NWSREP'S

FISCHER–PORTER REBUILD (FPR-E)

OPERATIONS MANUAL

SEPTEMBER 2011

U.S. Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service - Cooperative Weather Observer Program
Observing Services Division - W/OS7

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CHAPTER 1 - IMPLEMENTATION RESPONSIBILITIES:

1.1 NWS Headquarters:

The Fischer-Porter Rebuild (FPR-E) is a modified configuration for the existing Fischer & Porter (F&P) gauges and the NWS implementation plan is modeled according to the ***FPU Operational Implementation Plan***. For background on F&P modernization management, you are encouraged to read the ***COOP FPU Implementation Plan Text*, April 28. 2005.** It is accessible on; http://www.nws.noaa.gov/ops2/Surface/coopimplementation.htm in the folder marked, Fischer Porter Upgrade (FPU).

The NWSREP assembles the FPR-E in his/her WFO and then installs it at the designated COOP site. A site installation instruction handbook, ***FPR-E Assembly Procedures,*** shall be used by the NWSREP. It is located via: http://www.nws.noaa.gov/ops2/Surface/coopimplementation.htm, in the folder marked "FPR-E Fischer-Porter Rebuild (CES)".

The FPR Kit will come delivered to your WFO with the ***FPR Kit Operations and Maintenance Manual (2010)*** published by Coastal Environmental Systems, Inc. (CES).

The NWS Office of Operational Systems (OPS22) in 2008 implemented an interactive web-based Geographic Information Systems (GIS) to display the locations and COOP Site Identifiers for the F&P network of approximately 2,300 sites. See: http://www.gis.srh.noaa.gov/.

1.2 Regional Headquarters:

Your Regional Cooperative Program Manager (RCPM) coordinates with NWSHQ to identify candidate COOP Stations to receive the FPR-E modification. Changes to the designated site list are authorized by the Observing Services Division (OS7). The OS7 coordinates changes with the RCPM for the selection of sites to receive the FPR kit.

The NWS HQ prioritizes WFOs with the greatest number rain gauges to install (i.e., 42 gauges in the Ft. Worth county warning area). The goal of FPR-E implementation is to have delivered and implemented all 940 kits by Sep 30, 2012, per agreement with the National Climatic Data Center.

The Regional COOP Managers participate in monthly conference calls with OS7 to learn of engineering, procedural, and schedule issues that affect the rate of deployment. Peak rate of deployment will not exceed 200 FPR Kits per month, nor exceed 21 kits per forecast office.

1.3 Field Offices:

The National Weather Service Representatives (NWSREP) receives from the RCPM a Pre-Implementation Worksheet (PIW) in the form of an Excel spreadsheet, at least one month in advance of the equipment delivery date. Approval of equipment delivery is made in a Conference Call attended by the NWSREP and RCPM, in which the completed PIW is the subject of review and approval. The NWSREP will receive the FPR-E kits within one week of the Conference Call.

The NWSREP coordinates with Cooperative Observer to schedule a date for the FPR installation work and make time to give the Observer a tutorial in FPR operations. Update your Observer on your planned schedule, at least 14 days in advance. Explain to your Observer how the FPR-E is very easy to operate and how your hands-on tutorial should take just 30 minutes. If practical, mail your Observer a printed copy of the ***FPR-E Observer Instruction*** booklet, two weeks in advance of your visit, so s/he understands the concept of operations.

Receive FPR-E Kit, disassemble F&P gauge, assemble FPR-E gauge in your field office.

Each FPR-E Kit will arrive at your WFO in <u>one</u> cardboard box with an interior paper wrap.

- Main box: Zeno Assembly (data logger), Load Cell with mounting hardware, S-Hook, Solar Panel with cable, solar panel mounting hardware, USB Flash Drive, and FPR Kit Operations and Maintenance Manual.

- Interior paper wrap: 12V Battery (4 lbs).

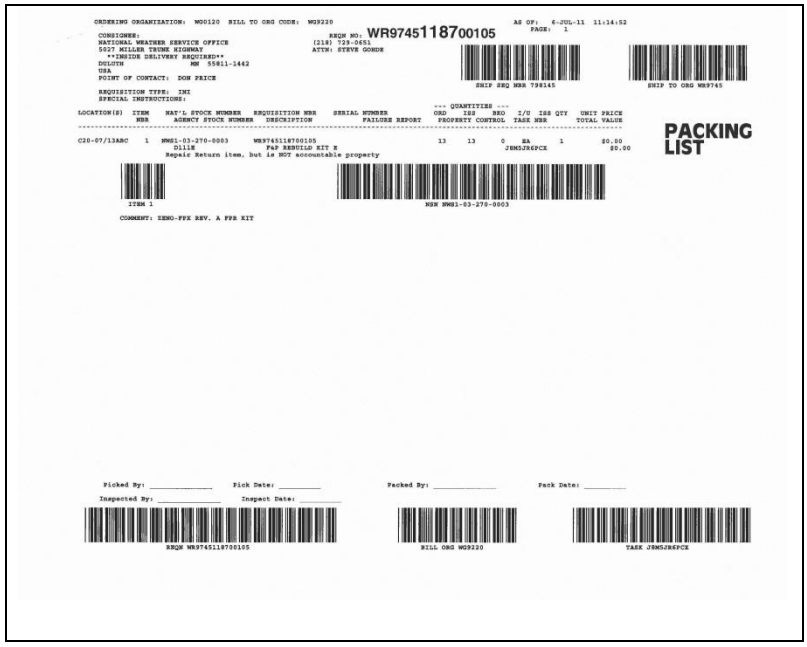
ORDERING ORGANIZATION: WS0120 BILL TO ORG CODE: WS9220
AS OF: 6-JUL-11 11:14:52
PAGE: 1
CONSIGNEE:
NATIONAL WEATHER SERVICE OFFICE
5027 MILLER TRUNK HIGHWAY
INSIDE DELIVERY REQUIRED
DULUTH MN 55811-1442
USA
POINT OF CONTACT: DON PRICE
REQUISITION TYPE: INI
SPECIAL INSTRUCTIONS:
REQN NO: WR9745118700105
(218) 729-0451
ATTN: STEVE GONDE
SHIP SEQ NBR 798145
SHIP TO ORG WS9745
LOCATION(S) ITEM NBR | NAT'L STOCK NUMBER / AGENCY STOCK NUMBER | REQUISITION NBR / DESCRIPTION | SERIAL NUMBER / FAILURE REPORT | QUANTITIES ORD ISS BAO / PROPERTY CONTROL | I/U ISS QTY / TASK NBR | UNIT PRICE / TOTAL VALUE
C20-07/13ABC 1 NWS1-03-270-0003 WR9745118700105 13 13 0 EA 1 $0.00
D11LN F&P REBUILD KIT E J8M5JR6PCX $0.00
Repair Return item, but is NOT accountable property
PACKING LIST
ITEM 1
NSN NWS1-03-270-0003
COMMENT: ZENO-FPX REV. A FPR KIT
Picked By: _____ Pick Date: _____ Packed By: _____ Pack Date: _____
Inspected By: _____ Inspect Date: _____
REQN WR9745118700105
BILL ORG WS9220
TASK J8M5JR6PCX

Fig 1.1 NLSC packing slip affixed to each FPR-E Kit.

After you have installed the FPR Kit to the Cooperative Observer site and updated the Station Information Report (Form B-44), transmitted the ZIP file, and confirmed NCDC ingested the individual TXT files, you are ready to certify the FPR-E system as 'operationally implemented.'

MIC signs the ***FPR Operational Implementation*** (OI) Certificate to signal the completion of all FPR upgrade activity and successful operation of data logging in the county warning area.

When all FPR-E rain gauges are installed, the NWSREP may issue a single Public Information Statement (PNS) to inform the user community. Instructions for issuing a PNS are found in NWSI 10-1805, *Service Outreach*. A hypothetical PNS for Elko is given in Figure 1.6.

1.4 Records Retention Policy for FPR:

The following data records and procedural documents for FPR-E shall be saved by the WFO:

- FPR-E monthly files (e.g., Z5678AHA.txt) for at least 12 months on the network workstation.

- Any *FPR Log Sheet*, or any *30-Day Evaluation Report*, keep a printed or an electronic copy (i.e., optical scan of printed form) at WFO for 12 months.

- The *30-Day Evaluation Report* and the *Operational Implementation Checklist – Part B* – keep at WFO for 6 months.

- Bookmark: http://www.nws.noaa.gov/ops2/Surface/coopimplementation.htm for ready access to FPR-E manuals and FPR-E policy directives issued by NWS headquarters.

1.5 FPR-E CONFIGURATION REQUIREMENTS:

1.5.1 Precipitation Gauge Type:

The modernization to FPR-E (Coastal Environmental Systems, Inc.) configuration shall be made only upon the Fischer-Porter/Belfort punch tape model, as identified in your CSSA equipment description as, "F&P Modification 6, Model 3." There are approximately 940 of the legacy rain gauges sited in the CONUS that are qualified for the FPR-E retrofit.

You may not request an FPR-E modification for any F&P that operates with the following:

- Shaft Encoder with Data Telemetry Device
- Fischer-Porter Upgrade (FPU) * [* Ten sites in New England are exempt]

1.5.2 Laptop / Netbook Requirement for Calibration and On-Site Maintenance:

The FPR-E requires a portable computer (i.e. laptop) to conduct all calibration resets of the weighing sensor and any to achieve any type of configuration or firmware updates.

The NWS Headquarters (NWSHQ) appropriated funds to the four conterminous regions to finance the purchase of Netbooks/Laptops to serve the FPR-E equipment (i.e., 41 offices). The funds amount to $550 for one Netbook/Laptop. .

The minimum requirements for a Netbook/Laptop to serve the FPR-E/COOP maintenance are:

- Windows 7 Enterprise Operating System is required with Bitlocker that overrides the Safeboot application. Requires a Microsoft Software Assurance (SA) license. http://www.microsoft.com/licensing/about-licensing/windows7.aspx#tab=3

- Hardened metallic case with durable hinges

- USB to Serial DB-9F Connection With Null Modem (mark the cable 'Null-Modem Cable')
- Install HyperTerminal to Netbook. Ask ITO for assistance, use Windows XP
- Capability to Link-to-Network
- AutoUpdate via Network – No expense software
- Maintenance/ Repair Coverage by Existing Enterprise Software License
- Battery Life, 4.5 to 10 hours

1.5.3 Precipitation Data Transfer onto:

Instruct your Observer on how to use a Flash Drive to transfer his data to you each month, via United States Postal Service (USPS) mail.

Establish strict logistics management of all your sites Flash Drives through use of a Flash Drive Log Sheet posted in your WFO.

Offer your observers the opportunity to email the monthly precipitation data to your NWSREP email address. See qualifications for email participation, found in Section 1.3.10 of this manual.

Note: Each Observer is issued just one Flash Drive by the NWSREP at the time of installation when he trains the Observer. The NWSREP must have one spare Flash Drive for each Observer who reports data in this mode, and to place it into circulation when needed.

1.5.4 Virus Scanning of External Flash Drives:

Each Weather Forecast Office (WFO) has an Information Technology Officer (ITO) whose responsibility it is to conduct virus/malware scans of all external sourced media. The ITO manages a secure platform and ensures routine updates of the McAfee Active Virus Defense (AVD) dat files.

The flash drives submitted by the COOP Observers for delivery of the FPR-E precipitation data are considered externally sourced media.

Therefore, follow your office's ITO security policy as it applies to the FPR-E flash drives that arrive each month.

If your ITO scans the flash drives, then ensure s/he communicates this action to you. Create an accurate account of which flash drives have been scanned and saved to the WFO workstation.

If a flash drive is detected with malware or a virus, notify your ITO and regional IT system security officer.

If malware or virus is detected, and your ITO authorizes so, you may dispose of the flash drive according to National Institute of Standards and Technology (NIST) policy, NISTS P800-88, revision 1. The policy directive is accessed: http://csrc.nist.gov/publications/nistpubs/800-88/NISTSP800-88_rev1.pdf .

1.5.5 Precipitation Data File Storage Standard:

Each month, the NWSREP shall copy the most current month's file in the Observer's Flash Drive (as determined by the TXT file's filename), onto the WFO workstation. The copied file shall be saved to a dedicated permanent directory with a sub-directory structure that is organized by year and month (e.g., c:\hpd\2011\june\ ) for at least 12 months. See Chapter 2.2.3, in this manual for specific instructions.

1.5.6 Precipitation Data Reporting to NCDC

The NCDC, Climate Data Division, Data Ingest and Processing Branch (E/CC11), instructs each WFO to use these software and network standards to prepare and transmit monthly FPR data:

- File compression (ZIP) software, WINZIP32.EXE
- File Transfer Protocol (FTP) executable file, WSFTP95.EXE
- NOAA/NWS Enterprise Network Connection (NOAA Compliant Terminal in WFO), only

1.5.7 Precipitation Data Quality Assurance NCDC

The NCDC quality controls your station's files to prepare the FPR data for publication so the FPR data appear in the same publication, same quality control flags, and same units of measure as the F&P data.

Note: The NCDC ingests, quality controls, collates and converts FPR data and produces an Hourly Precipitation Data (HPD) product some 6 months after the precipitation was measured. At this later time you may view the precipitation data online in the NCDC monthly, ***Hourly Precipitation Data***, on http://www7.ncdc.noaa.gov/IPS/hpd/hpd.html.

1.6 IMPLEMENTATION CHECKLIST TASKS:

Ensure that you have accessed the June 2011 version of the NWS Operational Implementation Checklist. It is accessible on the NWSHQ webpage, and Click on the document titled, 'OI Check List – FPR-E.' See http://www.nws.noaa.gov/ops2/Surface/coopimplementation.htm .

1.6.1 Training the Observer in Basic FPR Operations and Maintenance

All training for authorized operators and maintenance personnel will be completed prior to operational implementation. Training materials are accessed from NWS Headquarters webpage; http://www.nws.noaa.gov/ops2/Surface/coopimplementation.htm.

The NWSREP delivers to the COOP Observer one printed copy of ***FPR Observer Instructions*** and at least one printed copy of the ***FPR Log Sheet***. The NWSREP may provide additional printed guidance, yet it should follow the instructions made available on the NWSHQ webpage.

No later than the day of operational implementation, NWSREP trains, witnesses, and validates (i.e., documents) that his Observer has been trained on the FPR-E.

Maintenance training for NWSREPS will be the responsibility of the National Weather Service Training Center (NWSTC) and offered through training modules or the COOP training course.

NWSHQ over the course of time may issue specific updates to its 'FPR-E Observer Instructions' or the 'FPR Log Sheet' template to aid the Observer. The NWSREP is authorized to provide on-site observer training in the operation and simple maintenance (i.e., non-electrical) of the FPR-E equipment. If so delegated, the NWSPEP will provide the Observer these documents:

- *FPR-E Operations Manual*, (July 2011), printed from headquarters web-site.
- *FPR-E Observer Instructions*, (May 2011), printed from headquarters web-site.

National Weather Service - Cooperative Observer Program

FPR-E OPERATIONAL IMPLEMENTATION CHECK LIST

Planned Product Improvement: __Fischer-Porter Rebuild (FPR-E)__.

COOP Site (SID, Name, State): _____

NWSREP Completing this Check List: _____**Date:** _____

Item #	Item Description	OPR	Date
1.	**FPR Operational Support Activities**		
a.	Select F&P sites to rebuild in 'FPR Designated Sites Spreadsheet.'	OPL	
b.	Submit 'FPR Pre-Implementation Worksheet' with projected dates.	OPL	
2.	**FPR Installation Activities**		
a.	Assemble FPR-E Kit in field office, or if necessary at the COOP site.	OPL	
b.	At COOP site retrieve all B-18 punch tape from gauge. Separate the partial month (ended on installation day) from last whole month.	OPL	
c.	Install / Checkout FPR-E according to *FPR-E Assembly Procedures*.	OPL	
3.	**FPR Monitoring and Coordination Activities**		
a.	Generate a Site Inspection Report in CSSA.	OPL	
b.	Submit new B-44 rendition to Workflow within **five days** of installing.	OPL	
c.	Establish a WFO Log Sheet to track Flash Drives / Emails received.	OPL	
4.	**FPR Post-Installation Activities**		
a.	Dispose of old equipment according to *FPR-E Assembly Procedures*.	OPL	
b.	Transmit first month's precipitation data and verify NCDC received TXT files according to *FPR-E Operations Manual*.	OPL	
c.	Decode partial month F&P tape, enter to Form 79-1D, email to Ncdc.	OPL	
d.	FAX the MIC-signed OI Certificate to Tom Trunk (OS7) only after all FPR-Es in your CPA have been implemented by steps listed, above.	OPL	
e.	Transmit a public notification message (PNS) on AWIPS.	OPL	

Fig 1.2 Check List for WFO Action

1.6.2 System Assembly, Installation, and Checkout

Installation and checkout of the FPR-E will be performed in accordance with the ***FPR-E Assembly Procedures,*** on: http://www.nws.noaa.gov/ops2/Surface/coopimplementation.htm . The document was issued by NWS Engineering and Acquisition Branch (OPS11) and is similar in purpose to a Modification Note. The implementation work is conducted in two locations; inside the forecast office and at the COOP site. Each activity will require approximately 3 hours, not including the time to transport the F&P gauge to and from the Observer's site.

Key activities include: (a) modify an F&P unit inside WFO* to create one FPR unit, (b) configure and calibrate the FPR in WFO*, (c) transport FPR to site, (d) remove the F&P from site, (e) replace the F&P assemblies with the FPR-E assemblies, (f) check calibration with five inch equivalent weight with Zeno's display reading, (g) train the Observer on monthly download; and (h) witness the Observer download data to Flash Drive.

Note *: It may not be possible to pre-assemble and calibrate each rain gauge inside the WFO when two or more rain gauges will be installed on a given road trip. Instead, the NWSREP should work at the COOP site to install the FPR-E hardware, enter SID metadata, and calibrate the sensor.

1.6.3 Ensure Continuity of Precipitation Records – WS Form 79-1D

The National Climatic Data Center (NCDC) has just one method to ingest the precipitation data from the F&P paper tapes when the same observation month will contain electronic data from the FPR-E. The NCDC relies on the WS Form 79-ID to account for what the paper tape recorded in the days or weeks prior to the FPR-E being installed.

If you installed the FPR-E on August 17, then decode just the days August 1 through Aug 17, inclusive. If your installation date was August 5, then you only have to decode August 1 through August 5, inclusive.

Instructions for decoding the paper tape are found on the NWS Training Center's web site.

http://www.nwstc.noaa.gov/DATAACQ/d.CPM/PuncTape.HTML

Obtain the partial-month B-18 and locate the 12AM to 1AM division for the first day of the month. There are four 15-minute records per hour, decode just the one record closest to the top of the hour for each of the 24-hour divisions.

Thus, decode every *fourth* 15-minute record. Subtract the 12AM value from the 1AM value and enter it to the '1AM' cell in the Form 79-1D table. Repeat this process for each hour in the B-18, up to the final full hour's record.

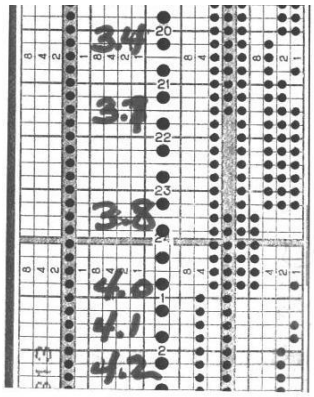

Fig 1.3 WS Form B-18 (Punch Tape)

Obtain a new copy of the WS Form 79-1D from the NWS COOP modernization web site: http://www.nws.noaa.gov/ops2/Surface/Coopimplementation.htm. It is located among the FPR-E assembly and operations documents.

The spreadsheet will add each hour's value, across the row, and produce a daily-total amount in the 'TOTAL' column on the right side of the table.

NOAA Form 79-ID — U.S Department of Commerce — STATION NUMBER 40-5956

August 2001 — National Oceanagraphic and Atmospheric Administration

Environmental Data and Information Service — STATION NAME MemphisWFO

National Climatic Data Center

HOURLY PRECIPITATION — MONTH MAY — YEAR 2005

Recorded by a F&P Weighing Rain Gauge

Date	1 AM	2 AM	3 AM	4 AM	5 AM	6 AM	7 AM	8 AM	9 AM	10 AM	11 AM	NOON	1 PM	2 PM	3 PM	4 PM	5 PM	6 PM	7 PM	8 PM	9 PM	10 PM	11 PM	MID	TOTAL	Date
1																									0.00	1
2																									0.00	2
3																									0.00	3
4																									0.00	4
5																									0.00	5
6																									0.00	6
7																									0.00	7
8																									0.00	8
9							0.1					0.1	0.1												0.30	9
10																									0.00	10
11																									0.00	11
12																									0.00	12
13															0.1										0.10	13
14						0.4	0.3																		0.70	14
15											0.1														0.10	15
16																									0.00	16
17																									0.00	17
18																									0.00	18
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27																									0.00	27
28																									0.00	28
29																									0.00	29
30																									0.00	30
31																									0.00	31
Date	1 AM	2 AM	3 AM	4 AM	5 AM	6 AM	7 AM	8 AM	9 AM	10 AM	11 AM	NOON	1 PM	2 PM	3 PM	4 PM	5 PM	6 PM	7 PM	8 PM	9 PM	10 PM	11 PM	MID	TOTAL	Date

Amounts in inches,tenths and hundredths for hour ending at observation time; therefore, time distribution of amounts less than one hundredth of an — 1.20

Times are Local Standard Time (LST)

* Amounts included in following measurement; time distribution unknown

M = No Record

Fig 1.4 Example of a Form 79-1D

Edit the Form 79-1D with a notation, 'END', into the cell that corresponds to the Date and Hour of the paper tape's last full hour of 15-minute data perforations.

Name your Excel spreadsheet file according to this convention: 791D_SSnnnn_MonYY.xls

For example: 791D_405956_JUL11.xls

Then e-mail this 79-ID spreadsheet to NCDC: Joseph.E.Kraft@noaa.gov.

The NWS Training Center (NWSTC) provides us detailed instructions for completing the WS Form 79-1D, (see, Fig 1.5). Reference the Remote Training Module (RTM), page 630-60.

RTM 630-60
Page A-36

NOAA Form 79-1 D.1 DATA SHEET, HOURLY RECORD

Description: The 79-1D.1 is the form normally used by the NWSREP to extract hourly precipitation data from punch tapes if it is unlikely that data can be successfully extracted by NCDC's translator. The 79-1 provides a convenient format for manually extracting precipitation data and recording it for processing at NCDC.

Completion:	Fill in the heading of the form as follows, for:
Station Number:	Give same COOP Index Number as on B-44.
Station Name:	Give same COOP Station Name as on B-44.
Month:	Give the month the precipitation was measured.
Year:	Give the year the precipitation was measured.

For partial month data extractions from tape/chart:

Enter "PARTIAL MONTH" on line below HOURLY PRECIPITATION.

Enter BEGINS: Date/Time in Date row before 1st hourly data entry.

Enter ENDS: Date/Time in Date row after last hourly data entry.

For full month data extraction from tape/chart:

Enter "FULL MONTH" on line below HOURLY PRECIPITATION.

Note that DAYS (1-31) are listed vertically while hours (AM & PM) are listed horizontally across the top of the form. Calculate the differences in punch holes on the punch tape for every consecutive hourly punch (Every 4th punch). Enter this difference in tenths (e.g., 0.3) in the appropriate time block corresponding to the hourly precipitation indicated on the punch tape.

Note: Entry instructions on bottom of form ask for amounts in inches and hundredths. Since punch tape gage only records data to the nearest tenth, extracted data are to be entered on form in tenths, only.

Fig 1.5 Description of Form 79-1D

Note: Completing the WS Form-79-1D is a 'Post-Implementation' task that should be done within 3-months of the installation of the FPR-E equipment.

Before you start to decode the paper tape, remove the last month (i.e., partial month) from the full scroll of paper tape you removed from the F&P when the kit was installed. Keep this last portion, the paper tape representing the partial month in your forecast office to decode.

Then, mail the large portion of the scroll containing the months prior to the month the FPR-E installation, to the NCDC Service Center, Rockcastle Industrial Park South, at 618 Progress Drive, Mt. Vernon, Kentucky, 40456.

1.6.4 Open a Site Inspection Report in CSSA

After the NWSREP returns to the forecast office after installing the FPR-E modernization kits, the NWSREP creates a new Site Inspection Report in the CSSA system.

The primary purpose of this Site Inspection Report is to indicate the F&P paper punch was removed and replaced with the FPR-E electronic data logger and weighing sensor.

The NWSREP takes these five actions to complete the Site Inspection Report in CSSA.

a. Inspection Data: Describe this trip in terms of date of inspection, staff hours, miles driven, inspection type, supplies cost, and trip cost. Follow procedures described in NWS Manual 10-1313, Appendix E (*Station Inspection*), ***Cooperative Station Service Accountability (CSSA)***. For an example see, Fig 6.4 (CSSA Inspection Report), in Chapter 6 of this FPR-E manual.

