



FISCHER–PORTER UPGRADE (FPU)
OPERATIONS MANUAL
FOR THE
WFO NWSREP

DRAFT
SEP 2006

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



SEP 2006

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1.1 **IMPLEMENTATION RESPONSIBILITIES:**

1.1.1 **NWS Headquarters:**

The Fischer-Porter Upgrade (FPU) is a modification to existing Fischer & Porter (F&P) gauges and the project is mapped according to a detailed plan, known as the *FPU Operational Implementation Plan*. To read the plan, access our NWS Surface Program webpage on: <http://www.nws.noaa.gov/ops2/Surface/coopimplementation.htm> and near the end of the listed documents, click on: *COOP FPU Implementation Plan Text*, April 28, 2005.

The NWSREP assembles the FPU in his WFO and then installs it at the designated COOP site. An installation instruction handbook, *FPU Assembly Procedural* shall be used by the NWSREP. It is located on: <http://www.nws.noaa.gov/ops2/Surface/coopimplementation.htm>, it is near the end of the listed documents. Click on, *FPU Assembly Procedural*, Aug 2006.

The FPU Kit will come delivered to your WFO with the, *FPU Technical Manual* (v 3.2), on CD-ROM. However, a revised version of the contractor's technical manual is posted to the web <http://www.nws.noaa.gov/ops2/Surface/coopimplementation.htm>. Search to the near the end of the listed documents and click on, Fischer-Porter Upgrade Technical Manual v2.2. (Dec 4, 2003).

Note: The gauge sensor calibration instruction in the delivered CD-ROM is out of date.

The NWS Office of Operational Systems (OPS22) works with a contractor to display COOP Sites and ASOS Sites on regional and semi-regional maps. The F&P network of 2,500 sites is displayed on ten maps and those sites designated for FPU modification are indicated by a bulls-eye circle about the point. These maps will be updated monthly to give implementation status of each FPU site. Maps are viewable on: <http://www.nws.noaa.gov/ops2/Surface/coopmaps.htm>

1.1.2 **Regional Headquarters:**

Your Regional Cooperative Program Manager (RCPM) coordinates with OPS22 to identify candidate COOP Stations to receive the FPU modification. Changes to the designated site list are authorized by OPS22. The OS7 coordinates changes with the RCPM for the selection of sites to participate in the Fischer & Porter Data Intercomparison Study.

Your RCPM coordinates with WFOs with the greatest number of designated sites, to minimize storage and scheduling difficulties at the WFO.

The RCPM participates in bi-weekly or monthly conference calls with OPS22 to learn of engineering, procedural, and schedule issues that affect the rate of deployment. Peak rate of deployment will not exceed 10-15 FPU Kits per week, or approximately 4 units per Region per week.

1.1.3 **Field Offices:**

1. Once per week, inform your RCPM via e-mail, of your planned installation schedule and provide a status update on the systems installed. Coordinate with RCPM to determine the ideal number of FPU Kits to be delivered your WFO in the four weeks ahead.
2. Coordinate with Cooperative Observer to schedule dates for the FPU mounting-post

work, FPU installation work, and FPU operations tutorial. Update your Observer on your planned schedule, at least 14 days in advance. Explain to your Observer how the FPU is relatively easy to operate and how your hands-on tutorial should take just 30 minutes. If practical, mail your Observer a printed copy of the *FPU Observer Instruction* booklet, two weeks in advance of your visit, so s/he understands the concept of operations.

3. Receive FPU Kit, disassemble F&P gauge, assemble FPU gauge in your field office.

Each FPU Kit will arrive at your WFO in four cardboard boxes.

- a. FPU Upgrade Kit (3 boxes, one each for Steel Enclosure Cabinet, Solar Panel, and the 12V Battery)
- b. FPU Auxiliary Install Parts Kit (1 small box with updated U-bolts and Hangers)

The packing list from NLSC (bar codes, below) identifies a third requisition item, the Data Key Reader. This Reader is used by the WFO only and not at the COOP Observer's site. Hence, it is issued only once to the WFO and for convenience it is bundled with the first FPU Kit delivered in the initial requisition order.

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PACKING LIST

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Note: Inside the FPU Kit's largest box will be the manufacturer's parts packing slip (graphic, right).

Realize that none of the FPU Kits are packaged with a Thermistor Cable, the fifth item on this packing slip.

The handwritten word, 'Removed' (see graphic, right) was written by the manufacturer and applies to all FPU Kits being delivered.

The manufacturer kept this part listed just to comply with a government contract obligation made years prior to the deployment decision.

ORDER TO: US DEPT OF COMMERCE/NOAA P/O # 50DGNW190100-L001 SALES ORDER 3105		 Coastal Environmental Systems
Qty.	Description	
✓	1 Package 1 - LOAD CELL ASSY. - Load Cell Assembly - Load Cell Plunger and Mounting Hardware	
✓	1 Package 2 - ENCLOSURE MOUNTING HARDWARE - Enclosure Mounting Hardware	
✓	1 Package 3 - MISC. HARDWARE and MANUALS - CD, Technical Manuals. Zeno and Enclosure - Cable, Battery, 6003124007 - Datakeys (2)	
✓	1 Load Cell Cable, 6003124004	
✓	1 Thermistor Cable, 6003124003 <i>Removed</i>	
✓	1 Certificate of Conformance	
Checked/Packed by: <u>QJOC</u>		
Date: <u>2/18/03</u>		

4. Perform the Equipment Installation at the Cooperative Observer site.
5. MIC signs the Installation and Check-Out Form (Appendix X) INCO gives NWSREP name and date of installation and start of operations of the FPU data logging.
6. NWSREP will issue a single Public Information Statement (PNS) within 5 days after each FPU data logger is powered-on as an operational system. [Instructions are given in NWSI 10-1805, change in data assimilation method.]

1.3.4. Records Retention Policy for FPU:

The following FPU data records and FPU data media shall be kept on hand at the WFO:

- a. HPD monthly files (e.g., 41008778_20050415_1010459_...4414.csv) for at least 12 months on the network workstation.
- b. Any *FPU Event Log Worksheet*, or any *FPU Trouble Report*, keep an electronic copy (i.e., optical scan of printed form) at WFO for 12 months.
- c. The *30-Day Evaluation Report* and the *Operational Implementation Checklist – Part B* – keep at WFO for 6 months.
- d. One spare Data Key at WFO if you serve fewer than ten FPU Observers. Three spare Data Keys at WFO if you serve more than ten FPU Observers. **Note:** You may order a spare Data Key from NLSC - it has a separate ASN part number.

Maintain a bookmark on: <http://www.nws.noaa.gov/ops2/Surface/coopimplementation.htm> for ready access to FPU manuals and FPU policy directives issued by NWS headquarters.

1.2. FPU NETWORK REQUIREMENTS

1.2.1 Precipitation Gauge Type:

The recording precipitation gauge is required to be a Fischer-Porter/Belfort punch tape model, designated by the acronym F&P Modification 6, Model 3. There are approximately 2,500 of these gauges sited in the CONUS, Alaska, Hawaii, Guam, Puerto Rico, and the Virgin Islands.

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

- a. Data Telemetry Device
- b. Stream Level or Lake Level Gauge
- c. Extreme Cold Climate Exposure
- d. High Latitude – Low Solar Exposure

1.2.2 Precipitation Data Transfer

- a. The COOP Observer may not e-mail FPU precipitation data files to your WFO
- b. Instruct the COOP Observer to use the portable electronic medium (data key) to transfer his data to you each month, via United States Postal Service (USPS) mail
- c. Establish strict logistics management of the ‘data key’ through use of a Data Key Log Sheet posted in your WFO.

