# SECTION V. SYSTEM MAINTENANCE

**WARNING**

Before attempting to service any ASOS equipment, the technician must perform the following:

Upon arrival at an airport, notify airport security and gain access to the system by following local procedures.

Adhere to all airport traffic regulations.

Before crossing any runway, radio the tower and request clearance.

Proceed only with clearance, and only after illuminating the caution light mounted on top of your vehicle.

## 1.5.1 INTRODUCTION

This section contains corrective and preventive maintenance procedures for the ASOS. Preventive maintenance identifies the quarterly and semiannual tasks required to keep the ASOS in peak operational condition. Corrective maintenance provides detailed procedures for performing the system diagnostic test, performing fault isolation, and removing and installing FRU's. The system diagnostic test is continuously running and automatically prints system status that identifies the operational status of the system after each cycle of the self-test. If the self-test detects a failure, the suspected FRU is identified in the system maintenance log and printed on the printer. The technician's first step in system repair is to replace the indicated FRU. If the system does not identify an FRU, the corrective maintenance table in this section is then used to isolate to a faulty FRU. Table 1.5.1 lists the tools and test equipment required to perform maintenance on the system. These are the preferred items that the technician should have available to perform maintenance on the system. If the specific item listed in the table is not available, an equivalent item may be substituted. The specific tools required for removal and installation of each FRU are specified within each procedure. Table 1.5.2 lists the required consumables needed to maintain the ASOS. Although the Source column in table 1.5.2 provides a recommended source for some of the items, the technician can substitute an equivalent product.

## 1.5.2 MAINTENANCE ACTION RECORDING AND DOCUMENTATION

Whenever the technician performs maintenance tasks, all actions must be documented in the system maintenance log. For the purpose of entering unit/assembly or modification kit identification numbers, the process is initiated by the ACT key of the maintenance screen keypad. Next, the technician continues entry process to the system maintenance log by activating the START key of the maintenance action screen (paragraph 1.3.4.40), then performs the specified maintenance action under preventive maintenance, corrective maintenance, calibration, or field modification kit installation. When all actions are completed, the technician accesses the corresponding PM, CM, CAL, or FMK screens (paragraphs 1.3.4.41 through 1.3.4.44) and enters appropriate identification numbers, which, in turn, are written to the system maintenance log. The technician can write corresponding maintenance messages to the log at any time during the process by accessing the SYSLG screen (paragraph 1.3.13). Table 1.5.3 provides a sequence to be followed when specified maintenance tasks are to be performed by technicians at ASOS sites. In addition, the sensor firmware version screen allows the current version of sensor firmware to be documented (changed) if required by the specified maintenance action. $

**Table 1.5.1. Tools and Test Equipment**

| | Item | Description | Part No./Model No. |
|---|---|---|---|
| | 1 | Common handtools (i.e., wrenches, screwdrivers, nut drivers) | |
| | 2 | Digital multimeter (DMM) | Fluke 77 |
| | 3 | Laptop computer | ZEOS 286 (minimum) |
| | 4 | PROCOMM software | PROCOMM Plus, Datastorm Tech. |
| | 5 | Precision torque gauge | PN SO-3, SEEKONK Mfg. |
| | 6 | STI LEDWI calibration kit | Model STI200, Scientific Technology, Inc. |
| | 7 | PorTable pressure standard | Model 760-16B, Paroscientific, Inc |
| | 8 | Ceilometer calibration reflector | Model CT-16, Vaisala, Inc. |
| | 9 | RF UHF to BNC adapter (MIL-SPEC) | MIL-SPEC 9183 UG-20/A/U |
| | 10 | Visibility sensor calibration kit | 32041, Belfort Equipment Company |
| | 11 | Black Box (Mini Sam)RS-232 Test Tool | Model TS153B |
| | 12 | Magnetic compass | S&Y 183, Stocker and Yale |
| | 13 | Laptop Interface cable | 62828-90314-2 |
| | 14 | Laptop Null cable | 62828-90314-1 |
| | 15 | Adapter - DB9 (male) to DB25 (female) | Black Box TR-FA601 |
| | 16 | Adapter - DB9 (female) to DB25 (male) | Black Box TR-FA600 |
| | 17 | In-line rf power meter | Bird model 43 (with BNC connectors) |
| | 18 | RF meter plug-in module | Bird model 5d |
| | 19 | Sun program disk (wind alignment) | |
| | 20 | Wind alignment tool | CIMTECH 2767 |
| | 21 | Psychrometer | Belfort 556-8 |
| | 22 | Laboratory beaker | Fischer Scientific Model 2-540 (NSN 6640-00-264-8323) |
| | 23 | Cable, RF (N to N) | 62828-42016-30 |
| | 24 | Cable, RF (BNC to N) | 62828-42024-30 |
| $ | 25 | Davis Pelorus Instrument | Davis Instrument Corp. Model 031 |
| $ | 26 | Spotting Scope (Monocular) | Bushnell Corp. Model 78-1545 (or equiv.) |
| | 27 | Alignment protractor | |
| $ | 28 | Tripod | Bogen Photo Corp. Model G120 w/G1171 Head |
| | 29 | Dual speed F420 wind speed calibrator | ASN F850A-1 |
| | 30 | Ribbon Cable, Audio Adj | 62828-42037 |
| | 31 | 50 Ohm Load | Bird 8362NM |
| | 32 | Meter Element | Bird 25-C (6625-00-980-8255) |
| | 33 | Oscilloscope | Tektronix TAS485 (6625-00-548-8181) |
| | 34 | RF Frequency Counter | HP5384A/34110/A |
| | 35 | RF Load Sampler | Bird 4274-025 (6625-01-080-5452) |
| | 36 | Meter Element | Bird 110-1 (6625-00-502-7502) |
| $ | 37 | Extender Board, VME | Dawn VME Products 20800-188 |
| | 38 | Test Cable, BNC to BNC | 62828-42046 |
| | 39 | Scanner w/AC Adapter | Radio Shack PRO 36/273-1455 or equivalent |
| | 40 | Wire brush | (Commercial) |
| | 41 | Scraper, w/razor blade | (Commercial) |
| | 42 | Gloves, rubber | (Commercial) |

