any graffiti as required.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check the connection box for water infiltration.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Make sure that the phone service is checked and cleaned (static noise).	Yes/No /NA	Excellent	Good	Fair*	Bad*

*** CONTACT INTEGRATOR AND REPORT**

Recommendation / Comments



Power Cables and Conduit Checklist

Task	Completed (Circle One)	Condition (Shade one)			
		Excellent	Good	Fair*	Bad*
➤ Check conduit run from cabinet to utility pole/pedestal for settling of trench backfill.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check conduit run toward the device (along trench, wood poles, overhead sign structures, or bridge abutments) for settling and/or erosion.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Visually inspect splice kit in junction for water infiltration, rodent damage and missing jell.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Pump junction box dry if water is present in areas where freezing is possible.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check and tighten (as required) mounting brackets on bridges and/or sign structures.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Visually inspect lugs for burning corrosion, water infiltration and rodent damage to wire insulation.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check all equipment grounding conductors and connections.	Yes/No /NA	Excellent	Good	Fair*	Bad*

* CONTACT INTEGRATOR AND REPORT

Recommendation / Comments

Communication Cables and Conduit Checklist

Task	Completed (Circle One)	Condition (Shade one)			
		Excellent	Good	Fair*	Bad*
➤ Check conduit run from cabinet to utility pole/pedestal for settling of trench backfill.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Visually check conduit run toward the device for obvious problems.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Visually inspect splice kit in junction box for water infiltration and rodent damage.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Pump junction box dry if water is present in areas where freezing is possible.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Visually inspect splice tray and patch panel for corrosion, water infiltration, and rodent damage.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check and tighten (as required) mounting brackets on bridges and/or sign structures.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check all equipment grounding conductors and connections.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Visually inspect communications trunk conduit areas for damage, trench settlement, washouts, etc. Route of the conduit should be driven if necessary.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check under-bridge conduits if applicable.	Yes/No /NA	Excellent	Good	Fair*	Bad*

* CONTACT INTEGRATOR AND REPORT

Recommendation / Comments

Power Distribution Unit Checklist

Task	Completed (Circle One)	Condition (Shade one)			
		Excellent	Good	Fair	Bad
➤ Measure and record input, output, voltages and currents.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ De-energize equipment (operator permission required).	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Verify function of emergency power off circuits (operator permission required).	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check all electrical transmissions for proper tightness and signs of overheating and corrosion.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Thoroughly clean interior and exterior of equipment.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Reenergize system.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check alarm set points if applicable.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check operation of metering controls and alarms.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check fans for free and quiet operation if applicable.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Take necessary ODTR measurements.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Verify proper operation of UPS & back-up generator systems.	Yes/No /NA	Excellent	Good	Fair*	Bad*

*** CONTACT INTEGRATOR AND REPORT**

Recommendation / Comments

Interconnect Checklist

Task	Completed (Circle One)	Condition (Shade one)			
		Excellent	Good	Fair	Bad
➤ Check pull box covers (broken, missing, and clear of dirt or debris).	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check communication (modem) indicator lights.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check SIC connection to terminal block.	Yes/No /NA	Excellent	Good	Fair*	Bad*

*** CONTACT INTEGRATOR AND REPORT**

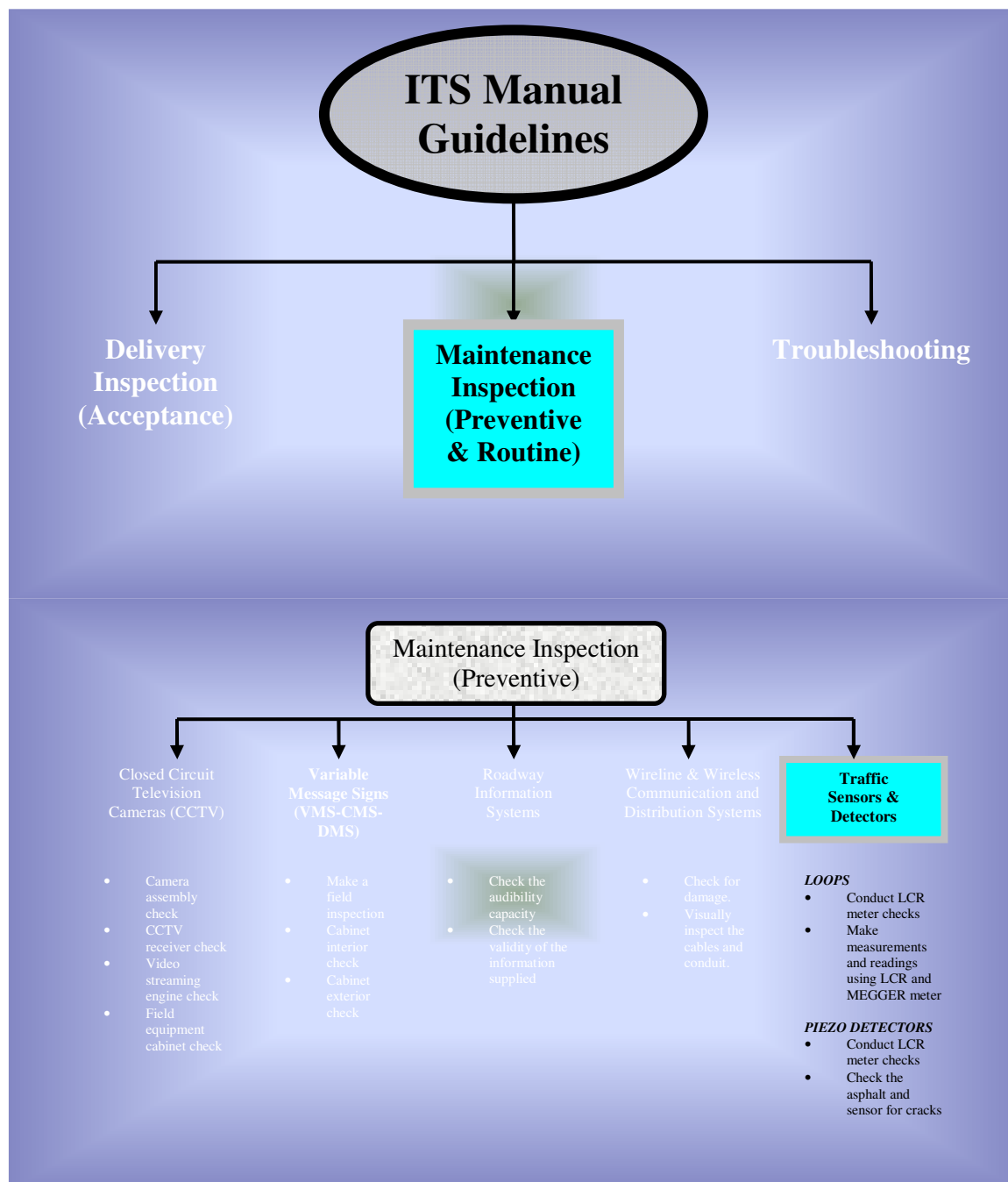
Recommendation / Comments

Communications Hub Checklist

Task	Completed (Circle One)	Condition (Shade one)			
		Excellent	Good	Fair*	Bad*
➤ Check hub site for damage (e.g., lightning, leaning, car impacts, vandalism, etc).	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check for water infiltration accumulation, duct sealant (interior and exterior), and erosion.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check for proper clearance of tree branches or brush; note any required trim work.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check vault for cracks in exterior.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Cut grass and shrubs around hub to a distance of 3-4 ft. plus path to roadside.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Remove graffiti.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Remove snow/brush around hub to a distance of 3-4 ft. plus path to roadside.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check hub conduit runs.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check meter cabinet.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check power distribution unit.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check ground rod clamp and wire.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check wiring schematics and records.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check operation of HVAC and heater. Replace filters.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check circuit breaker/fuses.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check ground fault receptacle.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Measure voltages at service inputs in vault.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check and record current being drawn.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check and inspect equipment racks/shelves (tighten any loosed hardware).	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check operation of SONET switch (for SONET Fiber-Optic Communications Hub only).	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check operation of T-1 multiplexer and perform the appropriate tests.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check and inspect video monitors if applicable.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check and inspect video switch if applicable.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check and inspect CODEC units if applicable.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check operation of modem unit(s) if applicable.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check security system.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Test & sign with a fire extinguisher.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check externally and vacuum interior of hub.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check noise measurements (above 30 dB: dirty).	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check all equipment grounding conductors and connections.	Yes/No /NA	Excellent	Good	Fair*	Bad*

* CONTACT INTEGRATOR AND REPORT

Recommendation / Comments



Loop Detectors Checklist

Task	Completed (Circle One)	Condition (Shade one)			
		Excellent	Good	Fair*	Bad*
➤ Disconnect loop.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ With LCR meter measure and record inductance of the loop ($L=\mu H$).	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ With LCR meter measure and record resistance ($R=ohms$).	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ With a MEGGER meter measure and record the insulation resistance (100 meg>).	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ If readings are outside specification, disconnect lead-in at the splice box and check all three parameters at that level.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ From the readings, determine whether loop or the lead-in need repair.	Yes/No /NA	Excellent	Good	Fair*	Bad*

* CONTACT INTEGRATOR AND REPORT

Recommendation / Comments

Out-Pavement Detectors (RTMS) Checklist

Task	Completed (Circle One)	Condition (Shade one)			
		Excellent	Good	Fair*	Bad*
➤ Check for vandalism and accidental damage.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Align and tighten detector unit and mounting hardware (some units may require lane closures); inspect for corrosion.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Replace any damaged or malfunctioning detector unit.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check and inspect all interconnecting cables.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check and inspect cabinet/meter cabinet.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check and inspect utility, pole/pedestal.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check and inspect conduit runs.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check 16-sec. counts (EIS).	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check the power distribution unit.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check function of all equipment in cabinet.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check condition of backup battery.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check all equipment grounding conductors and connections.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Connect the computer locally and verify vehicle detection for each detected lane.	Yes/No /NA	Excellent	Good	Fair*	Bad*

* CONTACT INTEGRATOR AND REPORT

Recommendation / Comments

Piezoelectric Detectors Checklist

Task	Completed (Circle One)	Condition (Shade one)			
		Excellent	Good	Fair*	Bad*
➤ Check cracks in the asphalt at the shoulder.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check cracks in the sensor at the shoulder.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check cracks in the sensor at the wheel tracks.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check cracks at the sensor/asphalt interface.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Using LCR meter, measure capacitance (C=μF).	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Using LCR meter, measure resistance (R=ohms).	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check and inspect the detector unit.	Yes/No /NA	Excellent	Good	Fair*	Bad*

* CONTACT INTEGRATOR AND REPORT

Recommendation / Comments

Microwave Vehicle Detection Systems Checklist

Task	Completed (Circle One)	Condition (Shade one)			
		Excellent	Good	Fair*	Bad*
➤ Check MVDS assembly and cables visually.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Inspect MDVS for proper operation and function per manufacturer's instructions.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check that cables are not stressed.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check function and communications (modem).	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check exterior cable condition.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check component mounting hardware securely.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Remove any dirt and debris.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Complete checklist located in cabinet.	Yes/No /NA	Excellent	Good	Fair*	Bad*

* CONTACT INTEGRATOR AND REPORT

Recommendation / Comments

Video Detection Systems Checklist

Task	Completed (Circle One)	Condition (Shade one)			
		Excellent	Good	Fair*	Bad*
➤ Check and inspect cabinet/meter cabinet.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check all mounting hardware/anchor bolts/connectors for tightness and corrosion.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check the Video Detection System visually for damage (lightning, leaning, car impacts, vandalism, corrosion, etc.).	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check for possible movement and alignment problems/tighten if necessary.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Make sure that the Video Detection System is properly working according to manufacturer's specifications/hardware.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check and inspect integrity of all interconnecting cables and connectors.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Replace any damaged or malfunctioning detector unit.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check and inspect utility, pole/pedestal if necessary.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check and inspect conduit runs.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check the power distribution unit.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check function of all equipments in cabinet.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check condition of backup battery.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check all equipment grounding conductors and connections.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Make sure that Video Detection System is properly working according to the manufacturer's specifications/hardware. This requires that a computer or other device (video monitor or keyboard) should be either in the cabinet or should be brought by the inspector to be sure that the device is detecting each vehicle in the proper lane and if the classifying is doing so correctly.	Yes/No /NA	Excellent	Good	Fair*	Bad*

* CONTACT INTEGRATOR AND REPORT

Recommendation / Comments

INTELLIGENT TRANSPORTATION SYSTEMS (ITS) INSPECTION AND ACCEPTANCE MANUAL (ITSIMM)