   Access the 10-1313: http://www.nws.noaa.gov/directives/010/pd01013013a.pdf

b. Maintenance Performed: Select the one check-box labeled, 'Replaced' to indicate the FPR-E was installed and the old F&P was removed. For an illustration, see Fig 6.4 (*CSSA Inspection Report*); in Chapter 6 of this FPR-E manual.

c. Remarks – General reason for visit: Give the exact reason in plain English in the remarks box at the bottom of the report. The following description should be entered: **' Replaced F&P with FPR-E. Requires USB flash drive to download monthly data.'**

d. Remarks- Metadata completeness: Enter calibration coefficient metadata to the Remarks field, at the bottom of the Site Inspection Report. Type the information into the free text field to indicate the values of the load cell calibration coefficients A, B, and C. They should appear on a single line:

   Coefficients A=0, B=1286.0523, C= - 4.1076

   Note: These Coefficient values are for example only. Each rain gauge will have unique values. Be careful not to lose the negative sign in front of the numerical value for 'C.'

e. Reviews **Chapter 6** of this *FPR Operations Manual*, to ensure all metadata requirements are being met.

1.6.5 Create new Rendition of WS Form B-44 for NCDC

On the first page of WS Form B-44 the NWSREP ensures the Remarks section states at a minimum: **"Updated Equipment, Changed F&P to FPR-E with USB flash drive."** See Fig 6.1 (*Remarks Section for Installation*), in Chap 6 of this manual.

Page-down within the Form B-44 to the Observed Element page where it states: '**HOURLY PRECIPITATION REPORT.**' On this page there are five fields that must be revised when an F&P is converted from a paper recorder to an FPR-E electronic rain gauge.

Equipment Code: Ensure the "FPR-E" was selected from the drop-down menu.

Serial Number: Ensure the eight-digit serial number from the load cell's decal is entered. See Fig 6.3 (Load Cell) for a photo.

Equipment Description: Ensure the Calibration Coefficients, A, B, and C, are entered; and then add the Calibration Constants exactly as they appeared on the decal of the load cell. See Fig 6.2 (*Detailed Entries for FPR-E*), in Chap 6 of this manual.

Report Method: Ensure the "ADP" appears in this field.

Data Ingest Via: Ensure the words 'USB Flash Drive' appear in this field.

For graphic illustration of the WS Form B-44, see Chapter 6, in this manual and Fig 6.1 (*B-44 Remarks Section for Installation*) and Fig 6.2 (*Detailed Entries for FPR-E*).

Due to the large number of COOP sites being retrofit in 2011 and 2012 and the need for timely updates of the NCDC master station inventory (MSI), all parties involved in the B44 workflow have been instructed to expedite their review and approval, to ensure the new rendition arrives in the CSSA data base in less than half the time than it would have ordinarily.

Important: Review **Chapter 6** (Metadata Requirements) in this ***FPR Operations Manual***, to learn ways to organize and create accurate metadata for each of your FPR-E systems.

1.6.6 CSSA Fast Track for B-44 Approval

Within five (5) days of successful installation of the FPR-E you will update the CSSA rendition of the respective site's B-44 (Site Inspection Report).

As soon as practical after entering the new B-44 rendition to CSSA workflow, report to the MIC (or the designated approver) and the RCPM, that you have updated a Fischer-Porter Rebuild Rendition. Inform them of the Site Name and SID and ask them to "fast-track approve" the document, so it advances to NCDC.

1.6.7 Start-Up Monitoring and Evaluation

There are three operational areas each NWSREP shall monitor. First, is FPR data representative of meteorological conditions? Second, is the data complete based on nominal system operations? Third, can you describe any system component that will require maintenance or a situation that might lead to discrepancies in precipitation measurement or the generation of non-valid precipitation records?

For each FPR system conduct an ongoing monitoring and retrospective evaluation of the first 30-days of system and data performance. Write a short summary to outline the general performance of the FPR system. If precipitation events occurred then account for them, including variations

in local precipitation amounts, and possible non-representative values attributed to mesoscale phenomena.

1.6.8 Policy for COOP Observers to Email FPR data files

The NWSHQ has approved the use of observer email for the delivery of FPR precipitation data files as the means to replace U.S. postal service method of delivery. The email method is an optional way to report and not a requirement of the observer.

This email reporting method will save the NWS substantial expense from the postal mailing of the FPR monthly record.

The Observer must meet the following requirements:

- Ability to read the data file on the computer.
- Access to the internet.
- Ability to send an email with a file attachment.
- Knowledge for how to attach a file to an email message
- Understanding that the NWS can/will **not** be able to offer any IT support for doing this.

As NWSREP you will provide these observers with a one-page instruction guide (see *FPR Observer Instructions*, Appendix D).

The Observer E-Mail Instructions Sheet will require you as NWSREP to fill in your NOAA email address and the observer's COOP Station Number.

The email 'subject' naming convention is not critical. The example in the E-Mail Instruction Sheet states: "FPR Data: <COOP station number>, and this is intended to make it easier for NWSREPS to sort through the inbox messages.

After you receive the observer's emailed precipitation file, save it to the same permanent workstation directory designated for all other FPR data files, as instructed in Chapter 2, of this *FPR Operations Manual*.

1.7 POST-IMPLEMENTATION ACTIONS:

1.7.1 Post-Implementation Packet to RCPM

Review the *FPR Operational Implementation Checklist* (see Appendix B of this manual) to see if there are any uncompleted administrative actions, or if there is a performance issue with either the transfer of the monthly data, or the data quality itself. Review any questions your Observers have or any discrepancies reported, attempt to answer and resolve the issues at the WFO level. If questions remain or if Sterling Field Support Center (SFSC) was consulted then report this to your RCPM and draft a self prepared, ***30-Day Evaluation Report***.

Ensure these five actions are completed prior to completing the operational implementation of all the FPR-E rain gauges. Keep these documents and emails on station for 12-months.

a. Sign the ***FPR-E Implementation Checklist*** (Appendix A) that vouches for the proper installation, calibration, and initial operation of the FPR-E.

b. Print a copy of NCDC inventory of ingested HPD files as a confirmation receipt: **http://www1.ncdc.noaa.gov/pub/data/hpd/inv/HPD_Received201107.txt**

c. Email your ***'30-Day Evaluation Report***', to your RCPM if any one of the FPR systems experienced a significant discrepancy as defined in Section 1.3.7, above.

d. Email your RCPM if you journalled to an ***FPR Log Sheet***, or an ***FPR Trouble Report***; or to account for the ***30-Day Evaluation Report***.

e. Fax to NWS headquarters the, ***FPR Operational Implementation (OI) Certification form,*** after your MIC signed this form. Fax #301-713-1598.

1.7.2 Discrepancies: Submit the 30-Day Evaluation Report

Only if one of your FPR-E gauges experienced a significant operational anomaly in the first 30 days of FPR-E field operation, then elaborate them in your *'30-Day Evaluation Report*' and e-mail it to your RCPM. If needed, ask the Observer to submit his '*FPR Log Sheet*.'

This report shall include COOP Station Name, Number, Observer, date of problem and names of anyone who performed maintenance on the FPR system. The final version of the *30-Day Evaluation Report* must give a description of how the discrepancy was resolved or who repaired or replaced any components (i.e., NWSREP, ET, IT, SFSC, NRC, or Engineering (W/OPS11).

Next, inform the Sterling Field Support Center (SFSC) with an email of your *30-Day Evaluation Report*, use nws.sfsc@noaa.gov. You may also phone SFSC on 703-661-1259 to discuss the report.

Finally, email or fax (301-713-1598) your *30-Day Evaluation Report* to NWSHQ (ask for the current point of contact) as soon as practical, or within one month of informing your RCPM and SFSC.

1.7.3 Operational Quality Control

Beyond the initial 30-day evaluation period, continue to monitor the FPR system performance; look at the TXT data file before you send it to NCDC. Follow the guidelines in Section 2.2.6, of this *FPR Operations Manual*, "Examine TXT to Confirm Collection Month is Present'. If an extreme meteorological condition occurred scroll through the data file to the date of the event and examine for any ambiguous or discrepant precipitation data. If any anomalous data is found, journal it to the Special Notes column of the *FPR Log Sheet*. Lastly, visit the NCDC inventory webpage and ensure your monthly ZIP file is present and is not flagged for errors.

1.7.4 Dispose of Old Equipment

No equipment is to be returned to the National Reconditioning Center (NRC) or the National Logistics Supply Center (NLSC). Rather, the WFO may choose to retain used, undamaged F&P equipment at the WFO.

Follow policy in Appendix B in the ***FPR Assembly Procedures (Jul 2011)***, on web site: http://www.nws.noaa.gov/ops2/Surface/coopimplementation.htm. It calls for you to save eight pieces for any legacy F&P rain gauges in the Region that may require these parts.

Otherwise, the WFO may dispose of any used F&P 'old equipment' only after NWS headquarters has stated the FPR-E Operational Implementation (OI) has officially concluded.

1.7.5 Public Information Statement (PNS)

Upon completion of all your FPR-E sites in your Cooperative Program Area (CPA), prepare and transmit a Public Information Service (PNS) announcement on AWIPS. This is done after the MIC signed Operational Implementation Certificate is submitted to HQ (FAX# 301-713-1598).

The NWSREP should be familiar with the NDS 10-1805, Section 2.1; Local or Regional Service and Technical Changes. The changes are announced via a local PNS transmitted by the WFO. For specific policy see NWSI 10-501, *WFO Statements, Summaries, Tables Products Specification.*

The format and style of the PNS should be similar to those of the national service and technical change messages described in the NDS 10-1805.

The NWSREP accesses the PNS template, edits it for COOP station name, and enters the 'Implemented Date' which is the calendar day (e.g., Aug 26, 2012) when the FPR began operational service (i.e., date of installation).

The PNS is transmitted after your MIC has signed the FPR-E Operational Implementation Certificate. The certificate officially documents that all FPR-E have been successfully installed in your Cooperative Program Area (CPA).

```
NOUS45 KLKN 291805
PNSLKN
NVZ013-030>037-220300-

PUBLIC INFORMATION STATEMENT
NATIONAL WEATHER SERVICE ELKO NV
1105 AM PDT MON AUG 29 2012

. . . FISCHER-PORTER REBUID /FPR/ NOW IMPLEMENTED ON ALL ELEVEN NON-TELEMETRY
RAIN GAUGES, IN NORTHERN NEVADA, EFFECTIVE AUGUST 26, 2009.

THIS EQUIPIMENT MODIFICATION WILL CHANGE THE WAY THE PRECIPITATION
MEASUREMENT IS TAKEN.  THERE WILL BE NO CHANGE IN THE QUALITY OR THE
TIMELINESS OF THIS STATION'S HOURLY PRECIPITATION DATA /HPD/.  DATA WILL
CONTINUE TO BE REPORTED IN MONTHLY HPD PUBLICATIONS.

A TOTAL OF ELEVEN SITES WERE RETROFIT WITH THE FISCHER-PORTER ELECTRONIC
WEIGHING GAUGE IN THE WFO-ELKO COOPERATIVE PROGRAM AREA /CPA/.  THE
IMPLEMENTATION DATE FOR EACH OF THE RAIN GAUGES IS LISTED TOGETHER WITH THE
COOP SITE NUMBER.

COOP STATION NAME . . . . . .COOP NUMBER . . .  . . IMPLEMENTED
MCDERMITT. . . . . 26-4935. . . . . JUN 28 2012
SHOSHONE 5N .  . . . . . 26-7450. . . . . JUL 17 2012
INDIAN CREEK RANCH-DUCKWATER . . . 26-3964. . . . . JUL 26 2012
LAGES. . . . . 26-4341. . . . . JUL 28.2012
BATTLE MOUNTAIN 4SE. . . . . 26-0691. . . . . JUL 28 2012
ELKO . . . . . 26-2570. . . . . AUG 07 2012
SMOKEY MOUNTAIN CARVERS. . . . . 26-7620. . . . . AUG 09 2012
WILDHORSE RESERVOIR. . . . . 26-9072. . . . . AUG 10.2012
GRANTSVILLE 2W . . . . . 42-3348. . . . . AUG 10 2012
SUNNYSIDE - LUND 2W. . . . . 26-7908. . . . . AUG 17 2012
GREAT BASIN NATL PARK. . . . . 26-3340. . . . . AUG 26 2012

THE DATA FROM FPR GAUGES WILL BE REPORTED BY THE NATIONAL CLIMATE DATA CENTER
/NCDC/ AS A MONTHLY PRODUCT IN THE HOURLY PRECIPITATION DATA /HPD/ BULLETIN
FIVE MONTHS AFTER THE MONTH OF MEASUREMENT.

INFORMATION ON HPD PRECIPITATION PRODUCTS IS AVAILABLE FROM NCDC.

HTTP://WWW.NCDC.NOAA.GOV/OA/MPP/  USE LOWER CASE LETTERS AND SCROLL DOWN TO
/MOST REQUESTED F/ SECTION - THE SIXTH SECTION ON THE PAGE - AND THEN CLICK
ON THE WORD /SAMPLE/ TO VIEW AN HPD BULLETIN.

IF YOU HAVE ANY QUESTIONS REGARDING THE IMPLEMENTATION OF THE FISCHER-PORTER
REBUILD, AT THE ABOVE LISTED SITES, PLEASE CONTACT:

PHILLIP SCHEIBE
NWS/WFO-LKN...OBSERVATIONS PROGRAM LEADER (OPL)
ELKO, NEVADA
PHONE: 775 778 6716
EMAIL: PHILLIP.SCHEIBE@NOAA.GOV
THIS AND OTHER NWS PUBLIC INFORMATION STATEMENTS ARE AVAILABLE ONLINE AT /USE
LOWER CASE LETTERS/:

   HTTP://WWW.NWS.NOAA.GOV/OM/NOTIF.HTM

$$
NNNN
```

Fig 1.6 Public Information Statement (PNS)

CHAPTER 2 – MONTHLY DATA COLLECTION AND TRANSMISSION

2.1 FPR Data File Exchange Requirements and Tasks:

2.1.1 NWSREP Responsibilities

A major task with the FPR-E is to successfully manage with your Observers, the exchange of the government issued Flash Drives to and from your office. You mail out one Flash Drive to your Observers by the 25th of each month as a matter of priority. This will ensure the Observer has at least one Flash Drive in his/her possession at the start of the new month to download new data. These responsibilities do not apply for Observers who email you their data.

The Observer is instructed to download FPR data anytime in the first five days of the month, yet not before 12AM on the first day of the month. You should work a monthly Flash Drive Log Sheet (see Fig 2.1) to journal the date you mailed your Observers their return Flash Drive. The term 'Incoming Data' refers to any Flash Drive or Email an Observer sends you, filled with the most recent month's records, but has yet to be uploaded to your WFO's workstation. The term 'Return Flash Drive' applies to a Flash Drive only after you have downloaded the TXT to the WFO's workstation. Once you complete this transfer, place the 'Return Flash Drive' in a container or box, marked 'Outgoing.'

Month Ending	COOP Station Name	When did you mail Observer his 'Return' Flash Drive?	When did WFO Receive this Observer's 'Incoming Data?	When was the Flash Drive virus scanned?	When did you transmit the Zip file to NCDC?
JUNE 30 2011	Angel Fire 1S	June 25th	July 6th	July 24th	July 25th
	Clovis	June 25th	July 8th	July 24th	July 25th
	Roswell 2S	June 25th	July 19th	July 24th	July 25th
	Socorro	June 25th	July 7th	July 24th	July 25th
	Tucumcari 4NE	June 25th	**Not In Yet:** Phoned him on 7/20, he'll send in two days.	**NOT as of 7/25.**	**NOT as of 7/25!**

Fig 2.1 Flash Drive Log Sheet

Important: If you have not received the Observer's Flash Drive or Data Email by the 10th day of month, phone the Observer to inform him you are missing the current precipitation report and ask if he had any difficulties or was simply behind in mailing. On the 20th review the Flash Drive Sheet to identify any Flash Drive still missing, if so, phone that Observer a second time. If the Observer does not have a phone, or Institution Observer's automated phone attendant prevents direct conversation, then mail a letter to the attention of the Observer, to direct him to mail the Flash Drive.

Note: Flash Drives, when mailed to the Observers, are not required to be labeled to identify a specific COOP SID. Likewise, the Observers are not required to label or identify on the flash drive any information. The NWSREP may choose to label the flash drives when necessary to resolve certain situations (i.e., flash drive missing current reporting month's file).

Note: Each incoming Flash Drive should contain only two (2) TXT data files. The current reporting month and the preceding reporting month – each were given a filename upon download at the Observer's site. You may not rename any TXT data file, neither those on the Flash Drive nor those in your NWS workstation.

Note: Keep a log sheet to account for any incoming Flash Drive that arrives 'blank.' You may affix a label to these Flash Drives to check them later when you visit the COOP site.

Your next major responsibility is to transmit the monthly FPR precipitation records to the NCDC before the 30th or last day of each month. For rare occasions, when the Observer was unable to mail the flash drive or was instructed by the WFO to postpone a download to Flash Drive, the date of your transmitting the FPR file may be extended by one or two weeks. The intention here is to limit unnecessary FTP transmissions and to simplify your Flash Drive tracking work.

2.1.2 Observer Responsibilities:

New policy in 2011 permits the Observer to e-mail the monthly FPR-E data directly to the NWSREP. This is optional and not a requirement of the observer. The observer must meet the following requirements.

- Be able to read the data file on their computer. The NWS will not be providing any type of card reader.
- Have internet access
- Able to send and email with a file attachment
- Have knowledge of how to attach a file to an email message
- Make clear to observer that NWS can/will not be able to offer **any** IT support for doing this.

Flash Drive USPS Exchange: Emphasize to your Observer how his major responsibility is to be the full-time 'keeper' of the FPR Flash Drive. He will need the Flash Drive at the start of each month to download precipitation for mailing to you in the WFO. His/her full-time awareness of the location of this government issued Flash Drive is essential.

The Observer needs to understand how you will use the United States Postal Service (USPS) to routinely mail a Flash Drive each month to his preferred mailing address. This Flash Drive will be mailed in the familiar looking envelope and will be sent to arrive to accommodate the Observer's scheduled monthly download on or after the 1st day of the month.

To meet this 1st day of month schedule you need to anticipate how each Observer actually receives USPS mail. Where is his/her USPS delivery location?

- Residence?
- Rural highway 'box'?

- PO Box at local Post Office?

Monthly Data Collection: Observer shall download the data to the Flash Drive any time after 12:00 AM local time on the first day of the month, through the 5th day of the month. For additional information on how to download data, the Observer should refer to his printed copy of the ***FPR Observer Instruction*** guide.

The 'return flash drive' you mailed is likely to have arrived a day or two before the Observer downloads the monthly records and so the Observer will have two Flash Drives in his/her possession. The Observer should realize that he may use either Flash Drive to download as they are both considered available 'blanks.' However, once data is downloaded to the Flash Drive the Observer needs to immediately package it to the NWS-addressed mailer envelope, to reduce risk of Observer mailing his other Flash Drive, the one that was intended for his next monthly download.

At the time you install FPR equipment and conduct a familiarization tutorial with the Primary Observer (and Secondary Observer, if possible), make sure he is knowledgeable of the NWS operations and maintenance policy as outlined in the W-OS7 issued, '***FPR-E Observer Instructions.'*** Encourage their dialogue, solicit their questions, and offer them additional instruction if needed to bring them to a qualified level of experience after two or three months' operating the FPR-E.

An Observer who is qualified to operate the FPR-E recording gauge will have demonstrated proficiency in the following tasks:

- Able to locate and describe the purpose of the: Zeno display, USB flash port, and the Log Sheet if he conducts maintenance on his F&P rain gauge. Possess a printed copy of the ***FPR-E Observer Instructions,*** (April 2011).

- Have him download to Flash Drive (i.e., dry run) on the day you install his FPR system. Observe his level of familiarity with inserting the Flash Drive, interpreting the Zeno display for the download complete message (i.e., UFdC), and removing the Flash Drive.

- Timely operational download to Flash Drive on the first five (5) calendar days of the month. The Observer <u>shall not</u> download before 12AM on the first day of month!

- Timely mailing of Flash Drive to WFO by the 10th day of month. Observer shall mail you his Flash Drive (i.e., 'Reporting Drive') on same day that he downloaded his data.

- Possess a filled-in copy of the ***Mailing Address/WFO POC Sheet*** (Appendix A, *FPR-E Observer Instructions*, April 2011).

- Identify a secure location where the Observer will keep the Flash Drive during the month.

2.2 General Month-by-Month Responsibilities and Timeline

2.2.1 Mail Observers a Flash Drive:

On or about the 25th of each month mail each Observer a Flash Drive.

Note: Flash Drives you mail to the Observer are not required to have any type of label or marking. Each Flash Drive should contain only one TXT file, the last reported month. The file is not required to have originated from the Observer to whom you are mailing. Rather, the purpose is to deliver a nearly blank Flash Drive.

Write down to the monthly Log Sheet (Fig 2.1) the date you mailed-out the new Flash Drives.

2.2.2 Log-in Each Flash Drive as Received by NWSREP:

By the 15th of the month, ensure you have received either the Flash Drive or the Email from all your FPR observers.

Read the return address on the USPS mailing envelope (Fig 2.2) to identify from which site this Flash Drive originated, and mark the Flash Drive Log Sheet (Fig 2.1) for the date it arrived. Positively identify all observer files between the 15th and 25th of each month.

Check the same mailing envelope for these items:

- USB Flash Drive,
- *FPR Log Sheet* (for a report of bucket maintenance or anomaly).

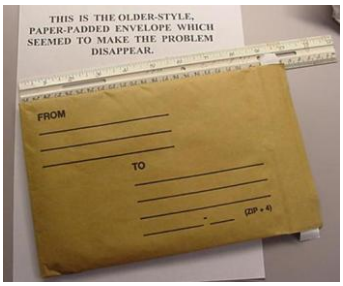


Fig 2.2 Mailer for Flash Drive And Log Sheets

The Jiffy No. 0 (zero) padded mailing envelope (Fig 2.2) is sufficient to hold the F&P Log Sheet and Flash Drive. This photo shows the standard ten inch square, darker color envelope. Newer, bubble-pack square envelopes have thinner paper and tear more easily and can result in the Flash Drive being lost in the mail.

If any Email or Flash Drive is missing on the 15th, first search your office's Email inbox, or incoming USPS mail station, for possible mis-distributed / misplaced envelopes.

The same day you open the envelope holding the Observer's mailed Flash Drive, log the date to the 3rd column of your Flash Drive Log Sheet (Fig 2.1), in the column titled, 'Received the Flash Drive.'

Note: You may want to wait until the 25th of the month until all Flash Drives have arrived, and scan them at the same time. Instruct the Information Technology Officer (ITO) to inform you when he/she has run the McAfee software on all Flash Drive. After you open the TXT file and check the identity and date for current reporting month (see Section 2.2.7), then log each Flash Drive as 'scanned' in the ***Flash Drive Log Sheet*** (Sec 2.1.1).

Phone the Observer if his Flash Drive has not arrived by the 10th day of month.

Observer Emailed Precipitation Data: Account for each email data file received. If your office has a number of Observers who email, then modify the Flash Drive Log Sheet to accommodate the sites that send monthly FPR precipitation files.

2.2.3. Filename and Storage Standard:

The following COOP Program standard for filename and file allocation folder-name convention shall apply to each WFO handling the exchange of FPR-E data files for the NWS and NESDIS.

This standard will apply to both platforms in the WFO where you handle FPR data files:

- Virus Scanner PC with McAfee and Federal Desktop Core Configuration (FDCC)
- NWS workstation's (i.e., AWIPS) directory for "HPD" (i.e., C:\HPD\YEAR\month)

After you run McAfee Active Virus Defense (AVD) suite and you have confirmed 'no detections' remove the Flash Drive. Do not save the TXT file to the Virus Scanner PC.

Each Flash Drive should hold just two files: (a) the reporting month – with precipitation data in all 15-minute periods, from every day of the entire calendar month; and (b) a second file, the preceding month's TXT file, preferably from the same Observer's site.

Only the current TXT file shall be saved to a dedicated permanent directory on the NWS workstation, with a sub-directory structure that is organized by year and month as follows: C:\HPD\2011\JUNE\.

Store, and do not delete the TXT data files for at least 12 months. Also, never rename files that are being stored. Always keep the file in its original filename, ZnnnnMDv.txt, (e.g., **Z5678AHA.txt**).

Example: **Z5678AHA.txt**

Format: **ZnnnnMDv.txt**

Translation: **Z** =Zeno is the model name
nnnn = COOP SID (Minus the two digit state code),
M = month of download
D = date of download
v = Incremental count, A, B, C, of the files downloaded on a given day.

Month (M) Code Values

January	February	March	April	May	June	July	August	September	October	November	December
1	2	3	4	5	6	7	8	9	A	B	C

Date (D) Code Values

1	-	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
1	-	9	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V

Fig 2.3 Month (M) and Day(D) Code for Data Filenames

Each filename generated by Zeno is coded this way to indicate the Month and Day of download.

If January 9, then MD appears '19'
If January 15, then MD appears '1F'
If Sep 9, then MD appears '99'
If Sep 15, then MD appears '9F'
If Oct 9, then MD appears 'A9'
If Oct 17, then MD appear as '**AH'** as in the example on preceding page.

Note: Ensure all monthly files in your laptop/netbook directory remain unchanged from their automatically named format! Never rename a data logger generated filename!

2.2.4 Setting the Data Folder-name in NWS Workstation:

In the same NWS workstation you plan to FTP your monthly files to NCDC, you need to establish a directory folder according to the year and month, for easy, ready reference of the precipitation data files.

A good example is to go to root drive C:\ and establish the directory 'HPD' then create several subfolders named by the months.

C:\HPD\2011\JULY\

Note: Always keep in mind that Notepad is the only program for viewing and opening the TXT stored in these directory folders! To do otherwise will corrupt the data format of the TXT file!