**Table 1.5.2. Consumable Materials List**

| Item | Quantity | Source | |
|---|---|---|---|
| Alcohol, anhydrous isopropyl, 91% | 1 quart | ASN-052-C-12 | |
| Applicator, cotton-tip | 100 pieces | | |
| Bottle, squeeze | | | |
| Brush, soft (1-inch paint) | 1 each | | |
| Cloth, lint-free | 10 pieces | | |
| Coating Compound, metal pretreatment | 1 quart | MIL-C-8514, or (DOD-P-15328) | |
| Detergent, liquid | 22 oz | Joy dish washing liquid | |
| DC-4, Dow Corning, anti-corrosion dielectric compound | 1 tube | | |
| Filter-Coat | 1 can | | |
| INSECTA paint | 1 pint | INSECTA Incorporated | |
| Lacquer thinner, odorless | 1 quart | Parks 2215 | |
| Optical Gel Code 0608 | 4 oz | R.P.Cargille 24231 (AMP 501555-1) | $ |
| Paint, Cabinet | 1 quart | Sherwin-Williams, Polane, No. 521-1719 F663W56, Hi-Gloss White, Non-Textured Finish | |
| Paint, Enamel, gloss-white | 1 quart | Rust-Oleum, or equal | |
| Paint, Primer, for clean metal | 1 quart | Rust-Oleum, or equal | |
| Paint, Primer, for rusty metal | 1 quart | Rust-Oleum, or equal | |
| Paint, Primer, zinc-rich | 1 quart | Rust-Oleum, or equal | |
| Paint, Wind Tower | 1 quart | FED-STD-595 Color 12197 (Orange) 17875 (White) | $ |
| Primer | 1 quart | Zinc Chromate, TT-P-1757, Type I, Color Y | |
| RTV 732 Silicon Sealer | 1 tube | | |
| Rust Stripper (for lightly rusted surfaces) | 1 quart | Rust-Oleum, or equal | |
| Rust Reformer (for heavily rusted surfaces) | 1 quart | Rust-Oleum, or equal | |
| Restorer, contact | 1 can | Radio Shack 64-2315 | |
| Tape, adhesive, electrical | 2 rolls | | |
| Tissue, lens | 50 pieces | | |
| Window cleaner | 12 oz | Windex glass cleaner with ammonia | |

**Table 1.5.3. Maintenance Action Sequence**

| Step | Procedure |
|---|---|
| 1 | Sign on system as a technician. |
| 2 | Select MAINT function and observe maintenance screen. Observe that MAINTENANCE keypad is displayed in lower right corner. |
| 3 | Press ACT key and observe that maintenance action screen is displayed. |
| 4 | Press START key. This stores a maintenance action message in the system maintenance log, indicating the start of a maintenance action to follow. |
| 5 | Perform specified preventive maintenance, corrective maintenance, calibration, or field kit modification tasks. Verify that all maintenance steps are complete and that appropriate units/assemblies or field modification kits are identified. |
| 6 | Reaccess maintenance action screen. Use PREVT, CORR, CAL, and FMK keys to document all maintenance tasks performed. If necessary, enter any additional relevant maintenance data or messages into SYSLG screen (paragraph 1.3.13). |
| 7 | Verify that system maintenance log has recorded complete and relevant maintenance notations regarding each task performed. |
| 8 | Sign off ASOS. |

1.5.3 **PREVENTIVE MAINTENANCE (PM)**

1.5.3.1 **Introduction**. ASOS preventive maintenance is performed at two intervals: 90 days and semiannually. Table 1.5.4 provides the preventive maintenance schedule for each system major assembly.