Note: For each FPU gauge there will be just one data key issued to the Observer (no spare) and just one Data key issued to the WFO (as a spare). So then, for a WFO with fifteen FPU gauges, the NLSC will initial issue a total of thirty-one (31) data keys to this WFO.

1.2.3 Precipitation Data - Electronic Records Collection

Electronic data collection of the Observer’s Data Keys first involves a stand-alone personal computer (PC) or laptop PC computer, one with absolutely no electromagnetic means of communication with any NWS-network workstation within the WFO. The stand-alone PC/laptop shall not in any way directly communicate with any Government furnished workstation or terminal that is capable and used as a link to the NWS-network enterprise (i.e., AWIPS). The stand-alone/laptop serves each month to virus scan and otherwise isolate the COOP Observer’s data key files from NOAA/NWS enterprise network systems. This stand-alone/laptop has another function not easily accomplished on a NOAA/NWS enterprise workstation, this is to host obsolescent operating system software. The data key reader for our FPU system relies on a graphical user interface (GUI) developed by the same vendor, Coastal Environmental Systems, Inc. (CES), and their GUI runs only on Windows 95/98/ME operating systems. The Windows 95/98/ME operating systems are not available on the NWS-network system terminals.

For this reason the stand-alone PC/laptop (from here on referred to as the ‘Coastal-PC’) that hosts the CES ‘PC Data Key Reader’ user interface, shall be configured non-integral with the NWS-network station. The Coastal-PC shall be free of data cables, data wires, infrared signal (wireless), radio, laser signal, or any other similar means of communication with the NWS enterprise systems.

As NWSREP you will ensure the Coastal-PC (stand-alone PC/Laptop) meets the following minimum requirements.

Hardware: Any microprocessor with the following:

- a. 3.5inch disk drive, 100MB of hard-disk storage volume
- b. CD-ROM for the install disk, otherwise you will have to copy CD-ROM files onto a 3.5 inch floppy disk to install the Key Reader program to PC.
- c. 4MB RAM; 386MHz processor,
- d. One parallel port (i.e., a printer port) to connect Coastal’s Key Reader device (the data key receptacle) to the Coastal-PC.

Operating System: The Coastal-PC shall be configured with any one of the three Windows operating systems. If your hardware can support the minimum system requirements as described by Microsoft (<http://support.microsoft.com>) then you may install a clean, new, operating system.

Minimum Required:	Windows 95	Windows 98	Windows ME
Microprocessor	386DX 486 Recommended	486DX, 66MHz Pentium Recommended	Pentium 150MHz, or better
RAM Memory	4MB 8MB Recommended	16MB; 24MB Recommended	32MB, or better
Hard-Drive Volume	55MB for a full-system install, or 40MB to upgrade	295MB for a full-system install on FAT32, or 355MB for full- system install on FAT16	320 MB
External Disk Port	3.5 inch high-density	3.5 inch high density	CD-ROM / DVD-ROM
Pointing Device	None specified	None specified	Microsoft Mouse

Key Reader Utility: Coastal Environmental Systems, Inc (CES) ‘PC Key Reader’ Ver. __

File-directory structure: All folder names should be identical to that described in Section 2.2.5, for the NWS-network workstation. For example C:\hpd\2005\month .

On or before the day you transmit the monthly precipitation data to NCDC, you will access the Coastal-PC sub-directory and copy each of CSV file onto a portable 3.5inch diskette. The diskette is then used to transfer these CSV files to the NWS-network workstation with an FTP utility, such as WsFTPLE marketed by the Ipswich Corporation.

1.2.4. Filename and Storage Standard:

The NWSREP shall ensure the totality of data on each Coop Station=s Data Key is copied as a single file into the WFO workstation. **Note:** The FPU key data file shall not be renamed. The

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\2005\jun\) for at least 12 months.

Note: Ensure all monthly files in your PC directory remain unchanged from their automatically named format!

Example: coopidno_yyyymmdd_hhmmss_yyyymmdd_hhmmss.csv

41008778_20050415_101459_20050702_094414.csv

(Station ID__OldestDate__Time__YoungestDate__Time.CSV)

1.2.5 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 FPU data:

- a. File compression (ZIP) software, AWINZIP32.EXE@
- b. File Transfer Protocol (FTP) executable file, AWSFTP95.EXE@
- c. NOAA/NWS Enterprise Network Connection (NOAA Compliant Terminal in WFO), only

1.2.6 Precipitation Data Quality Assurance NCDC

The NCDC quality controls your station's files to prepare the FPU data for publication so the FPU data appear in the same table, same quality control flags, and same units of measure as the F&P data. To meet ORE requirements in 2005 the NCDC posted some CSV files for NWS users' view on a limited access site: ftp://ftp.ncdc.noaa.gov/pub/data/hpd/fpu/csv_files/ . No decision has been made on whether to make all CSV files viewable on a limited access web site.

Note: NWS offices ordinarily do not see their FPU data until 3 months after the FPU data was transmitted from WFO. Then you are able to view data on-line in the periodicals: *Hourly Precipitation Data* and *Climatological Data*, on <http://occluded.ncdc.noaa.gov/SerialPublications>.

1.3. IMPLEMENTATION CHECKLIST TASKS:

Ensure that you have accessed the latest version of the NWS Operational Implementation Checklist – Part B. It is accessible on the NWS webpage:

<http://www.nws.noaa.gov/ops2/Surface/coopimplementation.htm>

Click on the document titled, 'COOP FPU Implementation Plan Appendix, April 28, 2005'.

The following Checklist - Part B, (see text box, below) should appear.

Item #	Item Description	OPR	Completion Date
Cooperative Observer Program Planned Product Improvement OI Check List – Part B			
Planned Product Improvement: <u>Fischer-Porter Upgrade</u>			
Location (SID, Name, State): _____			
Office Completing this Check List: _____ Date: _____			
3.4 Pre-OI Operational Support Activities			
B.	Conduct Local operator/maintenance Training	WFO	
4.3 OI Installation Activities			
A.	Download files for archive	WFO	N/A
B.	Perform installation and checkout in accordance with MOD NOTE	WFO	
4.4 OI Monitoring and Coordination Activities			
A.	Installation Notification (i.e., transmit PNS)	WFO	
B1.	Begin routine maintenance monitoring and documentation	WFO	
B2.	Prepare and provide 30-day report as necessary	WFO	
B.3	Ensure data continuity for transition month. Decode final month of F&P data from B-18 (i.e., partial month) and enter hourly and daily totals to Form 791D. E-mail to Stu Hinson (NCDC)	WFO	
5.0 Post OI Activities			
A.	Operational Quality Control: Monitor ongoing meteorological performance	WFO	
B2.	Submit WS Form B-44 to NCDC	WFO	
B5	Enter data in CSSA	WFO	
C.	Dispose of old equipment in accordance with installation instructions.	WFO	

Appendix Page I-5

Operational Implementation Plan for Fischer Porter Sensor Upgrade – June 2005

1.3.1 Training the Observer in Basic FPU 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>, and through the NWSREP delivery of printed *FPU Observer Instructions Guide* to the COOP Observer, and eventually

through NWSTC training sessions. No later than the day of operational implementation, NWSREP trains and witnesses and validates (i.e., documents) that his Observer has been trained on the FPU. Field level maintenance training will be the responsibility of the National Weather Service Training Center (NWSTC) and offered through training courses and training modules. Primary instruction will be included within the annual course titled, COOP Network Operations. Supplementary distant learning modules will be developed by the NWSTC. The OS7 will provide the WFO the necessary training materials for instructing the COOP Observers in the use of the FPU equipment. The WFO will provide local observer training in operation and simple maintenance of the FPU equipment. The following materials will be provided to the WFO:

- a. NWSREP maintenance training materials will be provided in Contractor's Technical Manual, Version 2.2 (December 4, 2003).
- b. Observer training materials will be provided by OS7.