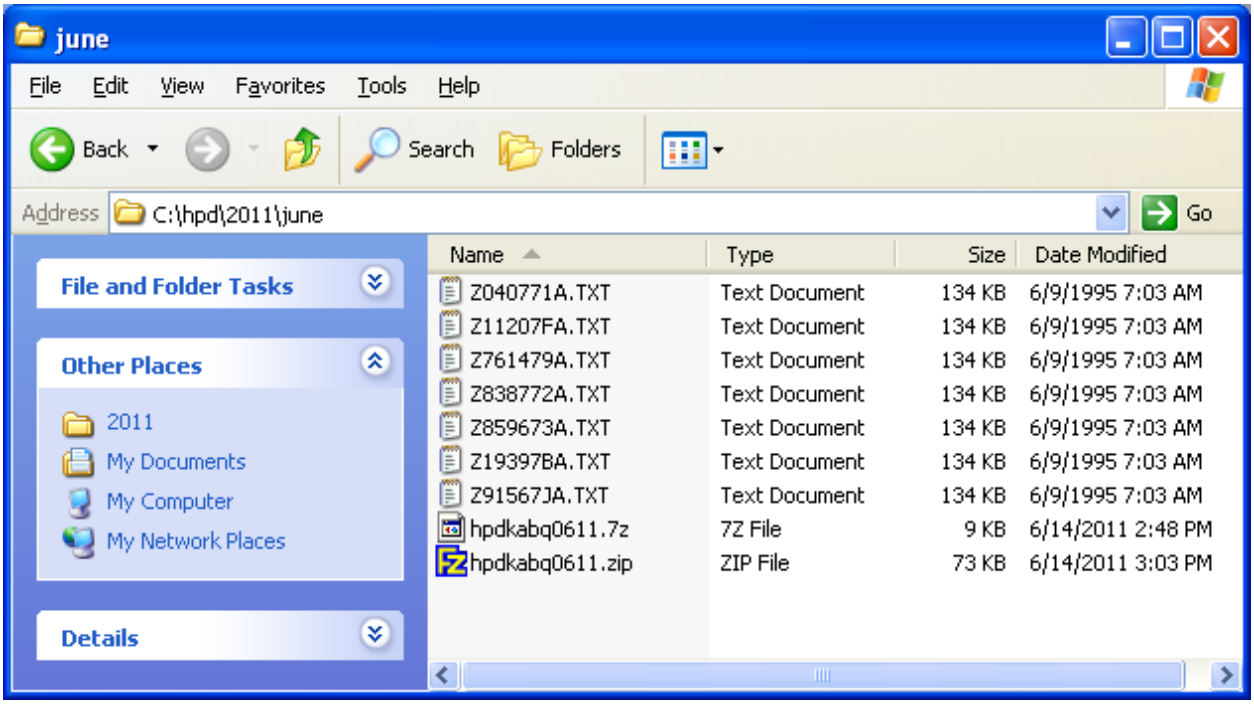


Fig 2.4 For Each Month Create a New Sub-Directory

2.2.5 Instructions to Virus Scan and Upload the Data Files:

A. Follow your forecast office's established Virus scanning procedures for external flash drive media. The NWS uses McAfee Active Virus Protection (AVD).

B. If this is your office's policy, then work with your Information Technology Officer (ITO) to arrange a time for the ITO to scan as many Flash Drives as possible.

C. Ensure that all the Flash Drives are virus-free with no detections. Increment the current collection month in accordance with the convention stated in Section 2.2.3 of this manual (e.g., C:\HPD\2011\JUNE).

D. Upload the most recent month's TXT data file, from each Flash Drive to the NWS workstation. Click "File → Save As." Keep the filename unchanged for each TXT file. See Section 2.2.3, for details on the filename standard.

E. Follow the instructions in sections 2.2.6 and 2.2.7. View the TXT data file's contents from the pop-up 'Notepad' window to ensure the most recent month was delivered.

Delete the TXT file if it is missing 15 days or more from the collection month. Phone the Observer to inquire into the problem and ask Observer to perform a download today, and mail the data his earliest convenience. When you receive his Flash Drive, then mail the Observer a replacement Flash Drive because he has none.

F. To finish the process, delete the oldest of the two files on the Flash Drive.

G. Unplug the Flash Drive and place it in a new Jiffy envelope ready for mailing back to the Observer.

2.2.6 Examine TXT file in Windows Notepad:

Examine the contents of the TXT data file, to identify from which COOP Site this Flash Drive originated.

At this time, it is essential to read the COOP Site Identifier (SID) in the first eight digits of each line (i.e., #41005678) and use this to update your 'Flash Drive Log Sheet.'

Update the Flash Drive Log Sheet in the respective row (i.e., Roswell 2S) and write in the date on which this TXT file was virus scanned and uploaded to NWS workstation.

The next section, 2.2.7, explains how to decode each of the nine fields in the FPR-E data records.

Always use Notepad (Fig 2.4) to view the TXT data file. Never open the TXT file at any time in an Excel (XLS) application!

Follow these Windows procedures to call up the Notepad application to view the TXT contents.

Access your Network station's file directory containing these FPR data files and carefully single click the right-mouse-button to select the TXT file for a controlled application opening within **Notepad** and not Excel.

Important: Be careful not to double click the CSV file as this will open it within the Excel spread-sheet applications program and you risk losing the date/time data format!

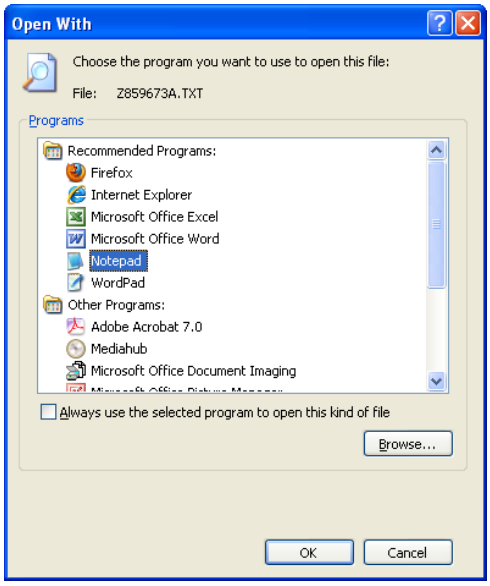


Fig 2.5 Use Notepad to View the Files

Now, click the right-mouse-button once to expand the drop down menu (see graphic, below), and notice the option "Open With". Slide the cursor to the word, 'Notepad' it is the second application listed on this pop-out menu. Single click on it to open a Notepad text screen viewer window and conduct your examination of the 15-minute data records.

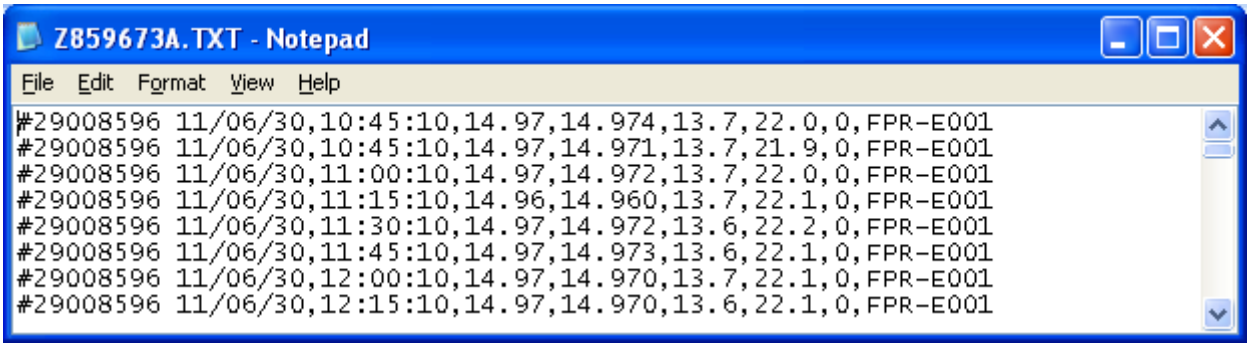


Fig 2.6 One Data File as Viewed in Notepad

2.2.7 Examine TXT to Confirm Collection Month is Present:

Give a quick, one minute or so, visual inspection of your Observer's TXT file's contents, to confirm his TXT file is holding data records for the collection month. Confirm there is data from the start of the month as accounted for by the 12:00AM record from the first day of the month: **11/06/01, 00:15:10**, 7.85; is valid for the month of June.

Check to ensure the proper month's data was delivered. This can be diagnosed soon enough for you to document the problem and phone the Observer for a resend. The Observer should have a spare government issued Flash Drive available for such a contingency.

```
#29008596 11/05/31,23:45:10,07.85,07.848,13.7,22.3,0,FPR-E001
#29008596 11/06/01,00:00:10,07.85,07.848,13.7,22.2,0,FPR-E001
#29008596 11/06/01,00:15:10,07.85,07.848,13.7,22.2,0,FPR-E001
#29008596 11/06/01,00:30:10,07.85,07.848,13.6,22.3,0,FPR-E001
```

Fig 2.7.a Verify First Record of Data Month is Present

Scroll to the end of the TXT file and locate the end of the collection month. Confirm there is data from end of the month as accounted for by the first 15-minute record just past 12 Midnight on last day of the month: **11/06/30, 00:00:10**, is valid for the month of June.

```
#29008596 11/06/30,23:45:10,09.23,09.233,13.7,22.3,0,FPR-E001
#29008596 11/06/30,00:00:10,09.23,09.233,13.7,22.2,0,FPR-E001
#29008596 11/07/01,00:15:10,09.23,09.233,13.7,22.2,0,FPR-E001
#29008596 11/07/01,00:30:10,09.23,09.234,13.6,22.3,0,FPR-E001
#29008596 11/07/01,00:45:10,09.23,09.233,13.6,22.3,0,FPR-E001
```

Fig 2.7.b Verify Last Record of Data Month is Present

In this way you have confirmed the Observer submitted a valid station record for the collection month being reported. You may also have noted the bucket level increased by 1.38" in June.

Note: If the beginning and ending lines (fifteen minute records) contain missing data, or skipped readings, then the NWSREP shall note the discrepancy, inquire with the Observer, and then e-mail your RCPM to report the event. Include the TXT file as an e-mail attachment.

Note: Your TXT data will appear in Notepad similar to site, #29008596, Sumner Lake, NM, from October 17, 2010, about 18:00 local standard time.

Saved files may be accessed by opening the TXT file with Notepad using the Mouse right-button. Notepad should open, displaying the selected file. See the example in Fig 2.5.

```
#29008596 10/10/17,17:30:10,15.00,14.999,13.7,22.3,0,FPR-E001
#29008596 10/10/17,17:45:10,15.00,14.998,13.7,22.2,0,FPR-E001
#29008596 10/10/17,18:00:10,15.00,14.998,13.7,22.2,0,FPR-E001
#29008596 10/10/17,18:15:10,15.00,14.999,13.6,22.3,0,FPR-E001
#29008596 10/10/17,18:30:10,15.00,14.999,13.7,22.2,0,FPR-E001
#29008596 10/10/17,18:45:10,15.00,14.997,13.7,22.3,0,FPR-E001
```

Fig 2.7.c Contents of an FPR-E Data File

Format: #SS00NNNN yy/mm/dd,hh:mm:ss,PL,PC,BV,IT,BIT,VERS

Field	Definition	Units
SS00NNNN	COOP site number	User settable
yy/mm/dd	Year, Month, Day	
hh:mm:ss	Hour, Minute, Second	
PL	Current Precipitation Level	Inches (2 decimal places)
PC	Precipitation Calibration Value	Inches (3 decimal places)
BV	Battery Voltage	Volts
IT	Internal Temperature	Degrees Centigrade
BIT	Built In Test	
VERS	Configuration Version	FPR-E

Fig 2.7.d Code Explanation for FPR-E Data File

After you have examined the TXT file for proper dates and times to verify the full reporting month is present, you may wish to confirm the Precip values are consistent in that they contain data and not 'zeroes.'

2.2.8 Zip Compress all Observers' Data Files:

Once you have received all the Observers Flash Drives and Emails for the reporting month (after logging their arrival in the Flash Drive/Email Log Sheet), you are ready to 'zip' all the TXT data files into a single .ZIP file on the NWS network workstation.

Use only the NWS network workstation to zip together <u>all</u> TXT files from the <u>observed</u> month.

a. Using Windows Explorer, select all files in folder by selecting one file in the folder and then using (Ctrl-A),

b. Right-Click on files and select "add to ZIP"

c. The file should now be re-named hpdkxxxMMyy.zip

You must always use this NCDC filename convention, **hpdkxxxMMyy.zip**, for all files transmitted to NCDC. Code explanation: kxxx= is your 4-letter WFO identification (e.g., kabq for Albuquerque), and >MM= is the data-month (i.e., 06), and >yy= is the data-year (i.e., 11).

<u>Flash Drives Delivered Late to WFO</u>: If any Observers have not yet sent you their Flash Drive, phone and remind them, and wait until the 25th of the month. Then, on or about the 25th of the month use WinZIP to bundle-zip the full complement of TXT files into one ZIP file.

In certain rare cases of lateness, you may postpone the ZIP process and FTP transmission for six weeks beyond the 15th. August 31, 2011, is seven weeks 'late' from the Observer's reporting date for the June 1-30, 2011, precipitation report. Further lateness from the Observer will cause confusion in your account of HPD transmissions to NCDC. Remind the Observer to download and mail the Flash-Drive the first week of each month.

<u>NCDC Advice on Zip Compression</u>:

- The TXT data file must contain the **<u>entire</u>** month's data being reported in the file name of the zip file.

- For example, a ZIP file named **hpdkxxx0611.zip** must contain all data for the month of June. The Observers shall download the data logger to their key only <u>after</u> midnight on June 30, 2011. Since NCDC will be processing the June data, if any data is missing, it will not appear in the publication or archive databases, and will be marked "missing".

<u>Caution</u>: Do <u>not</u> right-click on the folder and "add to zip" as this causes your PC's folder name to appear to NCDC as the path name from which to extract data. Then, your data will never get processed by the ingest program!

Caution: Make sure that the "save full path info" is not checked under the Folder Option. This creates a separate sub-folder. Then, your data will never get processed by the ingest program!

Caution: Do not send a self-extracting executable file (.exe). The files must be zipped with a file compression utility such as winzip or pkzip.

2.2.9 Transmit Precipitation Data to NCDC:

Between the 15th or 25th of month, you should have zipped together all your current TXT files at your NWS-network workstation (Sec 2.2.9, above). Now you are ready to start an FTP session.

Double-click the desktop icon for WsFTPLE (i.e., Ipswich WSFTP95.exe) on your network workstation. If there is no icon, run the executable file that is located in C:\Program_Files\WS_FTP Windows\. The Session Properties 'General' panel will open immediately (graphic, below). Confirm it is configured properly with each NWSRSEP to use 'anonymous' as his User ID, and each NWSREP shall use his NWS-network e-mail address as his Password.

Host Name / Address:
ftp.ncdc.noaa.gov
User ID: anonymous

your.name@e-mail.address.

The general session properties do not change, except for the Password field, which will show the e-mail address of the person who most recently transmitted an FTP data file to NCDC. Also, about half of all offices send upper-air observations this same way. So, now update the Password: dialogue box with your name.

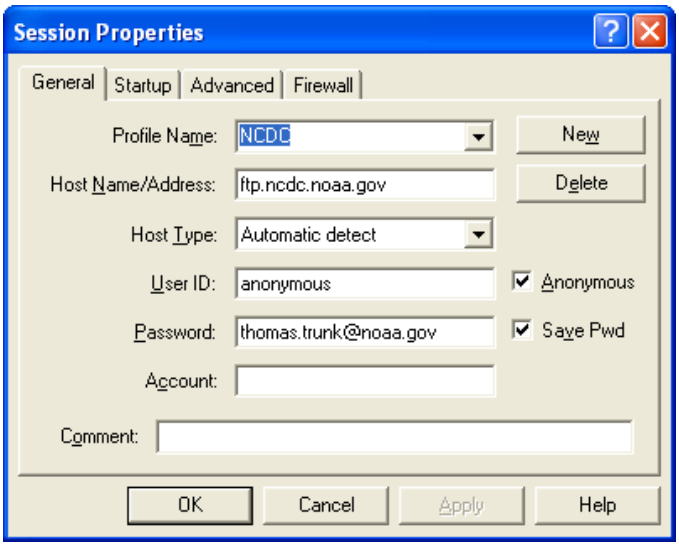


Fig 2.8 Set-up Your FTP Session

Click on the Apply button (on bottom of Fig 2.8, to the right of the 'OK' button) so you can enter your password (do not click on OK, yet call-up the 'Startup' tab immediately it is located on the top of Fig 2.7) to advance the session.

Place your mouse cursor inside the second dialogue box, marked 'Initial Local Folder:' (see graphic, right) and update the default local folder from C:\hpd\2011\may, to C:\hpd\2011\june, by typing in the letters 'june' (below) and clicking on the button Apply.

Finally, while still in 'Session Properties', click on the OK, expect sound-effects (i.e., train-whistle), and the program will quickly update your FTP user-control panel (see graphic, below) as the Session Properties windows closes.

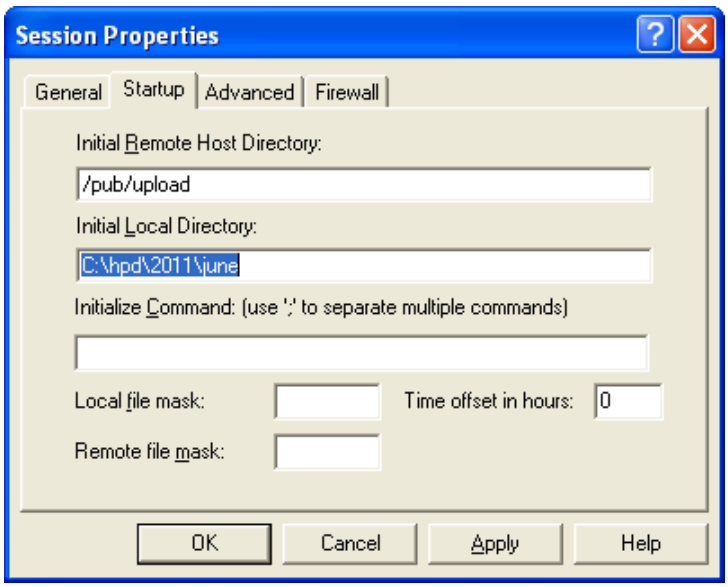


Fig 2.9 Select Your Data Sub-Directory

The FTP twin-pane user-control panel (see, below) is a standard design with the left-pane titled 'Local System', and the right-pane titled, 'Remote Site'. Your Observers' monthly data files are visible in the Local System's left-pane view arranged by filename as they appear in your NWS-network (AWIPS) workstation. The NCDC directory path for data file ingestion appears in the right-pane, under the title, Remote Site.

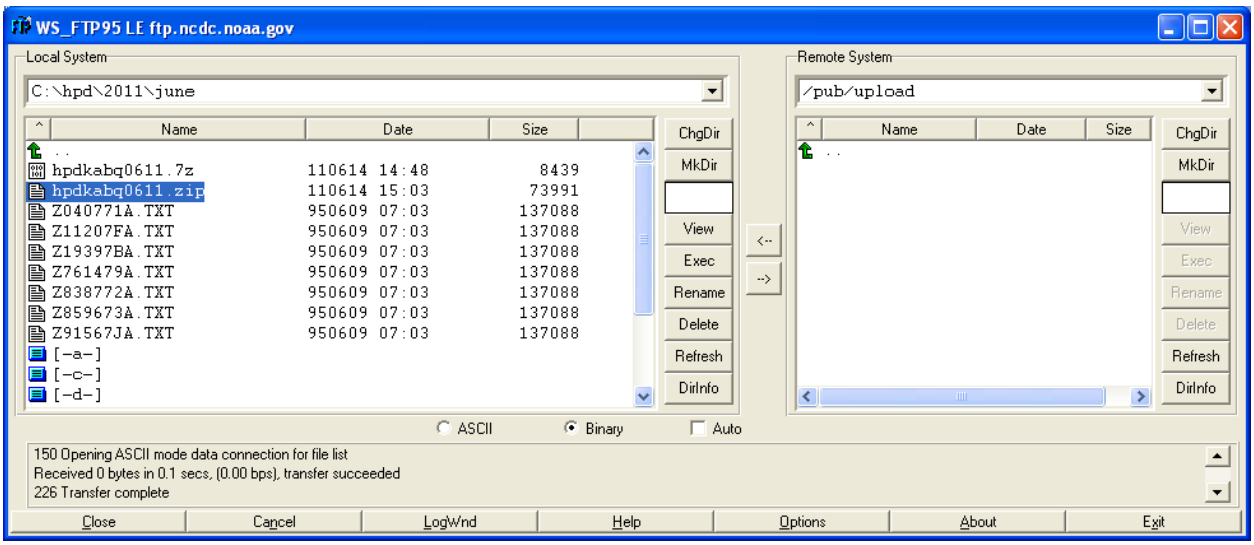


Fig 2.10 Select your ZIP file to send to NCDC

Note: Verify that your ZIP filename is properly coded and spelled: **hpdkxxxMMyy.zip** is the proper code, where 'kxxx= is your 4-letter WFO identification (e.g., kabq for Albuquerque), and 'MM' codes for data-month (i.e., 06), and yy= codes for data-year (i.e., 11). For zip files the year 'yy' is always on the end of the filename!

Note: Always name the ZIP file with the same month designation as the Collection Month of the observed precipitation data being reported to NCDC! You may call-up a full view of the precipitation data files to understand which TXT files you have just zipped. Use your mouse – locate the lowest tab in the median of the double-pane window – labeled 'DirInfo'. Click on this 'DirInfo' tab to open the viewer as seen in the illustration, below.

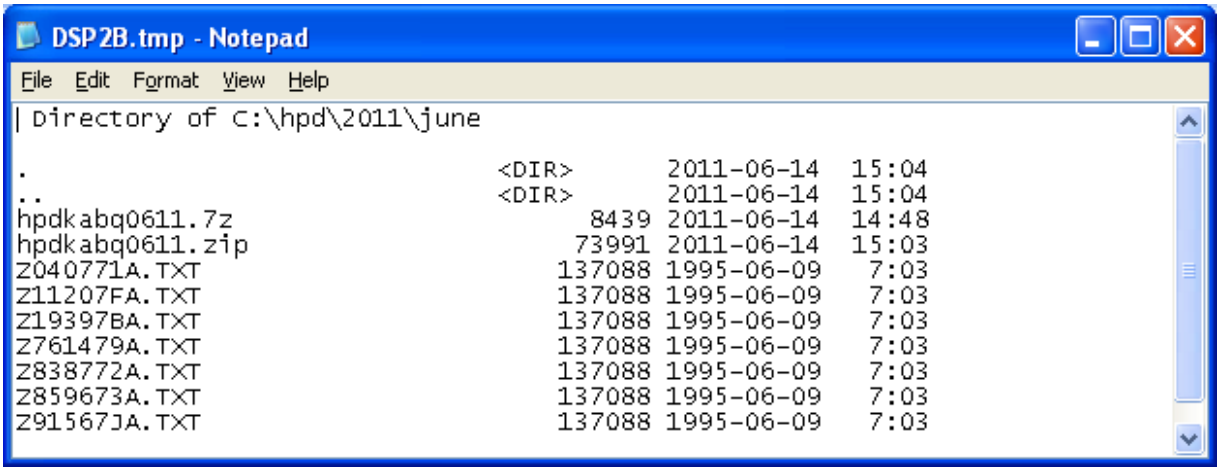


Fig 2.11 Keep the ZIP file saved within the Data Sub-Directory

Ensure that the Local System window displays the relevant month's FPR zip files (e.g., hpdkxxx0611.zip) along with the TXT filenames of each COOP station that sends you monthly FPU data. The Remote Site window will show no files having been uploaded as of this session.

a. **Select** the ZIP file (e.g., hpdknws0611.zip) you will send to NCDC. This is the one file that encapsulates all your FPR stations' precipitation data for the most recent collection month (e.g., June 1-30, 2011). Click (single click with left mouse button) the ZIP filename in the left-side window.

b. Locate the two small square buttons [←] and [→] that **control** the direction of FTP file transfer. They are located in the vertical median of the twin-pane panel.

c. Click on the right pointing button [→] and you will **transmit** your monthly FPR-ZIP file to the NCDC's data ingest port. Your task is now completed.

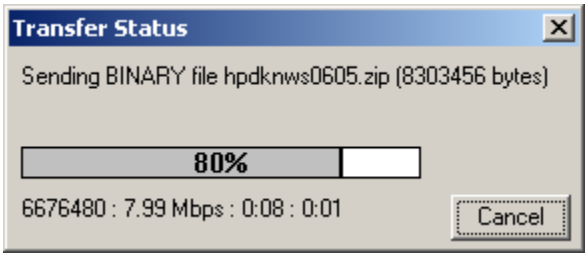


Fig 2.12 Ensure the FTP is successful!

At the 100% transfer complete, audio effects will sound (i.e., several rapid chirps).

d. Click on '**Exit**', on the menu bar at the bottom-right of the twin-pane panel.

Click on the receipt file that arrived upon successful transmission, titled “WS_FTP.LOG”, highlighted in the graphic, below. Note: It has been discovered some versions of Ipswitch FTP will not produce this *log* file.