PREVENTIVE/ROUTINE MAINTENANCE BRAND SPECIFIC CHECKLISTS

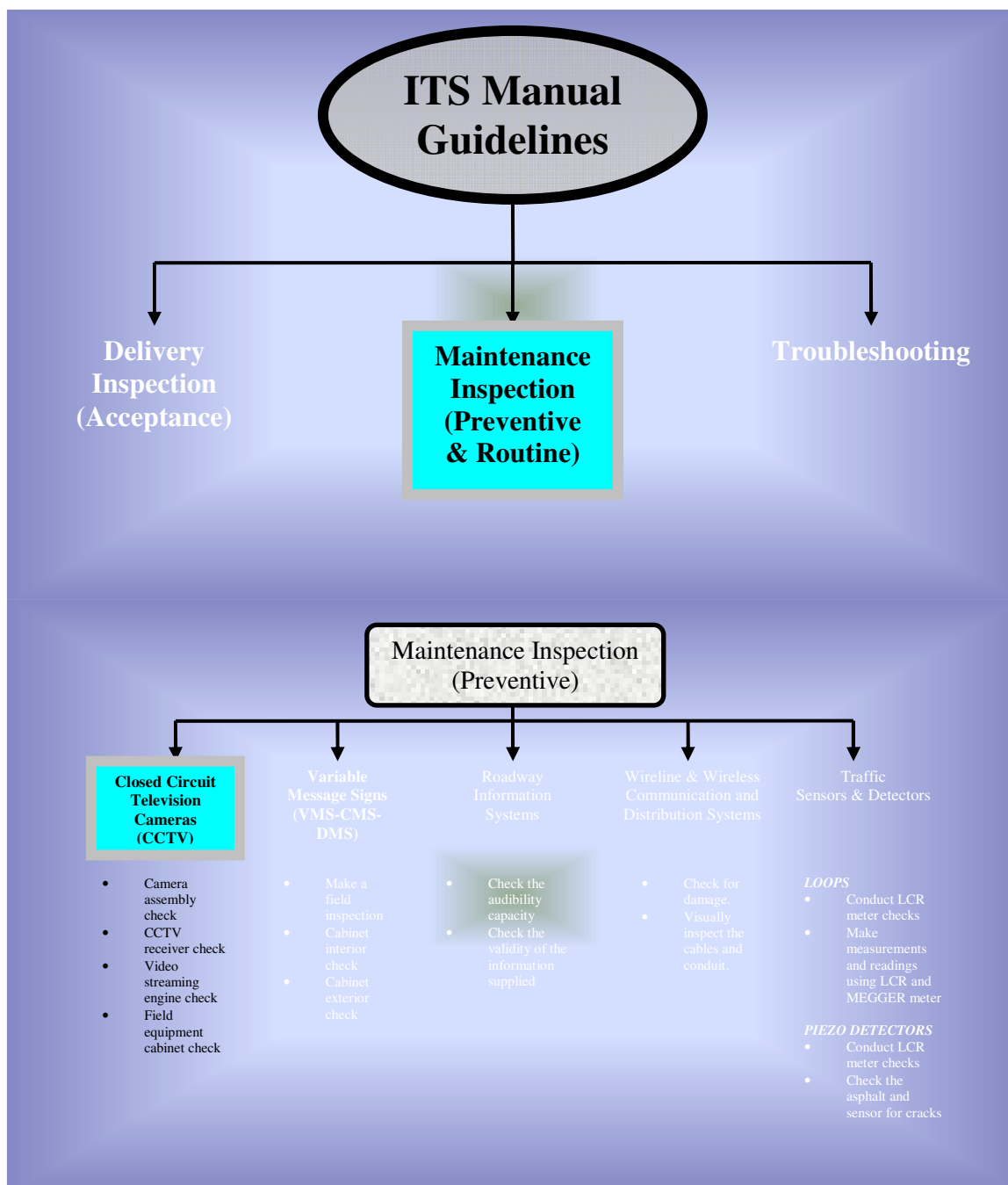
Prepared by



**Rutgers Intelligent Transportation Systems
(RITS) Laboratory**

Rutgers University

December 2007

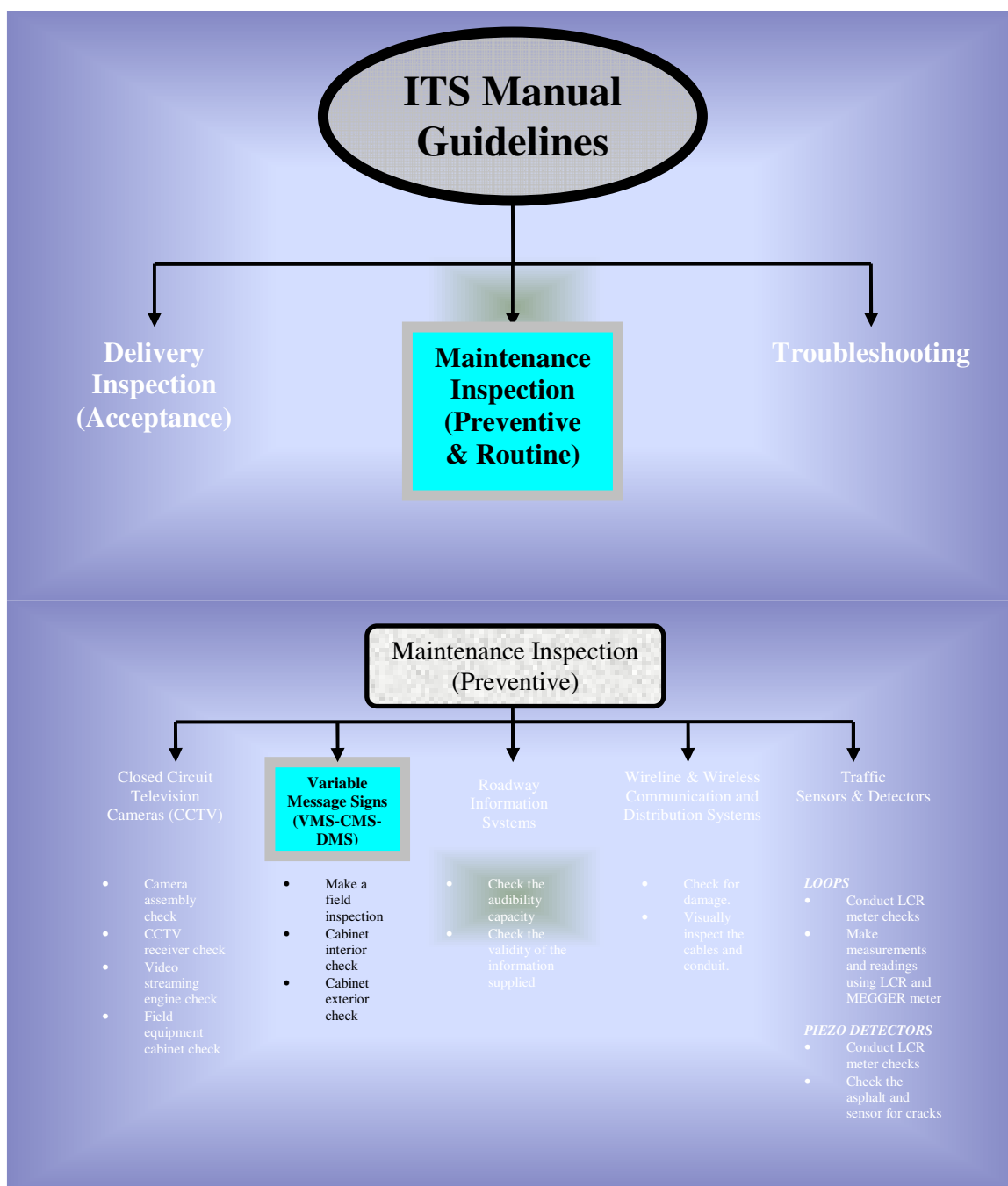


Pelco ES30PC/ES31PC Esprit with Pressurized IOC Checklist

Task (<i>Base and Meter Cabinet Level</i>)	Completed (Circle One)	Condition (Shade one)			
		Excellent	Good	Fair	Bad
➤ Clean the enclosure window periodically with a mild non-abrasive detergent in water and a soft cloth to help maintain picture clarity. If operating problems are experienced with the system, refer to the Troubleshooting section.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ If the window wiper is installed, replace worn or deteriorated wiper blades immediately. At a minimum, replace wiper blade once a year. To order replacement wiper blades or if further maintenance is required, contact Pelco's Customer Service Department for assistance.	Yes/No /NA	Excellent	Good	Fair*	Bad*

*** CONTACT INTEGRATOR AND REPORT**

Recommendation / Comments



Daktronics VF-1420-3-7x60-18-A Sign Cabinet Checklist

Task	Completed (Circle One)	Condition (Shade one)			
		Excellent	Good	Fair	Bad
➤ Check for evidence of water intrusion in the sign, i.e. water stain marks.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check for any leaks that may have developed. Seal them with a silicone sealant or other suitable sealer.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Inspect all door gaskets for tears, missing pieces, etc. Repair as necessary.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check the drain holes in the bottom of the cabinet to ensure they are unobstructed.	Yes/No /NA	Excellent	Good	Fair*	Bad*

Daktronics VF-1420-3-7x60-18-A Structural Checklist

Task	Completed (Circle One)	Condition (Shade one)			
		Excellent	Good	Fair	Bad
➤ Inspect the mounting structure thoroughly for signs of corrosion, loose bolts and overall stability.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check the connections of the earth ground wires if they are accessible.	Yes/No /NA	Excellent	Good	Fair*	Bad*

Daktronics VF-1420-3-7x60-18-A
Temperature & Light Sensor Assembly Checklist

Task	Completed (Circle One)	Condition (Shade one)			
		Excellent	Good	Fair	Bad
➤ Inspect the temperature and light sensor assemblies for foreign material that could obstruct airflow around the temperature sensors or light sensors.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Clear away any foreign material.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Clean the windows if they are dirty.	Yes/No /NA	Excellent	Good	Fair*	Bad*

*** CONTACT INTEGRATOR AND REPORT**

Recommendation / Comments

Daktronics VF-1420-3-7x60-18-A Face Panel Cleaning Checklist

Task	Completed (Circle One)	Condition (Shade one)			
		Excellent	Good	Fair	Bad
➤ Clean the face panels as necessary, inside and out with a wet cloth, followed by a dry cloth. An anti-static plexi-glass type cleaner is highly recommended and will yield the best long-term results.	Yes/No /NA	Excellent	Good	Fair*	Bad*

Daktronics VF-1420-3-7x60-18-A LED Cleaning Checklist

Task	Completed (Circle One)	Condition (Shade one)			
		Excellent	Good	Fair	Bad
➤ The LEDs can be cleaned with a damp cloth, a soft brush or a feather duster. An anti-static plexi-glass type cleaner applied to a damp cloth can also be used. Do not spray the cleaner directly onto the LEDs. The frequency that the LEDs will need to be cleaned depends on the site conditions.	Yes/No /NA	Excellent	Good	Fair*	Bad*

Daktronics VF-1420-3-7x60-18-A Fans & Thermostat Checklist

Task	Completed (Circle One)	Condition (Shade one)			
		Excellent	Good	Fair	Bad
➤ Check that all the fans run.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Verify that the thermostats in the sign cabinet are working. To do this, note the setting on the cooling thermostat, and then turn it clockwise until the fans turn on. Make sure all fans are running. Return the thermostat to its original setting.	Yes/No /NA	Excellent	Good	Fair*	Bad*

* CONTACT INTEGRATOR AND REPORT

Recommendation / Comments

Daktronics VF-1420-3-7x60-18-A

LED & Electronic Circuitry Checklist

Task	Completed (Circle One)	Condition (Shade one)			
		Excellent	Good	Fair*	Bad*
➤ A series of tests should be performed on the sign to check for hardware problems, and incorrect variable settings. Among the processes that will be checked is the exhaust fan turn-on temperature set point (incorrect settings can adversely affect LED lifetime.).	Yes/No /NA	Excellent	Good	Fair*	Bad*
Check the operation of the sign. (This is a test of sign functions only. It does not include tests of other VMS equipment hardware.). The following procedures are to be followed.					
➤ Connect the laptop computer to the sign controller and establish communication with the sign.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Perform the sign checks listed in the operator's manual.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check that the temperature levels shown on the Sign Status screen of the Sign Control tab are the appropriate values.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Display the "All On" test message to turn all the sign pixels.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Set the brightness to manual, 75% and Max PWM to 67%.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Look for the pixels that are either completely "dead" or which have only half of their LEDs on, and check that the intensity appears to be correct.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check the output voltage of all power supplies. They should be within 0.1V DC of each other.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Change the brightness to 10% and check that the LEDs dim properly.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Return the light control to AUTO.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Display the moving row and moving column test messages. Check for pixels that are on when they should be off, or off when they should be on.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Blank the sign. Make sure all the LEDs are off.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Make sure the photocell frequencies are appropriate for the current conditions.	Yes/No /NA	Excellent	Good	Fair*	Bad*

* CONTACT INTEGRATOR AND REPORT

Recommendation / Comments

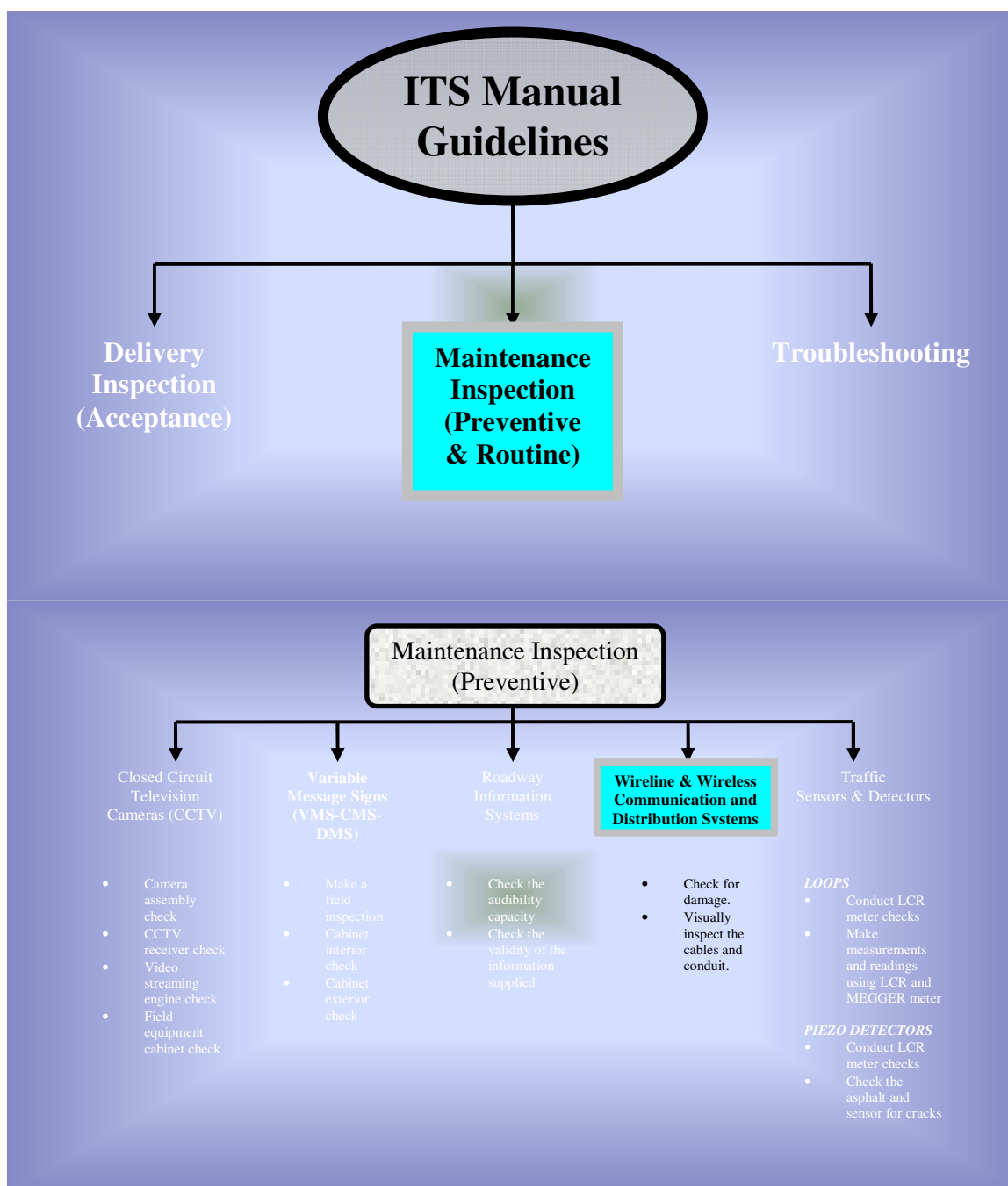
Daktronics VF-1420-3-7x60-18-A

LED & Electronic Circuitry Checklist (continued)