**Table 1.5.4. System Preventive Maintenance Schedule**

| Interval/Unit | What To Do | How To Do It |
|---|---|---|
| **90 Days** | | |
| ACU | Clean air filters.<br>Clean CRT screens.<br>Clean cabinets.<br>Check memory board LOW BATT indicator. | Table 2.5.2<br>Table 1.5.7<br>Table 2.5.3<br>Paragraph 2.5.2.4 |
| Ceilometer | Routine inspection and cleaning<br>Clean windows.<br>Check window conditioner. | Paragraph 9.5.2.2<br>Table 9.5.2<br>Table 9.5.2 |
| CODEX modem | Clean and inspect. | Paragraph 13.5.2.1 |
| DCP | Clean cabinets. | Table 3.5.2 |
| Freezing rain sensor | Clean and inspect. | Table 11.5.1 |
| GTA radio | RF power output<br>Modulation level check<br>VSWR at transmitter output check<br>Frequency stability check | Table 12.5.2<br>Table 12.5.3<br>Table 12.5.4<br>Table 12.5.5 |
| Present weather sensor | Clean lenses.<br>Calibrate sensor. | Paragraph 7.5.2.2<br>Table 7.5.2 |
| Pressure sensor | Clean and inspect.<br>Verify accuracy of pressure sensor data. | Paragraph 8.5.2.2<br>Table 8.5.2 |
| SCA | Perform visual inspection.<br>Clean CRT screens. | Table 14.5.2<br>Table 14.5.4 |
| $ System | Perform visual inspection.<br>Clean peripherals. | Table 1.5.5<br>Table 1.5.7 |
| Temperature/dewpoint sensor | Clean/inspect aspirator air passages.<br>Clean/inspect aspirator mirror.<br>Perform optical loop adjustments.<br>Verify temperature and dewpoint readings. | Table 5.5.2<br>Table 5.5.2<br>Table 5.5.3 or 5.5.4<br>Table 5.5.5 |
| Thunderstorm sensor | Clean and inspect. | Table 16.5.1 |
| Tipping bucket | Clean and inspect. | Table 10.5.1 |
| Visibility sensor | Clean lens assemblies.<br>Calibrate sensor. | Table 6.5.2<br>Table 6.5.3 |
| Wind sensor | Perform routine inspection.<br>Check obstruction lights. | Paragraph 4.5.2.1<br>Paragraph 4.5.2.2 |
| **Semiannually** | | |
| ACU | Check/clean batteries. | Paragraph 2.5.2.5 |
| Ceilometer | Check sensor calibration. | Table 9.5.3 |
| DCP | Check/clean batteries, inspect desiccant (at special sites). | Paragraph 3.5.2.2 |
| SCA | Check/clean batteries, inspect desiccant. | Table 14.5.2 |
| System | Visual inspection and cleaning (as reqd). | Table 1.5.5 |
| Temperature/dewpoint sensor | Check DC power supplies.<br>Calibrate sensor. | Table 5.5.8<br>Table 5.5.9 or 5.5.11 |
| Wind sensor | Mechanical operation inspection (bearings, cup balance, vane balance).<br>Perform starting torque bearing test.<br>Check wind direction and speed data.<br>Check wind direction alignment. | Table 4.5.2<br><br>Table 4.5.17<br>Table 4.5.5<br>Paragraph 4.5.2.5 |
| **Annually** | | |
| GTA radio | Antenna cable conductance and insulation | Table 12.5.6 |
| Present weather sensor | Treat with insect paint. | Paragraph 7.5.2.4 |
| System | Visual inspection (as reqd)<br>Paint Refurbishment | Table 1.5.5<br>Paragraph 1.5.3.5 |
| Thunderstorm sensor | Replace desiccant. | Table 16.5.1 |
| Tipping bucket | Inspect cable connector. | Table 10.5.1 |
| Wind sensor | Inspect crossarm assembly cable connector. | Table 4.5.2 |

1.5.3.2 **Visual Inspection**. Visual inspection is performed in two parts. The first part requires that power be applied to the system; the second part requires that power be removed from the system. The visual inspection procedure is provided in table 1.5.5. The DCP and sensor facilities must be inspected periodically. Table 1.5.6 specifies a checklist of items and the period for performing these tasks.

1.5.3.3 **Cleaning**. Cleaning is required for the ACU, DCP, and sensor cabinets; the CRT and display screens on the OID's, VDU, and CVD; and the printer and OID keyboard. The cleaning procedure is provided in table 1.5.7.

1.5.3.4 **Corrosion Removal and Prevention, Steel Surfaces**. If corrosion (rust) is detected on steel parts such as instrument subsystem pedestals, towers, wind tower base, or masts, proceed as follows: $

a. Wire brush affected areas thoroughly; then, wipe away all residue powder with a dry, clean cloth.

b. Inspect rusted areas to determine whether remaining rust lies on surface, or whether it has corroded deeply into the metal. If rust has penetrated below the surface, proceed with step d; if not, proceed with step c.

**CAUTION**

Do not allow any chemicals used in this procedure to contact the skin or eyes. Wear rubber gloves and safety glasses. If any fluid splashes on exposed skin or eyes, flush with water immediately.

c. If rust is on or near the surface, proceed as follows:

1. Wearing rubber gloves, apply Rust Stripper with an applicator pad or a cloth. Apply evenly over rusty surfaces; scrub vigorously.

2. Allow 30 minutes for Rust Stripper to work; then, wipe dry with a clean cloth.

3. Allow treated surfaces to air-dry for 30 minutes.

4. Using a clean, 2-inch paint brush, coat all treated and bare areas with zinc-rich primer.

5. Allow 1 hour drying time for primer.

6. Coat the entire surface with gloss white enamel.

7. Allow painted surfaces to dry for 8 hours; do not contact painted surfaces during drying period.

d. If rust has penetrated below the surface, proceed as follows:

1. Wearing rubber gloves, apply Rust Reformer with an applicator pad or cloth. Apply evenly over rusty surfaces, and scrub thoroughly.