1.3.2 System Assembly, Installation, and Checkout

Installation and checkout of the FPU will be performed in accordance with the *FPU Assembly Procedural* (originally titled, '*Beta Site Procedural*') issued by OS7 and available on webpage: <http://www.nws.noaa.gov/ops2/Surface/coopimplementation.htm>. This is a two-step process. The first step is to prepare the site for installation. This involves pouring cement to support the stand alone pole for the data logger, battery, and solar panel. The time to complete this task is generally two hours or less, but the curing time for the cement is at least 24 hours before step two can occur. Step two will also take about 4 hours or less. Key activities include: (a) modify an F&P unit inside WFO to create one FPU unit, (b) configure and calibrate the FPU in WFO, (c) transport FPU to site, (d) remove the F&P from site, (e) replace the removed F&P with the FPU transported to site, (f) mount the data logger and solar panel to pole, (g) check calibration with five inch equivalent weight with data logger's display of 'Rain:' reading, and (h) witness the Observer download data to data key.

1.3.3 Public Information Statements (PNS)

Upon successful completion of FPU installation and checkout the NWSREP will update the CSSA Station Inspection Report Page, transmit a Public Information Statement (PNS) to announce the equipment modification, update the WS Form B-44 (CSSA Station Report) , and conduct a 30-day system and data evaluation.

The PNS shall be transmitted within 5 working days after successful installation and checkout. The NWSREP will prepare and issue a PNS for each FPU implemented location within the WFO's County Warning Area.

The NWSREP should be familiar with the NDS 10-1805, Section 2.1; Local or Regional Service and Technical Changes. Procedures for changing local or regional products are determined by the appropriate Regional Headquarters. The changes are announced via a local PNS transmitted by the appropriate offices, as specified in the following instructions:

- a. NWSI 10-501, WFO Statements, Summaries, Tables Products Specification
- b. NWSI 10-1701, Test Product Formats and Codes

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.

In the day or two prior to transmitting the PNS, the NWSREP must complete the Installation Checkout form and validate that the FPU is logging data. The NWSREP accesses his PNS template, edits it for COOP station name, and enters the 'Implement Date' which is calendar day (e.g., May 18, 2005) when the FPU first began logging data operationally.

```

PUBLIC INFORMATION STATEMENT
NATIONAL WEATHER SERVICE NASHVILLE TN
748 AM CDT THU MAY 19 2005

...FISCHER-PORTER UPGRADE (FPU) NOW IMPLEMENTED AT COOPERATIVE
STATION, CHEATHAM LOCK & DAM, TENNESSEE ON MAY 18, 2005

THE EQUIPMENT MODIFICATION WILL ONLY 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 BE REPORTED IN THE MONTHLY HPD PUBLICATIONS ONLY.

THERE AREA A TOTAL OF 13 COOPERATIVE STATIONS IN THE WFO NASHVILLE
COUNTY WARNING AREA (CWA) THAT WILL BE UPGRADED. THESE STATIONS
WILL BE UPGRADED ON THE DATES INDICATED BELOW.

COOP STATION NAME.....COOP STN ID...IMPLEMENT DATE...DATA AVAIL DATE
OLD HICKORY WFO, TN      40-6806      MAY      2005     JUNE      2005
LIVINGSTON WLIV, TN     40-5332      MAY      2005     JUNE      2005
PORTLAND, TN           40-7359      MAY      2005     JUNE      2005
CHEATHAM LOCK & DAM, TN 40-1663      MAY      2005     JUNE      2005
CELINA, TN              40-1561      JUNE     2005     AUGUST    2005
LEBANON, TN             40-5108      JULY     2005     SEPTEMBER 2005
CENTERVILLE, TN        40-1587      JULY     2005     SEPTEMBER 2005
WAVERLY AIRPORT, TN    40-9493      AUGUST   2005     OCTOBER   2005
LAWRENCEBURG, TN       40-5089      AUGUST   2005     OCTOBER   2005
CARTHAGE, TN           40-1480      SEPTEMBER 2005     NOVEMBER  2005
MONTEREY, TN           40-6170      OCTOBER  2005     DECEMBER  2005
SPRINGFIELD, TN        40-8562      NOVEMBER 2005     JANUARY   2006
ROCK ISLAND, TN        40-7811      DECEMBER 2005     FEBRUARY  2006

THE NEW FPU DATA WILL BE PUBLISHED BY THE NATIONAL CLIMATIC DATA CENTER
(NCDC) IN THE HOURLY PRECIPITATION DATA (HPD) PRODUCT NO EARLIER THAN
THE DATA AVAILABILITY DATE LISTED ABOVE.

INFORMATION ON THE HPD PRODUCT IS AVAILABLE FROM NCDC ON THEIR
WEBSITE:

HTTP://OCCLUDED.NCDC.NOAA.GOV/SERIALPUBLICATIONS/

IF YOU HAVE ANY QUESTIONS CONCERNING THE IMPLEMENTATION OF THE
FISCHER-PORTER UPGRADE AT OLD HICKORY WFO, TENNESSEE PLEASE
CONTACT:

RALPH TROUTMAN
NWS/WFO-OHX, DATA ACQUISITION PROGRAM MANAGER
OLD HICKORY, TN
PHONE: 615-754-4634 EXTENSION 225
EMAIL: RALPH.TROUTMAN@NOAA.GOV

THIS AND OTHER PUBLIC INFORMATION STATEMENTS AREA AVAILABLE ONLINE
AT(USE LOWER CASE LETTERS): HTTP://WWW.NWS.NOAA.GOV/OM/NOTIF.HTM

$$
NNNN
    
```

At this time the NWSREP should review the template PNS and update it for any schedule changes to the planned month and year of future FPU site installations. Inquire with the NWS regional focal point to confirm availability of FPU Kits and delivery schedules to the WFOs.

1.3.4 Monitor and Evaluate Routine Operations

There are 3 operational areas each NWSREP shall monitor. First, is FPU 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 FPU system conduct an ongoing monitoring and retrospective evaluation of the first 30-days of system and data performance. Each NWSREP will write a short 300 to 500 word summary to outline the general performance of the FPU system. If precipitation events occurred account for them, including variations in local precipitation amounts, and possible non-representative values attributed to meso-scale phenomena.

1.3.5 Discrepancies: Submit the 30-Day Evaluation Report

If any significant discrepancies were discovered, elaborate them in your '30-Day Evaluation Report' and e-mail your RCPM in a timely manner. If needed, ask the Observer to submit his 'FPU Event Log Worksheet'. When you submit the 30-Day Evaluation Report to RCPM include the recommended resolutions and identify any collateral effects that might have resulted from these discrepancies. The report shall include COOP Station Name, Number, Observer, date of problem, and names of anyone who performed maintenance on the FPU system either at the Observer site, or in your WFO. The final version of the 30-Day Evaluation Report must give a description of how the discrepancy was resolved, or mitigated, who corrected the fault (i.e., factory, warehouse, headquarters, local office, Observer) or discrepancy.

Retain both the checklist and the evaluation report in the WFO for 6 months. Only if there is a significant FPU discrepancy identified in your report, then ensure a copy of your 30-Day Evaluation Report is e-mailed to your RCPM within five working days after completion of the 30-day monitoring period. A measure of significance of a discrepancy is when a problem either cannot be resolved by your WFO, or the problem has regional or national implications.