Task	Completed (Circle One)	Condition (Shade one)			
		Excellent	Good	Fair	Bad
➤ Perform a “Pixel Test”, and make appropriate repairs if any pixels appear to be bad.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Return the Max PWM to its previous setting.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Disconnect the portable controller, call the central controller operator and have him/her call the sign and check that the variable information (password, messages, schedule, etc.) are correct. Inform the operator you are returning control of the sign to him/her.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Be sure the operator can communicate with the sign before leaving the site.	Yes/No /NA	Excellent	Good	Fair*	Bad*

*** CONTACT INTEGRATOR AND REPORT**

Recommendation / Comments



Comlux Opt. Transmission Terminals – CL3683/CL3684 Checklist

Task (Base and Meter Cabinet Level)	Completed (Circle One)	Condition (Shade one)			
		Excellent	Good	Fair	Bad
➤ Maintenance of the system is limited to occasionally verifying proper LED indicator status. Alarms may be remotely monitored via the monitor connector on the rear panel as described in the manufacturer's specifications. If a warning alarm occurs and a cause cannot be found, refer the problem to Force Incorporated.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ If the links needs to be cleaned, avoid the use of all solvents, and use low-pressure clean air to remove loose dirt.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Use low-pressure clean air to clear the connectors of any debris.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Do not try to use liquids or high-pressure air to clean out the optical ports. Foam-tipped swabs such as the 2.5mm Mini Foam Swab offered by Fiber Instrument Sales may be saturated with denatured alcohol and inserted into the optical port for cleaning. <i>Do not insert a dry swab into the optical port as this may damage the fiber end face.</i>	Yes/No /NA	Excellent	Good	Fair*	Bad*
Required Connector Cleaning Equipment: - Kimwipes or any lens-grade, lint-free tissue. The type sold for eyeglasses work quite well. - Denatured Alcohol (Use only industrial grade 99% pure isopropyl alcohol. Commercially available isopropyl alcohol is for medicinal use and is diluted with water and a light mineral oil. Industrial grade isopropyl alcohol should be used exclusively). 30X Microscope. - Canned Dry Air. The following procedures are to be performed for connector cleaning:					

* CONTACT INTEGRATOR AND REPORT

Recommendation / Comments

Comlux Opt. Transmission Terminals – CL3683/CL3684 Checklist (continued)

Task (<i>Base and Meter Cabinet Level</i>)	Completed (Circle One)	Condition (Shade one)			
		Excellent	Good	Fair*	Bad*
➤ Fold the tissue twice so it is four layers thick.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Saturate the tissue with alcohol.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ First clean the sides of the connector ferrule. Place the connector ferrule in the tissue, and apply pressure to the sides of the ferrule. Rotate the ferrule several times to remove all contamination from the ferrule sides.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Move to a clean part of the issue. Be sure it is still saturated with alcohol and that it is still four layers thick. Put the tissue against the end of the connector ferrule. Put your finger nail against the tissue so that it is directly over the ferrule. Now scrape the end of the connector until it squeaks. It will sound like a crystal glass that has been rubbed when it is wet	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Use the microscope to verify the quality of the cleaning. If it is not completely clean, repeat the steps with a clean tissue.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Mate the connector immediately! Do not let the connector collect dust before mating.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Air can be used to remove lint or loose dust from the port of a transmitter or receiver to be mated with the connector. Never insert any liquid into the ports.	Yes/No /NA	Excellent	Good	Fair*	Bad*
Important Notes: 1. <i>Never touch the fiber end face of the connector!</i> 2. Connectors not in use should be covered over the ferrule by a plastic dust cap. It is important to note that inside of the ferrule dust caps contain a sticky residue that is the by-product of the making of the dust cap. This residue will remain on the ferrule end after the cap is removed. Therefore, it is critical that the ferrule end be cleaned thoroughly BEFORE it is mated to the intended unit.					

* CONTACT INTEGRATOR AND REPORT

Recommendation / Comments

Comlux Opt. Transmission Terminals – CL3803/CL3804 Checklist

Task (<i>Base and Meter Cabinet Level</i>)	Completed (Circle One)	Condition (Shade one)			
		Excellent	Good	Fair	Bad
➤ Maintenance of the system is limited to occasionally verifying proper LED indicator status. Alarms may be remotely monitored via the monitor connector on the rear panel as described in the manufacturer's specifications. If a warning alarm occurs and a cause cannot be found, refer the problem to Force Incorporated.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ If the links needs to be cleaned, avoid the use of all solvents, and use low-pressure clean air to remove loose dirt.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Use low-pressure clean air to clear the connectors of any debris.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ The CL3803 and CL3804 are generally used with optical terminals. Do not try to use liquids or high-pressure air to clean out the optical ports. Foam-tipped swabs such as the 2.5mm Mini Foam Swab offered by Fiber Instrument Sales may be saturated with denatured alcohol and inserted into the optical port for cleaning. <i>Do not insert a dry swab into the optical port as this may damage the fiber end face.</i>	Yes/No /NA	Excellent	Good	Fair*	Bad*
Required Connector Cleaning Equipment: • Kimwipes or any lens-grade, lint-free tissue. The type sold for eyeglasses work quite well. • Denatured Alcohol (Use only industrial grade 99% pure isopropyl alcohol. Commercially available isopropyl alcohol is for medicinal use and is diluted with water and a light mineral oil. Industrial grade isopropyl alcohol should be used exclusively). • 30X Microscope. • Canned Dry Air. The following procedures are to be performed for connector cleaning:					

* CONTACT INTEGRATOR AND REPORT

Recommendation / Comments

Comlux Opt. Transmission Terminals – CL3803/CL3804 Checklist (continued)

Task (<i>Base and Meter Cabinet Level</i>)	Completed (Circle One)	Condition (Shade one)			
		Excellent	Good	Fair*	Bad*
➤ Fold the tissue twice so it is four layers thick.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Saturate the tissue with alcohol.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ First clean the sides of the connector ferrule. Place the connector ferrule in the tissue, and apply pressure to the sides of the ferrule. Rotate the ferrule several times to remove all contamination from the ferrule sides.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Move to a clean part of the issue. Be sure it is still saturated with alcohol and that it is still four layers thick. Put the tissue against the end of the connector ferrule. Put your finger nail against the tissue so that it is directly over the ferrule. Now scrape the end of the connector until it squeaks. It will sound like a crystal glass that has been rubbed when it is wet	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Use the microscope to verify the quality of the cleaning. If it is not completely clean, repeat the steps with a clean tissue.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Mate the connector immediately! Do not let the connector collect dust before mating.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Air can be used to remove lint or loose dust from the port of a transmitter or receiver to be mated with the connector. Never insert any liquid into the ports.	Yes/No /NA	Excellent	Good	Fair*	Bad*
Important Notes: 3. <i>Never touch the fiber end face of the connector!</i> 4. Connectors not in use should be covered over the ferrule by a plastic dust cap. It is important to note that inside of the ferrule dust caps contain a sticky residue that is the by-product of the making of the dust cap. This residue will remain on the ferrule end after the cap is removed. Therefore, it is critical that the ferrule end be cleaned thoroughly BEFORE it is mated to the intended unit.					

* CONTACT INTEGRATOR AND REPORT

Recommendation / Comments

Comlux Opt. Transmission Terminals – CL3687/CL3687E Checklist

Task (<i>Base and Meter Cabinet Level</i>)	Completed (Circle One)	Condition (Shade one)			
		Excellent	Good	Fair	Bad
➤ Maintenance of the system is limited to occasionally verifying proper LED indicator status. Alarms may be remotely monitored via the monitor connector on the rear panel as described in the manufacturer's specifications. If a warning alarm occurs and a cause cannot be found, refer the problem to Force Incorporated.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ If the links needs to be cleaned, avoid the use of all solvents, and use low-pressure clean air to remove loose dirt.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Use low-pressure clean air to clear the connectors of any debris.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Do not try to use liquids or high-pressure air to clean out the optical ports. Foam-tipped swabs such as the 2.5mm Mini Foam Swab offered by Fiber Instrument Sales may be saturated with denatured alcohol and inserted into the optical port for cleaning. <i>Do not insert a dry swab into the optical port as this may damage the fiber end face.</i>	Yes/No /NA	Excellent	Good	Fair*	Bad*
Required Connector Cleaning Equipment: - Kimwipes or any lens-grade, lint-free tissue. The type sold for eyeglasses work quite well. - Denatured Alcohol (Use only industrial grade 99% pure isopropyl alcohol. Commercially available isopropyl alcohol is for medicinal use and is diluted with water and a light mineral oil. Industrial grade isopropyl alcohol should be used exclusively). 30X Microscope. - Canned Dry Air. The following procedures are to be performed for connector cleaning:					

* CONTACT INTEGRATOR AND REPORT

Recommendation / Comments

Comlux Opt. Transmission Terminals – CL3687/CL3687E

Checklist (continued)

Task (<i>Base and Meter Cabinet Level</i>)	Completed (Circle One)	Condition (Shade one)			
		Excellent	Good	Fair*	Bad*
➤ Fold the tissue twice so it is four layers thick.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Saturate the tissue with alcohol.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ First clean the sides of the connector ferrule. Place the connector ferrule in the tissue, and apply pressure to the sides of the ferrule. Rotate the ferrule several times to remove all contamination from the ferrule sides.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Move to a clean part of the issue. Be sure it is still saturated with alcohol and that it is still four layers thick. Put the tissue against the end of the connector ferrule. Put your finger nail against the tissue so that it is directly over the ferrule. Now scrape the end of the connector until it squeaks. It will sound like a crystal glass that has been rubbed when it is wet	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Use the microscope to verify the quality of the cleaning. If it is not completely clean, repeat the steps with a clean tissue.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Mate the connector immediately! Do not let the connector collect dust before mating.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Air can be used to remove lint or loose dust from the port of a transmitter or receiver to be mated with the connector. Never insert any liquid into the ports.	Yes/No /NA	Excellent	Good	Fair*	Bad*

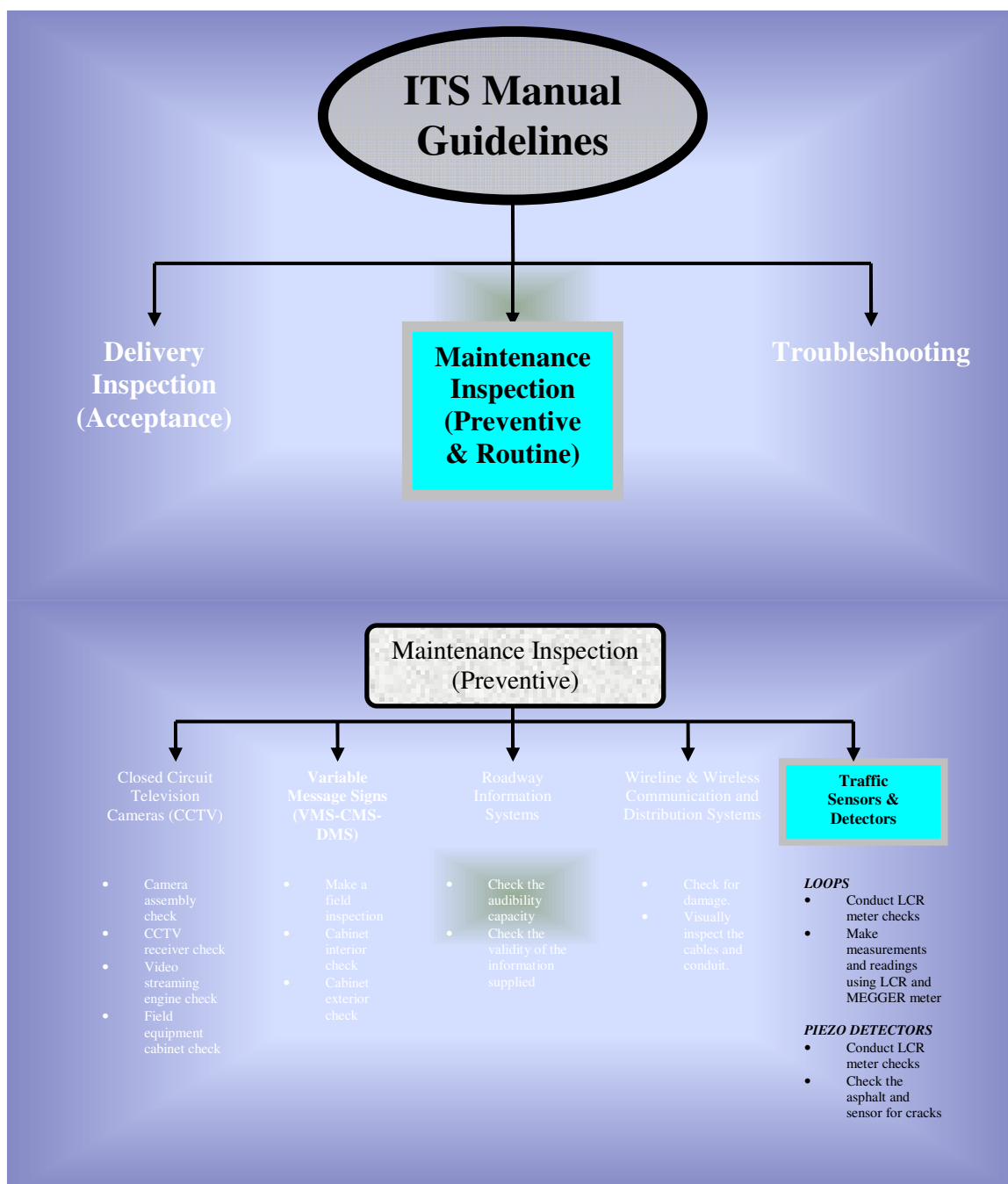
Important Notes:

5. *Never touch the fiber end face of the connector!*

6. Connectors not in use should be covered over the ferrule by a plastic dust cap. It is important to note that inside of the ferrule dust caps contain a sticky residue that is the by-product of the making of the dust cap. This residue will remain on the ferrule end after the cap is removed. Therefore, it is critical that the ferrule end be cleaned thoroughly BEFORE it is mated to the intended unit.