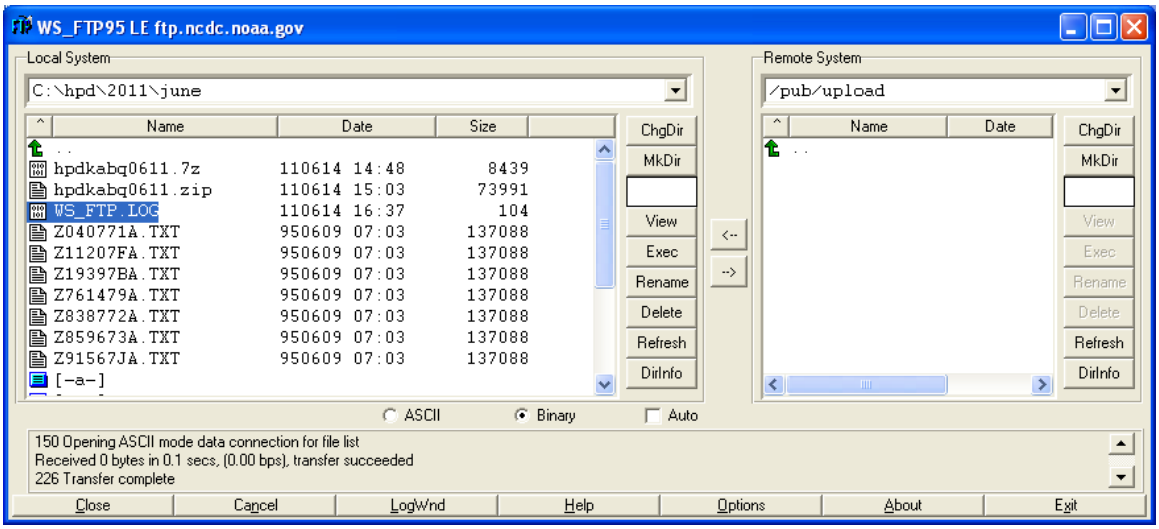


Fig 2.13 Example of a Receipt Message ‘WS_FTP_LOG’

Select the WS_FTP.LOG in your subfolder C:\hpd\2011\june\ with mouse cursor (so it highlights), then click on the ‘View’ tab, to the right, the fourth tab from top of the center median. To produce an ‘FTP transmission receipt’. Note the date and time 16:29 Jun 14, 2011.

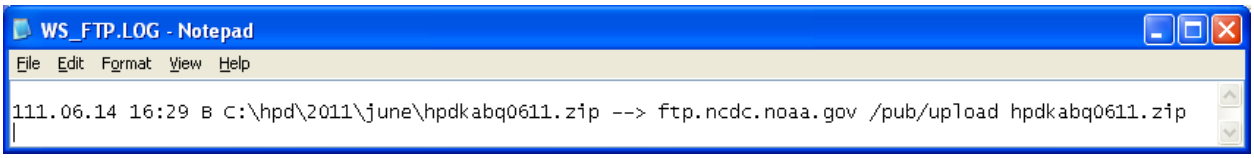


Fig 2.14 Contents of the ‘WS_FTP_LOG’ message

At NCDC an automated program (Cron job) will be looking for the "hpdknws0611” and the “zip" when it runs once each hour. Any files located will be automatically processed.

Immediately after you have FTP’d your Zip file, use the same utility to call up the ‘message log’ to confirm your Zip file was successfully received to the /upload/ folder. See the screen display, of the FTP-LE Message Log (see Fig 2.12, below).

Note: NWSREPs should e-mail or phone Daniel Manns (NCDC), on 828-271-4458, if there are any questions on the ZIP compression and/or FTP transmission procedures

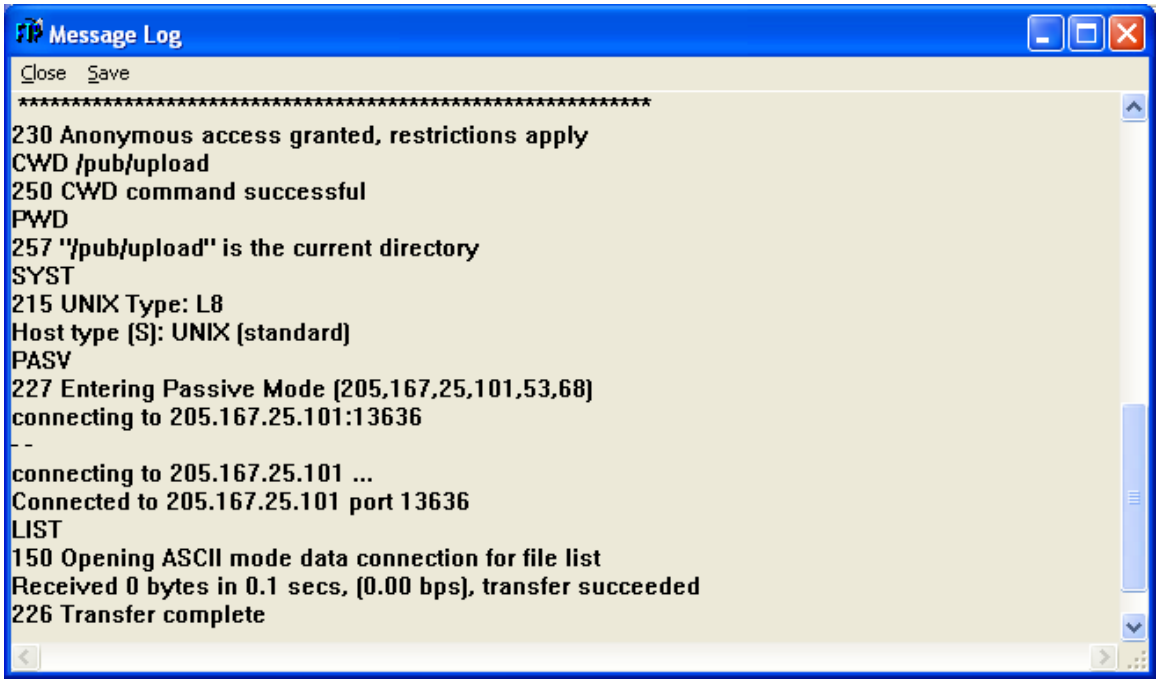


Fig 2.15 Message Log confirms Zip file was received to '/pub/upload'

2.2.10 Confirm NCDC Has Ingested Your Monthly Precipitation File:

Call up the NCDC website, 'HPD-Received,' the day after you have transmitted your monthly ZIP file. You must check for the successful arrival of your monthly FPR data files at the NCDC point of ingest.

To access the current month's web site's file (i.e., HPD-Inventory_201107.txt), when the precipitation data collection month of interest is July 2011, then you type the following site address: http://www1.ncdc.noaa.gov/pub/data/hpd/inv/hpd-inventory_201107.txt .

Note: 'July' is selected because it is the same month you transmitted your Zip file to NCDC.

Scroll through the reports, until you locate your office ID (e.g., **`hpdkabq0611.zip`**) with the files unpacked directly below the zip filename. (*Notice the '0611' in the zip file's name…this is proper - you must use the month '06' because this is when precipitation was measured…and the zip filename 'hpdkabq0611.zip' you created to contain all COOP sites for this reporting month*)

```
hpdkabq0611.zip  [2011-07-25 13:47:05 EST]
  Z193973A.txt      OK
  Z761472A.txt      OK
  Z915674A.txt      OK
  Z040775A.txt      OK
```

Fig 2.16 NCDC Ingest Folder Reveals COOP Sites Received

Now ensure each of your FPR-E sites appears beneath your WFO zip file date line. Look for their COOP number (e.g., sites are 5678, 0890, 2177, and 3524). Each line should end with an ”OK” and not a “ERROR ” If “ERROR” appears analyze your Zip file to see if you accidentally zipped the folder rather than just the data file. If so, then re-Zip, and transmit data.

If any problems are encountered with data or with FTP transmission of data to NCDC, then inform NCDC (daniel.manns@noaa.gov) and NWS (thomas.trunk@noaa.gov).

2.3 Monthly Timeline of FPR Tasks:

Day of Month	Countdown to FTP X-mission	Task to perform.
Jun 25th	T – 31 days	Access the http://www1.ncdc.noaa.gov/pub/data/hpd/inv/hpd-inventory_201106.txt website to confirm NCDC has received your FPR stations’ monthly TXT files. (**Sec 2.2.10**)
25th	T – 31	Mail each of your Observers their new Flash Drive.
July 1st	T - 24	Prepare a new Flash Drive Log Sheet for month ending June 30th.
3rd	T – 22	Log first Flash Drive arrival into your ***Flash Drive Log Sheet***. Did the Observer enclose any operational log-sheet or notes?
3rd	T – 22	McAfee virus scan each Flash Drive on same day it arrives. Then plug card into NWS enterprise workstation’s reader. Now examine TXT file’s date/time headings to confirm proper month.
10th	T – 15	Virus scan any outstanding ‘Flash Drives’ and update the ***Flash Drive Log Sheet***. Identify any missing (late) drives. Check WFO mail inbox to reduce risk of envelopes getting misplaced. Phone the Observer to prompt for the missing (late) flash drive.
15th	T – 10	Check WFO inbox and retrieve Observer envelopes to reduce risk of being misplaced. Upload any outstanding Flash Drives and update the ***Flash Drive Log Sheet***.
15th	T – 10	Take inventory of TXT files on your enterprise workstation. Examine the date/time fields to ensure the first and last days of the reporting month are present with no missing data.
20th	T – 5	Upload any outstanding Flash Drives and update the ***Flash Drive Log Sheet***. There should be no missing or late cards now. Check WFO mail inbox for any ‘found’ Flash Drive envelopes. Phone the Observer a second time (first time was on the 10th) to prompt him to mail it!
25th	T – 0	Confirm all Flash Drives were received and McAffee virus scanned (PC/laptop) - then update the ***Flash Drive Log Sheet*** as necessary. Ensure all TXT files were saved to your proper month HPD folder in the NWS enterprise workstation.
25th	T – 0	ZIP all the TXT files submitted this month, to form a single bundled ZIP file.

25th	T – 0	Important: Ensure the filename is spelled properly. **Example: hpdkxxx0611.zip** Where the **kxxx** is the WFO site ID (e.g., kohx); the **06** is the data-filled month (June); and **11** represents year 2011.
July25th	T – 0	FTP Transmit the **June 2011** FPR-ZIP file to NCDC.
25th	T – 0	Access the http://www1.ncdc.noaa.gov/pub/data/hpd/inv/hpd-inventory_201107.txt website to confirm NCDC has received your FPR sites' monthly TXT files. (**Sec 2.2.10**)
25th	T – 0	Delete the older of the two files from each Flash Drive. Strive to keep each Flash Drive holding just one data file, the one most recently downloaded by the Observer.
25th	T – 0	Mail each of your Observers his new Flash Drive. It should contain just one data file on it.

Fig 2.17 Monthly Timeline of FPR Data Exchange Tasks

Note: T-0 Denotes the day on which you FTP'd the monthly file to NCDC.

CHAPTER 3 – ROUTINE OPERATIONS AND BEST PRACTICES

3.1 Introduction

Fischer & Porter Rain Gauge: The new electronic precipitation recorder fits right in place where the mechanical weighing assembly and paper puncher were mounted in the Fischer & Porter (F&P) housing. When you open the access door (Fig 3.1) you will see a clear plastic box (Fig 3.2) which contains the data recorder. This is known as the Zeno Assembly and it must remain closed in its protective, clear plastic shell. Behind the recorder you may see the weighing sensor, an S-shaped metallic bar that measures the weight of the bucket and its liquid contents (Fig 3.3).

Fig 3.1 FPR-E Recording Rain Gauge

Fig 3.2 Zeno Assembly

3.1.2. Weighing Sensor: The weight of the catch bucket with liquid pulls on an S-shaped metallic bar that stretches with increased weight. This weighing sensor is very sensitive and can detect changes of one thousandth of an inch of precipitation in a matter of several seconds. Readings from the sensor are processed by the recorder every fifteen minutes and stored. The stored data is transferred to the USB memory stick when you insert it into the socket on the right side of the Zeno Assembly.

Fig 3.3 Weighing Sensor

3.1.3. Rain Gauge Display: The display stays in a sleep mode until you wake it up by pressing the Display button on the Zeno's right side (Fig 3.4).

This display tells you the accumulated rain-equivalent weight of everything in the bucket, i.e., rain water, plus any additives like food grade propylene glycol (FGPG) or oil. The units are hundredths of an inch of rainfall.

Fig 3.4 Rain Gauge Display

The Zeno Display will stay lit for about two-minutes before automatically going back to sleep.

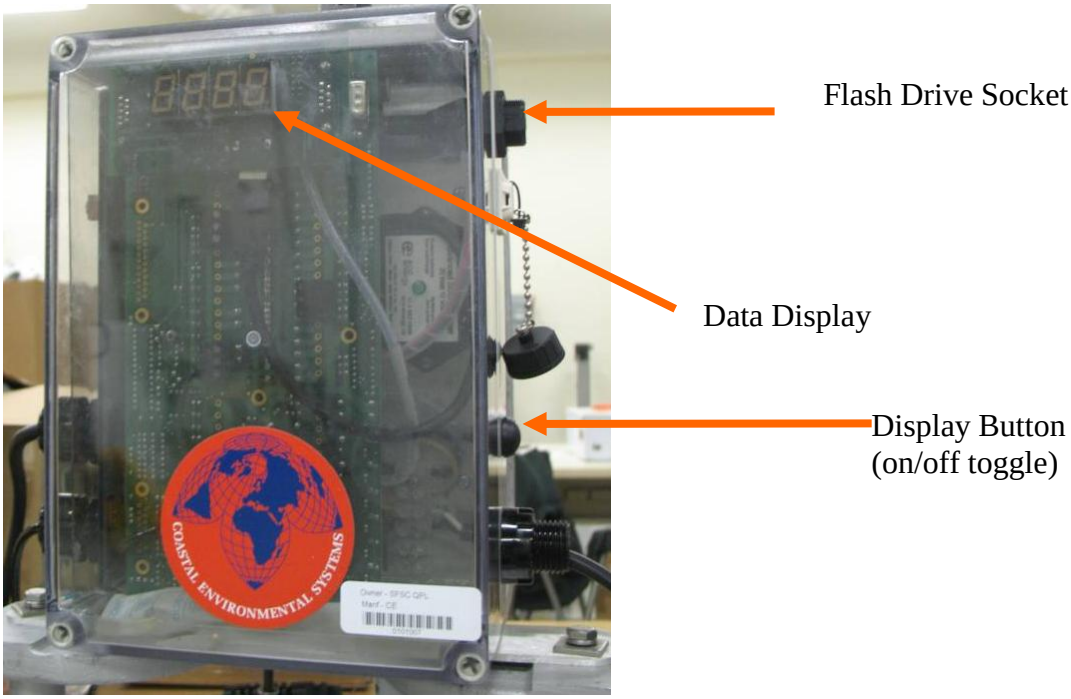


Fig 3.5 Zeno Assembly

3.1.14 Observer Instructions: To collect data, mail your Observer the Government issued USB Flash Drive, each month. In the first few days of the month the observer unscrews the protective cap and inserts the Flash Drive into the recorder. It will collect the data. Your Observer will either mail the flash drive back to the WFO along with the log sheet (if necessary), or your Observer will e-mail you the monthly data file to your NOAA.GOV email address.

Fig 3.6 Typical USB Flash Drive

Expect the recorder to take about five minutes to download the last 100 days of data to the flash drive. Stand by the Zeno Assembly while it conducts the download for any messages that may appear.

3.2 Routine Checks

When you open the F&P door press the Display Button on right side of Zeno Assembly, to light-up the display of the current bucket level.

Fig 3.7 Rain Gauge Display

3.2.1 Amount in Gauge: The display gives the current rain equivalent, in inches, of everything in the bucket. This includes rain water, melted snow, oil (to prevent evaporation), food grade propylene glycol (to prevent freezing solid), and possibly anything that fell or crawled into the bucket since it was last serviced.

In Fig 3.7, the Zeno display shows 15.01 inches of liquid in bucket.

Have your Observer phone you if the display ever reads a negative value or reports more than 15.00 inches (bucket capacity is 20 inches). This way you will know to arrange a visit to service the gauge. Some Observers have an agreement with their NWSREP to drain the bucket; or add oil; or add food-grade propylene glycol. Instruct your Observers who have this responsibility they need to follow Section 3.6, Journal Responsibilities, to write their maintenance actions into the F&P Log Sheet (Appendix I) and mail/email you this log sheet at end of the month in which buck maintenance was performed.

3.2.2 Spare Flash Drive: Have your observer keep a spare government-issued Flash Drive readily available for situations where you may need to ask for a high priority download to diagnose a fault, or obtain a data file that was missing from the last used Flash Drive.
Note: Do not leave the spare Flash Drive outdoors – as some may not work at cold temperatures.

3.2.3 Review the F&P Log Sheet: Certain observers are given the responsibility to drain and recharge the collection bucket. These observers are required to review and update the F&P Log Sheet for any performed maintenance or discrepancies that occurred since the last monthly mailing. Otherwise, should any observer encounter a system anomaly, this observer should phone the NWSREP first, and then obtain an F&P Log Sheet to write down the nature of the system anomaly and any error messages that appeared on the Zeno display.

3.2.4 Clean Solar Panel: Make sure the surface of the solar panel is free of dust or mildew or snow. Trim any tall grass, bushes, or tree branches that would cast a shadow on the solar panel.

3.3 Monthly Data Retrieval

In the first five days of each month, but never before 12am on the first day of month, at a time when it is not raining or snowing, the Observer walks out to the Fischer & Porter gauge, and retrieves the precipitation measurements. This outdoor procedure might take 5 minutes.

Fig 3.8 Flash Drive Port

3.3.1 Un-cap the USB Port: First unscrew the cap that covers the Flash Drive socket (Fig 3.8).

3.3.2 Turn on the Display: Turn on the display by pressing the button several inches below the Flash Drive socket (Fig 3.5). The Flash Drive will not work unless display is on.

3.3.3 Insert Flash Drive: Then insert the Flash Drive into the socket on the right side of the Zeno Assembly (Fig 3.5).

3.3.4 Display Activates: The display responds with the amount of time the Zeno will be active copying the last 100-days of data onto the Flash Drive. This 'time to complete,' is measured in minutes and seconds (Fig 3.9 shows 3 minutes and 23 seconds to finish).

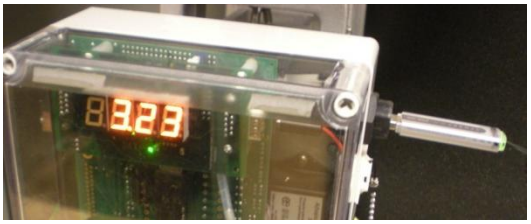


Fig 3.9 Time left to finish download

The display counts down until the download is finished. This process might take 5-minutes to complete.

3.3.5 Verify the End of Download: When the download is finished the code, **UFdC** will display.

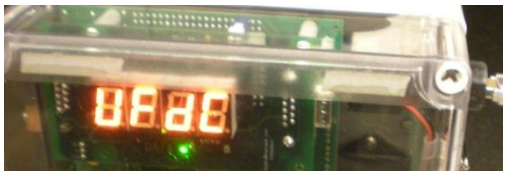


Fig 3.10 Monthly data saved and done

3.3.6 Remove Flash Drive: Pull the Flash Drive gently from its socket. Recap the Flash Drive.

3.3.7 Re-cap the USB Port: Place the circular cap which is kept on its chain, onto the USB socket, and screw it closed to a finger-tight level.

Then, the Flash Drive is placed into the designated durable padded envelope, the kind supplied to all the FPR observes. Ensure the Flash Drive is either capped or in a closed position.

3.4 Data Acquisition Requirement:

The NWSREP's responsibility is to obtain from each Observer the monthly report of precipitation – and not permit precipitation reporting to NCDC to lapse, by even one month.

Instruct your Observer to download always in the first five days of each month at a time when it is not raining or snowing. Remind them to never download before 12am local standard time, on the first day of the month! Have them refer to their printed copy of the FPR-E Observer Instructions; http://www.nws.noaa.gov/ops2/Surface/Coopimplementation.

Remember, the Observer should always have an available Flash Drive on hand. So there is ample time to purchase a replacement, in the event your forecast office has run out of spare flash drives. Encourage your observer to phone you of immediately when the Observer has lost his Flash Drive. Strive to mail the Observer a new flash drive immediately upon new of a lost/missing Flash Drive.

3.5 Monthly Data Transmission:

Each month you are required to 'FTP' the data (i.e., StationNumber_log_yyyymmdd.csv) to the NCDC to be in accord with national policy. See Chapter 2, for detailed instructions.

a. By 10th day of month phone your Observer if you have not received his flash drive or e-mailed data file.

b. Scan the flash drive on the 'External non-NWS memory device scanning workstation. If the virus checker give a 'clean' report of the flash drive, then download the TXT file that has the most recent saved date, as seen in the Windows viewer environment.

c. Display the contents of the file in a Notepad file – Read the flash drive and scroll thru the top and bottom lines of the 15-minute data to ensure the full calendar month of data was sent. Phone the observer if his flash drive is missing some portion of the calendar month, for example several days of missing records). When you phone the Observer, instruct him to download to his spare flash drive, the last 100 days of the precipitation data.

d. Save each TXT file received from your FPR-E sites, multiple observers, into a single folder for named with the Month in which the precipitation was measured. This way all FPR-E sites' data recorded for this given month, will be grouped together: For example:

   C:\HPD\2011\\JUN
   C:\HPD\2011\JUL
   C:\HPD\2011\AUG
   C:\HPD\2011\SEP
   C:\HPD\2011\OCT

e. No later than the 25th of month, mail back your observer one Flash drive, per routine.

f. By 25th of month, transmit to NCDC all your sites' FPR data in one Zip file.

3.6 Log Sheet Review:

Certain Observers are given the responsibility to perform gauge/bucket maintenance. These Observers are required to review and update the Log Sheet for any performed maintenance or discrepancies that occurred since the last monthly submission.

Closely review your Observer's Log Sheet to see if s/he is in need of supplies or if there is an operational issue that warrants your visit. Phone your Observer to learn more about the reported discrepancy in an attempt to see if the problem is one the Observer could resolve on his/her own. If your Observer's Log Sheet contains any maintenance entries, then update your CSSA Site Inspection Report.

F&P LOG SHEET

COOP Number: 01-5678 Your Name: Walter Roberts, Pinetree St Park NWSREP Name: Michael Jones (TAE) .

Date MM/DD/YY	Time hh:mm am/pm	Amount NN.cc	Routine Actions	Special Notes (i.e., displayed error messages, etc.)
03/28/2011	Start: 10:15 am Stop: 10:45 am	15.47 02.75	☐ Add Oil ☐ Add FGPG ☐ Empty Bucket ☒ Partial Drain Funnel - ☒ In ☐ Out	
06/14/2011	Start: 4:15 pm Stop: 4:45 pm	8.72 8.72	☐ Add Oil ☐ Add FGPG ☐ Empty Bucket ☐ Partial Drain Funnel - ☐ In ☐ Out	'Err 12' message displayed. Phoned NWSREP.
09/28/2011	Start: 2:30 am Stop: 2:45 am	10.39 10.39	☐ Add Oil ☐ Add FGPG ☐ Empty Bucket ☐ Partial Drain Funnel - ☐ In ☒ Out	Wiped down the F&P shell to remove dust.

Fig 3.11. This Log Sheet is required if Observer is authorized to add Food Grade Propylene Glycol (FGPG), Oil, Drain the Bucket, or change the funnel.

3.6.1 Special Notes Reported in FPR Log Sheet: Phone the Observer and inquire into the nature of the event s/he reported on the *FPR Log Sheet.* Analyze and understand the history of installation, implementation, calibration data, maintenance actions, and seasonal weather conditions that might have contributed to the reported event. Does the event involve a faulty or broken system component that could be resolved with a maintenance visit?

Phone Sterling Field Support Center (SFSC), on 703-661-1259, or email nws.sfsc@noaa.gov, if there is a system technical error. Inform your RCPM to report what type of maintenance action was necessary. See Chapter 4, Maintenance, of this *FPR Operations Manual*, for general policy on trouble shooting and procedures for ordering replacement parts.

3.7 Journal Responsibility:

3.7.1 Continuous Automated Logging: Previously, any time you suspended the F&P gauge from its 15-minute timer or each month when you removed the Punch Tape from the sprockets, you were required to write down the 'OFF Date/Time', as well as your Station ID (i.e., 23-4652), your Station Name (i.e., Lake City), and your State (i.e., MO) in felt tip marker to your Punch Tape. You then had to draw a straight line (i.e., a "time line") across the width of the Punch

Tape, to stand as an unmistakable reference to show where the interruption began. When you rethreaded the paper you would mark 'ON Date/Time.'

With the FPR however, the recorder continues to run un-interrupted while you perform the critical monthly task of downloading precipitation data to the Flash Drive. So, you do not need to document the date or time (i.e., OFF date/time) when you download the monthly data.

3.7.2 Bucket Maintenance – Journal Entries: When routine maintenance activity changes the weight of the collection bucket – the precipitation record for the climate program is at risk of data corruption. To avoid damaging the climate data record, changes in the bucket level have to be accounted for with a written entry in the F&P Log Sheet. Each time you or your observer add Food Grade Propylene Glycol (FGPG) for winter season – this must be accounted, and when the one-half quart of oil is added to the bucket to prevent evaporation write an entry to the F&P Log Sheet. Appendix I, gives an example with instructions on how to journal these important interruptions in the data record. This is analogous to the "OFF Date/Time" you entered on the F&P Punch Tape.

The Log Sheet is formatted so you can mark with a pen multiple boxes for a given maintenance job, and simply report the Start Time, Stop Time, the corresponding Bucket Level (i.e., display reading), at start and finish of the maintenance.