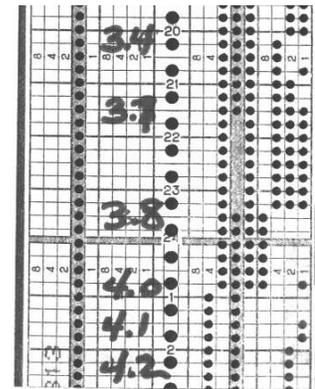
Your RCPM may be required to initiate timely corrective actions, which are beyond the capability of the WFO. The RCPM will analyze the issue identified in your 30-day report and e-mail it to the NWS FPU Implementation Manager, David Mannarano (OPS22), only when problems either cannot be resolved at the Region level or have national implications.

1.3.7 Ensure Continuity of Precipitation Records – Transition Month

In the transition month when F&P operations are discontinued, the NWS risks losing quality controlled data records from the F&P gauge's final days/weeks due to NCDC's inability to quality control both F&P and FPU datasets for the given month. A gap in NCDC's monthly climate publications would result if it were not for a data recovery method.

For this reason NCDC requests field office's help in recovering the punch tape (WS Form B-18) records from the final month of F&P operation.

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 791D table. Repeat this process for each hour in the B-18, up to the final full hour's record.



WS Form B-18

The spreadsheet will add each hour's value, down the row, and produce a daily-total amount to the 'total' cell at the end of the row.

Edit the Form 791D with a notation, 'END', into the cell that corresponds to the Date and Hour of the B-18'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_May05.xls

Then e-mail the file to Stuart.Hinson@noaa.gov, at the NCDC.

Form-791D, below, is an Excel (XLS) formatted file with embedded arithmetic formula.

NOAA Form 79-ID		U.S Department of Commerce												STATION NUMBER		40-5956										
August 2001		National Oceanographic 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
19																									0.00	19
20																									0.00	20
21																									0.00	21
22																									0.00	22
23																									0.00	23
24																									0.00	24
25																									0.00	25
26																									0.00	26
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																										

The NWS Training Center (NWSTC) provides us detailed instructions for completing the WS Form 79-1D, (see, above). Reference the Remote Training Module (RTM), page 630-60, and page A-36.

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.

1.3.8 Open a Station Inspection Report in CSSA

Follow the procedures as described in Appendix E of the National Weather Service Manual, 10-1313, dated March 18, 2005, *Cooperative Station Service Accountability (CSSA) User Manual*. It is accessible on webpage: <http://www.nws.noaa.gov/directives/010/pd01013013a.pdf>.

Station visits, including the installation of FPU mounting pole (i.e., 3 inch diameter pipe), and the installation of the data logger and solar panel, shall be logged into the CSSA Station Inspection Report. Each visit to the COOP site shall be documented this way by the 10th day of the month following the visit.

Complete all the prompted fields in the Report Screen (see graphic below).

For Inspection Type, enter “Annual”

For Equipment, Maintenance Performed, go to the third line, F&P, and enter: “Replaced”.

In the Remarks window (i.e., free text box), enter “Replaced F&P with FPU.” and the time you spent on site, e.g., “2.5 hours on site.”

1.3.9 Submit WS Form B-44 to NCDC

Update the CSSA Station Report (e.g., WS Form B-44) for each COOP Station that has completed its modification from F&P Model 3, Modification 6, to Fischer-Porter Upgrade (FPU) Data Key. Use the terms of reference contained in the document National Weather Service Manual, 10-1313, dated March 18, 2005, Cooperative Station Service Accountability (CSSA) User Manual. It is accessible on webpage:

<http://www.nws.noaa.gov/directives/010/pd01013013a.pdf>

Update the **Remarks**: section to explain: “Updated equipment, replaced F&P with Fischer Porter

Upgrade (FPU) electronic load sensor.”

Update the **Observed Element:** section in the appropriate panel with the large block letters “HOURLY PRECIPITATION REPORT”. In the first row, with EQUIPMENT, enter the following:

Equipment Code: FPU
 Serial Number: 0ccc (4-digit GMA data logger’s serial number, located several inches in front of the Data Key receptacle inside the stainless steel enclosure)
 Owner: NWS
 Telemetry: N
 Equipment Description: CALIBRATION: A=0, B= NNNN.nnnn, C= - N.nnnn”
 Azimuth: (do not change, unless you have moved the gauge’s catch bucket)
 Distance: (do not change, unless you have moved the gauge’s catch bucket)

In the second row, with ‘REPORTING / PAY’ enter the following:

Ob Time: MID
 Rept Method: ADP
 Recipient: WFO-SID / NCDC
 Sponsor: FC-1 (default, unless otherwise sponsored)
 Paid: N (unless paid)
 Data Ingest Via: DATA KEY
 Special Network: -leave blank- (unless Climate Reference Network ‘CRN’)
 Mode: -leave blank-
 Relay: -leave blank-
 When?: MONTHLY

From the time you submit your Station Information Report (SIR) to Workflow for NCDC approval to the time the CSSA data base is updated will take approximately 15 calendar days. If you have any questions on the CSSA Workflow Process, e-mail or phone your RCPM.

COOPERATIVE STATION SERVICE ACCOUNTABILITY									
STATION REPORT(B-44 Long)									
Observation Info									
Station Name: OLD HICKORY WFO				Station Number: 40-6806 Climate Division: 03 Rendition: 13					
Observed Element:HOURLY PRECIPITATION REPORT									
EQUIPMENT									
Equip	Serial Number	Owner	Exp	Tel	Equipment Description	Azimuth	Distance	Backup?	
FPU	0018	NWS		N	CALIBRRATION: A=0, B=1286.0523, C=-4.1076	090	8	N	
REPORTING/PAY									
Ob Time	Rept Method	Recipient	Sponsor	Paid	Data Ingest Via	Special Network	Mode	Relay	When?
MID	ADP	DHX,NCDC	FC-1	N	DATA KEY				MONTHLY

https://ops13web.nws.noaa.gov - CSSA Observation Info - Microsoft Internet Explorer

*Items in Red indicate required fields

COOPERATIVE STATION SERVICE ACCOUNTABILITY (CSSA)

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

Station Name: **OLD HICKORY WFO** Station Number: **40-6806** Climate Division: **03** Rendition: **13**

Observed Element: HOURLY PRECIPITATION REPORT

EQUIPMENT

Equipment Code	Serial Number	Owner	Exp	Tel	Equipment Description	Azimuth	Distance
FPU	0018	NWS		N	CALIBRATION: A=0, B=1286.0523, C=-4.10;	090	8

REPORTING/PAY

Ob Time	Rept Method	Recipient	Sponsor	Paid	Data Ingest Via	Special Network	Mode	Relay	When?
MID	ADP	OHX,NCDC	FC-1	N	DATA KEY				MONTHLY

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

 3 of 3

CSSA Station Info

COOPERATIVE STATION SERVICE ACCOUNTABILITY (CSSA)

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

Station Name: **OLD HICKORY WFO** Station Number: **40-6806** Climate Division: **03** Rendition: **12**

<p>STATION LOCATION Station ID: NSHT1</p> <table border="0" style="width: 100%;"> <tr> <td>Latitude</td> <td>Longitude</td> <td>Horiz Ref Datum</td> <td>Vert Ref Datum</td> </tr> <tr> <td>36.2469 (36.14.49N)</td> <td>-86.5631 (86.33.47W)</td> <td>NAD83</td> <td>NAGVD29</td> </tr> </table> <p>Lat/Lon Source: GPS - GARMIN MODEL III CPA Rgn: SR</p> <table border="0" style="width: 100%;"> <tr> <td>County</td> <td>State</td> <td>Elevation</td> </tr> <tr> <td>WILSON</td> <td>TN</td> <td>590</td> </tr> </table>	Latitude	Longitude	Horiz Ref Datum	Vert Ref Datum	36.2469 (36.14.49N)	-86.5631 (86.33.47W)	NAD83	NAGVD29	County	State	Elevation	WILSON	TN	590	<p>STATION DETAIL</p> <p>Zero Datum (River Sites) Time Zone: CENTRAL</p> <p>Station Type: WEATHER FORECAST OFFICE (WFO) - 40</p> <p>COOP Network: COOP STATION HYDRO (B)</p>
Latitude	Longitude	Horiz Ref Datum	Vert Ref Datum												
36.2469 (36.14.49N)	-86.5631 (86.33.47W)	NAD83	NAGVD29												
County	State	Elevation													
WILSON	TN	590													