* CONTACT INTEGRATOR AND REPORT

Recommendation / Comments



EIS Remote Traffic Microwave Sensors (RTMS) Checklist

Task	Completed (Circle One)	Condition (Shade one)			
		Excellent	Good	Fair	Bad
➤ The RTMS requires a yearly based maintenance. It is recommended that the Self-Test is included in the installation procedure. Self-Test is a 20-second complete test of the sensor hardware, returning a diagnostic message by the serial port including the RTMS software revision. Self-Test should be invoked with the unit installed and aimed at a road. Self-Test performed indoors may produce confusing diagnostics. If the unit fails to operate, it is significant to refer to the Troubleshooting section or call EIS technical support. An RTMS sensor connected to a dial-up modem can be accessed remotely for testing and support purposes.	Yes/No /NA	Excellent	Good	Fair*	Bad*

*** CONTACT INTEGRATOR AND REPORT**

Recommendation / Comments

INTELLIGENT TRANSPORTATION SYSTEMS (ITS) INSPECTION AND ACCEPTANCE MANUAL (ITSIMM)

PREVENTIVE/ROUTINE MAINTENANCE CHECKLISTS FOR SPECIFIC COMPONENTS

Prepared by



**Rutgers Intelligent Transportation Systems
(RITS) Laboratory**

Rutgers University

December 2007

Backup Battery Assemblies Checklist

Task	Completed (Circle One)	Condition (Shade one)			
		Excellent	Good	Fair	Bad
➤ String Voltage – measure/record.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Individual Voltages – measure/record.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Remove battery(s) from service and load test for each individually.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Pilot Unit Voltage – measure/record.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Ambient Temperature – measure/record.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Units Interconnection – inspect, clean, retorquing.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ The unit must be cleaned quarterly to remove dust from covers.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ If signs of corrosion, clean with a solution of baking soda and water or isopropyl alcohol.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ If corrosion occurs, report to the Department.	Yes/No /NA	Excellent	Good	Fair*	Bad*

*** CONTACT INTEGRATOR AND REPORT**

Recommendation / Comments

Air Conditioning Unit Checklist

Task	Completed (Circle One)	Condition (Shade one)			
		Excellent	Good	Fair*	Bad*
➤ Air Filter – remove and clean or replace.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Blower Unit – check for bearing noise.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Compressor – check functions, reset thermal overload.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Refrigerant Loss – check refrigerant level and pressure, check cracks and leaks in pipe lines.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ On multiple unit systems, check cycling and auto-transfer controls to ensure proper operation if one unit fails.	Yes/No /NA	Excellent	Good	Fair*	Bad*

*** CONTACT INTEGRATOR AND REPORT**

Recommendation / Comments

Generator Checklist

Task	Completed (Circle One)	Condition (Shade one)			
		Excellent	Good	Fair*	Bad*
➤ Check oil and change if necessary. Replace oil filter if necessary.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Clean air filter and replace if necessary.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check and clean sediment bowl.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check for gas leaks.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Inspect battery terminals and fluid.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Check hydraulic fluid, brake fluid, lube jacks and sign pole (for portable VMS only).	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Clean cooling fins.	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Set rocker arm clearance (for mechanic).	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Set and clean injectors (for mechanic).	Yes/No /NA	Excellent	Good	Fair*	Bad*
➤ Start the generator and take a power reading.	Yes/No /NA	Excellent	Good	Fair*	Bad*

* CONTACT INTEGRATOR AND REPORT

Recommendation / Comments

INTELLIGENT TRANSPORTATION SYSTEMS (ITS) INSPECTION AND ACCEPTANCE MANUAL (ITSIMM)

GENERIC TROUBLESHOOTING GUIDE

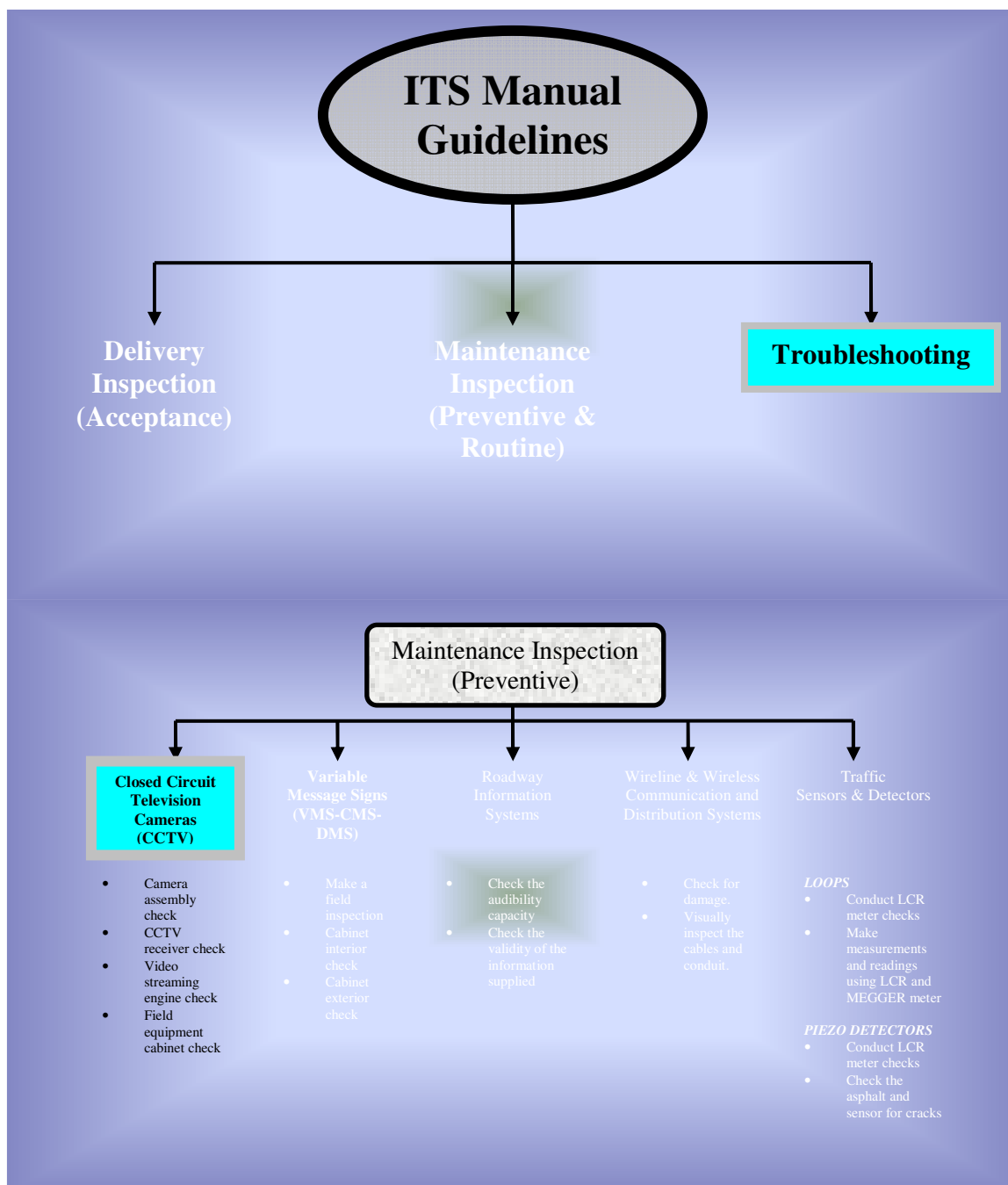
Prepared by



**Rutgers Intelligent Transportation Systems
(RITS) Laboratory**

Rutgers University

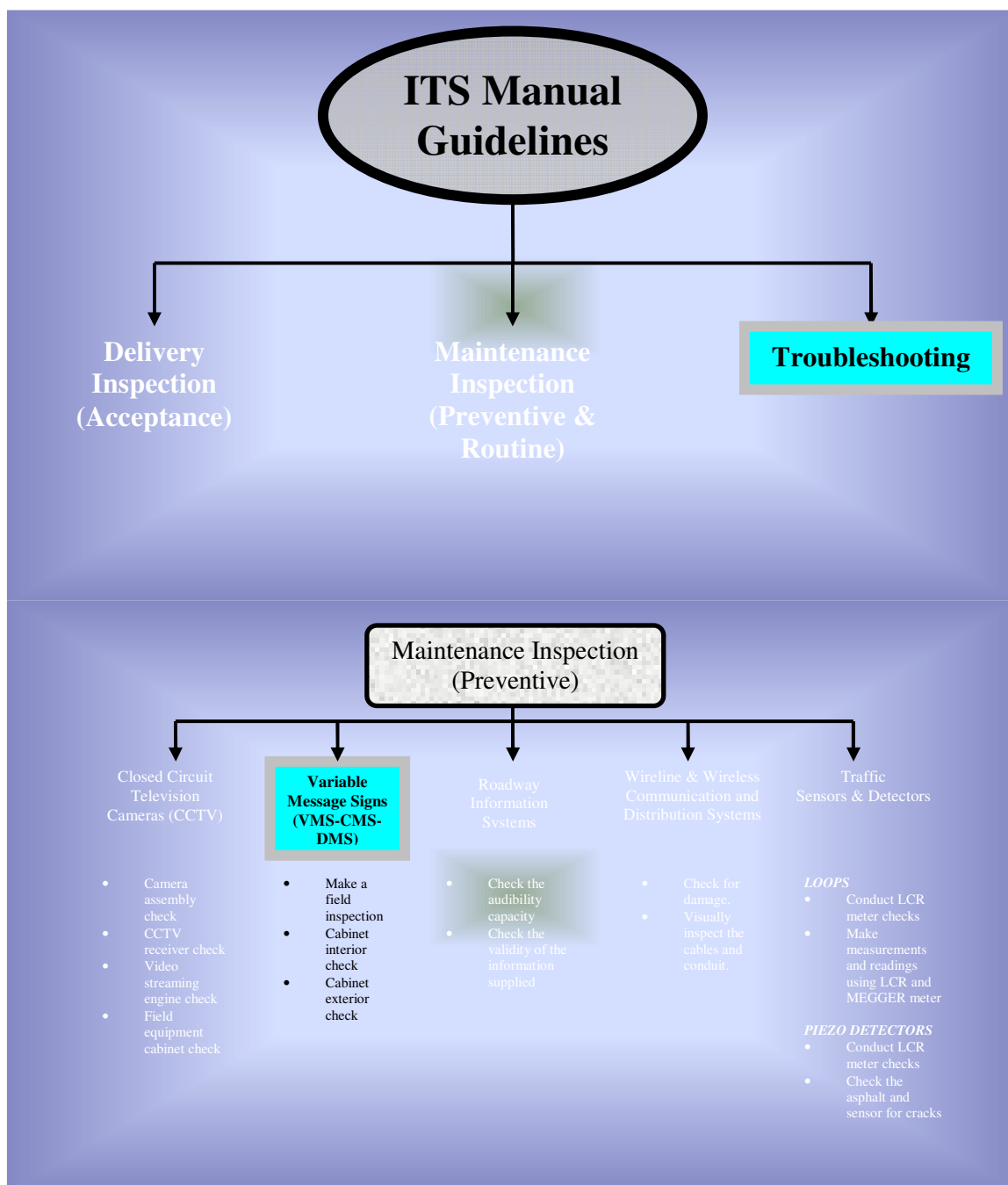
December 2007



Closed Circuit Television Systems and Communications Hub

Symptom Observed	Possible Cause	Remedial Action
No response from hub.	Power feed/power supply.	Reset or replace as required.
	Faulty telephone line.	Contact telephone company.
No signal from camera(s) from multi- or single-drop feed.	Video switch malfunction.	Check/replace connections or replace video switch.
	Distribution line control malfunction.	Check/replace connections or replace distribution line control.
	Hub controller malfunction.	Check/replace connections or replace hub controller.
	Faulty telephone line.	Contact telephone company.
No signal from one camera part of multi-drop feed.	Cables disconnected or damaged.	Check/replace cable between camera and hub.
	Modem/interface malfunction.	Replace modem/interface.
	Transceiver malfunction.	Replace transceiver.
	Video switch malfunction.	Check connection and/or replace unit.
	Codec unit malfunction.	Check connection and/or replace unit.
	Camera malfunction.	Replace camera.
Poor signal.	Camera faceplate marred.	Clean faceplate or replace enclosure.
	Poor connection or fault cable.	Check/replace cables.
	F/O transceiver malfunction at camera site or hub.	Replace F/O transceiver.
	Video switch malfunction.	Replace video switch.
	Codec unit malfunction.	Replace Codec unit.
	Camera malfunction.	Replace camera.