3.7.3 Delegated Responsibilities: If your Observer has agreed to take-on routine maintenance activities, then the Observer also must agree to take on the responsibility of writing journal entries to the FPR Log Sheet. The Observer shall follow the instructions for completing the FPR Log Sheet (Appendix I) whenever the buck is drained, emptied, or the fluid levels in any way are altered. Likewise whenever Food Grade Propylene Glycol (FGPG) is added to prevent freezing, or oil is added to retard evaporation. The Observer will write these actions to the Log Sheet.

Then on the next available routine monthly mailing after these actions, the Observer will enclose a hard copy of the FPR Log Sheet, into the same mailer-envelope as the Flash-Drive, and mail to the attention of the NWSREP. If the Observer uses e-mail, he will attach a softcopy of the FPR Log Sheet, as a separate file, when he emails the monthly data file.

Before you Begin Maintenance Activity: Obtain the FPR Log Sheet, and on the next available row, write down the current Date (MM/DD/YYYY), and the Start Time (HH:MM, for local 'standard' hours, i.e., do not use Daylight Time values). Then write down the 'Amount' that appears in the display – this is the bucket level that is about to change.

Maintenance Activities to be Noted Move your pen to Column 3, 'Routine Actions,' and mark off one or more of the Check Boxes that describe this maintenance action.

Types of Maintenance Activities:

- Partial Draining of Bucket: Drain the bucket into a sealable container. When finished, return the drain tube to its operational position, and in the same row of the Log Sheet write down the Stop Time, and the Amount that now appears in the display. Make sure you marked the box, "Partial Drain" in the 'Routine Actions' column. See example in Appendix I.

- ❖ Emptying of Bucket: Empty the bucket into a sealable container. When finished, return the drain tube to its operational position, and in the same row of the Log Sheet write down the Stop Time, and the Amount that now appears in the display. Make sure you marked the box "Partial Drain" in the 'Routine Actions' column.

- ❖ Added FGPG (Winter): Add one or more whole Quarts of Food Grade Propylene Glycol (FGPG) to prevent seasonal freezing of the bucket fluids. Make sure you marked the box 'Add FGPG' in the 'Routine Actions' column.

- ❖ Added Oil: Add one quart of Oil to the bucket to retard evaporation of the collected precipitation liquids. Make sure you marked the box, 'Add Oil' in the Routine Actions, column.

- ❖ Removed/Installed Funnel: Remove the funnel at start of winter season, and install the funnel at start of summer season. Make sure you marked the box, 'Funnel In' when you are installing the funnel. Make sure you mark the box, 'Funnel Out' when you are removing the funnel in the Routine Actions column.

- ❖ Removed Object from Bucket: Twice yearly inspection of the contents of the bucket is advised. If you find an object, such as a pinecone, bird, or small animal, proceed to empty, rinse, and towel dry the bucket. Then describe the object that was removed, with a written entry to the 'Special Notes' section (Log Sheet, Column 5).

3.8 Quality Assurance Checklist:

Use these 'best practices' to prevent transmission of incorrect monthly files, improperly named files, and prevent a disorganized exchange of Flash Drives. These guidelines need to be stressed when you train a new person on FPR-E tasks.

3.8.1 Log-in the Flash Drives and E-Mails that arrive each Month

- Establish a Flash Drive Log Sheet template; update and print it monthly
- Consider a QA Log Sheet for broader, more general FPR responsibilities
- Establish firm time-table, routine
- Perform Quality Assurance review of the monthly data files (see 3.8.4)

3.8.2 Transmit to NCDC

- Assure all FPR data files are FTP'd to NCDC in sufficient time to meet the deadline of the 25th day of Month
- Do not e-mail the FPR data files to NCDC.
- Check NCDC Inventory web site to confirm NCDC receipt of all of your FTP'd files
- http://www1.ncdc.noaa.gov/pub/data/hpd/inv/hpd-inventory_201108.txt (see Section 2.2.11 of this Manual)

3.8.3 Set a 'Best Practice Policy' for your WFO to handle all the FPR stations.

- Establish expectations with Cooperative Institutions.
- Establish consistency
    - Schedule firm cut off for routine receipt

- Follow-up on missing Data Emails, and Flash-Drives consistently
- Establish deadlines, patterns with Observers

3.8.4 Perform Quality Assurance Review:

Look at the data in a text viewer like Notepad to verify:

- The date/time of the start and end points of the data file are correct
- The data file possesses proper filename, station number, Year/Month/Day
- There are no data missing problems, no garbled data; and there are no zeroes filling the pages

Look at the data with a plotting program "FPRE_PlotData_V1_2_6.xls" to verify the following:

- The data is smooth and continuous, not noisy, disjointed, or has other problems
- The battery voltage is being maintained by the system
- That evaporation is not occurring
- If the gauge needs emptying

Resource: Obtain a copy of the **FPRE_PlotData** Excel program from the NWS HQ website: http://www.weather.gov/ops2/Surface/coopimplementation.htm

- If there is a problem in the data file; does this problem fit a pattern from the same Observer?
- Have there been quality improvements (observer) for same site?
- Log problems at the WFO to establish patterns
- Read and take action on any FPR Log Sheet that is submitted by the Observer.
- Determine QC corrective procedures. Is there something NCDC can do; or recover?
- Schedule your QC. Does NCDC need to be specially notified about this Station's data?
- Follow-up with your Observer, and with NCDC if needed.

3.8.5 Records Retention Guidelines from NWS Headquarters

The following FPR data records and FPR meta-data shall be kept on hand in the WFO:

- Electronic copy of the month's FPR files (TXT) shall be stored for at least 12 months on an NWS-network workstation.

- Paper or electronic copy of the '***Flash Drive Log Sheet'*** for 12 months.

- Paper or electronic copy of Observer-submitted ***FPR Log Sheets*** and print a copy of any e-mail correspondence on subject matter. Save it at WFO for 12 months.

O Paper or electronic copy or electronic bookmark for each of the FPR documents that appear in this manual's Appendix C. This includes the relevant administrative and procedural directives for the FPR program (i.e., FPR-E Operations Manual, FPR-E Assembly Procedures; FPR-E Observer Instructions; NWSM 10-1315 (Cooperative Station Observations); EHB-10 (Hydrologic Equipment), Coastal Environmental Systems Inc.'s *FPR Kit Operations and Maintenance Manual*, and any memos issued by NWSHQ).

CHAPTER 4 – MAINTENANCE POLICY

4.1 Semi-Annual Site Visitation:

A day or two prior to your trip, call up this site's CSSA **Inspection Report** (Form B-23) and review the results of your last inspection. Also review the current B-44 to view the Calibration Coefficients values 'A,' 'B,' and 'C.' A check of the calibration shall be performed once per year, though you may check it any time you schedule a site visit. Realize that any changes to Coefficients A, B, and C, need to be saved to the B-44 'Equipment Description' field. If you replace the Load Cell, then you will need to enter the Calibration Constants, C1, C2, and C3; that appear on the decal of the new Load Cell.

Some NWSREPS have ten or more FPR to monitor and maintain a collection of the metadata that is saved to the CSSA inspection report. So call up any other ready reference you may have, such as an electronic FPR Service Logbook. In it you might have journalled any operational anomalies or maintenance performed on the FPR that involved an interruption to the data logger of any length of time. See Appendix H, of this handbook, *FPR Log Sheet*, for an example of what to keep in an FPR Service Logbook.

Phone the Observer and ask if his site requires any supplies, including mailing envelopes (e.g., Jiff #0), or any printed instructions, or *FPR Log Sheet*. Also, ask if a general cleaning is required for the exterior surfaces, and most importantly, for the solar panel.

For general policy on COOP site visits, access Appendix B, **Visitation Procedures**, in NWSI 10-1307, *Cooperative Station Management* (Jan 2008). This directive is located on the NWS web site: http://www.nws.noaa.gov/directives/sym/pd01013007curr.pdf.

SEMIANNUAL CHECK BY NWSREP

What to Check	How to Check	Precautions and Remarks
1. Overall Appearance	Observe paint finish, or evidence of vandalism.	Clean oil film from the outside of gauge using GSA nonflammable liquid detergent.
2. Weather Stripping around Base Plate and Cylindrical Door.	Check for breaks or general deterioration. Weather stripping is used around Base Plate of the Model 1558 and 1559 gauges only.	Replace as needed: Weather Stripping or Door Gasket. Cut base plate weather stripping to about 50 inches in length.
3. Horizontal Flexures in the FPR Weighing Mechanism.	A quick glance will reveal the condition of all four horizontal flexures. If any are bent, broken, or binding it might effect gauge	Use the smallest test weight of the D111-500TE set to ensure the `Zeno Display` reading shows a change in current values. If it does not

	calibration. Horizontal flexures which are 'v-shaped' must be replaced. The upper-rear flexure (ASN part # "**D111-3SP112**") is most susceptible to bending.	change after 15 minutes, the flexure should be repaired. Under no circumstances should any flexures, except the upper-rear flexure be replaced at the observer site.
4. Collection Bucket	The collection bucket is to be emptied whenever the Zeno display reads in excess of **15.00 inches**.	First, before you start any action on bucket, press a button on **Zeno Assembly**, to **wake-up** the display.
A. Emptying and charging collection bucket	Collection bucket is charged for warm weather operation by adding approximately one half-quart of Oil, (ASN part # "**014-O-15**"); to retard evaporation.	Remove any foreign material in the collection bucket and clean. Journal to, ***FPR Log Sheet,*** 'Cleaned Bucket,' before charging collection bucket. Journal to, ***FPR Log Sheet,*** 'Bucket completely emptied'; or journal, 'Partially drained bucket'. And/or 'Added oil to bucket'.
B. Charging Collection Bucket – Cold Weather Operation	Then collection bucket is emptied and charged for cold weather operation, add two quarts of food grade propylene glycol (FGPG), (ASN part # "**D111-153"**) then add one half-quart of oil.	For colder climate sites where temperatures drop to 15°F and below zero, more FGPG needs to be added when collected rain and melted snow dilutes the FGPG concentration. Refer to the table in Section 4.2, for the number of quarts to add as the bucket level rises. Journal to, ***FPR Log Sheet,*** 'Added FGPG to bucket', and 'Added oil to bucket.' Journal to, ***FPR Log Sheet,*** 'Removed Funnel'.

5. Funnel	During the period of year when snow or freezing weather is expected, remove funnel from the conical upper housing.	Reinstall funnel after cold weather season ends. Reminder: All the ***FPR Log Sheet*** entries should be entered to CSSA Site Inspection Report.

Fig 4.1 Semi-Annual Maintenance (Refer to EHB-10; Section 4.2, April 1976)

4.2 Winter Operation:

Minimize the risk of damage to the collection bucket from freezing of the bucket fluids. When water freezes it expands and presses the bucket walls and can crack the floor of the bucket.

a. At the start of winter, remove funnel from the collector. Store it in base of gauge.

b. Empty the collection bucket with the drain tube into a multi-gallon container. If there is any doubt about your ability to drain and then remove the bucket contact your NWSREP for instructions. **Caution:** A full bucket can weigh 40 pounds.

c. Return the empty bucket to its regular position to ready the bucket for its charge of Food Grade Propylene Glycol (FGPG). Following the FGPG you will add one quart of oil. Do not use commercial anti-freeze or add water.

d. Initial charge: Into the empty bucket, pour an amount of FGPG as specified by one of the three temperature categories listed in this table. Choose the category that offers protection against the coldest condition possible for the site. Make an initial charge of 1.0 quart of FGPG if the coldest the site could get is 15ºF.

Coldest Temperature	Initial charge and subsequent charges of FGPG. Each time the Zeno Display rises and reaches: 3.5 inches, 7.0 inches, 10.5 inches, and 14.0 inches, then add this amount of FGPG.	To Maintain this Concentration
+ 15º F	1.0 quart	25%
0º F	1.5 quarts	35%
- 30º F	2.0 quarts	50%

Fig 4.2 For Increasing Display Levels – Add More FGPG to Bucket

Note: An initial 2 quarts charge of propylene glycol produces a height of just one inch in bucket.

e. Subsequent Charges: When the Zeno Display shows the level has reached 3.5 inches add the specified amount of FGPG; for example the coldest category sites (- 30ºF) require 2 quarts be added. Always add the same amount as the initial charge. If you had not serviced the bucket at either 3.5 inches, or 7.0 inches, or 10.5 inches and now notice the bucket holds 11 inches, and you are in the coldest category, then pour six quarts of propylene glycol to maintain the 50% concentration. To prevent the bucket contents from ever freezing add FGPG per the schedule in Fig 4.2, each time the level reaches 3.5, 7.0, 10.5, and 14.0 inches.

f. Install one quart of oil after the initial charge of FGPG. For sites more prone to evaporation, these include tropical sites and sites with windy conditions with low relative humidity; ensure a film of oil is visible after draining water/FGPG mixture. Use NWS supplies, only.

g. Make no adjustments to the gauge after FGPG and/or oil has been added.

h. Document the date and hour each time the bucket was charged with FGPG and/or oil. Remember to journal this action into the FPR Log Sheet (Appendix I).

4.3 Observer Delegated Activities:

Some offices have an agreement with Observers to assist in basic works of maintenance on the FPR. Consider asking your Observers if they could conduct the following activities:

a. Draining and recharging the collection bucket

b. Installing/removing funnel

c. Cleaning the solar panel

If you have a site where you are fully confident they can assist you, then train them in the agreed to maintenance actions and provide them with the necessary supplies and forms. Inform the Observers that all check-ups and bucket discharges shall be conducted in dry weather only.

4.4 Review CSSA Station Inspection Report:

4.4.1 Rain Gauge Supplies: These quantities will vary as a function of the amount of precipitation a site receives in a given season. Phone your Observer and ask him if his gauge requires a certain type of servicing this visit. For example:

a. One quart of Oil might be consumed each year.

b. Three 2-quart containers of Food Grade Propylene Glycol might be consumed each year.

c. One multi-gallon sealable plastic container available to discard bucket fluids.

4.4.2 Prepare for Cold Season: Partially drain the FPR bucket (journal to *FPR Log Sheet*) so as to retain the oil layer in the bucket. Remember to recharge with two quarts of Food Grade Propylene Glycol (journal to *FPR Log Sheet*). Then if necessary, add oil (journal to *FPR Log Sheet*). You never need more than ¼ inch surface oil layer in the Fischer Porter's fourteen-inch diameter bucket. Add one half quart of oil when completely replacing the charge (journal to *FPR Log Sheet*).

Remove funnel: Remove the cone-shaped hood, tip it upside down and set it down. Rotate the funnel so its slots allow it to slide free from the three pins located on the base of the hood assembly. Check the box marked: 'Removed Funnel' in the *FPR Log Sheet* (Appendix I).

Further Considerations: Snowfall and high-rate rainfall events can lead to a layer of snow, ice, or fresh rainwater that rests on top of the oil layer. For these events stir the bucket with a mixing stick to bring the oil layer to the top. This will prevent freezing and possible equipment damage.

4.4.4 Prepare for Warm Season: Remove the cone-shaped hood and inspect the contents of the bucket with a mixing stick (i.e., paint stirrer). Remove and properly dispose of any leaves or debris that might have collected when the funnel was removed at start of winter season. Then with the stick, ensure there is still a ¼ inch film of oil on the surface to inhibit evaporation. If the Zeno's **Display** value exceeds **15.00 inches** on the day you are installing the funnel then perform a partial emptying of the bucket by keeping the oil from running out the drain tube. Add FGPG if local conditions require.

Install the funnel: Remove the conical housing, turn it upside down, and fasten the funnel by rotating its three slots onto the three pins of the cone shaped hood. Return this hood assembly to the gauge (Fig 3.1). Check the box 'Installed Funnel' in the *FPR Log Sheet*, (Appendix I).

4.4.5 Rain Bucket Draining: The bucket's capacity is about 20 inches of precipitation or 4.9 gallons. Advise the Observer to daily monitor the Zeno's **Display** readings and to phone you when it surpasses **15.00 inches**, at that time the collection bucket needs to be drained. Always schedule the bucket draining to be done when weather is dry, when no precipitation is forecast for either the day before, or the day of, this important maintenance.

If your Observer has agreed to conduct the bucket draining or emptying, then remind him/her to always **make note of the Level in the bucket to the FPR Log Sheet.** Also, have him/her write down the Day/Hour/Minute the Bucket activity was started and completed, and write down the new Level in the bucket.

Note: Remind your Observer to mail you the ***FPR Log Sheet*** as soon as the next monthly Flash Drive is mailed. You should enter his maintenance actions to your CSSA site inspection report for continuity of records.

4.4.6 Visual Check List: Ensure there are no obstructions that block the opening of the collection bucket. Ensure that all access doors and their hinges, latches, and locks, are working properly. After clearing obstructions, use a damp cloth or paper towel with gloves to wipe clean exterior surfaces.

a. F&P Hood, Funnel and Bucket: each free and clear of debris.

b. Data Logger Access Door, hinges, latch, and lock is functional.

c. Solar Panel, fastened tight, free and clear of debris. Ensure the cable and cable plugs are properly positioned and appear in good condition. Ensure the solar panel is not covered by dust, bird droppings, or obstructed by any objects.

4.5 Battery Voltage Too Low – Repeated:

Always carry a spare fully charged battery with you when visiting an FPR-E site. It is not possible to trouble shoot the system if the existing battery is dead or low on charge.

The battery of the FPR weighs four pounds, and is a 12V, lead-acid, rated 7 Amp-Hours. Battery voltage is a problem when it runs below 11.5V. Repeated system shutdown due to low battery voltage is caused by either

a. No sunlight on panel:
   i. Panel Fully or partially shaded by obstructions
   ii. Weak or low sun angle (i.e., Alaska in winter)
   iii. Panel dirty

b. System fault, load failure:
   i. System shorted, or high load, draining battery too fast.
   ii. Fuse blown

c. Charging system failure:
   i. Panel, regulator or connection failure (See illustrations in Sec 19, of the *FPR-E Assembly Procedures*, for which terminal in the junction box, the multi meter probes need to touch.)

d. Battery failure:
   i. Battery cell shorted
   ii. Battery worn out
   iii. Battery destroyed by repeated deep discharge cycles

All the above must be checked when you see repeated shutdowns in the data, or have a dead system. To troubleshoot a failing system use the following instructions.

4.5.1 First check the battery voltage. Disconnect positive lead from battery. Measure voltage across battery.

a. If below 12.0V, swap out battery with fully charged spare. Do not reconnect positive lead to battery, yet.

b. If about 12.0V, proceed to System Fault Check, do not reconnect positive lead to battery, yet.

4.5.2 Check System Fault, Load failure – With solar panel in <u>full</u> sun, oriented to sun, and clean:

a. Solar Panel Wake Up – wake up logger to see if it will run on solar panel alone.
   i. Logger wakes up – Good. Proceed to Battery wake up.
   ii. Logger does not wake up – proceed to Check Charging System (Sec 4.5.3)

b. Battery Wake Up – Disconnect solar panel, connect positive lead to fully charged battery.
   i. Logger wakes up – Good. System will run on both battery and solar panel confirmed. Proceed to Check Charging System (Sec 4.5.3)
   ii. Logger does not wake up
      1. Check fuse – replace as necessary.
         a. Fuse blows again, replace Zeno logger assembly.
      2. Replace Zeno logger assembly.

4.5.3 Check Charging System - With solar panel in FULL sun, oriented to sun, and clean, disconnect positive lead from battery, measure voltage on battery and on positive lead. Voltage on disconnected positive lead must be highter than Battery voltage by 1.2Vmin, in order to charge battery.

a. **Positive lead voltage -** Must be 13.6V or higher and could be > 26V.
   i. If 13.6 to 27.0V, solar panel voltage is okay. Go to Load Test (4.5.3.b)
   ii. If not 13.6 to 27.0V, troubleshoot the charging system (4.5.3.c).

b. **Load test** – Connect 40-50 ohm 10watt resistor across the positive lead and negative lead. Measure the voltage across the resistor.
   i. If still above 13.6V, charging system is working fine.
   ii. If below 13.6V, find what is stopping the current from solar panel / wiring / connectors / regulator path. Corrosion in connectors is typical cause. Go to Troubleshoot charging system (4.5.3.c).

c. **Troubleshoot charging system** – Leave battery disconnected, disconnect solar panel first connection, and repeat tests 4.5.3.a, and 4.5.3.b (above), at that point.
   i. If both tests are good at solar panel, reconnect solar panel connector and move to next connection, repeat tests at each successive accessible point in charging path until you find blockage. Repair the fault.
   ii. Done when tests (Items 4.5.3.a., and 4.5.3.b, above) pass at the battery leads.

4.5.4 Reconnect everything. At this point the system should be working fine on a good batter /power system.

4.5.5 Check Old Battery – This can NOT be done in the field.

a. Take the old battery back to your WFO workshop charging station

b. Connect it to an AC charger that is appropriate for the size of the battery.

c. Leave it on for three (3) days.

d. Disconnect from the charger.

e. Wait 12 hours for it to cool to room temperature. Have nothing connected to the battery.

f. Measure battery voltage. Should be fully charged.
   i. 12.6 or above, battery is good. Load test it if you have a 1 amp load tester to confirm (do NOT use an automotive load tester!!) Put battery in your truck as a spare.
   ii. 11.2V and below. Battery is bad, has at least one cell dead. Discard/recycle battery per NWS guidelines.

Caution: Be familiar with the safety precautions when you are charging a lead-acid battery. Access https://www.ops1.nws.noaa.gov/Secure/SAFETY/Safety_manual.htm and click on chapter 15, to read, NWSM 50-1115, Procedure 15.3, *Battery Charging and Storage Operations*.

Background Discussion: If any part of the solar panel is shaded, the panel may shutdown and not deliver any real power to the application. The solar panels we use are made up from multiple solar cells connected in series to give the voltage needed and then in parallel to give the power needed. When a solar cell is shaded it becomes a high resistance to any current impressed upon it. Thus, if any individual cell of a series string is shaded, that cell will block the current generated by the other cells in that string, effectively shutting off the output. Mount the solar panels where they are in full sun, not in the fringe area under trees or behind guy wires or tower supports. Also, problems have been reported where construction or farming resulted in a lot of dust on the panel (charging always improved after a good rain!).

So, train the Observer to inspect and clean the solar panel on an 'as needed basis'. The FPR-E is supplied with a 15 foot connecting cable. The cable can be extended as far as you need, provided you use good outdoor rated wire of the same size or larger, and make waterproof connections above ground. If you need to trench the cable, use direct burial rated cable.
To troubleshoot a failing system:

4.6 Zeno Display Will Not Illuminate:

It is normal for the display to go dark (asleep) after approximately two minutes of inactivity.

Wake-up the display by pressing the display button, on the right side of the Zeno Assembly and the screen will illuminate. (see Fig 3.5, in preceding chapter).

If the Zeno Display fails to respond, there are five fault conditions that could be the cause:

a. Faulty battery,

b. Faulty battery cable,

c. Faulty battery charger,

d. Blown fuse,

e. Faulty Zeno Assembly.

Use your multi-meter at the battery terminals and cable wires to rule out faulty battery and charger. If it is lower than 11.5V, then check the solar charging. Refer to the preceding section (Sect 4.5) for testing of solar charging. Review a recent data file to examine the voltage history, recorded in every 15-minute precipitation record to see when, or how often the battery voltage is too low.

Inspect for blown fuse.

If all the above check-points test 'good,' suspect an internal fault with the Zeno Assembly.

4.7 FPR Site Visitation – Restorative Maintenance:

When you visit a station to perform FPR restorative maintenance consider conducting preventative maintenance including a check on sensor calibration, and draining the collection bucket if needed. Carefully follow the procedures given in Section 4.5 for practical examples of diagnostic checks you can perform while at the COOP site.

Reminder: Always journal these restorative activities to your ***FPR Log Sheet***, see Appendix I, of this manual.

4.8 Protecting the Flash Drive:

The Jiffy No. 0 (zero) padded mailing envelope (photo, right) is the appropriate package for exchanging the Flash Drive between the Observers and the NWSREP. This is the standard, ten inch square, darker color envelope. Newer, bubble-pack square envelopes (Jiffy No. 00) have thinner paper and tear more easily and can result in the Flash Drive being lost in the mail.

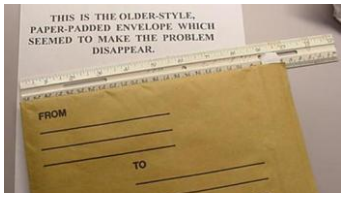


Fig 4.4 Mailer for Flash Drive And Log Sheets

Certain United States Postal Service (USPS) centers might use electro-magnetic scanning devices to screen materials coming through the mail. To avoid potential damage to the Flash Drive, you may write: **"Sensitive Magnetic Media, Handle Manually**." on the front of the Jiffy No. 0 mailing envelope.

CHAPTER 5 – SENSOR CALIBRATION POLICY

5.1 Rain Gauge Accuracy:

At least once per year, preferably at the time of the semi-annual site visitation, conduct a Calibration Check-Up on the FPR rain gauge. This requires the use of the large brass test weights and a lap top computer. You may use one, two, or three test weights, so long as each is the 4,111 gram size. Each is equivalent to five inches of rain water.

If the rain gauge tests within the standard calibration range (Fig 5.2) you will *not* have to conduct a complete reset of calibration of the FPR system.