2. When treated surfaces appear to be dry, wipe with a clean cloth.

3. Using clean, 2-inch paint brush, coat all treated and bare areas with rusty metal primer.

4. Allow 2 hours drying time.

5. Coat all treated surfaces with gloss-white enamel.

6. Allow 8 hours drying time; then, coat the entire surface with gloss-white enamel.

1.5.3.5 **Refurbishment of Painted Aluminum Surfaces**. Wherever paint has been damaged, or is peeled or blistered, proceed as follows:

a. Scrape away all loose paint with a razor blade scraper.

b. Using a 2-inch paint brush, coat the bare aluminum areas, and areas where yellow primer is showing, with zinc-chromate primer.

c. Allow primer to dry for 4 hours.

$ d. Apply a coat of paint (refer to table 1.5.2 for proper paint) to primed areas.

$ e. If repainting of the entire surface is required, allow 8 hours drying time, then paint entire
$ surface.

**Table 1.5.5. Visual Inspection Procedures**

| Step | Procedure |
|---|---|
| 1 | With power applied, ensure that blower at the bottom of the ACU equipment cabinet, the fans on the rear of the UPS's, and the muffin fans on the bottom of the DCP VME card rack are operating properly. |
| 2 | With power applied, at the wind sensor tower, cover the light sensor on the tower light control box and ensure that the clearance lights at the top of the tower illuminate. |
| 3 | Remove power from the system and inspect the inner ACU, DCP, and sensor cabinets for signs of pinched or chafed wiring, loose hardware, and proper connector mating. |
| 4 | With power removed from the system, check the outside of all enclosures for signs of corrosion. |
| 5 | With power removed from the system, at the sensor pad, ensure that all hardware securing the sensors to the pad is tight. Check each mounting column for visual signs of wear or corrosion. Ensure that there are no cracks in the columns.<br>**NOTE**<br>After performing the visual inspection procedure, reapply power to the system and wait until the system initializes and successfully completes its diagnostic check before leaving the area. |

**Table 1.5.6. Facilities Maintenance Checklist**

| Item/Task | Period |
|---|---|
| **EXTERNAL SURFACES** | |
| Corrosion, Removal & Treatment | Semiannually (para 1.5.3.4) |
| Fasteners, tighten | Semiannually |
| Paint | Yearly |
| **FOUNDATIONS** | |
| Condition | Yearly |
| **FENCING** | |
| Condition | Yearly |
| Paint | Yearly |
| **SIGNAGE** | |
| Condition | Yearly |
| Paint | Yearly |
| **LIGHTNING PROTECTION SYSTEM** | |
| Condition (visual inspection) | Semiannually |
| **ROADS AND WALKWAYS** | |
| Condition | Yearly |
| Snow removal | Quarterly (in season) |
| **LAND** | |
| Ground cover | Yearly |
| Grass height | Quarterly (in season) |
| Snow removal | Quarterly (in season) |
| **ELECTRICAL EQUIPMENT AND CABLES** | |
| Condition (visual inspection) | Semiannually |
| Operation | Quarterly |

$

**Table 1.5.7. Cleaning Procedure**

| Step | Procedure |
|---|---|
| | **WARNING**<br>Ensure that power has been removed from a peripheral device before cleaning the device.<br><br>Tools and Material Required:<br>Hand-held vacuum cleaner<br>Mild detergent and water<br>Lint-free cloths |
| | **NOTE**<br>Wring out the cloth before washing the screens. |
| 1 | Using soft cloth dampened with a mixture of mild detergent and water, clean CRT and display screens and external cases of the peripheral devices. Using lint-free cloth, dry screens and cases. |
| 2 | Using small hand-held vacuum cleaner, remove dust from the OID keyboard and the printer. |