Symptom Observed	Possible Cause	Remedial Action
Pan/tilt not responding.	Poor cable connection.	Check/replace cable.
	CCR/MPC malfunction.	Replace CCR/MPC.
	Distribution line control malfunction.	Replace distribution line control.
	Hub controller malfunction.	Replace hub controller.
Out of focus or no zoom.	Lens malfunction.	Replace lens.
	CCR/MPC malfunction.	Replace CCR/MPC.
	Damaged cable between camera and controller.	Replace cable.
	Hub controller malfunction.	Replace hub controller.
	Distribution line control malfunction.	Replace distribution line control.



Variable Message Signs

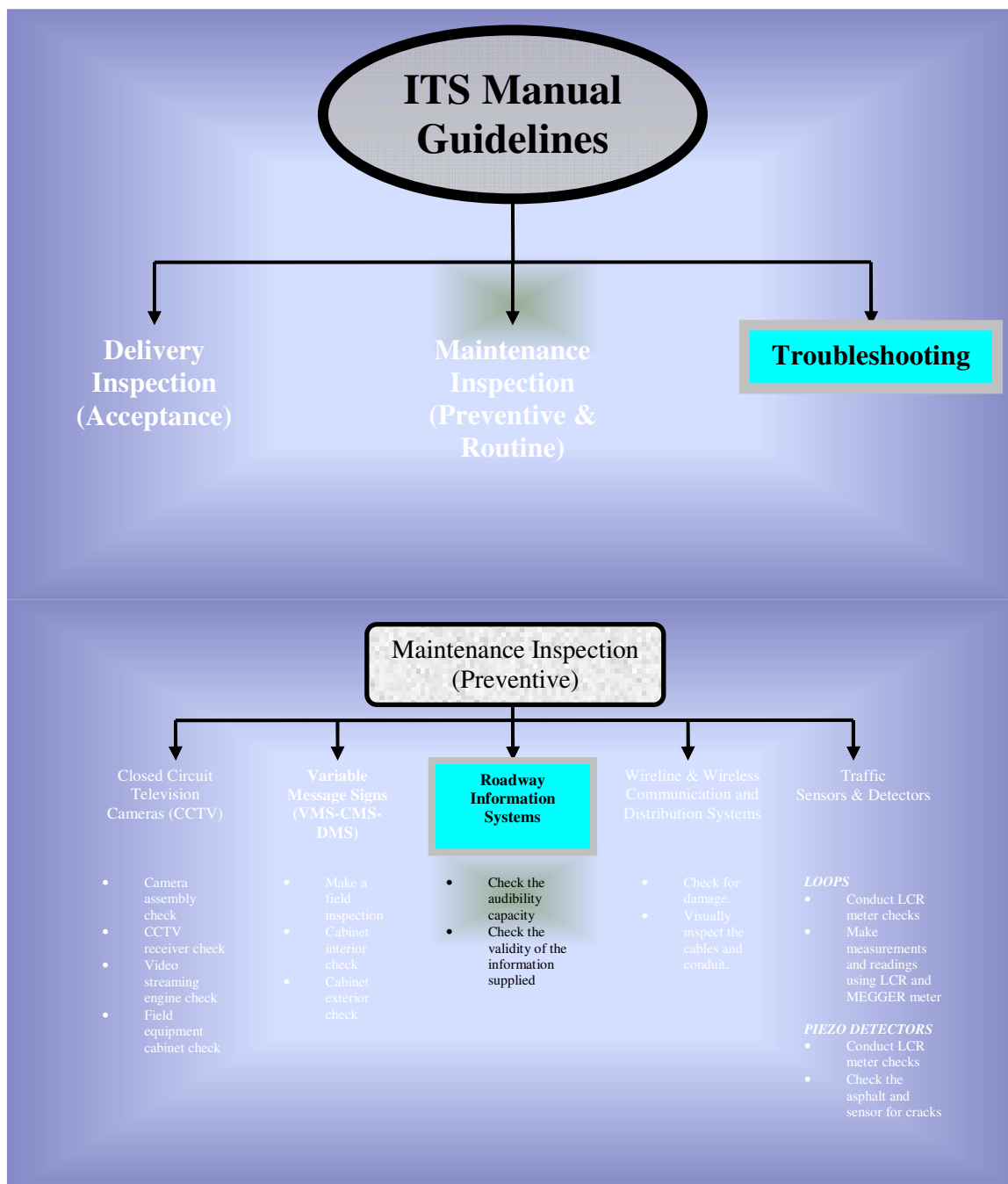
Symptom Observed	Possible Cause	Remedial Action
The field controller appears “dead”, no LEDs are lighted on the traffic isolator board.	Power is not being supplied to the field controller.	Check 120V AC power supplied to the field controller. Check the circuit breaker for AC power outlet, check power at AC outlet, check field controller power cord.
	The field controller power supply fuse is “blown”.	Check that the field controller power switch is on. Check whether the field controller power supply fuse is okay. Replace fuse if necessary.
	Output from the power supply is not reaching the field controller processor board.	Check the power supply output.
	Power supply has failed.	Check the power supply output. Replace the power supply.
	A component has failed or there is bad wire between the input power jack and the power supply input jack.	Unplug the power to the field controller and test all wiring and components from the input power jack to the power supply input plug.
No message will display on the sign; field controller does communicate with the central controller and/or laptop computer.	A control cable is not plugged into the field controller.	Check that all control cables are plugged in on outside of field controller.
	Address on display interface column card or row card is incorrect; connector is in wrong place.	Check that all DIP switches are set correctly and all connectors inside the field controller are connected properly and to the proper place.
	COM port on the CPU has failed.	Replace the CPU.
	Display interface column card or row card has failed.	Replace the display interface column card. If the problem is not solved, replace the display interface row card.
	A problem exists within the sign.	Refer to the operator’s manual.
LEDs on the entire sign are garbled; wrong LEDs on throughout the sign.	There is a ground reference problem.	Check that all the signal ground wires are properly connected at the field controller.
	A display interface PCB has failed.	Replace the display interface PCBs.

Symptom Observed	Possible Cause	Remedial Action
The field controller won't communicate with the laptop computer, or the field controller will not communicate with the central controller throughout the modem.	The displayer interface column card or processor PCB has failed; the power supply is bad.	Check the -12V, +12V, and 5V LEDs on display interface column card. They should be lit. Note: The power supply can be bad even if the LEDs appear to be okay. If the LEDs are not lit: • Replace the power supply. • Replace the display interface column card. Check that "RUN" LED on the display interface column card is blinking. If not: • Replace the processor PCB. • Replace the display interface column card.
	The DIP switches are not set correctly.	Check that all DIP switches on the display interface column card are set correctly. Note: Momentarily turn off power to the field controller so the changed DIP settings take effect.
	Connectors inside the field controller are not connected.	Check that all connectors inside the field controller are connected properly and to the proper place.
	The wrong cable is being used between the modem and either computer or field controller.	Check that the proper cable is being used from the field controller to the modem or laptop computer. Make sure there are no wires or terminals misplaced, open or shorted.
	Various entries are not correct in the sign data base record for the site.	Check that entries are correct in the sign data base record for the site being called.*
	The COM port setting is incorrect.	Check the COM1 port setting from within the central controller program for the laptop or central computer.
	Cannot communicate using a laptop computer with the field controller through a direct connection to J32.	Try communicating using the modem RS232 port (J101 on the bottom of the field controller.). Direct connect must be set to YES.
	Bad COM port or other circuitry.	Replace the processor PCB and retest.
	The RS232 spike suppressor has failed.	Replace the spike suppressor.
	Bad modem.	Replace modem.

Symptom Observed	Possible Cause	Remedial Action
The field controller won't communicate with the laptop computer, or the field controller will not communicate with the central controller throughout the modem.	Sign controller software is corrupted.	Download new software to the sign controller and do these: • Make sure the power is applied to the field controller. • In the laptop sign data base record, the phone number should be blank, and direct connect should be set to YES. • Connect the laptop computer to J32 on the bottom of the field controller using a RS232 null modem cable. • Call the sign. The central controller software should automatically download the new code to the controller. Normal communications will now be established.
One "line" of the modules in the sign does not respond properly, no LEDs will light, or message is garbled, or too bright or dim, etc.	One or more wires or terminals in the control cable for Data, Dim, or Strobe for this line misplaced, open, or shorted to other wires or frame.	Check the wiring. Check wiring in sign, field controller, or control cable from sign to field controller.
	Display interface row card has failed.	Replace the display interface row card.
	A problem exists in the sign, possibly with the drivers.	Refer to the operator's manual.
Sign LEDs brightness wrong, too bright or dim (entire sign).	"Automatic Light Level" is set to "Override Lighting".	Set the "Override Lighting" to "Automatic Light Level".
	"Automatic Light Level" has not registered.	Reset the "Override Lighting" to "Automatic Light Level".
	The display interface column card has failed.	Check that the ISO+5V LED on the VMS I/O card is lit. If it is not, replace the card.

Symptom Observed	Possible Cause	Remedial Action
Sign LEDs brightness wrong, too bright or dim (entire sign).	One or more wires or terminals in the control cable for the photo/temp sensor is misplaced, open, or shorted to other wires or frame, in sign, field controller, or control cable from signal to the field controller.	Check whether Photo1, Photo2, and Photo3 LEDs on the VMS I/O card are flashing (they may be flashing so fast that they appear to be on steady). If they are not, check the wiring. If the wiring is okay, there may be a problem at the sign or photo/temp sensor. Check that the photo sensor signals are reaching the field controller (refer to the operator's manual). If not, replace the display interface column card.
	The display interface column card has failed.	See if the brightness level can be changed (refer to the operator's manual). If the brightness cannot be changed, replace the display interface column card.
	One or more wires or terminals in the control cable for DIM signal misplaced, open, or shorted to other wires or frame in the sign, field controller, or control cable from the sign to the field controller.	Check the wiring.
	There is a problem at the sign.	Refer to the operator's manual.
The field controller is malfunctioning in ways not otherwise covered in above troubleshooting charts.	The DIP switches are not correctly set; cables and/or connectors are not connected properly inside the field controller.	Check all the DIP switches; check that all the cables and connectors are connected properly inside the field controller.
	The processor board has failed.	Replace the processor board (set the DIP jumpers before installing).
	The display interface column card has failed.	Replace the display interface column card (set the DIP switches and jumpers before installing).

Symptom Observed	Possible Cause	Remedial Action
The field controller is malfunctioning in ways not otherwise covered in above troubleshooting charts.	The power supply has failed.	Replace the power supply.
	The 120 VAC power to the field controller is too low, too high, too noisy, etc.	Check the 120 VAC power.
* The sign data base corrections: • For communication with a central controller using a modem: The phone number must be correct, the password stored in the field controller at the sign site, and direct connection should be set to NO. • For communication with a laptop computer with an RS232 null modem cable through a direct connection to J102 on the bottom of the field controller: The phone number must be blank, the password must be the same in the laptop data base as in the field controller, and direct connection should be set to YES. • For communication with a laptop computer through a direct connection to J101 (the modem port on the bottom of the field controller) with an RS232 null modem cable: The phone number must be blank, the password must be the same in the laptop data base as in the field controller, and direct connection should be set to YES. • For communication over a fiber line where a fiber modem is used and the connection is made through a direct connection to J101 on the bottom of the field controller: The phone number must be blank, the password must be the same in the laptop data base as in the field controller, and direct connection should be set to YES.		