Follow the steps in 'Sensor Check-Up Procedures,' given in section 5.2, below. The same procedures are also documented in Appendix C, of the *FPR-E Assembly Procedures* (July 2011). If the Zeno display returns you Display values that fall into the acceptable range as called for by the FPR Tolerance Table (Figure 5.2), then you will *not* need to re-calibrate the load cell sensor. If the display gives values outside the criteria given in the Tolerance Table (Figure 5.2), then calibrate the sensor through the ZENO Data Logger's Test Menu. The full calibration reset instructions are also given in Appendix D, of this manual.

Remember, whenever you conduct the Semi-Annual maintenance, you should check the calibration. If the Calibration Check-up fails to come into tolerance of ±0.25 inch of 15.00 inches, you need to connect to the ZENO Logger's menu, 'Calibration' and reset the calibration with an empty bucket. Otherwise, you should not perform a calibration reset.

5.2 Calibration Check-Up Procedure:

A. Before you install oil or propylene glycol for full-time operation…and while the bucket is still clean and dry, perform this Calibration Check. Use a carpenter's level across top if you have already placed oil or propylene glycol in the bucket.

B. Place carpenter's level flat-side, across the top of the collection bucket.

C. Wait 15 minutes. Press the button on the side of the ZENO® Assembly to activate the display and take a reading. Write it down to a piece of paper.

Fig 5.1 Brass Weight on Top of Bucket

NOTE: To reduce the waiting time, you are permitted to speed-up the sampling rate of the FPR gauge from once per 15 minutes to once every 10-seconds. Instructions to change the rate are found in Appendix D of this manual. Always remember to return the rate back to 15 minutes (900 seconds) once this calibration check is completed.

D. Then place one, two, or three large brass weights (4111g each) upon the carpenter's level.

E. Take a new reading after 15 minutes. Write down this weighted value.

F. Subtract the first reading written in Step C, from the second reading taken in Step E. Write down this difference in hundredths of an inch.

G. If the difference falls into the acceptable range as given in the FPR Tolerance Table, the calibration is acceptable and full calibration is not needed. Then write down in your site inspection report 'Cal Check – Good Readings.' You may enter the same phrase into the Special Notes column of the ***FPR Log Sheet***. If any difference falls outside of its respective range listed below, then you will need to do a full calibration as described in Appendix D, of this manual. Then write down in the ***FPR Log Sheet***, 'Calibration Check – Performed Reset.'

H. Remove the weight(s) from the carpenter's level (Fig 5.1), and then remove the carpenter's level.

NOTE: Always take the un-weighted measurement first, and then place the weight in/on bucket to get the weighted value.

CAL TEST OPTIONS	WEIGHTS REQUIRED	ACCEPTABLE RANGE
5.0" equivalent rain	1 large weight	4.75 " thru 5.24"
10.0" equivalent rain	2 large weights	9.75" thru 10.24"
15.0" equivalent rain	3 large weights	14.75" thru 15.24"

Fig 5.2 FPR Tolerance Table for Calibration Checks

CHAPTER 6 – METADATA REQUIREMENTS

6.1 Metadata Requirements:

There are two categories of metadata for the FPR-E:

- Station Equipment Data (i.e., Form B-44) – Once upon implementation and any retrofits.
- Maintenance Data (i.e., FPR Log Sheet and/or Site Inspection Report) - Several times per year (i.e., Emptied Bucket)

The NWSREP shall produce metadata to account for these FPR-E actions:

- Initial installation of FPR-E system accounted by Form B-44.
- Seasonal Maintenance (draining) accounted by CSSA Inspection Report.
- Routine check of calibration accounted by CSSA Inspection Report.
- Restorative Maintenance accounted by CSSA Inspection Report and FPR Logbook.
- Equipment Modification Notes actions accounted by Form B-44 and Inspection Report.

The NWSREP shall store FPR-E metadata in these locations:

- CSSA Station Information Report (SIR) also known as Form B-44 gets saved to database.
- CSSA Site Inspection Report saved locally at WFO - yet Regional HQ may have access. (if necessary, Form B-23, Station Inspection, is the backup printed form.)
- *FPR Logbook*, electronic file (unrelated to CSSA), holds just FPR information, in a condensed format – some of which overlaps information already stored in the CSSA.

Secondary metadata that is tracked in an *FPR Logbook*, is saved and updated because it is useful for OPL/HMTs to quickly track which sites (i.e., up to 42 per WFO) are in need of a site visit.

6.2 Metadata Accuracy for FPR-E:

The NWSREP conducts semi-annual visits to the Fischer-Porter Rebuild (FPR) sites and checks the calibration of the weighing sensor. If the calibration needs to be reset, then new calibration coefficients (A, B, and C) get generated and have to be saved as revised metadata in an inspection report.

If the weighing sensor (load cell) is replaced from failure or due to a system-wide equipment modification, this will change the values of required metadata. The NWSREP is responsible for updating the metadata as needed following restorative maintenance or mod-note implementation.

The Cooperative Station Service Accountability (CSSA) system is the single most authoritative source of COOP station information. The information it contains describes site location, exposure, dates of changed equipment, and method of data reporting. These elements of information constitute ‘metadata’ that are then used by the NCDC to create a permanent archive of station information. The accuracy of each of these parameters should be checked every six months.

When an FPR-E recording gauge is implemented, it is critical to update the B-44 Station Information Report's '***Remarks***' field with the following text: "UPDATED EQUIPMENT, CHANGED F&P TO FPR-E WITH USB FLASH DRIVE."

Three pieces of information are saved to the WS Form B-44: the Serial Number of the weighing sensor (i.e., load cell), Calibration Coefficients (A, B, and C), and Calibration Constants (C1, C2, and C3). If any of these three items change, then the new values must be saved to the B-44 in a new rendition and reported to CSSA.

Policy on how metadata shall be accounted in CSSA (WS Form B-44) is found in the ***Cooperative Station Service Accountability (CSSA) Manual*** (NWSM 10-1313). The NWSM 10-1313 is undergoing a biennial revision and the new version will be available in 2011 on the NDS web site: http://www.nws.noaa.gov/directives/sym/pd01013013curr.pdf . Part of the manual that deals with equipment description (Appendix G) will be considered a living document and Appendix G, *CSSA Lookup Tables*, will be revised by the Observing Services Division (W/OS7) at NWS Headquarters, more often than every two years.

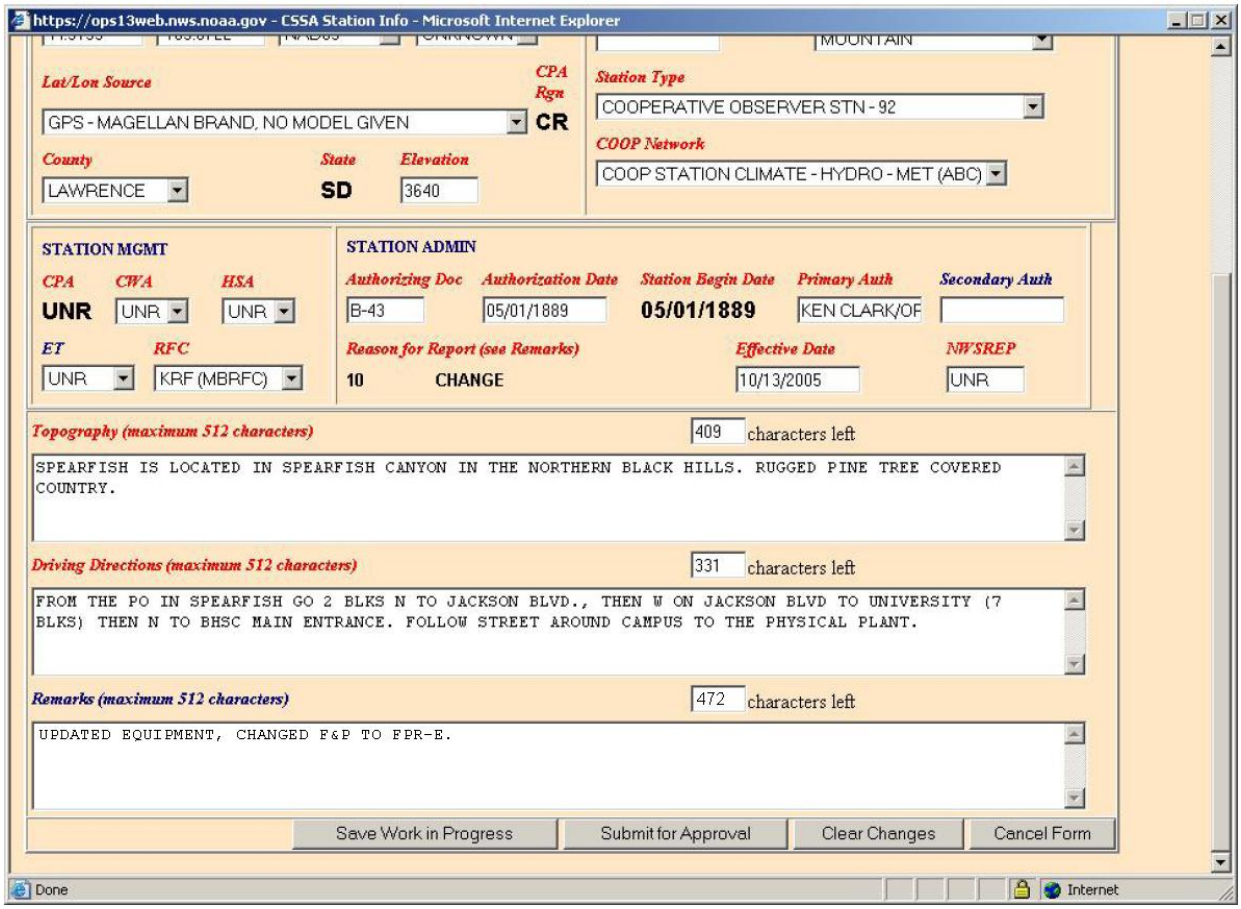
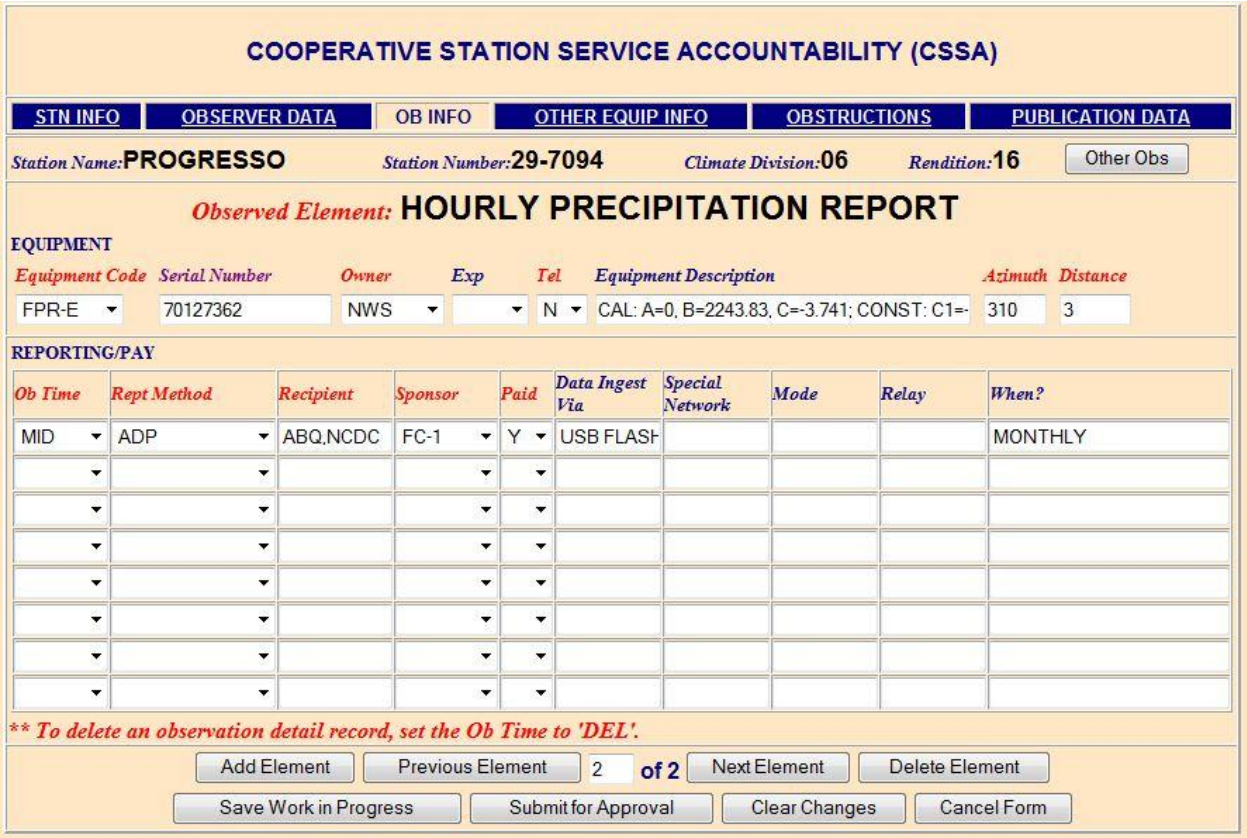


Fig 6.1 B-44 Remarks Section for Installation

6.3 Detailed Metadata Required for Form B-44:

The first page of the Station Information Report (Form B-44), gives the reason why a new Rendition of B-44 was necessary. There are several codes for "Reason for Report."

For initial FPR-E Installation, select "10 " which signifies "CHANGE" (see Fig 6.1).



COOPERATIVE STATION SERVICE ACCOUNTABILITY (CSSA)

STN INFO | OBSERVER DATA | OB INFO | OTHER EQUIP INFO | OBSTRUCTIONS | PUBLICATION DATA

Station Name: PROGRESSO Station Number: 29-7094 Climate Division: 06 Rendition: 16 Other Obs

Observed Element: HOURLY PRECIPITATION REPORT

EQUIPMENT

Equipment Code	Serial Number	Owner	Exp	Tel	Equipment Description	Azimuth	Distance
FPR-E	70127362	NWS		N	CAL: A=0, B=2243.83, C=-3.741; CONST: C1=-	310	3

REPORTING/PAY

Ob Time	Rept Method	Recipient	Sponsor	Paid	Data Ingest Via	Special Network	Mode	Relay	When?
MID	ADP	ABQ,NCDC	FC-1	Y	USB FLASH				MONTHLY

** To delete an observation detail record, set the Ob Time to 'DEL'.

Add Element | Previous Element | 2 of 2 | Next Element | Delete Element

Save Work in Progress | Submit for Approval | Clear Changes | Cancel Form

Fig 6.2 Detailed Entries for WS Form B-44 (Hourly Precipitation Report)

Enter a short description to the Remarks box (free text up to 512 characters) to explain in plain English the change you have made.

For example: "**Updated equipment, replaced F&P with FPR-E. Requires USB Flash Drive to download data.**" See Figure 6.2, below.

Make the following changes in the Station Information Report (Form B-44):

a. ***Equipment Code***, select '**FPR-E'** from the drop-down menu. This replaces F&P.

b. ***Serial Number*** (see Fig 6.3, below), enter the new Load Cell's serial number (i.e., 70054747). The initial Load Cell's serial number was entered upon FPR retrofit.

The serial number appears on the end of the Load Cell. Look for a small white decal on load cell.

Serial Number
i.e., 70054747

Fig 6.3 Load Cell Serial Number

c. ***Owner***, ensure the **NWS** appears in this category.

d. ***Equipment Description***, First enter text "**CAL: A=0 B=1256.3643 C= -3.5034**".

and then enter text "**CONST: C1=0.0011 C2=0 C3=-0.00003**".

(Use the numerical values specific to your gauge, these are example values.)

e. ***Ob Time***, keep 'MID' this refers to midnight, retain 'MID.

f. ***Report Method***, enter '**ADP**' this replaces B18.

g. ***Recipient***, keep 'Your WFO, NCDC' no changes.

h. ***Sponsor***, keep the same. If there is none use "**FC-1**" as the default. For a list of sponsor codes, see p. G-12 in the *CSSA Manual*, NDS 10-1313, and p. C-61, in Section 2.4.3.13, Sponsor.

i. ***Data Ingest Via***, enter text "**USB FLASH DRIVE**" this replaces a blank field.

j. ***Special Network***, default is a 'blank' field.

k. ***Mode***, default is a 'blank' field.

l. ***Relay***, default is a 'blank' field.

m. ***When?*** Keep the word "MONTHLY".

References: Access: http://www.nws.noaa.gov/directives/010/010.htm NWSM 10-1313, ***CSSA Manual***, Sec 2.4.3, Ob Info (p. C-48) and notice there is a left-most drop-down window, and select, **FPR-E.** Also, see the revised instructions in the NDS 10-1313, ***CSSA Manual***, Sec 2.4.3.7, Equipment Description, (p. C-54).

6.4 CSSA Site Inspection Report: When you have completed site visitation and are back in the office, access your CSSA and call up the CSSA Station Name/CSSA Station Number to generate a new Site Inspection Report.

Account for the following in the 'Inspection Data.' Refer to Figure 6.4 (next page) for a guide:

a.	**Inspector (Your Title):**	Network Program Manager (from drop-down menu)
b.	**Inspection Type:**	Annual (if this is initial FPR installation)
c.	**Inspection Date:**	10/17/2010 (free text - use this mm/dd/yyyy format)
d.	**Staff Hours:**	6 (free text)
e.	**Miles Driven:**	183 (free text)
f.	**Per Diem:**	No/Yes (drop-down selection)
g.	**Trip Number:**	2WT0B3804&05 (free text) WFO policy may apply
h.	**Supplies Cost:**	75.50 (free text)
i.	**Trip Cost:**	113.75 (free text)

Next section in Inspection Report is titled, '***Maintenance Performed***.'

So, create accurate metadata with the proper selections of the mouse-clicked check-boxes.

Note: Multiple check-boxes can be marked for the given maintenance.

If this visit is the semi-annual inspection without major modifications or equipment or major parts changes, then click, '**Routine Maintenance**.'

If the bucket was partially drained, or emptied, or charged with FGPG or oil added, click on the check box, '**Routine Maintenance**.'

When a Calibration Check is performed – as is required at least once per year - (See Appendix D, in this *FPR Operations Manual*), and FPR fails to meet standard, a Calibration Reset is made.

- If a Calibration Reset was not necessary, click on the check-box '**Routine Maintenance**.'
- If a Calibration Reset was necessary, and completed, then click on the check-box, '**Calibrated.'**
- If the OPL/DAPM removed a bad part from FPR and replaced it, click on check-box '**Replaced.**'
- If the OPL/DAPM restored the FPR system to full operation, click on the check-box

'**Repaired.**'

- If a configuration change (i.e., Modification Note) was made, click on the check-box '**Modified.**'

- If the FPR shell (hood and/or lower housing) was painted, click on the check box, '**Painted**.'

- If the FPR rain gauge was removed from this COOP site, click on the check box, '**Removed**.'

- If an FPR rain gauge was installed to this COOP site, when there had never been and F&P installed to this COOP site, then click on the check box, '**Installed**.'

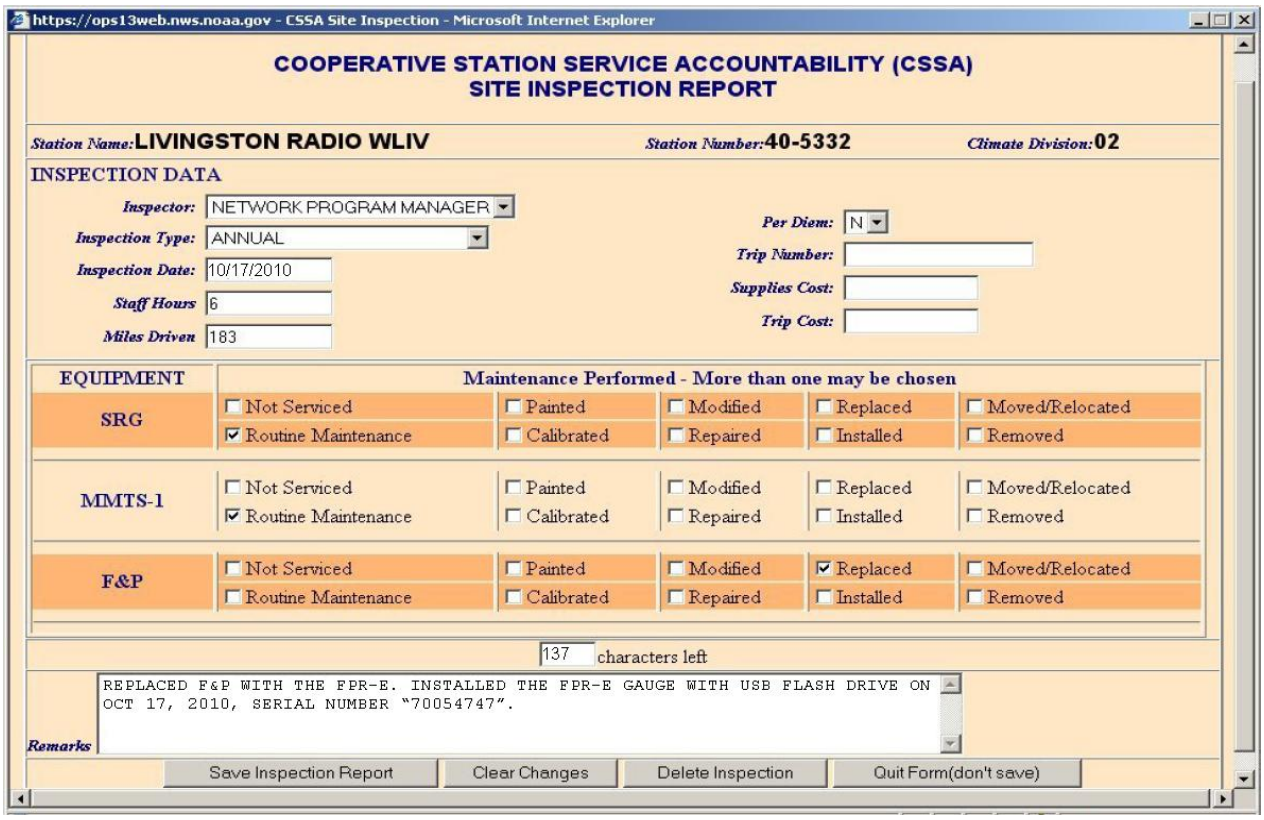


Fig 6.4 CSSA Inspection Report

Lastly, the final section is the '***Remarks***' box at the bottom panel of the first page:

Among the other notes from the site inspection, the ***Remarks*** always include one or the other statement, presented below:

- **FPR Calibration Check Passed: Coefficients, A = 0; B = 1372.87331; C = - 3.8994.**

- **FPR Calibration Was Reset: New Coefficients, A = 0; B = 1286.0523; C = - 4.1076.**

Note: These values are for example only. Each rain gauge will produce unique values.

Important: For full-time access to Coefficients A, B, and C. Keep the values updated and always stored in the Site Inspection Report's '***Remarks***' section.

6.5 FPR Station Logbook:

After you create a Site Inspection Report in CSSA and after your Form B-44 update was successfully processed by NCDC and is accessible in the data base, consider the benefits of organizing an **optional** FPR Logbook (electronic), particularly if you have more than ten COOP sites with FPR equipment.

The FPR Logbook will account for your installation work, expenses, calibration coefficients, calibration check dates, semi-annual visitation, maintenance trips, and any delegated maintenance responsibility given to the Observer. In this way you will have a ready reference from which to retrieve detailed information on FPR system and Observer correspondence, and not be limited to the 250 characters in the Site Inspection Report's 'Remarks' box.

Be careful to distinguish between the several models of FPR. A given forecast office may have a maximum of two varieties of FPR to maintain. One is based on non-telemetry configuration (either the FPR-D or the FPR-E), and the other an FPR installed to telemetry rain gauges.

You may want to spell out the definition of the 'E' suffix in the FPR-E acronym. The 'E' identifies this equipment as manufactured by Coastal Environmental Systems, Inc (CES). Both the weighing sensor assembly and data logger were manufactured by CES.

The suffix for FPR models encompasses just 'D' and 'E' as of 2011. It is our NWS chronological increment of the FPR models that have been deployed. The FPR-D was our first model in 2008 (Sutron, Company), and the FPR-E is our second model to deploy (CES).

CHAPTER 7 – SYSTEM MODIFICATION POLICY

7.1 Management Responsibilities:

Unlike ASOS managers, national managers who maintain COOP observing systems are *not* governed by the instructions covered in NWSI 30-1203, *Configuration Management Policy for Operational Systems*. However, instructions in the NWS Directives System written by the Office of Climate, Water, and Weather Services (OCWWS), for the surface observing program, do apply to the cooperative observing program. Specifically, field and regional managers follow the policies outlined in the, *Cooperative Station Management* (NWSI 10-1307) procedural.

The Observing Services Division (OS7), of OCWWS, will:

a. Evaluate existing and new requirements for FPR systems.

b. Fund, coordinate, and manage the development and certification of proposed changes that include Modification Notes to keep the FPR systems working properly.

c. Fund, coordinate, and manage the implementation of any new hardware and/or software for the FPR systems.

d. Coordinate change actions with Regional Managers, and maintains procedural and policy documents on, http://www.nws.noaa.gov/osp2/Surface/coopimplementation, the COOP Modernization web site; and ensure Mod Notes are posted on the NWSHQ Operational Systems site: http://www.ops1.nws.noaa.gov, under Surface Hydrology and Co-Op.

e. Verify completion of maintenance actions with effected field offices through the Cooperative Station Service Accountability (CSSA) system B-44 reports.