<p>STATION MGMT</p> <table border="0" style="width: 100%;"> <tr> <td>CPA</td> <td>CWA</td> <td>HSA</td> </tr> <tr> <td>OHX</td> <td>OHX</td> <td>OHX</td> </tr> </table> <p>ET RFC</p> <p>TIR (OHRFC)</p>	CPA	CWA	HSA	OHX	OHX	OHX	<p>STATION ADMIN</p> <table border="0" style="width: 100%;"> <tr> <td>Authorizing Doc</td> <td>Authorization Date</td> <td>Station Begin Date</td> <td>Primary Auth</td> <td>Secondary Auth</td> </tr> <tr> <td>WFS41</td> <td>04/23/1974</td> <td>06/01/1974</td> <td>DAPM/OHX</td> <td>SH/OHX</td> </tr> </table> <p>Reason for Report (see Remarks): 10 CHANGE Effective Date: 05/03/2005 NWSREP: OHX</p>	Authorizing Doc	Authorization Date	Station Begin Date	Primary Auth	Secondary Auth	WFS41	04/23/1974	06/01/1974	DAPM/OHX	SH/OHX
CPA	CWA	HSA															
OHX	OHX	OHX															
Authorizing Doc	Authorization Date	Station Begin Date	Primary Auth	Secondary Auth													
WFS41	04/23/1974	06/01/1974	DAPM/OHX	SH/OHX													

Topography
ROLLING HILLS WITH OLD HICKORY RESERVOIR 1/2 MI W.

Driving Directions
FROM I-40 TAKE OLD HICKORY BLVD N TO 2ND LIGHT, TURN R ON TO ANDREW JACKSON (BECOMES SAUNDERSVILLE RD) AND GO 5.7 MI. TURN R ON NEEDMORE AND THEN L INTO PARK. RADOME VISIBLE FROM TOP OF HILL.

Remarks
UPDATE EQUIPMENT, CHANGE F&P TO FPU. F&P WILL REMAIN FOR DATA CONTINUITY STUDY. SPOKE WITH MS WARNICK/IMC 5/12/2005.

1.4. POST-IMPLEMENTATION ACTIONS:

1.4.1 Post-Implementation Packet to RCPM:

By the fourth week after your first COOP station has completed its phase-over to FPU operations, review the Operational Implementation Plan (IOP), Checklist B, to see if there were any items outstanding or missing, or in some way needed follow-up with the Cooperative Observer. Compile, correct, re-address any Observer submitted documentation for one last WFO Packet to be mailed the RCPM.

Six weeks after phase-over of each FPU Station, mail your RCPM a copy of the following:

- a. NWSREP-signed *Operational Implementation Checklist B* that vouches for the proper installation, calibration, and initial operation of the FPU.
- b. Print copy of the NCDC inventory of ingested HPD files confirmation receipts: http://www1.ncdc.noaa.gov/pub/data/hpd/oresites/inv/HPD_Received.txt
- c. If any one of the FPU systems experienced a significant discrepancy as defined in Section 1.3.5, above, then e-mail your '*30-Day Evaluation Report*', to your RCPM. Also e-mail or FAX your RCPM the following two items:
- d. *FPU Event Log Worksheet*, to account for install date, calibration data, and power on date.
- e. *FPU Trouble Report*, if Observer reported no anomalies, then write down, 'None'.

1.4.2 Operational Quality Control

Beyond the initial 30-day evaluation period, continue to monitor the FPU system performance through visual inspection of the CSV data files when you upload each station's monthly reporting key. Also, be vigilant and periodically visit the NCDC inventory webpage, and inquire into the size of each of your FPU station's monthly CSV file (i.e., after NCDC unzips them). Follow the guidelines in Section 2.2.6, of this FPU Operations Manual, "Examine CSV to Confirm Collection Month is Present", if you suspect a meteorological condition has resulted in ambiguous or discrepant precipitation data.

1.4.3 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. Otherwise, follow policy in Appendix H, of the *FPU AssemblyProcedural (Aug 2006)*, the WFO may dispose of any used F&P 'old equipment' only after the NWS headquarters and your RCPM has stated the FPU Operational Implementation (OI) has officially concluded.

1.4.4 FPU Network Distribution about the NWS:

NWS Regions	WFO	COOP Stations Implementing FPU	Post-Implementation Packet sent to RCPM?
Eastern Region	13	40	
Southern Region	5	95	
Central Region	10	79	
Western Region	4	37	
Alaska Region	0	0	
Pacific Region	0	0	
Totals	32 WFO	251 Stations	
NWS Regions	WFO	COOP Stations Implementing FPU	Post-Implementation Packet sent to RCPM?
Eastern Region (13)	Buffalo	5	
	Gray-Portland	5	
	Albany	4	
	Burlington	4	
	Cleveland	3	
	Balt-WashDC	3	
	Morehead Cty	3	
	Roanoke	3	
	Wakefield	2	
	Binghamton	2	
	Raleigh	2	
	Charleston-WV	2	
	Mt.Holly/Phila	2	
Southern Region (5)	Shreveport	30	
	Memphis	24	
	San Juan	23	
	Nashville	12	
	Knoxville	6	
Central Region (10)	Rapid City	18	
	Kansas City	13	
	Springfield-MO	11	
	Dodge City	7	
	Aberdeen-SD	7	
	Grand Forks	6	
	Northern IN	5	
	N.Ctrl Lower MI	5	
	Indianapolis	5	

	Marquette	5	
Western Region (4)	San Fran. Bay Area	11	
	Flagstaff	11	
	Pendleton	10	
	Glasgow	5	
Alaska Region (0)	- None -	- None -	
Pacific Region (0)	- None -	- None -	
Totals	32 WFO	251 Stations	

Maps of Fischer-Porter/Belfort network sites (CONUS) are updated monthly by NWS Headquarters to show the location of the planned 250 FPU sites and also show their implementation status. See them on: <http://www.nws.noaa.gov/ops2/Surface/coopmaps.htm>

CHAPTER 2 – MONTHLY DATA COLLECTION AND TRANSMISSION

2.1 FPU Data File Exchange Requirements and Tasks:

2.1.1. NWSREP Responsibilities:

As NWSREP your major responsibility will be to manage the exchange of the red plastic data keys with your Observers. You must mail a new key to all your Observers on or about the 25th of each month as a matter of priority. This will ensure each Observer will again have a key in his possession on or about the day he mails you his monthly file.

The Observer is instructed to download FPU data anytime in the first five calendar days of the month, yet not before 12AM on the first day of the month. You should work a monthly Data Key Log Sheet (see template below) to journal the date on which you mailed each of your Observers their new data key. You will need to log the date you have opened the envelope containing the Observer’s reporting key (3rd column in Log Sheet). The term ‘Reporting Key’ refers to any key an Observer sends you, filled with the most recent month’s records, but has yet to be uploaded via Coastal’s Key Reader to produce a Comma Separated Value (CSV) file. The term ‘New Key’ applies to a data key only after the key was uploaded and produced a CSV file, and you have logged the key to the ‘upload column’ in the Data Key Log Sheet (see, fourth column).