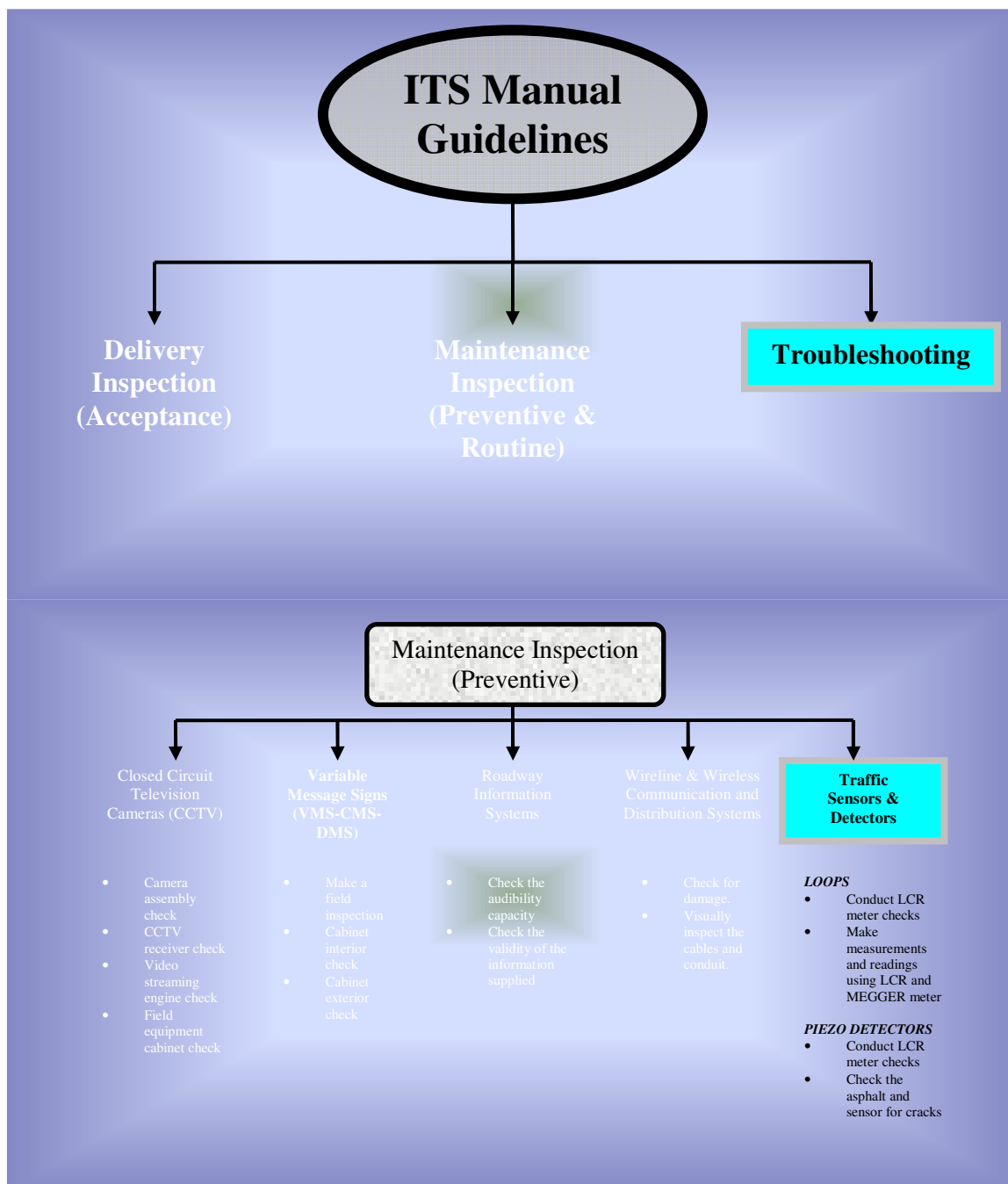


Highway Advisory Radio

Symptom Observed	Possible Cause	Remedial Action
No signal from antenna.	Poor cable connections.	Check/replace cable from transmitter to antenna. Check all the other cables.
	No electric power.	Check electric power. Reset circuit breaker. Replace surge unit.
	Transmitter malfunction.	Check/replace transmitter.
Signal transmitting but garbled.	Transmitter malfunction.	Check/replace transmitter.
	Digital voice recorder malfunction.	Check/replace digital voice recorder.
	Cable from transmitter to antenna.	Check/replace cable.
	Antenna malfunction.	Replace antenna.
Weak signal.	Transmitter malfunction.	Check/replace transmitter.
	Damaged cable and/or antenna.	Check/replace antenna cable and/or antenna.
Barge box failure.	Monitor time is short or audio is low.	Check settings of time and audio pots. Check sensitivity potentiometer setting.
High VSWR-antenna.	Faulty antenna.	Check tuning adjustment stub or replace antenna.
No transmission.	Modem malfunction.	Replace modem.
	Digital video recorder malfunction.	Replace digital video recorder.
	Transmitter malfunction.	Replace transmitter.
	Telephone line malfunction.	Contact telephone company.
No power.	Main breaker faulty.	Reset main breaker and/or replace main breaker.
	Breaker in equipment cabinet faulty.	Reset breaker in device cabinet and/or replace breaker.
	Wire connection to terminal strip faulty disconnected.	Tighten and/or replace connectors.
	Faulty meter.	Contact power company.
No phone line connection.	Faulty telephone line.	Contact telephone company.
No power (Portable HAR).	Power source malfunction.	Replace power source.

Weather Stations

Symptom Observed	Possible Cause	Remedial Action
No data received from sensors.	Disconnected/faulty cable.	Check/replace cable.
	Malfunction in sensor.	Replace sensor.
	RPU board malfunction.	Replace RPU board.
Apparent erroneous data reported.	Sensor malfunction.	Replace sensor.
	RPU board malfunction.	Replace RPU board.
No data received by SCAN.	Modem malfunction.	Replace modem.
	Disconnected/faulty cable.	Check/replace cable.
	RPU malfunction.	Replace selected boards in RPU.
	Electric power failure.	Reset/replace power disconnect/meter.
	Faulty telephone line.	Contact telephone company.
No power.	Main breaker faulty.	Reset main breaker and/or replace main breaker.
	Breaker in equipment cabinet faulty.	Reset breaker in device cabinet and/or replace breaker.
	Wire connection to terminal strip faulty disconnected.	Tighten and/or replace connectors.
	Faulty meter.	Contact power company.



Out Pavement Detectors

Symptom Observed	Possible Cause	Remedial Action
Detector malfunction.	PC board.	Replace detector unit.
	Radar assembly.	Replace multiplexer unit.
Multiplexer malfunction.	Power supply. PC board.	Replace multiplexer unit.
Controller power on, all display segments are lit and read zero.	Prom module not installed. Power supply or CPU not operative. I/O inoperative.	Replace controller unit.
Controller operational, one or more outputs on continuously.	Output shorted.	Replace controller unit.
Controller not responding to keyboard.	Keyboard and display module defective. Input module defective. Defective cable to front panel.	Replace controller unit.
Segment missing on display.	LED display defective. Defective decoder chip on module. Output module defective.	Replace controller unit.
Incorrect segment display indications.	Defective module.	Replace controller unit.
Keyboard response wrong or erratic.	Defective CPU module. Defective I/O module.	Replace controller unit.
No data transmission.	I/O error.	Contact telephone company.
No data transmission input/output.	Modem failed.	Replace modem unit.
No power.	Main breaker faulty.	Reset main breaker and/or replace main breaker.
	Breaker in equipment cabinet faulty.	Reset breaker in device cabinet and/or replace breaker.
	Wire connection to terminal strip faulty disconnected.	Tighten and/or replace connectors.
	Faulty meter.	Contact power company.

Symptom Observed	Possible Cause	Remedial Action
Signal not receiving (Locations with Spread Spectrum Radio).	Damaged cable or antenna.	Check/replace cable and/or antenna.
	Transceiver malfunction.	Check connections/replace transceiver
	No electric power.	Check electric power.

INTELLIGENT TRANSPORTATION SYSTEMS (ITS) INSPECTION AND ACCEPTANCE MANUAL (ITSIMM)

BRAND SPECIFIC TROUBLESHOOTING GUIDE

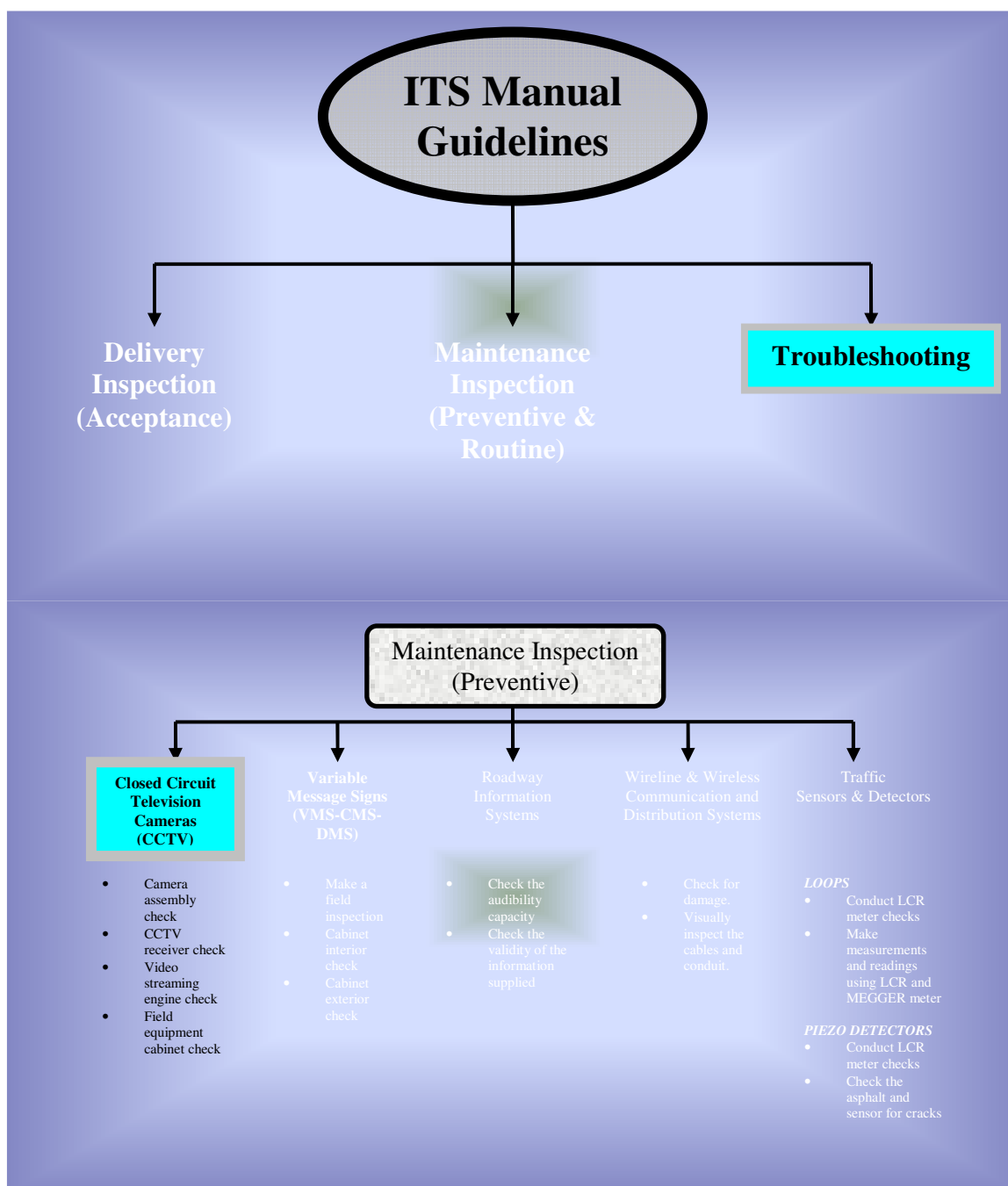
Prepared by



**Rutgers Intelligent Transportation Systems
(RITS) Laboratory**

Rutgers University

December 2007

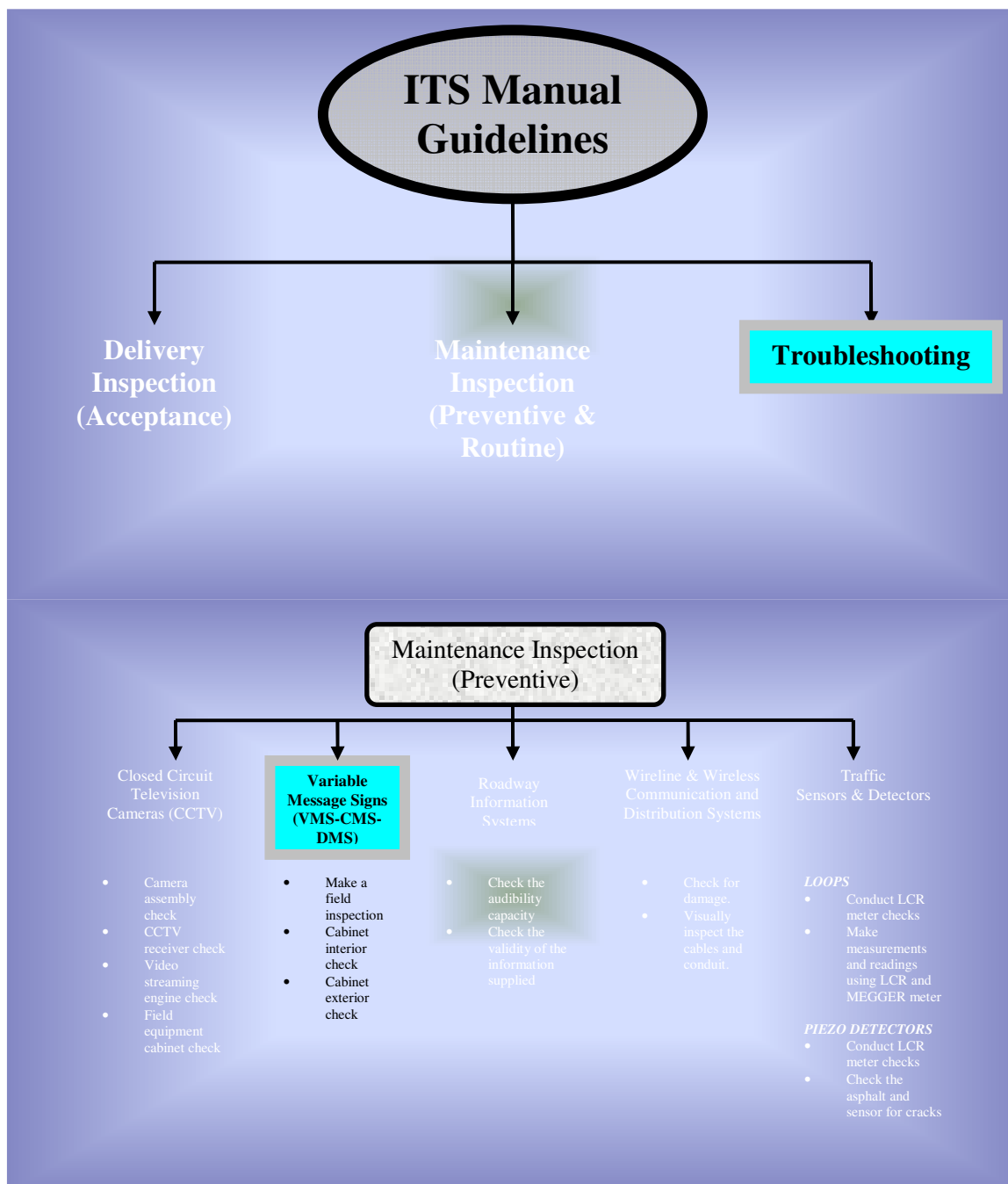


Pelco ES30PC/ES31PC Esprit with Pressurized IOC

The system contains no user-serviceable parts. If there is a problem with your system, it must be returned to Pelco for servicing. The troubleshooting guide is as follows.