**Table 1.5.8. Corrective Maintenance Symptom Analysis**

| Symptom | What To Do | How To Do It |
|---|---|---|
| **SYSTEM/ACU** | | |
| System is completely dead. | Check ac and dc power. | Reference ACU ac/dc power distribution diagram (Figure 2.4.12) and verify presence of ac and dc voltages. |
| Problem with ACU uninterruptible power supply (UPS) in Class II system. | Check UPS. | Paragraph 2.5.3.2 |
| ACU computer does not initialize. | Check VME card rack. | Paragraph 2.5.3.3 |
| Loss of ACU/DCP communications. | Check ACU/DCP communication link. | Paragraph 2.5.3.4 |
| Failure of an SIO board or loss of communication with a peripheral or user. | Check SIO boards. | Paragraph 2.5.3.5 |
| Printer malfunction | Check printer. | Refer to printer vendor manual. |
| **DCP** | | |
| DCP is completely dead. | Check ac and dc power. | Reference DCP ac/dc power distribution diagram (Figure 3.4.8) and verify presence of ac and dc voltages. Check fuses on DC Power Distribu-tion Assembly A4A1. |
| Problem with DCP UPS in Class II system. | Check UPS. | Paragraph 3.5.3.2 |
| DCP computer will not initialize. | Check VME cards. | Paragraph 3.5.3.3 |
| DCP cabinet overheats or becomes too cold. | Check DCP heater circuit. | Paragraph 3.5.3.4 |
| **CEILOMETER** | | |
| Sensor will not respond. | Check fiberoptic modules.<br>Troubleshoot sensor. | Paragraph 1.5.3.3<br>Paragraph 9.5.3.2 |
| **PRESENT WEATHER SENSOR** | | |
| Sensor will not respond. | Check fiberoptic modules.<br>Troubleshoot sensor. | Paragraph 1.5.3.3<br>Paragraph 7.5.3 |
| **PRESSURE SENSORS** | | |
| All three pressure sensors read incorrectly. | Clean pressure port. | Paragraph 8.5.2.2 |
| One or two pressure sensors read incorrectly. | Replace faulty sensor(s). | Paragraph 8.5.5 |
| Sensor will not respond. | Troubleshoot sensor. | Paragraph 8.5.3.2 |
| **TEMPERATURE/DEWPOINT SENSOR** | | |
| Sensor will not respond. | Check fiberoptic modules.<br>Troubleshoot sensor. | Paragraph 1.5.3.3<br>Paragraph 5.5.3.2 |
| **THUNDERSTORM SENSOR** | | |
| Sensor will not respond. | Check fiberoptic modules.<br>Troubleshoot sensor. | Paragraph 1.5.3.3<br>Paragraph 16.5.3.2 |
| **TIPPING BUCKET** | | |
| Sensor fails to report rain accumulation. | Test rain gauge. | Paragraph 10.5.3.2 |
| **VISIBILITY SENSOR** | | |
| Sensor will not respond. | Check fiberoptic modules.<br>Troubleshoot sensor. | Paragraph 1.5.3.3<br>Paragraph 6.5.4 |
| **WIND SENSOR** | | |
| Sensor will not respond. | Check fiberoptic modules.<br>Troubleshoot sensor. | Paragraph 1.5.3.3<br>Paragraph 4.5.3.2 |

### 1.5.4 CORRECTIVE MAINTENANCE

1.5.4.1 **Introduction**. Corrective maintenance involves the isolation, removal, and replacement of faulty FRU's. The ASOS is equipped with a powerful automatic self-test program designed to isolate most faults to a single FRU. However, due to system hardware configuration, there will be instances when the diagnostics can only isolate to a group of FRU's, such as a sensor or an I/O channel. Obviously, the troubleshooting approach for these two types of conditions is very different. When the FRU is specifically called out, the technician need only replace the faulty unit. When a group of FRU's is called out, the technician must isolate the failed FRU by referencing the theory of operation and associated drawings and following two basic procedures.

The first procedure involves connector checks that ensure that all boards, cables, and connectors are present and properly connected. The second procedure involves ac and dc power supply tests. Although the system monitors all critical power supply voltages in the ACU, DCP, and sensors, failure of a power supply may result in a loss of communications between the circuit powered by that supply and the rest of the system. Power supplies are tested by both visual and mechanical inspection. Before measuring any voltages, the technician should visually inspect the suspected area for obvious signs of power supply failure. During this inspection, the technician should pay particular attention to circuit breakers, panel lights, and light emitting diode (LED) indicators on the units to ensure that they are functioning normally. The physical checks involve checking fuses and the power supply voltages using a digital multimeter (DMM). In most cases, these tests isolate the fault.

To ensure proper operation of the system, the technician must allow the ASOS to automatically initialize upon the application of primary power to the ACU and verify that the continuous self-test diagnostics run without failure. Table 1.5.8 provides corrective maintenance symptom analysis information.

1.5.4.2 **System Diagnostics**. The system diagnostics run continuously in the background of the ASOS operating software. The diagnostics complete a check of the entire system every 7 minutes. The test data received via the diagnostic program are displayed on the technician interface screens. These screens are described in Section III of this chapter. Error messages are also entered into the system log and printed on the printer.

1.5.4.3 **Fiberoptic Module Test**. The DCP communicates with its sensors via fiberoptic data links. The ACU can also support up to three local sensors via fiberoptic links. Each fiberoptic link is made up of a fiberoptic module in the DCP (or ACU), a corresponding module in the sensor, and two fiberoptic cables connecting the two fiberoptic modules. The fiberoptic modules in the DCP (or ACU) and the sensors convert electrical RS-232 serial data to optical data and vice versa. The fiberoptic links are not tested automatically by the CST and must therefore be tested manually using an RS-232 test tool to check the electrical data paths. Data communication for all sensors except the model HO83 temperature/dewpoint sensor and the rain gauge is half-duplex. That is, the DCP first polls the sensor and the sensor then returns the requested data. Table 1.5.9 provides a procedure to manually test a fiberoptic link for the half-duplex communications links. The HO83 data link is simplex (one-way only) communication. This sensor outputs data to the DCP (or ACU) on a regular basis. The DCP (or ACU) then simply receives and processes the data. The procedure to test an HO83 data link is provided in table 1.5.10. The rain gauge is not digital communications at all. Rather, the rain gauge simply outputs an optical pulse to the DCP for each tip of its tipping bucket. The rain gauge fiberoptic link is tested as part of the overall sensor test (described in paragraph 10.5.3).