Data Key Log Sheet

Month Ending	COOP Station Name	Mailed-out 'New Key' to Observer?	Verify the 'Reporting Key'?	Upload 'Reporting Key' to Coastal Key Reader?	Transfer CSV file to NWS workstation?
J U N E 3 0 2 0 0 5	Hillsdale Lake	June 25 th	July 6 th	July 6 th	July 25 th
	Stanley 3S	June 25 th	July 8 th	July 8 th	July 25 th
	Gladstone	June 25 th	July 5 th	July 5 th	July 25 th
	Elm	June 25 th	July 7 th	July 7 th	July 25 th
	Kirksville	June 25 th	Not In Yet: Phoned him on 7/20, he'll send 2 nd key.	NOT as of 7/25.	NOT as of 7/25!
Longbranch Reservoir	June 25 th	July 5 th	July 5 th	July 25 th	

Important: If you have not received the Observer’s data key by the 10th day of month, phone the Observer to inform him you are missing his key, and ask if he had any difficulties or was simply behind in mailing. On the 20th review the Data Key Log Sheet to identify any key 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 have him mail the Data Key.

Note: Data keys are to be unlabeled when you mail them to the Observer, and the Observer is not required to label any key at any time.

Note: Each Data Key generates just one data file. The data file is automatically given a filename by Coastal's Key Reader software. You may not rename any data file either in the current month's, or the past months' HPD directory sub-folders.

Note: Keep at least one 'spare' Data Key in the WFO at all times. For NWSREPs who manage 10 or more FPU systems, a practical minimum number of spare Data Keys, might be five (5).

Your next major responsibility is to transmit the monthly FPU 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 key or was instructed by the WFO to postpone a download to data key, the date of your transmitting the FPU file may be extended by one or two weeks. The intention here is to limit unnecessary FTP transmissions and to simplify your data key tracking work.

2.1.2. Observer Responsibilities:

Data Key Exchange: Emphasize to your Observer how his major responsibility is to be the full-time 'keeper' of the FPU Data Key. He will need the Data Key at the start of each month to download precipitation for mailing to you in the WFO. His full-time awareness of the location of this small red plastic Data Key is essential.

The Observer needs to understand how you will use the United States Postal Service (USPS) standard mailing class to send a 'fresh' Data Key to the Observer's preferred mailing address. This new Data Key will be mailed each month in the usual NWS marked envelope and will be scheduled to arrive in Observer's mail no later than 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?

- a. residence ?
- b. rural highway 'box' ?
- c. PO Box at local Post Office?

Monthly Data Collection: Observer shall download the data to the Data Key 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 *FPU Observer Instruction* guide.

The 'new key' is likely to have already arrived a day or two before the Observer downloads the monthly records and so he will have two keys in his possession. The Observer should realize that he may use either key to download as they are both considered available 'blanks'. However, once data is downloaded to the key, the Observer needs to immediately package it to the NWS-addressed mailer envelope, to reduce risk of Observer mailing his other key, the one that is 'blank' and intended for his next monthly download.

At the time you install FPU 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, '*FPU 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' handling of the FPU system.

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

- Download to Data Key (i.e., dry run) on the day FPU is installed. As NWSREP, observe his level of familiarity with key pad control points and the data key receptacle.
- Possess a printed copy of the *FPU Observer Instructions*, (April 18, 2005) and be able to locate and describe the purpose of the: keypad, display, data key receptacle, and a list of the operator notation codes (i.e., 104 'Routine Gauge Check').
- Timely operational download to Data Key on the first five (5) calendar days of the month. The Observer shall not download before 12AM on the first day of month!
- Timely mailing of Data Key to WFO by the 10th day of month. Observer shall mail you his Reporting Key on same day that he downloaded his data.
- Possess a filled-in copy of the *Mailing Address/WFO POC Sheet* (Appendix C, *FPU Observer Instructions*, Apr 2005).
- Identify a secure location where s/he will keep the Data Key during the month.

2.2. General Month-by-Month Responsibilities and Timeline

2.2.1. Mail All Observers a Key:

On or about the 25th of each month mail each Observer a data key.

Note: Data Keys you mail to the Observer shall not be affixed with any type of label or marking.

Write down to the monthly Log Sheet (Sec 2.1.1) the date you mailed-out the new keys.

2.2.2 Log-in Each Reporting Key as Received by NWSREP:

All Observers should have mailed you their Reporting Key with the understanding that you have to have them received and positively accounted for between the 10th and 15th of each month. If any key is missing on the 15th, first search your office's incoming mail station, for possible mis-distributed / misplaced envelopes.

Receipt of the Observer's Reporting Key: Check the envelope's self-address to positively identify the location of the COOP Station Observer sending you the enclosed red plastic data key. Check the same mailing envelope to ensure it contains:

- a. Red plastic data key,
- b. Possible FPU Event Log, or related printed correspondence.

The same day you open the envelope holding the Observer's mailed key, log the date to the 3rd column of your Data Key Log Sheet, in the column titled, 'Verify the Reporting Key.'

Strive to have all Observers' keys logged as received by the NWSREP, and uploaded to the Coastal Key Reader by the 10th of the month. For offices with ten or more FPU stations by the 20th of month, strive to have all keys logged as received by NWSREP and uploaded to Coastal's Key Reader.

Write down to the monthly Log Sheet (Sec 2.1.1) the date you received his Reporting Key.

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

Upload each Reporting Key to the stand-alone Coastal Reader PC on the same day you receive the key.

Write down to the monthly Log Sheet the date you uploaded the key's contents.

2.2.3. Instructions to Create the Precipitation Data Files:

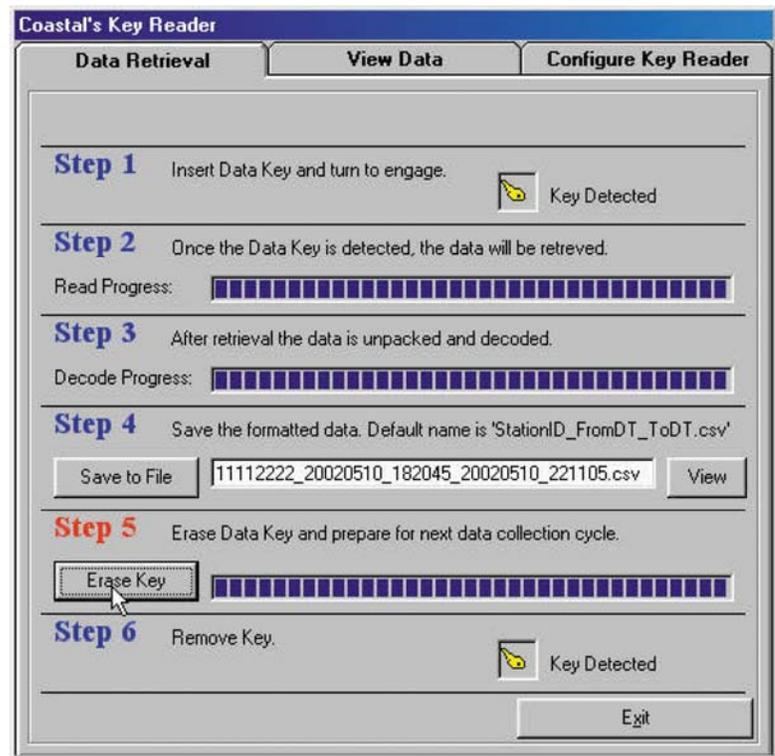
- A. Insert the Data Key into the Key Reader receptacle, turn the key to the right.
- B. The Coastal Key Reader's display will now feature a status panel, with 6 dialogue windows (see figure, below) and the system will automatically start reading the key, the

panel's "Step 1", will indicate 'Key Detected', and the program will automatically advance to "Step 2".

C. If you see the Key Detected symbol light-up ('Step 1'), but the program says that the key is empty, then look for the key reader's AC adapter's power cord to see if it is plugged in.