7.2 Policy on Cooperative Station Management:

The driving directive that governs the implementation, operation, maintenance, and modification of any type of meteorological or hydrological observing equipment, is the NWSI 10-1307, http://www.nws.noaa.gov/directives/sym/pd01013007curr.pdf, *Cooperative Station Management and Operations (2010)*.

Field and region managers who make equipment and service changes at the volunteer Observer sites whether in response to Observer requests, or in compliance with national headquarters directives, then have to comply with the policies in the Cooperative Station Management, Section 3.1.2. In that section, managers are instructed to use the Cooperative Station Service Accountability (CSSA) system – an online data base to track numerous minor and major modifications to each of the approximately ten thousand observation stations. The CSSA document is NWSM 10-1313: http://www.nws.noaa.gov/directives/sym/pd01013013curr.pdf.

The project to modify the F&P rain gauges was initiated with the *FPU Operational Implementation Plan* (OIP). It was developed in 2004 by the Office of Operational Systems (OPS22). All field managers involved in the FPU project had to abide by the OIP's management and administrative instructions.

A technical manual, the ***FPR-E Assembly Procedural***, was written to give a detailed description of the authorized configuration of the FPR system with an account of the Part Numbers and Software versions used in the FPR modification kit.

For the management of the FPR-E systems, including operations, maintenance, and issuance of Mod Notes for the FPR-E system, this handbook, the *FPR-E Operations Manual*, will be the governing document.

7.3 FPR System Modifications:

7.3.1 Hardware

Hardware components that may be affected by modifications appear in Appendix H, of this manual. The significant hardware groupings are:

- Load Cell Sensor Assembly
- Zeno Data Logger
- Solar Panel
- 12V Battery

Hardware modifications shall be issued as Mod-Notes by the NWS headquarters to be filed within this ***FPR Operations Manual***. For example the first FPU Mod-Note, dealt with an enhancement to the electrical grounding of the FPU system. The "Bond FPU Chassis to Gauge Chassis," is authorized as a routine maintenance action, effective September 2006.

7.3.2 Software

Software may be affected by upgrades issued by NWS Headquarters, refer to Chap 8.2, *FPR-E Assembly Procedures*, to identify the initial issue version number (i.e., V2.02-Z16eD Jan 28 2009). The significant software groupings in the FPR-E program are:

- Operating System of Zeno data logger (Coastal Environmental Systems, Inc.)
- Configuration Version (i.e., FPR-E001 is the initial issue by NWSHQ)
- McAfee Active Virus Defense (AVD) Suite
- Windows based operating system (i.e., Windows 7, Professional) used by NWSREP to access Zeno data logger via Laptop/Netbook

7.3.3 Priority of Mod-Note Implementation

There are three levels of Mod-Note priority for the FPR program:

a. <u>Routine:</u> make the change within 12 months or by the next regularly scheduled visit to the site. An example is the 'Bond FPU Chassis to Gauge Chassis' Mod Note.

b. High: make the change within 1 to 6 months of the release of the Mod-Note as distributed on the COOP-MOD list server.

c. Emergency: make the change as soon as practical (within 1 to 4 weeks) after the announcement. Inform your RCPM by phone and e-mail to coordinate before action.

7.4 What is a Coastal Environmental System (CES) Firmware Update?:

As of this time there is no anticipation of manufacturer updates of firmware that would require the NWSREP to install firmware to the Zeno Assembly. Should there be one, the NWSHQ policy in Section 7.6 will apply.

7.5 Prohibition Against Local Change:

Each FPR-E system comes delivered with a manufacturer developed firmware already installed. The data logger firmware version number (e.g., **V2.02-Z16eD Jan 28 2009**) can be accessed though laptop/Netbook via the Zeno System Function Menu, and select 'Program Version.'

This FPR-E firmware is standardized and configuration controlled. The configuration version number is visible at the end of each 15-minute data record (e.g., FPR-E001). No one has authority to change the data logger configuration software without the express and written direction from the W/OS7, the Observing Services Division, Cooperative Observer Program, of the NWS.

The FPR-E data logger will produce two types of measurements by default: the precipitation level and battery voltage. While the logger is capable of temperature sensor input, the FPR-E will not be configured to input the MMTS thermistor readings.

As of June 2011, with the initial FPR kit deployments, only the precipitation data is certified for operational use. In the future, if a temperature sensor becomes certified for use, updates will be given to the NWS field offices to install configuration software.

7.6 Modification Notes:

All Modification Notes issued from headquarters shall take into consideration the length of time that may be required to implement the Modification Note, due to the following: FPR site unique properties, difficult site exposures, harsh climates, difficult electrical grounding, and temporary interruption to institutional site activities, and interruptions to agreements with network users.

Emergency modification work is authorized for immediate restorative maintenance, when hardware or software has been damaged or at risk as described in the Modification Note. Preventative actions will only be authorized on a case by case basis, after the OPS11, Engineering and Acquisition Branch has been informed of site history and reviewed system outages or degradation from: (a) damaged hardware or software, or (b) hardware/software failures with damaged equipment.

Issue Date:	Title of Modification Note:	Regions/ Sites Effected	Complete-by Date:
09/2006	FPU Mod-note 01; Bond FPU Chassis to Gauge Chassis.	All	09/2007

Fig 7.1 An example of Fischer-Porter Upgrade modification dated Sep 20, 2006.

Implementation of a Maintenance Note must be completed by the 'Complete-by Date' specified in Fig 7.1, in this ***FPR-E Operations Manual***. Within two weeks of completion of the maintenance action, the NWSREP shall update the CSSA Report (Form B-44) in the Remarks section to account for the change to FPR-E equipment.

Then you shall report the completed modification via CSSA, Inspection Report. Include the following information in the report:

In the ***EQUIPMENT*** block of the Inspection Report under the heading ***Maintenance Performed*** locate the line for F&P equipment and check the box "Modified". Then, in the ***Remarks*** section, enter: "Completed FPU Mod Note 01, to reduce the risk of electrical damage to FPU."

See illustration (below) for an actual example of an Inspection Report, saved to CSSA.

7.6.1 Reporting Instructions

Report the completed modification (e.g., FPR-E Mod-Note 01) via CSSA, Inspection Report. Include the serial number of the FPR-E system, the SID, and the plain English name of the site which has been modified.

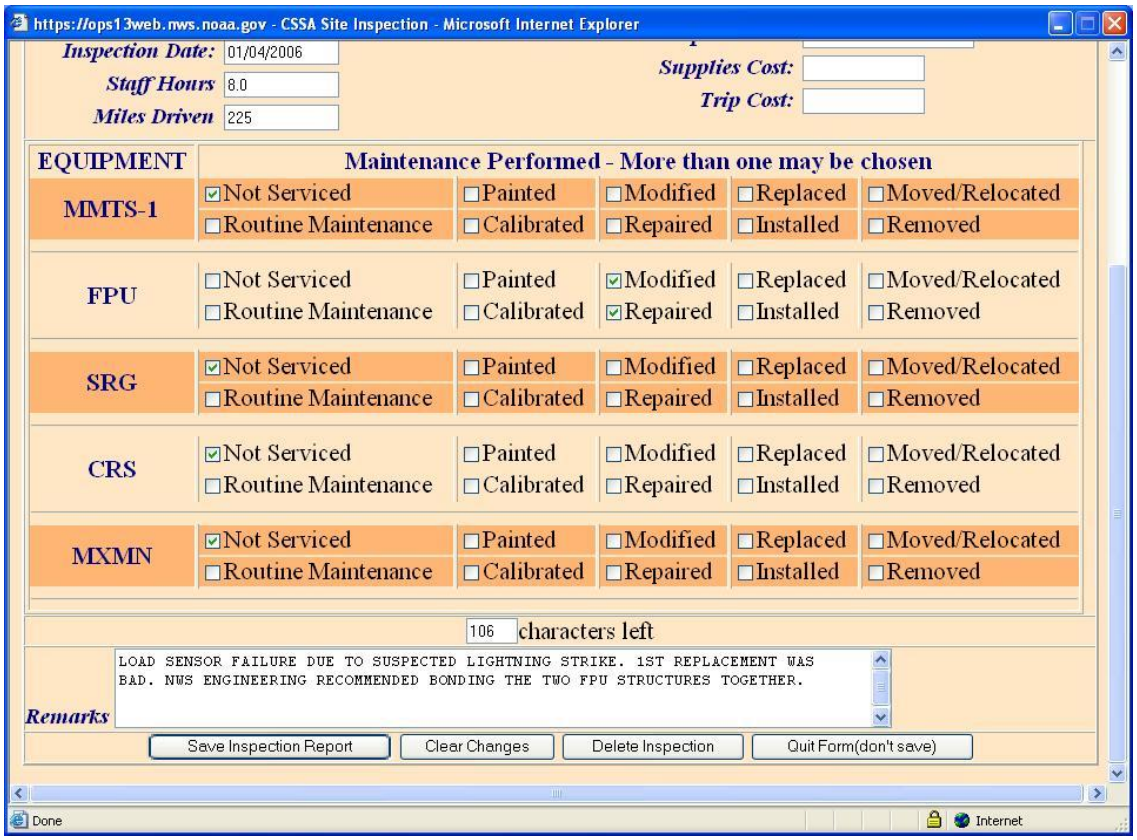


Fig 7.2 CSSA Inspection Report

When a Mod Note is installed to change an FPR-E system, you must also update the CSSA, Form B-44 (Station Information Report), see Fig 7.3.

This is accomplished by editing the *Equipment Description* field on the Observed Element page. The Equipment Description field already contains the weighing sensor metadata (i.e., CAL: A=0, B=2243.83, C=-3.741; CONST: C1=0.0011 C2=0, C3= -0.00005) from when you first installed the FPR-E system. Now, add these words immediately the Calibration Constants values: 'With FPR-E Mod Note #01'

Note: The FPR-E requires more metadata than the FPR-D, and the weighing sensor values are partly hidden in the Equipment Description data entry window. Equipment Description

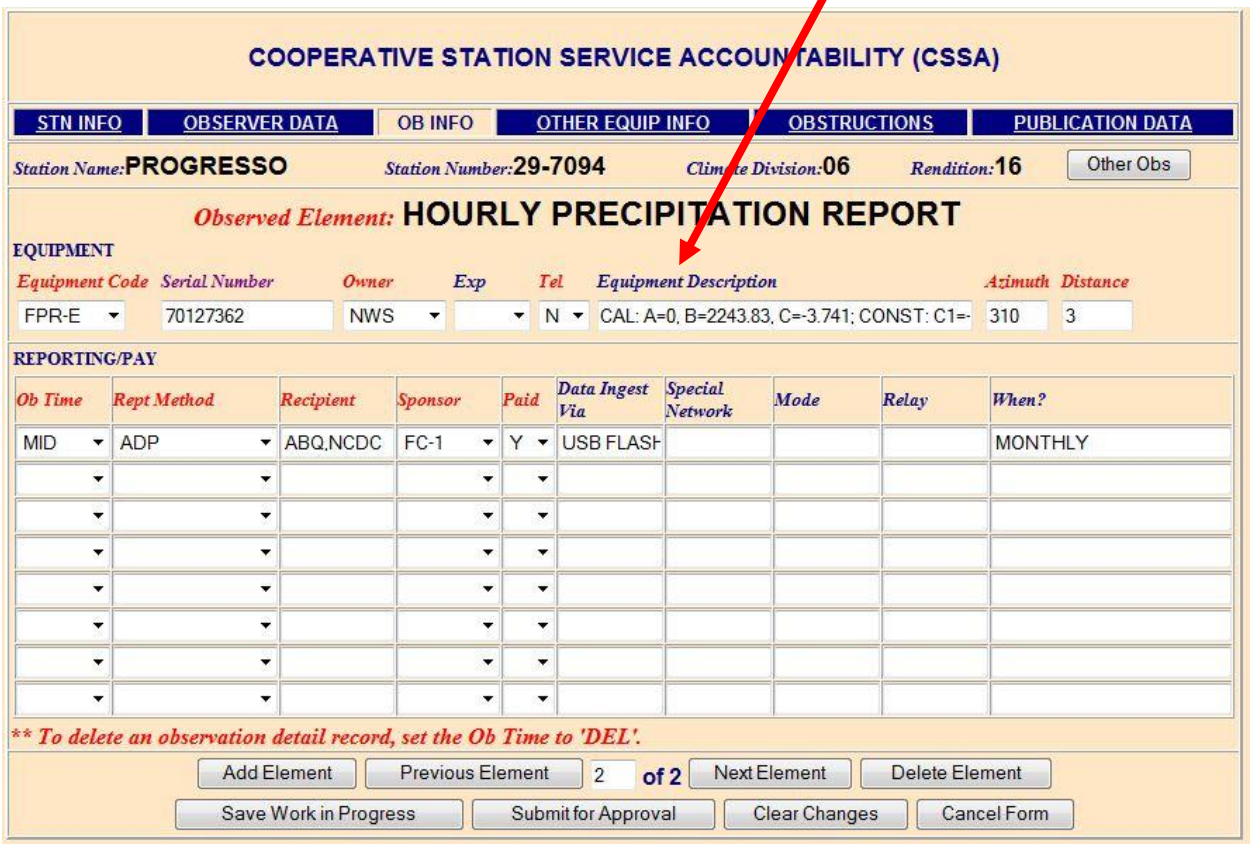


Fig 7.3 B-44 Equipment Description for FPR-E

7.6.2 Records Retention - Modification Notes

The Appendix G, 'Modification Notes, of this ***FPR Operations Manual***, is updated periodically http://www.nws.noaa.gov/ops2/Surface/coopimplementation (i.e., every 6 months) and posted on-line to instruct the NWSREP to make changes in the FPR system as authorized by the NWS Headquarters, Office of Climate, Water, and Weather Services (OCWWS).

APPENDIX A – WFO IMPLEMENTATION CERTIFICATE

FISCHER-PORTER REBUILD (FPR-E)

WFO OPERATIONAL IMPLEMENTATION CERTIFICATE

WFO - _____.

The WFO (SID) _____ hereby certifies the completion of all Fischer-Porter Rebuild (FPR-E) operational implementation activities in accordance with the *FPR-E Assembly Procedures* (2011), as of (Month/Day/Year) _____. Documentation listed below was submitted to the Meteorologist In Charge to validate the successful implementation of all FPR-E in this Cooperative Program Area / County Warning Area.

Required Documents — Initials / Date

A. ***FPR-E Operational Implementation Checklist*** completed by the NWSREP one per each F&P site converted to FPR-E in the County Warning Area / Cooperative Program Area. _____

B. ***FPR-E Thirty-Day Report*** provided by NWSREP if necessary to document any FPR-E system outages and/or HPD data file handling problems, that could not be resolved during the 30-day evaluation period. Documentation of follow-on remedial actions taken to resolve the problems, and results achieved, should also be included. COOP Station Number: _____

Meteorologist in Charge (MIC)

_____ _____

MIC Signature Date

Instructions: The NWSREP completes an ***FPR-E Checklist*** for each FPR-E site and notifies the MIC of each. In addition the NWSREP submits a ***Thirty-Day Report*** to document those problems at each COOP site where they could not be resolved locally in the 30-day evaluation period. Note: The evaluation period starts on the date the FPR-E was installed and activated. The NWSREP submits all ***FPR-E Checklists*** and ***Thirty-Day Reports*** to the MIC. When all checklists and reports have been reviewed to ensure remedial actions have corrected all documented problems, then the MIC signs and dates this Certificate. The NWSREP faxes just this ***WFO Implementation Certificate*** to Tom Trunk (NWSHQ) on FAX 301-713-1598, and informs his/her RCPM.

APPENDIX B – FPR-E IMPLEMENTATION CHECKLIST

National Weather Service - Cooperative Observer Program

FPR-E OPERATIONAL IMPLEMENTATION CHECK LIST

Planned Product Improvement: Fischer-Porter Rebuild (FPR-E) .

COOP Location (SID, Name, State): _____

NWSREP Completing this Check List: _____**Date:** _____

Item #	Item Description	OPR	Date
1.	**FPR Operational Support Activities**		
a.	Select F&P sites to rebuild in 'FPR Designated Sites Spreadsheet.'	OPL	
b.	Submit 'FPR Pre-Implementation Worksheet' with projected dates.	OPL	
2.	**FPR Installation Activities**		
a.	Assemble FPR-E Kit in field office, or if necessary at the COOP site.	OPL	
b.	At COOP site retrieve all B-18 punch tape from gauge. Separate the partial month (ended on installation day) from last whole month.	OPL	
c.	Install / Checkout FPR-E according to, *FPR-E Assembly Procedures.*	OPL	
3.	**FPR Monitoring and Coordination Activities**		
a.	Generate a Site Inspection Report in CSSA.	OPL	
b.	Submit B-44 new rendition to Workflow **within five days of** installing.	OPL	
c.	Establish a WFO Log Sheet to track Flash Drives / Emails received.	OPL	
4.	**FPR Post-Installation Activities**		
a.	Dispose of old equipment according to *FPR-E Assembly Procedures*.	OPL	
b.	Transmit first month's precipitation data and verify NCDC received TXT files according to *FPR-E Operations Manual*.	OPL	
c.	Decode the partial month F&P tape, enter into Form 79-1D, email to NCDC.	OPL	
d.	FAX the MIC-signed *WFO Certificate* to Tom Trunk (OS7) only after all FPR-E sites in your CPA have been implemented, by the steps listed above.	OPL	
e.	Transmit a public notification message (PNS) on AWIPS.	OPL	

Instruction: The Observations Program Leader (OPL) fills-out one Checklist for each FPR-E installed and notes the date of the completed actions. When all sites' Checklists are completed and any Thirty-Day Reports competed, then the MIC signs the WFO Implementation Certificate.

APPENDIX C – ONLINE RESOURCES AND REFERENCE MANUALS

1. Primary Resources On-Line:

a. http://www.nws.noaa.gov/ops2/Surface/coopimplementation.htm
- ***FPR-E Assembly Procedures*** *– July 2011*
- ***FPR-E Observer Instructions*** *– May 2011*
- ***FPR-E Operations Manual*** *– Aug 2011*
- ***FPRE_PlotData_V1_2_6.xls*** *– Sep 2011*

b. http://www.srh.noaa.gov/ohx/dad/coop/~~FPR.html~~
~~- NWSTC Training Class – Clear, labeled photos of the new rain gauge.~~

c. http://www.srh.noaa.gov/ohx/dad/coop/f-p_images
- Clear photos of the original F&P rain gauge.

2. Support Resources – NWS Policy and Procedures:

a. *NWSM 10-1315, COOP Station Observations* (Oct 2010) *****
http://www.nws.noaa.gov/directives/sym/pd01013015curr.pdf

b. *NWSM 10-1313, CSSA User Manual* (Mar 18, 2005) *****
http://www.nws.noaa.gov/directives/sym/pd01013013curr.pdf

c. Proposed: IT Security Statement (by FPR Project Leader to OS chief).

d. *EHB-1: Instrumental Equipment Catalog*
http://www.ops1.nws.noaa.gov/ehbs/ehb1.htm

e. *NWSM 50-1115: Occupational Safety and Health Manual*
https://www.ops1.nws.noaa.gov/Secure/SAFETY/Safety_manual.htm

f. *Integrated Logistics Support Planning* NDS 30-3102
http://www.nws.noaa.gov/directives/030/030.htm

g. *Supply Manual and Catalog* NDS 30-3101
http://www.nws.noaa.gov/directives/030/030.htm

h. *Public Information Statement (PNS) Template* (See Fig 1.5 of this manual) *****

***** The Observing Services Division (W-OS7) of the Office of Climate, Water, and Weather Services (OCWWS) is the Office of Primary Responsibility (OPR) for these asterisked documents. A PDF formatted version of each is available on the NWS Surface Program's webpage: http://www.nws.noaa.gov/ops2/Surface/coopimplementation.htm.

3. Vendor's Manual Supplied with the NLSC Kit:

a. *FPR Kit Operations and Maintenance Manual v4.2* (May 17, 2010), published by CES, Inc., and delivered to the WFO in the equipment kit package.

NOTE: The NWSHQ issued '*FPR-E Assembly Procedures (May 2011)*' is the primary assembly manual. You may reference *FPR Kit Operations and Maintenance Manual*, for detailed information on ZENO® data logger measurements and controls.

4. Engineering Handbooks (NWS):

The following content in EHB-10 is superseded by the, ***FPR-E Operations Manual*** (Feb 2011), and, ***FPR-E Assembly Procedures*** (January 2011), issued by the NWS, Observing Services Division:

Section 1.2: Items 10-204, 10-206, 10-207, and 10-208.

Section 4.2: Revised maintenance schedule for Fischer & Porter Punched Tape Precipitation Gage, April 30, 1976.

The following content in EHB-1, Issuance Number 02-11 (Nov 1, 2002), needs to be supplemented for the new Fischer-Porter Rebuild (FPR) equipment

Section D: Hydrologic Equipment; Instrumental equipment listings.

The NWS Logistics Branch (W/OPS14) has assigned Agency Stock Number (ASN), a National Stock Number (NSN), a Source, Maintenance and Recoverability (SM&R) Code, and will list this equipment in the EHB-1, Instrumental Equipment Catalog.

5. Sterling Field Support Center (SFSC)

For operational support when you implement the Fischer-Porter Rebuild (FPR) modification, you may phone the Sterling Field Support Center, 8:30am – 5:00pm, Monday – Friday, on 703-661-1268; or e-mail them, nws.sfsc@noaa.gov . Before calling SFSC, write down the issue or question and inform your Regional COOP Manager by phone or email.

The Sterling Field Support Center (SFSC) is located approximately 30 miles west of Washington, DC in Sterling, Virginia. The SFSC operates as an extension of National Weather Service (NWS) Headquarters to provide operational support to field personnel through a combination of sensor testing, sensor system analysis, and contact center support. Sterling provides a critical service to the NWS field community by using their years of knowledge and experience gained through extensive sensor/system testing and maintenance in assisting the field with sensor and system failures. When these failures arise in the field, the SFSC is there to provide assistance and help solve these problems.

The SFSC has been a critical component of the Fischer Porter Rebuild (FPR) Program. The SFSC will play a major role in assisting the field if issues arise when the FPR kits are installed at COOP sites around the country. The facility has created a contact center and should be the first point of contact made by NWS WFO's if there are questions or issues with the FPR kits. If the SFSC is unable to determine the correction for the issue, the SFSC will elevate it to NWS Headquarters level.

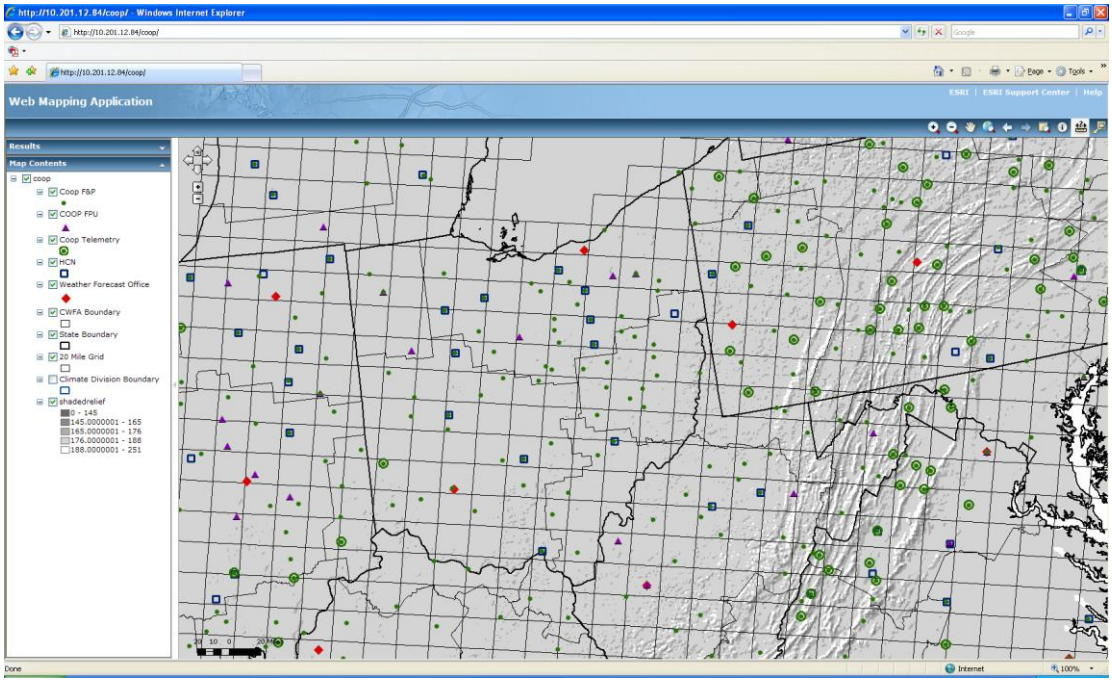
The contact center at the SFSC was established to troubleshoot potential issues in the field with the installation and usage of the FPR kits. The contact center is open Monday through Friday 8:00 AM to 5:00 PM Eastern Time. The SFSC is closed for all federal holidays. All emails and phone calls received during the hours of operation will be responded to in a timely manner. Emails received during non-operation hours will be returned in the order they are received on the following day in which the facility is open.

SFSC Contact Center Information

Main Line: 703-661-1268
Back-up Line: 703-661-1293
Email: nws.sfsc@noaa.gov

6. Maps of Fischer-Porter Locations:

All F&P recording rain gauges are plotted on a user-interactive map. Take careful note of telemetry sites. They are symbolized with a green circle surrounding a green dot – they are ineligible for FPR-E modernization. Access the application on: http://gis.srh.noaa.gov/coop/.