1.5.4.4 **Fiberoptic Cable Replacement**. During initial installation, fiberoptic cable lengths were custom cut to lengths required to run between the sensor and the ACU/DCP or Single Cabinet ASOS (Figure 1.5.1). Replacement fiberoptic cables are available in standardized lengths (Table 1.5.11). When fault isolation identifies the fiberoptic cable as the failure, the technician refers to table 1.5.12 to remove the defective fiberoptic cable, measures the fiberoptic cable length, and round the length up to the nearest standard cable length as identified in table 1.5.11. At most sites, a maximum of two standard cables can be joined using the fiberoptic joiner (62828-90432) to achieve the required length. At sites with a remote wind sensor group, up to three cables can be joined.
The replacement fiberoptic cable part numbers are identified as 62828-42100-XX where XX is the length of the cable (-10, -15, -20, -30, -40, -50, -100 for 10', 15', 20', 30', 40', 50' and 100' respectively). As an example, the fiber optic cable length for a rain gauge mounted on pedestal number 6 is 27.5'. After rounding up to the nearest standard length, the 62828-42100-30 (30 foot) fiberoptic cable is selected as the replacement cable. $

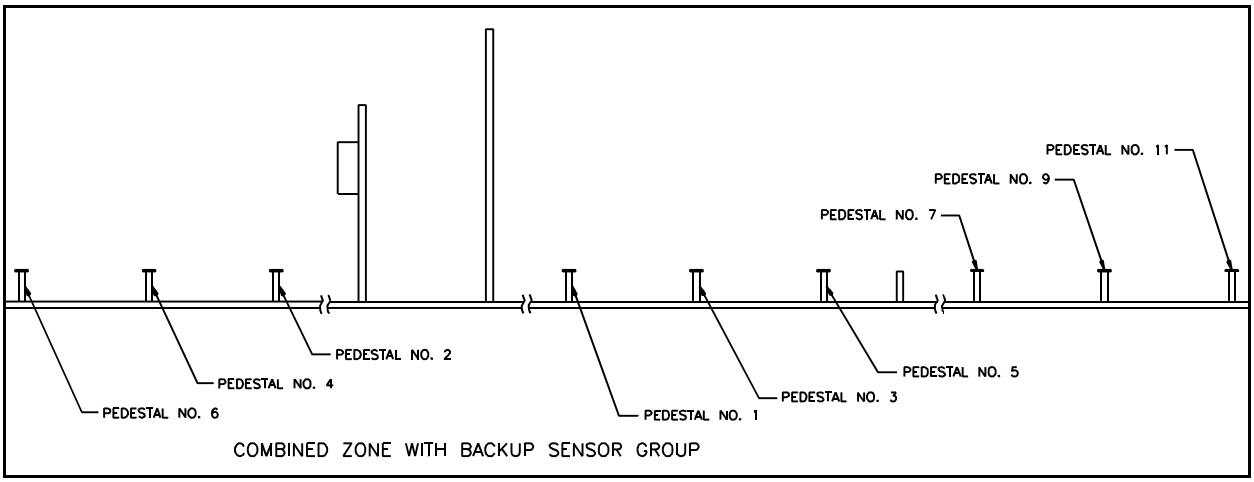


**Figure 1.5.1. Combined Zone Pedestal Locational**

**Table 1.5.9. Fiberoptic Link Testing - Half-Duplex Link**

| Step | Procedure |
|---|---|
| 1 | At the OID, access sensor configuration screen. If the failing sensor is associated with a remote DCP, determine the serial I/O (SIO) port to which the sensor is assigned. Refer to the list of Port Assignments for DCP SIO Boards (Chapter 3, Section IV) to identify the corresponding fiberoptic module. If the failing sensor is associated with the ACU, use this screen to identify the corresponding ACU fiberoptic module. |
| 2 | At DCP (or ACU), connect RS-232 test tool (Figure 1.5.2) in line with fiberoptic module (DTE to modem) for failing sensor (between fiberoptic module and corresponding DB-9 connector from cabinet harness). |
| 3 | On RS-232 test tool, verify periodic RxD signal activity from SIO board. If no activity, problem is in SIO board in DCP (or ACU). If activity is present, proceed to step 4. |
| 4 | On RS-232 test tool, verify TxD signal activity from fiberoptic module. If TxD signal is active, problem is in SIO board. If no activity is present, proceed to step 5. |
| 5 | Remove RS-232 test tool from fiberoptic module and reconnect DB-9 connector to module. |
| 6 | At failing sensor, connect RS-232 test tool in line with the sensor fiberoptic module (DTE to modem) between fiberoptic module and corresponding DB-9 connector from cabinet harness. |
| 7 | On RS-232 test tool, verify periodic activity on TxD signal from fiberoptic module in DCP (or ACU). If signal is active, continue with step 8. If signal is not active, proceed to step 9. |
| 8 | On RS-232 test tool, verify periodic activity on RxD signal from sensor. If no activity, problem is in sensor serial data interface circuits. If both TxD and RxD signals are active, proceed to step 9. |
| 9 | Remove RS-232 test tool from sensor fiberoptic module and reconnect DB-9 connector to module. One at a time, remove and replace the following units and retest system until the problem is corrected:<br>a. Fiberoptic module in DCP (or ACU)<br>b. Fiberoptic module in sensor<br>c. Fiberoptic cable |