Problem Observed	Solution
System does not operate.	Check system input voltage. The Esprit system is protected by a resettable overcurrent protective device located in the transformer module. Whenever a fault condition is experienced in the system causing excessive current flow through the protective device, a change occurs that will prevent current flow. The protective device will remain in this state as long as power is applied and the system fault remains. The protective device will reset itself after power has been removed for a few minutes and will operate normally when the system fault has been repaired. Check the camera and lens power connections and video BNC connections.
No control/sluggish control (Coaxitron)	Check for correct type and length of coax cable. Check for correct coax termination (refer to the controller manual to determine proper termination of video input). Normal load termination is 75 ohms. When looping through VCRs or multiplexers, make sure the signal is terminated at the end device. Some termination symptoms and problems are listed as follows. - Symptom: Extremely bright video. Problem: No termination or high resistance. - Symptom: Over contrast or contrast level of monitor needs to be increased to maximum for a good video image. Problem: Double termination (37.5 ohms). If pan and tilt operation is sluggish, check the controller manual to make sure the control signal is set in the extended mode, not standard mode.
No control (RS-422)	Check for correct cable type and length. The maximum cable distance for RS-422 communication over 24-gauge wire is 4000 feet (1219 m). Pelco recommends using shielded twisted pairs, such as Belden 9843 or similar cable, that meets or exceeds the basic requirements for EIA RS-422 or RS-485 applications. Check for correct wire connections between transmitting device (such as the CM6700 Series matrix system) and Esprit system receiver. Correct connections are from the transmitting device TX+ to Esprit system RX+ and from the transmitting device TX- to Esprit system RX-. Check for correct DIP switch settings.

Problem Observed	Solution
Ground loops (Ground loops are indicated by seeing 60 Hz noise in the video) It is recommended that a Pelco GIT100 ground installation transformer be installed.	Check for resistance between the grounds of the keyboard and the system. Ideally, there should be zero ohms. Remove the coax BNC connector and check for voltage between the BNC shield of the controller and the BNC shield of the system. No voltage should be detected.
No video or poor video	Check the video and power connections to the camera. Check for power to the camera from the Esprit system camera power output. Check all coax BNC connectors from the camera to the monitor. Make sure the controller is set for the correct camera-to-monitor viewing combination; for example, Camera 1 to Monitor 1. Refer to the controller manual for information. Check for normal load termination of 75 ohms. When looping through VCRs or multiplexers, make sure the signal is terminated at the end device. Some termination symptoms and problems are listed as follows. 1. Symptom: Extremely bright video. Problem: No termination or high resistance. 2. Symptom: Over contrast or contrast level of monitor needs to be increased to maximum for a good video image. Problem: Double termination (37.5 ohms).

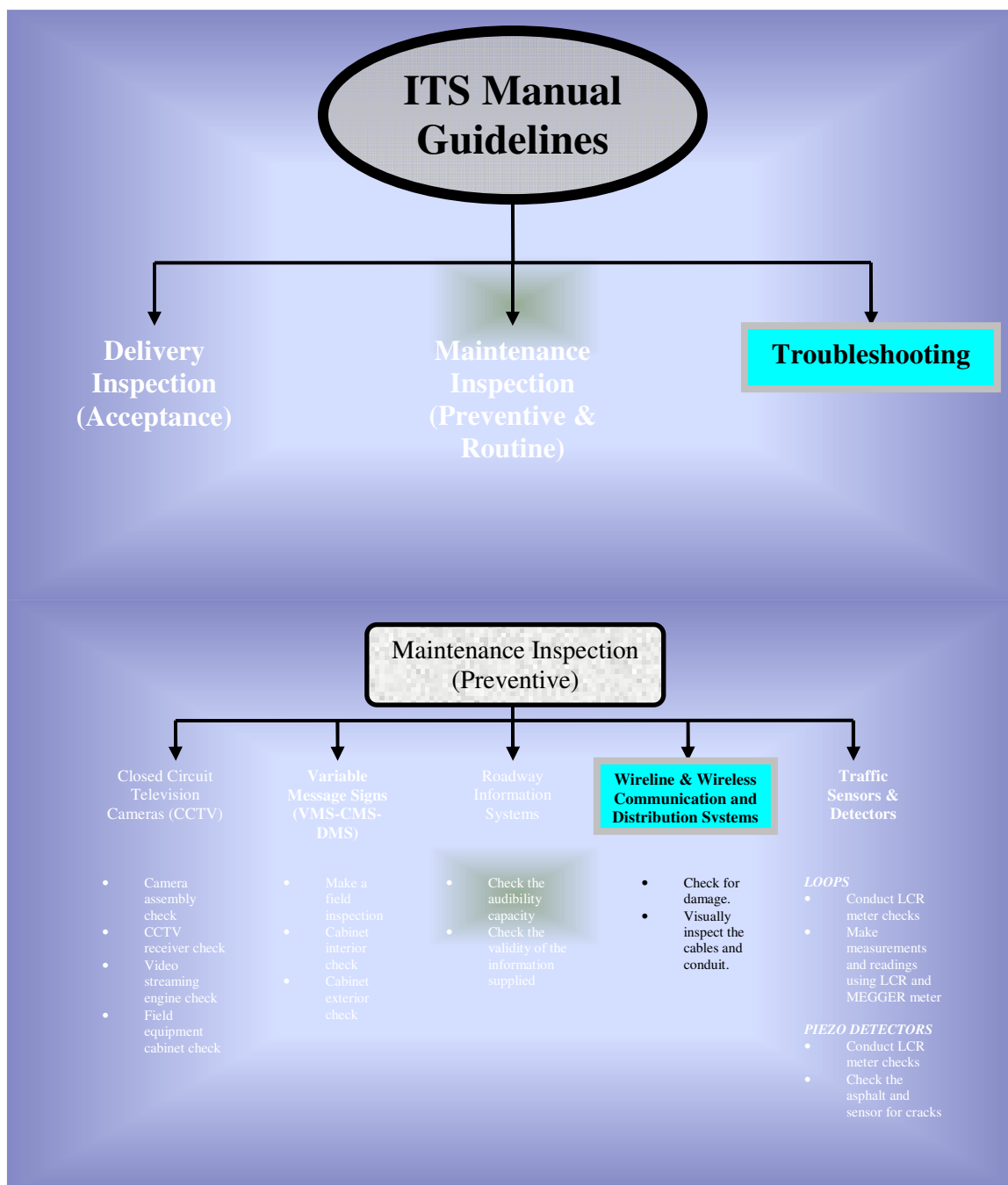


Daktronics VMS VF-1420-3-7x60-18-A

Symptom Observed	Possible Cause	Remedial Action
No LEDs will light and the sign controller will not communicate with the Central Controller.	No Power. Sign Controller or modem is bad.	Check if traffic cabinet has power. Refer to ED14480.
No LEDs will light, but the sign controller is communicating with the Central Controller.	No Power at the sign. Sign Controller is bad or not connected to the sign.	Check that the circuit breakers in the traffic cabinet are on and not tripped. Refer to ED14480.
LEDs on entire sign are garbled; wrong LEDs on throughout the sign.	Ground reference between the sign controller and sign is bad. Signal connections to the sign are incorrect. Sign controller is bad.	Check that the ground wires are properly grounded from the sign controller to the sign. Check the signal wiring. Refer to ED14480.
One bay of modules of the sign is "dead"--no LEDs will light. Remaining LEDs okay.	Fuse F5 or F6 in low voltage distribution panel is bad. All three power supplies are bad.	Replace bad fuse. Replace power supplies.
Three adjacent modules are "dead"--no LEDs will light. Other LEDs in the same line do light.	Fuse F1, F2, F3, or F4 in low voltage distribution panel is blown. Power or ground wire for this set of three modules bad at low voltage distribution panel or at modules.	Replace bad fuse. Repair as needed.
One line of modules does not respond properly. LEDs are garbled, do not change, too bright, too dim, etc.	One or more wires or terminals in the signal cable is misplaced, open or shorted to wires or frame, in sign, sign controller, or control cable from to sign controller. Terminating resistor on the CAN bus for this line is bad. One or more drives in this line are bad. Sign controller is bad.	Repair wires as needed. Replace the 120 Ω terminating resistor. Replace modules in the line one at a time and retest each time. Refer to ED14480.
One module is "dead"-- no LEDs will light.	12-pin connector unplugged at module. Terminal is bad or not fully seated in 12-pin plug at driver board, or wire is bad. The driver is bad.	Plug in connector. Inspect all wires and terminals for 12-pin plug. Repair as needed. Replace failed driver.

Symptom Observed	Possible Cause	Remedial Action
One module is garbled, too bright, too dim, erratic, etc.	Terminal is bad or not fully seated in 12-pin plug at driver board, or wire is bad.	Inspect all wires and terminals for 12-pin plug. Repair as needed.
	The driver is bad.	Replace failed driver.
One pixel board on one module will not light.	Connector unplugged at pixel board or driver board.	Plug in connector.
	Terminal is bad or not fully seated in plug at pixel or driver board, or wire is bad.	Repair as needed.
	The driver board is bad.	Replace failed driver board.
One pixel will not light.	Terminal is bad or not fully seated in plug at pixel or driver board, or wire is bad.	Repair as needed.
	The pixel board is bad.	Replace failed pixel board.
	The driver board is bad.	Replace failed driver board.
One "string" (1/2 of the LEDs) in one pixel will not light.	The pixel board is bad.	Replace failed pixel board.
One pixel will not turn off.	The driver board is bad.	Replace failed driver board.
Pixel cooling fans are not running.	Circuit breaker tripped in traffic cabinet.	Reset the breaker.
	Temperature inside the sign is lower than the thermostat setting.	This is not a problem.
	The thermostat/its wiring is bad.	Repair as needed.
Pixel cooling fans are running continuously.	Temperature inside the sign exceeds the thermostat setting.	This is not a problem.
	The thermostat is stuck on or the wiring is shorted.	Replace the thermostat or repair wiring.
LED brightness is wrong--entire sign is too bright or too dim.	Light sensor assembly is obstructed.	Clear obstruction.
	One or more wires or terminals in the light/temp control cable are misplaced, open or shorted to other wires or the frame in sign, sign controller, or control cable from sign to sign controller.	Repair as needed.
	Operator error-Light sensor is not enabled/levels are set incorrectly.	Correct settings.
	Light sensor PCB is bad.	Replace light sensor.
	Sign controller is bad.	Refer to ED14480.

Symptom Observed	Possible Cause	Remedial Action
"Pixel Test" shows all pixels on all sign lines as bad. Sign lines display messages correctly.	Connector unplugged at sign controller.	Plug in connector.
	Sign controller is bad.	Refer to ED14480.
One or more internal temperature sensors not reading.	Signal or power wiring is bad. One or more wires or terminals is placed, open or shorted to wires or frame at one of the temperature sensors or CAN distribution board.	Repair wiring as needed.
	One or both of the temperature sensors is bad.	Remove connectors at temperature sensor to test one sensor at a time.
	CAN distribution board is bad.	Replace the CAN distribution board.
One power supply indicates "bad" from the operator software. All others indicate "OK".	One input module bad in CAN I/O.	Replace module.
	Bad power supply.	Replace power supply.
	Wiring for power supply in CAN I/O is bad.	Repair as needed.



Comlux Opt. Transmission Terminals – Models CL3683/CL3684

System failures in Force Incorporated Comlux equipment generally result from a single point of failure. Depending on the location of the failure, alarms may propagate throughout the system and appear on the affected unit. In order to minimize troubleshooting time, these alarms are used as an aid in identifying failure location. Other common problems include a lack of continuity in the optical fiber, lack of power (or reversed power), or improper input levels.

There are no user-serviceable parts inside the equipment. In order to prevent shock hazard, avoid opening the cover. If the cover must be opened to change switch settings, first contact Customer Service who will make an entry in the equipment's service log to prevent possible voiding of the warranty. ***Before opening the cover, disable the incoming power line and wait 10 minutes for interval voltages to discharge.***

Troubleshooting usually consists of observing the lighted indicator on the front panel (or its equivalent display if remove alarm monitoring is used) and correcting the condition. Some problems and solutions are displayed below.

Problem Observed	Check	Comments
Transmitter or receiver "Power" LED is off.	In AC-powered units, check that the AC power cord is connected. Check to see if the rear panel fuses are blown. Also, check the fuse breaker for the AC power line itself to verify it has not blown. In DC-powered units, check to see if the rear panel fuse is blown. Check for DC power at the input terminals. Also, check the fuse for the DC power line itself to verify it has not blown.	The power supply fuse may need to be replaced. WARNING: Disconnect the power before replacing fuses to avoid the risk of shock or potential grounding or shorting of the power supply. Fuses for the AC-powered models are T2.0A, 250V cartridge type, 5x20 mm. Fuses for the DC-powered units are T3.0A, 250V cartridge type, 3AG slow-blow. Replacement fuses are available from any electronics store. If replacing fuse does not correct the situation, the power supply may need repair. Contact Force, Inc. for additional instructions.
Transmitter or receiver "PS Fail" LED is continuously lit.	Confirm proper primary input power.	If there is primary power to the unit (main "Power" LED is lit), the transmitter power supply may need be replacing. Contact Force, Inc. for additional instructions.
Transmitter or receiver "PS Fail" LED is flashing.	Check to see if the ventilation fan is operating properly.	If the ventilation fan is operating properly, check for obstructions in the airflow path.
Transmitter or receiver "Temp" LED is continuously lit. The internal temperature of the unit has risen above 70 °C.	Check to see if the "P.S. Fail" LED is flashing, indicating a fan failure or air obstruction.	If the ventilation fan is operating and there are no obstructions in the airflow path, the unit may require repairs. Contact Force, Inc. for additional instructions.
Transmitter or receiver "Clock" LED lit.	If an external reference clock is used, confirm frequency and level of the clock. Try removing the external clock source, and see if the unit works correctly on the internal clock source.	If the unit works on the internal clock source, the problem may reside in the external clock source. If the condition still exist using the internal clock source, the unit is need of repair. Contact Force, Inc. for additional instructions.
Transmitter "CH" LED's (1 through 8) are lit.	Check for incorrect and disconnected data input cables. Confirm that connected cables are in good condition and are not frayed or cut.	If the tables check out, the unit is in need of repair. Contact Force, Inc. for additional instructions.
Receiver "CH" LED's (1 through 8) are lit.	Check for adequate optical input at the receiver. The Model CL3684 receiver has a minimum sensitivity of -30 dBm..	If input levels are okay, check the integrity of the optical fiber connection. If no trouble is found in the connections or the fiber cable, the unit is in need of repair. Contact Force, Inc. for additional instructions.