D. The program should progress through the same 'Data Retrieval' panel's "Step 2" and "Step 3" (see graphic, right), without any operator input necessary.

E. At "Step 4" on the Data Retrieval panel (see graphic, right), a filename will display in the white background, text editor window. The standard filename will automatically post to the window – this is the convention - so do not alter this filename!



F. With "Step 4" you may click on "View" to examine a data key's contents in a 'Notepad' pop-up window. See Section 2.2.6 for information on how to decode data fields. Then, click **Save to File** button to save the key's entire contents to a single file in the Coastal-PC/Laptop. The file will be saved to a directory path you have configured in Coastal's Key Reader software (i.e., C:\hpd\2005\jun\).

Do **not** 'Save to File' if the Reporting Key is missing 15 or more days of the collection month. Phone the Observer to inquire into the problem and ask Observer to download to his New Key and mail you it at his earliest convenience. When key is received, mail the Observer a New Key because he has none.

Realize how in this "Step 4", the entire contents of a given Data Key are allocated and named into a single file by the Coastal Key Reader program. No additional operator commands are necessary.

Example: 41008778_20050415_231905_20050702_065958.csv

The filename convention is:

coopidno_yyyymmdd_hhmmss_yyyymmdd_hhmmss.csv

Here the ‘coopidno’ is an 8-digit coop id number where the first 4 digits are the state number (4100 is Texas) and the last 4 are the actual site id number for that station within the state. (e.g., 41008778, is assigned to Swan 4NW, TX)

“yyyymmdd” marks the date of the key’s oldest (first) data element on the key, and also later, the youngest (last) data element.

“hhmmss” marks the time of the key’s oldest (first) data element on the key, and also later, the youngest (last) data element.

- G. You may click the View Data tab (middle tab at panel’s top) to skim the data file inside the Notepad utility, or click the Exit button to leave the program.
- H. Do not erase the key prior to removing it.
- I. To finish the process, turn the key to the left, and remove it.
- J. Close the Coastal Key Reader program.

In the above process you have successfully uploaded your Observer’s Data Key records into your standalone-PC/laptop. This Coastal Key Reader computer may also be referred to as the ‘Coastal-PC’ or ‘Stand-Alone PC/Laptop’ in this manual.

Note: When seeking to examine the individual 15-minute data elements, use only the Coastal’s Key Reader panel (graphic above), by clicking on the middle tab ‘View Data’ at the top of the screen. Never open a file by going to Windows Explorer and double clicking the filename because this will open the file and immediately render a change to the cells’ data format settings! The most obvious corruption is a change to each record’s date field. Also, for data that end with a ‘.n0’ or ‘.00’ after the decimal point, the Excel-CSV will be permanently truncate these trailing ‘0’ numerals and alter the permanent data record!

2.2.4. 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 FPU data files for the NWS and NESDIS.

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

- a. Coastal-PC (i.e., Stand-alone PC/Laptop)
- b. NWS-network station’s (i.e., AWIPS) directory for “HPD” (i.e., C:\hpd\month)

When you upload the Data Key to your workstation, the Coastal’s Key Reader software will automatically produce just one data file with a long numeric filename. Each data file will hold the entirety of the most current reporting month, and also include the prior month’s data.

The file shall be saved to a dedicated permanent directory, with a sub-directory structure that is organized by year and month as follows: C:\hpd\2005\jun\

Store, and do not delete the CSV data files for at least 12 months. Also, never rename files that are being stored.

Example: coopidno_yyyymmdd_hhmmss_yyyymmdd_hhmmss.csv

41008778_20050415_101459_20050702_094414.csv

(Station ID__OldestDate__Time__YoungestDate__Time.CSV)

Important: Never rename a Coastal Key Reader generated filename! And never duplicate, i.e., 'copy-cat', an assigned filename if you generate a mark-up or work-file document for personal use!

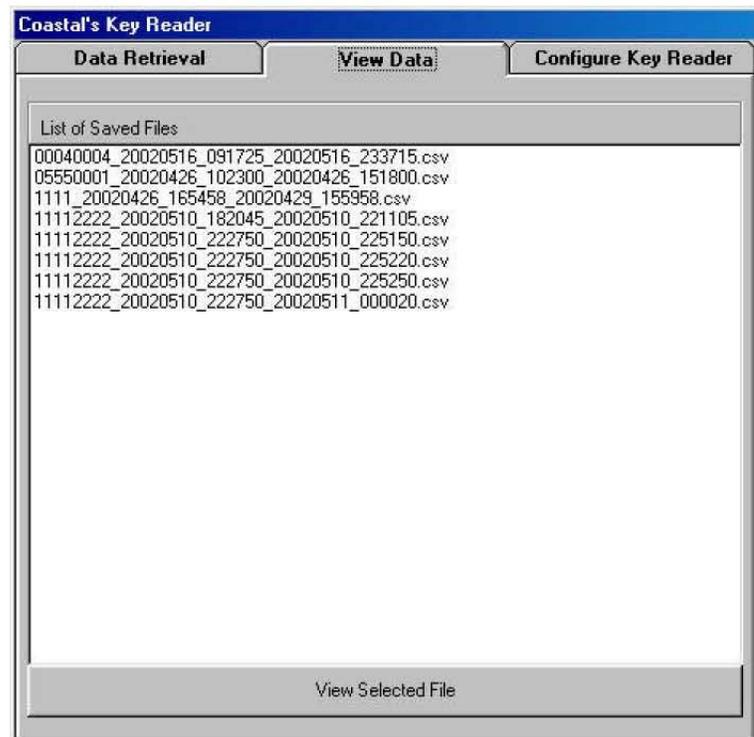
Filename Format: The first eight characters give the Station ID number (i.e., 41-8778); the next block gives the date of the **oldest 15-minute** data element (Apr 15, 2005) in the data file; the middle section (3rd block of the filename) gives the local time of the oldest 15-minute data element. The next block gives the date of the **youngest 15-minute** data element (July 2, 2005), and the final section (5th block) gives the local time of the youngest 15-minute data element.

2.2.5. Setting the Data Folder-name in Coastal-PC:

At any time in the month you may call-up a CSV file to view its contents.

Simply click-on the 'View Data' tab (graphic, right). It will link you directly to the C: drive folder-name you last established as your Saved Data Folder. The View Data screen opens to that folder-name (e.g., c:\hpd\2005\jun\) and lists all the CSV files.

Use the mouse to select a CSV file, it will highlight in dark blue, then move the cursor to the View Selected File tab on the bottom bar of the same panel. Click it, to open up the Notepad text file viewer to examine the 15-minute data elements.

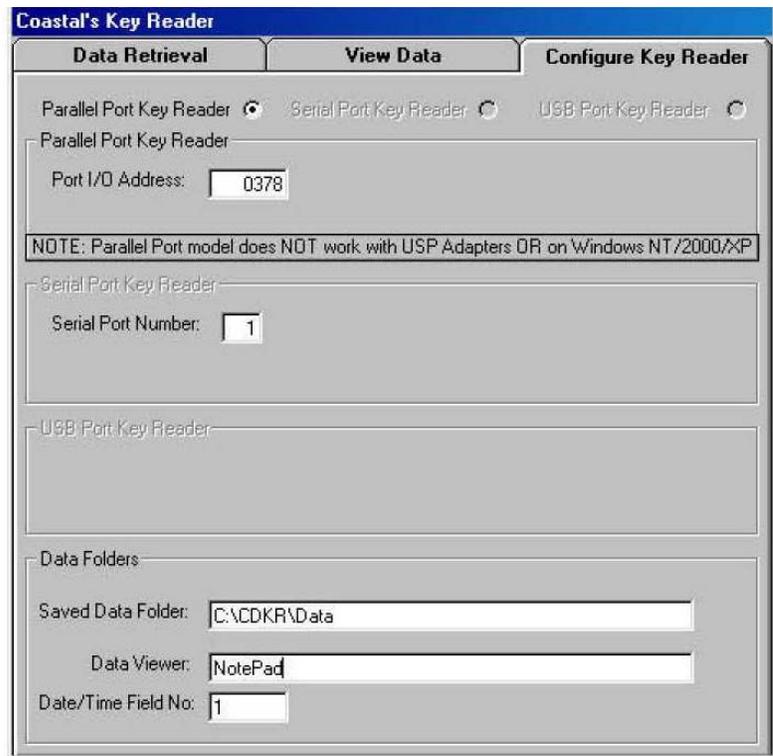


You may update your HPD data directory folder-names at any time by calling-up the right-most tab, 'Configure Key Reader' (see graphic, below) and finding the Data Folders section at the bottom of its panel.