APPENDIX D : CALIBRATION RESET PROCEDURE

1. Reset the Calibration:

If the Calibration Check (described in Chapter 5, of this manual) results in the Zeno Display failing to give readings within the acceptable range of ±0.25 of the brass weights loaded, then take the following steps to perform a complete Calibration Reset of the sensor. A Laptop / Netbook is required to access the Zeno data logger and conduct the Calibration Reset.

NOTE: Check the flexures before starting the calibration procedure. Verify that you have not inadvertently bent a flexure.

1.1 Enter the Load Cell Calibration Constants (C1, C2, C3) that you had entered into the B-44 Equipment Description field:

a. Access the ZENO® User Menu via the Netbook / Laptop.

b. At the User Menu, type **F** <**enter**> to access the System Functions Menu.

c. At the Systems Function Menu, type **K** <**enter**> to access the Constants Menu.

d. Type **C1/n** <**enter**> where "n" is the C1 calibration constant from the tag on the load cell. This uses the "Change Item n To Value m" command of the Constants Menu, to change Item #1.

e. Type **C2/n** <**enter**> where "n" is the C2 calibration constant from the tag on the load cell. (i.e., this value is usually zero; '0')

f. Type **C3/n** <**enter**> where "n" is the C3 calibration constant from the tag on the load cell.

NOTE: Remember to type in a Minus Sign if either C1 or C3 is negative!

g. Type **E <enter**> to save calibration constant information in non-volatile memory.

h. Type **Q** <**enter**> to exit.

1.2 Enter the Initial Load Cell Calibration Coefficients:

a. At the User Menu, type **S** <**enter**> to access the Sample Period Menu. It is necessary to temporarily change the Sample Interval and Offset values for the calibration procedure.

b. Type **C1/12**<**enter**>**.** The screen will update the Sample Period Menu to the one shown below:

SAMPLE PERIOD MENU

(Cn/m) Change Item n To Value m	(Q) Quit
(E) Save Parameters To EEPROM	(H) Help
(U) User Menu	

Item 1:	12	(Sample Interval Time)
Item 2:	10	(Sample Duration Time)
Item 3:	0	(Sample Offset Time)

d. Type **U** <**enter**> to return to the ZENO® User Menu. Then type **T** <**enter**> to display a Test Menu similar to the one shown below:

NOTE: To access the Test Menu more efficiently while in another menu, type **U T** <**enter**>. This shortcut can also be applied to other menus located above the User Menu.

TEST MENU

(Rx,y) Display Sensors x-y RAW Data	(Ex) Display Sensor x Error Codes
(Sx,y) Display Sensors x-y SCALED Data	(P) SDI-12 Pass-Through Mode
(Cx) Calibrate Sensor Record x	(U) User Menu
(Vx) View Process Record x	(Q) Quit
(D) View Data Collection Counters	(H) Help
(B) Display BIT Status	

e. Type **C2**<**enter**>. This is a request to calibrate sensor number two. If prompted for the Administrator Password, enter FPRECOASTAL.

This will display the sensor name, the current ‘A’ conversion coefficient, and a prompt to enter a new ‘A’ conversion coefficient, e.g.:

Sensor Name: RainWeight
Conversion Coefficient A: 0
Enter new Conversion Coefficient A:

f. Type **0** (zero) <**enter**> for the new ‘A’ conversion coefficient.

g. Similarly, the screen will display the current ‘B’ coefficient and prompt for a new value. Type **2000**<**enter**> for the new ‘B’ conversion coefficient.

Conversion Coefficient B: 1256.6
Enter new Conversion Coefficient B: 2000

h. Finally, the screen will show the current ‘C’ coefficient and prompt for a new value. Type **0**<**enter**> for the new ‘C’ conversion coefficient

Conversion Coefficient C: -4.92398
Enter new Conversion Coefficient C: 0

i. Type **u**<**enter**> to return to the ZENO® User Menu.

1.3 Calculate the Actual Gain/Slope

a. With an empty dry bucket on the gauge, lower the shipping bolt so that there is a visible gap (~ 1/4 inch) between the end of the bolt and the front support. Verify that the weight of the empty bucket assembly is on the load cell.

b. At the User Menu, type **D** <**enter**> to access the Data Retrieval Menu.

c. Allow the system to run for at least 90 seconds. Type **L6**<**enter**> to look at the last 6 Precipitation Calibration (PC) data samples. The PC data value will be to three decimal places and is the fifth field for each sample record. If the last three are stable readings (i.e. within ±0.005”), then write down the last PC data value and label it B1 for later use. If they are not stable then wait for 60 more seconds and repeat.

NOTE: The load cell is very sensitive. Use care to not bump the gauge during the following steps. If it is windy, replace the upper gauge cover during the following measurements.

CAUTION: Be careful not to drop the weights. You could damage the load cell and/or bend the flexures. We recommend that you raise the shipping bolt while adding or removing weights to the bucket, and subsequently, lowering the shipping bolt to verify that the weight of the bucket assembly is on the load cell.

d. Place 15 inches of weight into bucket. These are the three brass weights marked “4111G”.

e. Allow the system to run for at least 90 seconds. Type **L6**<**enter**> to look at the last 6 Precipitation Calibration (PC) data samples. If the last three are stable readings, then write down the last PC data value and label it B2 for later use.

f. Calculate the new gain coefficient B with B = 30000/(B2-B1).
[This equation represents: (15" x gain) / (full weight - empty weight)]

g. Type **U T** <**enter**> to access the Test Menu. Type **C2**<**enter**> to enter the new gain coefficient B. If prompted, enter password: FPRECOASTAL. Leave A and C at zero by pressing <**enter**> at both prompts. Enter the calculated B value for coefficient B.

1.4 Calculate the Actual Offset

a. Remove test weights from the bucket.

b. Type **U D**<**enter**> to access the Data Retrieval Menu. Allow the system to run for at least 90 seconds. Type **L6**<**enter**> to look at the last 6 Precipitation Calibration (PC) data samples. If the last three are stable readings, then write down the last PC data value and label it C3 for later use.

c. Calculate new coefficient C with C = **-** C3.

d. Type **U T**<**enter**> to access the Test Menu. Type **C2**<**enter**> to enter the new offset coefficient C. If prompted, enter password: FPRECOASTAL. Enter the calculated C value for coefficient C. Leave A and B as is by pressing <**enter**> for each.

1.5 Adjust the Actual Offset (Thermal Offset Correction)

Under some conditions there can be a small additional offset correction required due to temperature corrections done automatically by the instrument. With the bucket still empty, perform the following:

a. Type **U D** <**enter**> to access the Data Retrieval Menu. Allow the system to run for at least 90 seconds. Type **L6**<**enter**> to look at the last 6 Precipitation Calibration (PC) data samples. If the last three are stable readings, then write down the last PC data value and label it C4 for later use.

b. If C4 is not = 0, then calculate the new coefficient C with C = -(C3+C4).

c. Type **U T** <**enter**> to access the Test Menu. Type **C2**<**enter**> to enter the new offset coefficient C. If prompted, enter password: FPRECOASTAL. Enter the calculated C value for coefficient C. Leave A and B as is by pressing <**enter**> for each. (If the new C value has not changed, press <**enter**> to leave the C coefficient as is).

1.6 Verify Correct Calibration

a. Verify that the weight of the empty bucket assembly is on the load cell.

b. Type **U D**<**enter**> to access the Data Retrieval Menu. Allow the system to run for at least 45 seconds. Type **L3**<**enter**> to look at the last 3 Precipitation Calibration (PC) data samples. Verify that these values are 0.0 ± 0.02 inches. If not within the above range, redo the calibration, starting with Section 1.2, Step ‘d.’

c. Raise the bucket with the shipping bolt then place the equivalent weight of 15 inches of precipitation into the weighing bucket. (Use the same three large brass weights (4111) as used in Section 1.3, Step ‘d.’) Lower the shipping bolt ¼” below the point at which the load cell is supporting the bucket weight.

d. Type **U D**<**enter**> to access the Data Retrieval Menu. Allow the system to run for at least 45 seconds. Type **L3**<**enter**> to look at the last 3 Precipitation Calibration (PC) data samples. Verify that these values are 15.0 ± 0.02 inches. If not within the above range, redo the calibration, starting with Section 1.2, Step ‘d.’

e. If the calibration was successful, type **U S**<**enter**> to access the Sample Period Menu to reset the Sample Interval and Offset lines to the original values.

f. At the Sample Period Menu prompt, type **C1/900** <**enter**>**.** You should see the following on your screen:

SAMPLE PERIOD MENU
(Cn/m) Change Item n To Value m (Q) Quit
(E) Save Parameters To EEPROM (H) Help
(U) User Menu

Item 1: 900 (Sample Interval Time)
Item 2: 10 (Sample Duration Time)
Item 3: 0 (Sample Offset Time)

1.7 Save the Load Cell Calibration Coefficients

a. While still at the Sample Period Menu, type **E** <**enter**> to save calibration values to EEPROM. The display should appear similar (the numbers will be different) to that shown below:

Verifying parameters can be stored in EEPROM . . .
Saving parameters to EEPROM . . .
Saving sensor lists to EEPROM . . .
Saving process lists to EEPROM . . .
Saving data output lists to EEPROM . . .
Saving repeater lists to EEPROM . . .
Saving general serial scripts to EEPROM . . .
Saving constants to EEPROM . . .
1057 out of 8192 bytes used in EEPROM.
Total EEPROM Writes = 17, EEPROM Checksum = 200.

NOTE: This action shuts down all ZENO® data logging.

b. Type **U T** <**enter**> to access the Test Menu. Type **C2**<**enter**> to view the conversion coefficients (if prompted for the Administrator Password, **FPRECOASTAL**). Leave A, B and C as is by pressing <**enter**> for each.

c. Write down the values of the three conversion coefficients (A, B [Gain/Slope], C [Offset]) for ready reference for when you are conducting a future calibration **check** at the Observer's site. If the check fails to show measurements within ±0.25 inch of 15.0 inches you will need this reference to see if the cal values have changed.

d. Type **Q** <**enter**> to exit.

FPR-E Worksheet for Full Calibration

#	Parameter	Value
1	Serial Number, Load Cell	i.e., 70054747
2	Calibration Constant C1	i.e., 0.0011
3	Calibration Constant C2	i.e., 0
4	Calibration Constant C3	i.e., - 0.00003
4	Firmware Version	i.e., V2.02-Z16eD Jan 28 2009
6	Configuration Version	i.e., FPRE_ConfigFile_SID.txt
7	COOP Site ID	i.e., 41-5678
8	Site ID	i.e., 5678
9	State ID plus 2 zeros	i.e., 4100
10	PC data for b1	
11	PC data for b2	
12	B = 30000/(b2-b1)	
13	PC data for c3	
14	C = -c3	
15	PC data for c4	
16	C = -(c3+c4)	
17	Cal Coefficient A	i.e., **0** (Will always be zero)
18	Cal Coefficient B	i.e., 1256.6432
19	Cal Coefficient C	i.e., - 3.5564 (Will always be a negative value)
Note: "PC data" is the Precipitation Calibration Value in Inches (3 decimal places).		

Note: These Coefficients are for example only, each rain gauge will return unique values. Also, remember Coefficient 'C' is a negative value, so include the minus sign.

1.8 Site Inspection Report (CSSA):

Open up the edit panel of the CSSA Site Inspection Reports and obtain the ***FPR Log Sheet*** with your records of the values for each of the Calibration Coefficients A, B, and C.

Access the first page, look for the rows of check-boxes under Equipment – Maintenance Performed; and located third row titled, "F&P." Mouse-click on the box "**Calibrated**," only if you performed the **Calibration Reset** procedure. Otherwise, if the weighing sensor checked within tolerance, mouse-click on the box, "Routine Maintenance."

Then, on the same page, in the Remarks section, in plain text describe the outcome of the Cal-Check Procedure. Write either of these two outcomes:

- Cal Check – Good Readings
- Cal Check – Reset done and new Calibration Coefficients were saved into the B-44 new rendition.

APPENDIX E – SYSTEM TESTING AND TROUBLESHOOTING

The Zeno Data Logger is a microprocessor controlled instrument. It can detect and report malfunctions. The NWSREP can troubleshoot using a Laptop PC connected to the Zeno Assembly.

The NWSREP is encouraged to read Section 6, of the Coastal Environmental Systems, Inc., "*FPR Kit Operations and Maintenance Manual, ver 4.2*" © 2010.

1. **No Display on Zeno Assembly:** Five fault conditions can result in this symptom:
   faulty battery,
   faulty battery cable,
   faulty battery charger, or
   faulty Zeno data logger.
   Faulty fuse

   Before troubleshooting, disconnect the solar panel cable. Test and replace each as Necessary.

2. **Precipitation Sensor Data Missing, Out of Range, or No Change:** These conditions may be caused by a faulty load cell assembly or faulty Zeno data logger. Remove and replace each unit, until system is functioning properly.

   Equipment Needed:
   Spare Load Cell assembly.
   Spare Data Logger
   Calibration Weights

3. **Zeno Logger Displays 'Er30:'** If the Zeno Assembly displays Er30, wait 30 seconds and push the button again. If there is no data in the FPX then wait at least 15 minutes before pushing the button again. And if the Zeno still displays Er30, then remove and replace the Zeno Assembly..

4. **Data cannot be Retrieved from USB Flash Drive:** If data cannot be retrieved from the USB flash drive, it may be due to a faulty USB Flash Drive or due to a faulty Zeno Assembly. First obtain a known good USB flash drive that is freshly formatted; and if the data still cannot be retrieved, replace the Zeno Assembly (data logger).

5. **Wrong Time/Date on Data:** The date/time stamp is established from an internal real time clock (RTC). The RTC has a 10-year lithium Battery source, which is independent of the system backup battery. This allows the RTC to keep time even if all external power is removed. The clock is calibrated to give an accuracy of 30 seconds per month (2 parts per million). However, if either the clock or the clock battery fails, the time and date will begin to deteriorate. If this occurs, remove and replace the Zeno Assembly (data logger).

APPENDIX F - NOTES REQUIRED FOR INSPECTION REPORT

CSSA Site Inspection Report – Valid Entries for FPR-E Maintenance:

The FPR-E system does not flag/indicate external activity, nor does it have functionality for user entered notation codes. Therefore, both Observer and NWSREP shall document maintenance actions (i.e., adding propylene glycol, or adding oil) to an *FPR Log Sheet* to be able to validate for the NCDC, all known operator interruptions of the precipitation data record.

COOP Observer Reports these Events to Log-Sheet when delegated by NWSREP:

Valid Remarks for Observer to report in his FPR-E Log Sheet:
Added Oil to Bucket
Added Propylene Glycol to Bucket
Partially Drained Bucket – Some liquid left in bucket
Emptied Bucket – Bucket completely emptied
Foreign Object Found in Bucket
Routine Gauge Check
Installed Funnel
Removed Funnel
Time is more than 15 minutes fast/slow

CSSA Site Inspection Report – Valid Entries for FPR-E Maintenance:

Fischer-Porter Rebuild (FPR-E) Valid Entries for Site Inspection Report
Annual Visit
Semi-Annual Visit
Emergency Visit
Awake Display – Start
Awake Display – End
Precip Level Before Bucket Serviced
Precip Level After Bucket Serviced
Calibration Check – Good Readings
Calibration Check – Reset Performed
Partially drained bucket – some liquid remains in bucket
Emptied bucket
Added Oil to bucket
Added Propylene Glycol to bucket
Emptied and cleaned bucket
Installed Funnel
Removed Funnel
Foreign Object Found in Bucket
Data downloaded to USB Flash Drive
Cleaned F&P Housing
Cleaned Solar Panel
Cleaned FPR-E ZENO® Assembly
Cal Coefficient B – Value before Calibration
Cal Coefficient B – Value after Calibration

Cal Coefficient C – Value before Calibration
Cal Coefficient C – Value after Calibration
Installed Auto-Syphon
Removed Auto-Syphon
Time is more than 15 minutes slow.
Time is more than 15 minutes fast.
Replaced one or more Flexures
Replaced FPR-E ZENO® Assembly – With same model FPR-E ZENO® Assembly
Replaced Load Cell Assembly – With same model Load Cell Assembly
Replaced S hook
Replaced desiccant bags
Replaced fuse
Gauge moved to a compatible location – equipment move
Gauge moved to a non-compatible location – station relocation
Gauge removed from service – placed in storage
Gauge put back in service after being in storage

This second table gives the range of potential notes you should enter to the Remarks field of the *CSSA Site Inspection Report*. While at the rain gauge the NWSREP (and Observer, if delegated) shall journal to the ***FPR Log-Sheet*** any maintenance action that appears in this table. Reminder: While at the rain gauge you must wake-up the data logger display by pressing the black push button on the right side of the Zeno data logger case.

APPENDIX G – FPR-E MODIFICATION NOTES

Issue Date:	Title of NWS Engineering Mod Note:	Regions/ Sites Effected	Complete-by Date:
02/2018	FPR-E Solar Panel, Engineering Note 3, Feb 2018 *(hypothetical mod-note)*	All	05/2018

See Chapter 7.3 of this manual for policy on compliance with, and documentation of each Engineering Modification Note that affects FPR-E operational systems.

APPENDIX H - FPR-E PARTS AND AGENCY STOCK NUMBERS (ASN)

General Name	Short Description	Long Description	ASN	SMR *
Load Cell Assembly	Load Cell Assembly, FPR	Load Cell Assembly, FPR, complete with load cell, S Hook, and mounting hardware (CES)	**D111E-1**	PAODD
S Hook, LC mounting	S Hook, Load Cell mounting, FPR	S Hook, Load Cell mounting, FPR (CES or Open Market	**D111E-1MP1**	PAOZZ
FPR-E ZENO® Assembly	ZENO® FPX Assembly with Bracket	ZENO® FPX Assembly for F&P Gauge Rebuild, includes ZENO® datalogger, solar panel regulator, display, push button, USB Flash Drive interface, housing and mounting bracket (CES)	**D111E-2**	PAODD
Battery Cable	Battery Cable, FPR Kit	Battery Cable, FPR Kit	**D111E-2CBL1**	PAOZZ
Stuffing Gland	Gland Fitting, FPR Kit	Gland Fitting, FPR Kit	**D111E-2MP1**	PAOZZ
Desiccant Bag	Desiccant Bag	Desiccant Bag, 3.66 ounce, 4-Unit, Silica Gel, Silica Gel Desiccant Products Company P/N S-3043	**052-D-1**	PAOZZ
CES FPR Manual	Manual, FPR, OEM, CES	Manual, FPR, OEM (CES)	**D111E-2D1**	PAOZZ
Fuse	Fuse, 250V, 2A	Fuse, 250V, 2A, Busmann	**D111E-2F1** or **017-F-4-20**	PAOZZ
Battery	Battery, 12V, 7AH, Sealed Lead Acid	Battery, 12V, 7AH, Sealed Lead Acid, Spade Terminals, 4 lbs, Panasonic LC-R127R2P or Equivalent	**D111E-2B1** or **017-B-2-32**	PAOZZ
Solar Panel Assembly	Solar Panel, 10W, 12V nom, @0.66A, no regulator	Solar Panel, 10W, with Diode, 12V nom. @0.66A, no regulator, metal frame, with 15 feet cable, hardware and mounting arm (CES)	**D111E-3**	PAODD
Solar Panel (only)	Solar Panel only, 10W, 12V nom, @0.66A, no regulator, FPR Kit	Solar Panel only, 10W, with Diode, 12V nom. @0.66A, no regulator, metal frame, with 15 feet cable, PowerUp BSP-1012	**D111E-3A1**	PAODD
Solar Panel Mount (only)	Mounting Hardware, for Solar Panel, FPR Kit	Mounting Hardware, hardware and mounting arm (CES), custom for PowerUP BSP-1012 solar panel and F&P gauge, FPR Kit	**D111E-3A2**	PAOZZ

* The FPR unit has just three types of Source, Maintenance, and Recoverability (SMR) codes assigned to its parts: PADDD, PAODD, and PAOZZ.

Reference: **EHB-1, *Instrumental Equipment Catalog* (Issuance 1996-1),** Section 2.3, Source, Maintenance and Recoverability Code (SM&R).

PADDD: You must return these parts (i.e., faulty regulator) to National Reconditioning Center (NRC) in exchange for a replacement.
The 'PA' signifies item procured and stocked for anticipated or known usage that is not deteriorative in nature; the 'DD' signifies the part must be shipped to the depot (NRC) together with its integral component(s) for disassembly and be repaired by the depot (NRC); and the final 'D' signifies that just the depot (NRC) is authorized to repair, condemn, or dispose of this part.

PAODD: You must return these parts (i.e., faulty GMA) to NRC in exchange for a replacement.
The 'PA' signifies item procured and stocked for anticipated or known usage that is not deteriorative in nature; the 'OD' signifies this part shall be isolated and removed by the field and shipped to the depot (NRC) where the depot (NRC) will perform the repair; and the final 'D' signifies that just the depot (NRC) is authorized to repair, condemn, or dispose of this part.

PAOZZ: A non-repairable part. You may dispose of these parts (i.e., 5 Amp fuse) at the Weather Forecast Office (WFO).
The 'PA' signifies item procured and stocked for anticipated or known usage that is not deteriorative in nature; the 'OZ' signifies the field level shall remove and replace this part, however it is non-repairable and no repair to the item is authorized. The final 'Z' signifies that the field office is authorized to condemn and dispose of the part when it becomes unserviceable.

APPENDIX I - SAMPLE FPR LOG SHEET

Forecast Office (SID): TAE **COOP Station Name:** Pinetree State Park (01-5678) **Your NWSREP Name:** M. Jones .

Date MM/DD/YYYY	**Time** hh:mm am/pm	**Amount** NN.cc	**Routine Actions**	**Special Notes (i.e., displayed error messages, etc.)**
03/28/2011	Start: 10:15 am Stop: 10:45 am	15.47 02.75	☐ Add Oil ☐ Add FGPG ☐ Empty Bucket ☒ Partial Drain Funnel - ☒ In ☐Out	
06/14/2011	Start: 4:15 pm Stop: 4:45 pm	8.72 8.72	☐Add Oil ☐ Add FGPG ☐ Empty Bucket ☐ Partial Drain Funnel - ☐In ☐Out	'Err 12' message displayed. Phoned NWSREP.
09/28/2011	Start: 2:30 am Stop: 2:45 am	10.39 10.39	☐ Add Oil ☐ Add FGPG ☐ Empty Bucket ☐ Partial Drain Funnel - ☐In ☒Out	Wiped down the F&P shell to remove dust.
10/15/2011	Stop: 11:15 am Stop: 12:15 pm	14.35 0.75	☒ Add Oil ☐ Add FGPG ☒ Empty Bucket ☐ Partial Drain Funnel - ☐In ☐Out	Removed pinecone, cleaned bucket, and then added 1-qt of oil.
12/21/2011	Start: 9:30 am Stop: 9:30 am	6.14 6.43	☐ Add Oil ☒ Add FGPG ☐ Empty Bucket ☐ Partial Drain Funnel - ☐In ☐Out	Very cold month – had to add 2 quarts of FGPG to prevent ice damage.

Instructions: Before you start your action, enter the date and then at time of maintenance, enter current time (standard time, not daylight time) on the 'Start' line in Column 2. Then press the Display button to view the Amount in bucket. Write this value in Column 3 (Amount). Then mark appropriate box(es) in Column 4 (Routine Actions) to indicate your actions. If not a routine action, write your comments in Column 5 (Special Notes). When you have completed your action, go back to Column 2, and enter current time (standard time, only) into the 'Stop' line. Always phone your NWSREP if an error message displays or display fails to light-up on command. Always mail your Log Sheets to your NWSREP. Keep spare sheets inside shelter.

FISCHER & PORTER LOG SHEET

Forecast Office (SID): _____ COOP Station Name: _____ Your NWSREP Name: _____.

Date MM/DD/YYYY	**Time** hh:mm am/pm	**Amount** NN.cc	**Routine Actions**	**Special Notes (i.e., displayed error messages, etc.)**
_____.	Start: _____. Stop: _____.	_____. _____.	☐ Add Oil ☐ Add FGPG ☐ Empty Bucket ☐ Partial Drain Funnel - ☐In ☐Out	
_____	Start: _____. Stop: _____.	_____ _____	☐ Add Oil ☐ Add FGPG ☐ Empty Bucket ☐ Partial Drain Funnel - ☐In ☐Out	
_____	Start: _____. Stop: _____.	_____ _____	☐ Add Oil ☐ Add FGPG ☐ Empty Bucket ☐ Partial Drain Funnel - ☐In ☐Out	
_____	Start: _____. Stop: _____.	_____ _____	☐ Add Oil ☐ Add FGPG ☐ Empty Bucket ☐ Partial Drain Funnel - ☐In ☐Out	
_____	Start: _____. Stop: _____.	_____ _____	☐ Add Oil ☐ Add FGPG ☐ Empty Bucket ☐ Partial Drain Funnel - ☐In ☐Out	

Instructions: Before you start your action, enter the date and then at time of maintenance, enter current time (standard time, not daylight time) on the 'Start' line in Column 2. Then press the Display button to view the Amount in bucket. Write this value in Column 3 (Amount). Then mark appropriate box(es) in Column 4 (Routine Actions) to indicate your actions. If not a routine action, write your comments in Column 5 (Special Notes). When you have completed your action, go back to Column 2, and enter current time (standard time, only) into the 'Stop' line. Always phone your NWSREP if an error message displays or display fails to light-up on command. Always mail your Log Sheets to your NWSREP. Keep spare sheets inside shelter.