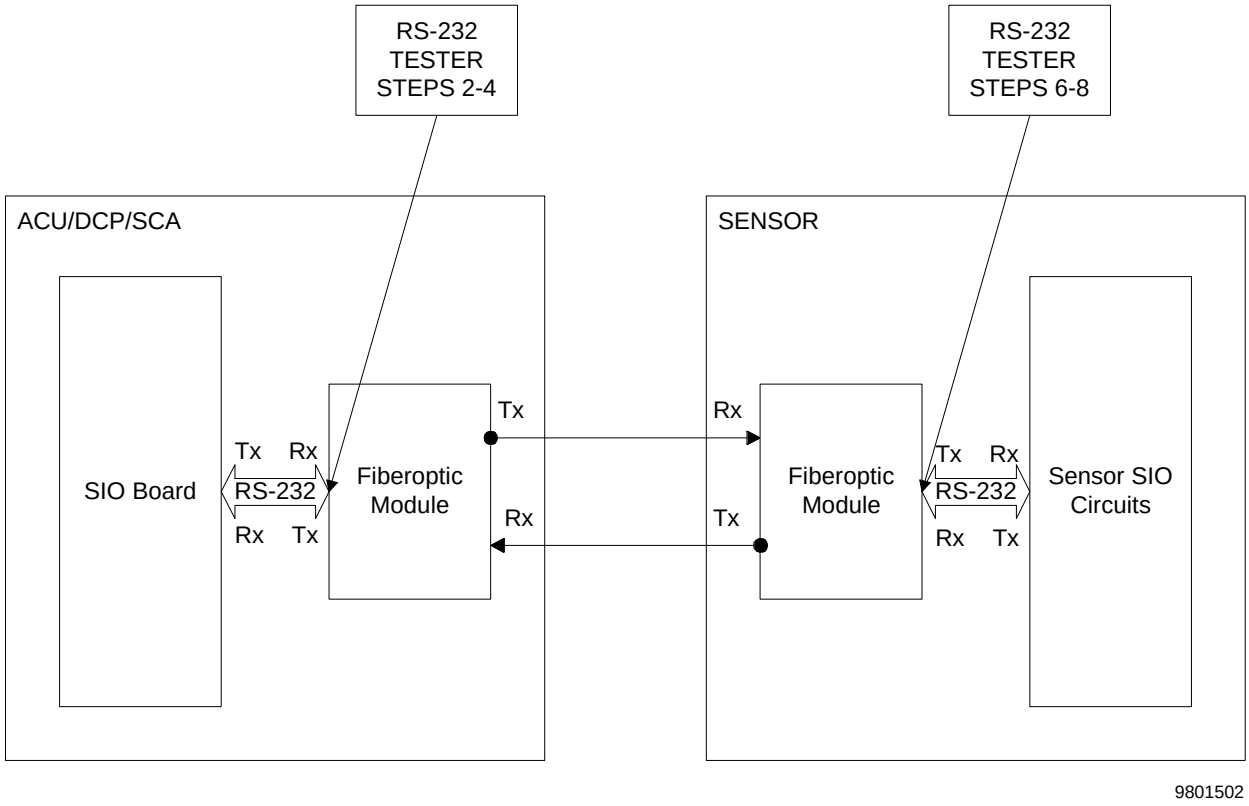


**Figure 1.5.2. Fiberoptic Link Testing - Half-Duplex Link**

**Table 1.5.10. Fiberoptic Link Testing - HO83 Link**

| Step | Procedure |
|---|---|
| 1 | In the HO83 sensor, connect RS-232 test tool in line with sensor fiberoptic module (between fiberoptic module and corresponding DB-9 connector from cabinet harness). |
| 2 | Verify periodic activity of RxD signal on RS-232 test tool. If signal is active, proceed to step 3. If not, problem is in serial data interface in HO83 sensor. |
| 3 | Remove RS-232 test tool from HO83 fiberoptic module and reconnect DB-9 connector to module. |
| 4 | At OID, access sensor configuration screen. If HO83 sensor is associated with a remote DCP, determine SIO port to which the sensor is assigned. Refer to the list of Port Assignments for DCP SIO Boards (Chapter 3, Section IV) to identify the corresponding fiberoptic module. If HO83 sensor is associated with the ACU, use this screen to identify the corresponding ACU fiberoptic module. |
| 5 | In DCP (or ACU), connect RS-232 test tool in line with fiberoptic module for HO83 sensor (between fiberoptic module and corresponding DB-9 connector from cabinet harness). |
| 6 | Verify periodic activity of TxD signal on RS-232 test tool. If signal is active, problem is in DCP (or ACU) SIO board. If signal is not active, proceed with step 7. |
| 7 | Remove RS-232 test tool from fiberoptic module and reconnect DB-9 connector to module. One at a time, remove and replace the following units and retest system until the problem is corrected:<br>a. Fiberoptic module in DCP (or ACU)<br>b. Fiberoptic module in sensor<br>c. Receive fiberoptic cable between DCP (or ACU) and sensor. |