Comlux Optical Video Digital Codecs – Models CL3803/CL3804

System failures in Force Incorporated Comlux equipment generally result from a single point of failure. Depending on the location of the failure, alarms may propagate throughout the system and appear on the affected unit. In order to minimize troubleshooting time, these alarms are used as an aid in identifying failure location.

Troubleshooting usually consists of observing the lighted indicator on the front panel (or its equivalent display if remote alarm monitoring is used) and correcting the condition.

There are no user-serviceable parts inside the equipment. In order to prevent shock hazard, avoid opening the cover. If the cover must be opened to change switch settings, first contact Customer Service who will make an entry in the equipment's service log to prevent possible voiding of the warranty. ***Before opening the cover, disable the incoming power line and wait 10 minutes for internal voltages to discharge.***

The following troubleshooting information assumes that the system has been configured in its most basic form, i.e. without any intermediate signal processing such as digital fan-outs and digital switches. The described problems are as seen at the output of the CL3804 Video Decoder.

Problem Observed	Check	Comments
No video output. CL3804 decoder "Power" LED is dark.	Check to see if all other LED's are dark, indicating that the unit is not receiving primary power.	In AC-powered units, check that the AC power cord is connected. Check to see if the rear panel fuses are blown. Check to see if the primary AC power line itself has a blown fuse. In DC-powered units, check to see if the rear panel fuse is blown. Check for DC power at the input terminals. For both types of units, replace only with a fuse of the type and rating indicated on the rear panel and in the manual.
No video output. CL3804 decoder "Power" LED is lighted.	Check the "P.S. Fail" LED.	If "P.S." fail LED is lighted, it indicates a failure in the power supply itself. Contact Force, Inc. for additional instructions.
No video output. Data, Clock, or Sync LED's are lighted.	Check the font panel LED's on the optical receiver to see if the video is being received from the optical receiver.	If receiver LED's are dark, check the equipment at the transmit site, including the optical transmitter and the CL3803 coder. Observe and respond to LED alarms may be present on those units.
No video output from one channel.	Check the "Data" LED on the non-working channel. (A/B or C/D)	If lighted, check if a data stream is present at the decoder input. If data is present, the decoder may be in need of repairs. If not, check for alarm LED's on the associated optical receiver. If the receiver is okay, check the CL3803 coder "Data" LED at the transmit site. If lighted, the coder may be in need of repairs. Contact Force, Inc. for additional instructions.
"Washed out" video.	Check the CL3803 coder "Overmod" LED of the channel in question at the transmit site. Check for proper input video level. Check the signal level at the input to the A/D converter.	If dark, check for problems in the input video signal. If lighted, the unit could be experiencing an excessive signal level at the input to it's A/D converter. Check the "75 ohms - U/T" switch position on the rear panel to see if the input video is properly terminated. If the input video is okay and the system is in regular operation, the 3803 coder may be in need of repairs. Contact Force, Inc. for additional instructions. Set the A/D input level (Refer to the Force Inc. Manual). If the A/D input level appears okay, the CL3803 coder may be in need of repairs. Contact Force, Inc. for additional instructions.

Problem Observed	Check	Comments
Noisy, snowy, or "sparkly" video, or no video output, from channel A/B or C/D.	Check the affected channel's "Data" LED.	If lighted, verify that the optical receiver is working properly and data is present at the input to the decoder.
	Check the "Clk" LED.	If lighted, check for proper connection and cable integrity between the CL3804 decoder and the optical receiver. If okay, the decoder may be in need of repairs. Contact Force, Inc. for additional instructions.
		If the "Data" and "Clk" LED's are both dark, the video signal is arriving properly at the decoder, the decoder may be in need of repairs. Contact Force, Inc. for additional instructions.
A/B Sync or C/D Sync LED lit (no other alarms).	Check to see if the Frame Shift cables from the recorder to the optical receiver are missing or are connected in reverse.	

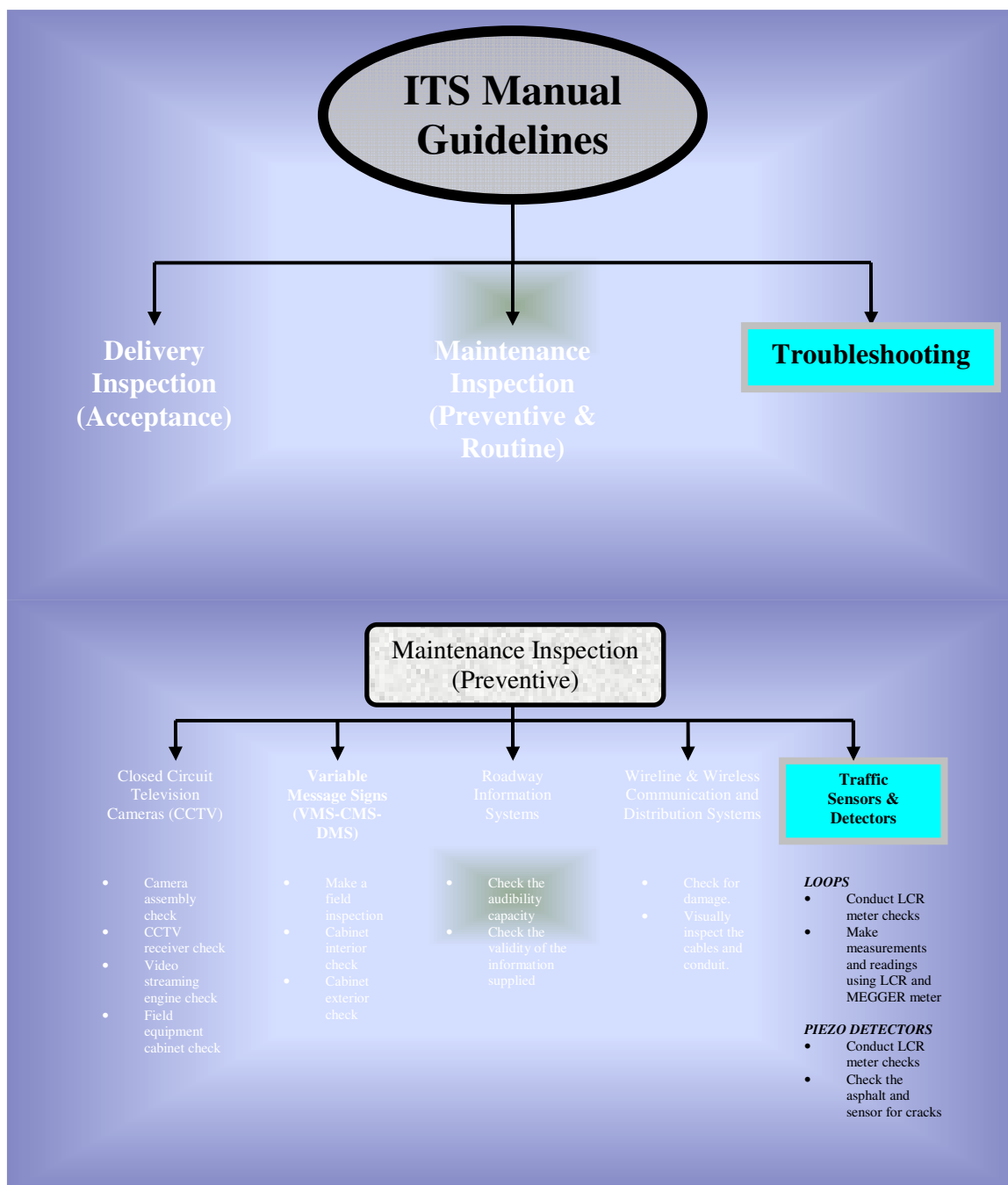
Comlux Optical Regenerators – Models CL3687/CL3687E

System failures in Force Incorporated Comlux equipment generally result from a single point of failure. Depending on the location of the failure, alarms may propagate throughout the system and appear on the affected unit. In order to minimize troubleshooting time, these alarms are used as an aid in identifying failure location. Other common problems include a lack of continuity in the optical fiber, lack of power (or reversed power), or improper input levels.

There are no user-serviceable parts inside the equipment. In order to prevent shock hazard, avoid opening the cover. If the cover must be opened to change switch settings, first contact Customer Service who will make an entry in the equipment's service log to prevent possible voiding of the warranty. ***Before opening the cover, disable the incoming power line and wait 10 minutes for interval voltages to discharge.***

Troubleshooting usually consists of observing the lighted indicator on the front panel (or its equivalent display if remove alarm monitoring is used) and correcting the condition. Some problems and solutions are displayed below.

Problem Observed	Check	Comments
Transmitter or receiver "Power" LED is off.	In AC-powered units, check that the AC power cord is connected. Check to see if the rear panel fuses are blown. Also, check the fuse breaker for the AC power line itself to verify it has not blown. In DC-powered units, check to see if the rear panel fuse is blown. Check for DC power at the input terminals. Also, check the fuse for the DC power line itself to verify it has not blown.	The power supply fuse may need to be replaced. WARNING: Disconnect the power before replacing fuses to avoid the risk of shock or potential grounding or shorting of the power supply. Fuses for the AC-powered models are T2.0A, 250V cartridge type, 5x20 mm. Fuses for the DC-powered units are T3.0A, 250V cartridge type, 3AG slow-blow. Replacement fuses are available from any electronics store. If replacing fuse does not correct the situation, the power supply may need repair. Contact Force, Inc. for additional instructions.
Transmitter or receiver "PS Fail" LED is continuously lit.	Confirm proper primary input power.	If there is primary power to the unit (main "Power" LED is lit), the transmitter power supply may need be replacing. Contact Force, Inc. for additional instructions.
Transmitter or receiver "PS Fail" LED is flashing.	Check to see if the ventilation fan is operating properly.	If the ventilation fan is operating properly, check for obstructions in the airflow path.
Regenerator "Temp" LED is continuously lit. The internal temperature of the unit has risen above 70°C.	Check to see if the "P.S. Fail" LED is flashing, indicating a fan failure or air obstruction.	If the ventilation fan is operating and there are no obstructions in the airflow path, the unit may require repairs. Contact Force, Inc. for additional instructions.
Regenerator "Tx" LED lit.	If the DB37 parallel alarm connector is connected to external alarms and controls, confirm that the laser has not been externally shut down.	If the unit has not been externally shut down as described in the Force Inc. manual, contact Force, Inc. for additional instructions.



EIS Remote Traffic Microwave Sensors (RTMS)

The RTMS Self-Test diagnostic program checks internal functions and locates hardware faults. Returned messages other than “All test complete. System OK!” may require further advice or return of the unit back to EIS for warranty service or repair. The list of Self-Test messages:

Message	Action
Power supply fault	Send back to EIS
Modulator signal fault	Send back to EIS
Microwave module fault	Call for advice
Temperature calibrator fault	Send back to EIS
Modulator memory fault	Send back to EIS
Program memory fault	Send back to EIS
DSP fault	Send back to EIS
Gain too low or ADC fault	Call for advice
Logic failure	Call for advice
No signal	Call for advice
Saturation signal level	Call for advice

Table 1.EIS RTMS Self-Test Messages

Self-Test cannot test the Opto-pairs. It, however, closes the zone contacts for one second in sequence. Operation of opto-isolated contacts can then be verified using the controller display, ohm-meter or any suitable device showing continuity.

Field troubleshooting of the RTMS consists mostly of ensuring that the unit is powered and communicating as follows (correct two-way communication is necessary to run Self-Test):

Symptom Observed	Possible Cause	Remedial Action
Sensor Inactive message is displayed.	Power failure	Check cable connections for continuity and/or wiring errors. Check that the supply voltage is within limits of EIS RTMS Manual. Voltage outside of limits (too low or too high) will cause power supply to shut down. With the PC connected from RTMS, check the RTMS serial bus by measuring -10V between pins 2 and 5 of the DB9 RS-232 connector. If voltage is not present, the unit is not powered or there is a hardware fault in the RTMS serial port.
Sensor Inactive message is displayed.	PC unable to communicate with the RTMS	Hit any key. If target blips are present, refer to the next problem. Check that the RTMS serial port is connected to the PC COM 1 port. Check that COM port is available and not used by another application (e.g. serial mouse). Check whether a second setup program is running and locking out the serial port.
Main screen shows target blips but no zones and all zero statistics. "Cannot read setup" message displayed. Self-Test initiated but results are not displayed on PC screen.	PC receives RTMS data without PC requests. RTMS serial port is unable to receive requests from PC.	Check PC's serial port (-10V between pins 3 and 5) Check cable. Send unit to EIS for repair if PC and cables are OK.
Main screen is displayed on program initiation (i.e. PC and sensor are communicating) but target "blips" are not shown.	RTMS is not in NORMAL mode. Unit is not aimed properly. Low Sensitivity Internal parameters are corrupted.	Ensure the unit is in the NORMAL mode (DATA menu). Generate a target by waiving a hand in front of the unit. If a blip does not appear, a hardware fault may be present. Check sensitivity setting. See if targets appear when sensitivity increased. Recycle power to unit. Load a prepared file on supplied software disks (e.g. FWDLK) and then edit parameters (mode, sensitivity, zone set-up, etc) Run Self-Test if above not successful. Report findings to EIS.