**Table 1.5.11. ASOS Fiberoptic Cables**

| Pedestal | Typical Sensor | Req. Length | New Length | New Part Number (Ref Des) | Old Part Number (Ref Des) |
|---|---|---|---|---|---|
| 6 | Rain Gauge | 27.5' | 30' | 62828-42100-30 (W120) | 62828-42040-60 (W23) |
| 4 | Temp/Dew | 25.5' | 30' | 62828-42100-30 (W118) | 62828-42040-40 (W21) |
| 2 | LEDWI | 18' | 20' | 62828-42100-20 (W116) | 62828-42040-20 (W19) |
| N/A | Thunderstorm | 8' | 10' | 62828-42100-10 (W124) | N/A |
| 1 | Ceilometer | 19.5' | 20' | 62828-42100-20 (W115) | 62828-42040-10 (W18) |
| 3 | Freezing Rain | 25.5' | 30' | 62828-42100-30 (W117) | 62828-42040-30 (W20) |
| 5 | Visibility | 28' | 40' | 62828-42100-40 (W119) | 62828-42040-50 (W22) |
| N/A | Wind | 26' | TBD | 62828-42100-xx (W121) | 62828-42040-80 (N/A) |
| 7 | Ceilometer | 36.5' | 50' | 62828-42100-50 (W122) | N/A |
| 9 | Reserved | 42.5' | 50' | 62828-42100-50 | N/A |
| 11 | Visibility | 48' | 50' | 62828-42100-50 (W123) | N/A |

**Table 1.5.12. Fiberoptic Cable Replacement**

| Step | Procedure |
|---|---|
| | Fiberoptic Cable Removal |
| | Tools required:<br>Small flat-tipped screwdriver<br>No. 1 Phillips screwdriver<br><br>**WARNING**<br><br>Death or severe injury may result if power is not removed from cabinet prior to maintenance activities. Ensure that UPS POWER switch is set to 0 (off) position and facility power is removed from cabinet. |
| 1 | If applicable, set UPS POWER switch to off (0) position. |
| 2 | Set primary Circuit Breaker Module to OFF position. |
| 3 | At ac junction box, remove facility power from equipment cabinet by setting cabinet circuit breaker to off. |
| 4 | Using Phillips screwdriver, remove 22 screws and flat washers securing shielded cover assembly to Faraday box. Lower Faraday box cover. |
| 5 | Accessing underside of fiberoptic module through Faraday box, disconnect fiberoptic transmit (TX) and receive (RX) cables. |
| 6 | Remove fiberoptic cable from cabinet. |
| 7 | At the sensor associated with the faulty fiberoptic cable, access underside of fiberoptic module and disconnect fiberoptic transmit (TX) and receive (RX) cables. |
| 8 | Remove fiberoptic cable from sensor. |
| 9 | Remove fiberoptic cable from raceway. |
| 10 | Measure length of faulty fiberoptic cable, round the length up to the nearest standard cable length as identified in the parts list and order replacement cable. |

**Table 1.5.12. Fiberoptic Cable Replacement -CONT**

| Step | Procedure |
|---|---|
| | **FIBEROPTIC CABLE INSTALLATION** |
| | Tools required:<br>Small flat-tipped screwdriver<br>No. 1 Phillips screwdriver<br><br>**WARNING**<br>Death or severe injury may result if power is not removed from cabinet prior to maintenance activities. Ensure that UPS POWER switch is set to 0 (off) position and facility power is removed from cabinet.<br><br>**NOTE**<br>Replacement fiberoptic cables must be properly marked prior to installation. |
| 1 | At equipment cabinet end of the replacement fiberoptic cable, apply the appropriate information to the wrap around tags using the following definitions:<br><br>a. On marker FOM#: line, write three letter code for ACU, DCP, or SCA followed by the fiberoptic modem number (1-3 for ACU, 1-16 for DCP, 1-13 for SCA).<br><br>b. On marker SENSOR: line, write two character software code for sensor as follows:<br>C1, C2, C3 for Ceilometer 1 thru 3<br>V1, V2, V3 for Visibility 1 thru 3<br>PW for Present Weather<br>FR for Freezing Rain<br>WS for Wind Sensor<br>TD for Temperature/Dewpoint<br>TB for Tipping Bucket<br>TS for Thunderstorm<br><br>c. On marker COUPLED? Y N line, circle Y if replacement cable uses two cables connected by a fiberoptic joiner or circle N if one cable is used. |
| 2 | Repeat step 1 for sensor end of replacement fiberoptic cable. |
| 3 | If applicable, at UPS, ensure that UPS POWER switch is set to off (0) position. |
| 4 | Ensure that power is removed from equipment cabinet. |
| 5 | **CAUTION**<br>Bending the fiberoptic cable during installation beyond the minimum bend radius of 1.8 inches could damage the cable. The minimum bend radius for long term storage is 1.2 inches. Ensure that the minimum bend radius is not exceeded.<br><br>**NOTE**<br>If two standard fiberoptic cables are joined to form the replacement cable, connect TX to RX at each fiberoptic joiner (62828-90432).<br><br>Couplers, if used, must be installed in an area that will not contact standing water.<br><br>Route replacement fiberoptic cable between sensor and equipment cabinet. Ensure that sufficient length of cable remains at each end to connect to the fiberoptic modems. Store excess cable in Faraday box, raceway, or sensor as applicable. |
| 6 | At sensor, using tags as a guide, connect fiberoptic TX and RX cables to module connector. |
| 7 | At equipment cabinet, using tags as a guide, connect fiberoptic TX and RX cables to appropriate module connector though opened Faraday box. |
| 8 | Using Phillips screwdriver, install screws and flat washers securing shielded cover assembly to Faraday box. |
| 9 | Apply facility power to equipment cabinet by setting circuit breaker in ac junction box to on position. |
| 10 | Set primary Circuit Breaker Module to ON position. |
| 11 | If applicable, set UPS POWER switch to 1 (on) position. |