Important: If you have not yet done so, go to the ‘Configure Key Reader’ tab and modify the ‘Saved Data Folder’ default from, C:\CDKR\Data\ to our COOP Program convention: C:\HPD\2005\Month\ .

Below the ‘Saved Data Folder’ user entry window, you will find the ‘Data Viewer:’ entry window (see graphic, right). Here we are told the name of the text file viewer in use. It should appear as ‘**Notepad**’. Always keep this as the default text file viewer.

Also, never change the ‘Date/Time Field No:’ setting. Keep ‘1’ as the default.



2.2.6 Examine CSV to Confirm Collection Month is Present:

Give a quick, one minute or so, visual inspection of your Observer’s CSV file’s contents, to confirm the Reporting Key was holding data records for the collection month. Confirm there is data from the start of the month as accounted for by the 12AM record from the first day of the month: **2005/05/31,23:59:58,1,14.13,9.70,12.16,10.35,12.49**, is valid for the month of June.

Example:

2005/05/31,23:44:58,1,14.13,9.85,12.16,10.35,12.49
2005/05/31,23:59:58,1,14.13,9.70,12.16,10.35,12.49
 2005/06/01,00:00:01,2,-0.02,0.00,19.70,7.37,0.00
 2005/06/01,00:14:58,1,14.13,9.65,10.30,9.70,12.49

Scroll to the end of the CSV 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 past 12 Midnight of the last day of the month: **2005/07/01,00:14:58,1,17.19,19.00,19.35,19.20,12.49**, is valid for the month of June.

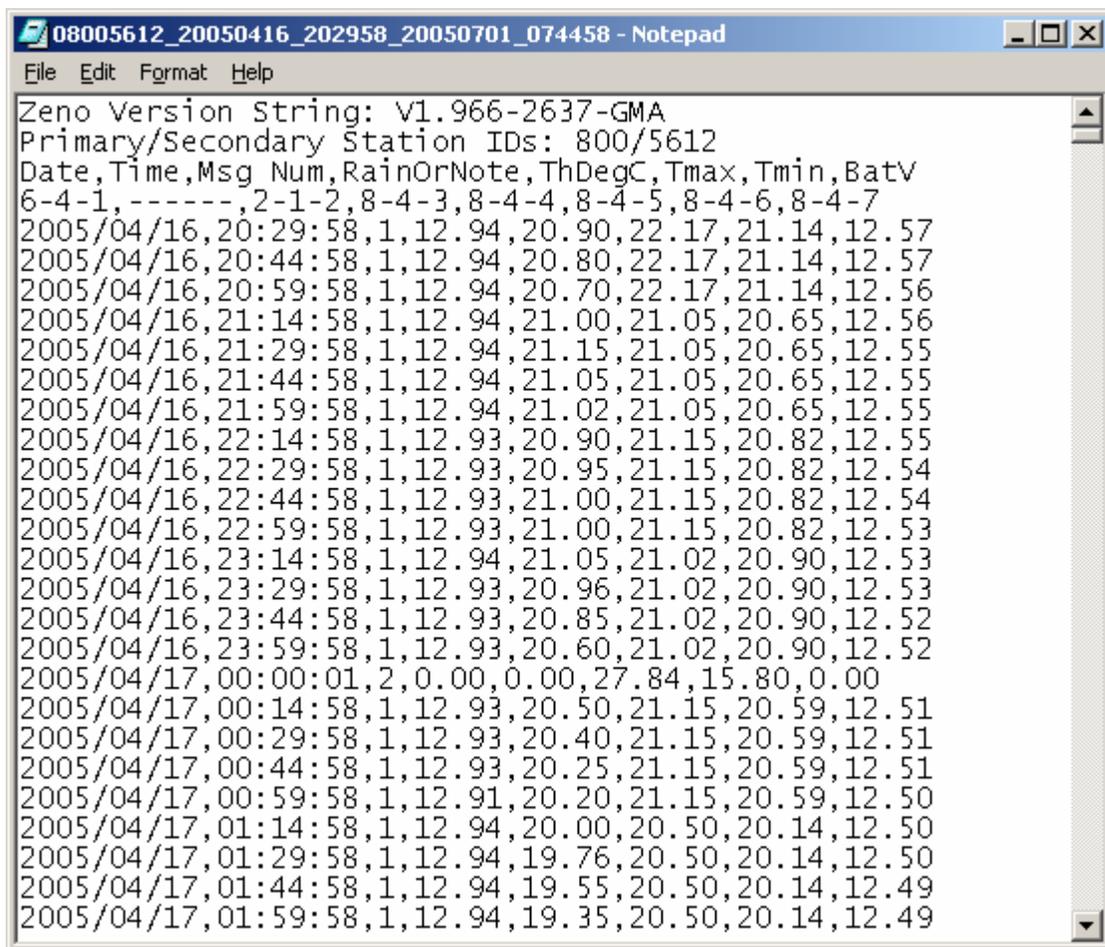
Example:

2005/06/30,23:44:58,1,17.20,19.25,19.50,19.35,12.50
 2005/06/30,23:59:58,1,17.19,19.30,19.50,19.35,12.49
 2005/07/01,00:00:01,2,0.02,0.00,24.00,16.90,0.00
2005/07/01,00:14:58,1,17.19,19.00,19.35,19.20,12.49
 2005/07/01,00:29:58,1,17.19,18.75,19.35,19.20,12.49
 2005/07/01,00:44:58,1,17.19,18.51,19.35,19.20,12.48

In this way you have confirmed the Observer submitted a valid station record for the collection month being reported.

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 CSV file as an e-mail attachment.

Note: Your CSV data will appear in Notepad similar to this synthesized example, below. Here the WFO-MLB opted to install a Battery Voltage tracking utility to over-write the Stream Level field. The battery voltage configuration is available from the NWS Headquarters Office of Operational Systems website: <http://www.nws.noaa.gov/ops2/Surface/coopimplementation> by accessing the link “FPU Configuration File with Battery Voltage Tracking Code“.



```

08005612_20050416_202958_20050701_074458 - Notepad
File Edit Format Help
Zeno Version String: V1.966-2637-GMA
Primary/Secondary Station IDs: 800/5612
Date,Time,Msg Num,RainOrNote,ThDegC,Tmax,Tmin,BatV
6-4-1,-----,2-1-2,8-4-3,8-4-4,8-4-5,8-4-6,8-4-7
2005/04/16,20:29:58,1,12.94,20.90,22.17,21.14,12.57
2005/04/16,20:44:58,1,12.94,20.80,22.17,21.14,12.57
2005/04/16,20:59:58,1,12.94,20.70,22.17,21.14,12.56
2005/04/16,21:14:58,1,12.94,21.00,21.05,20.65,12.56
2005/04/16,21:29:58,1,12.94,21.15,21.05,20.65,12.55
2005/04/16,21:44:58,1,12.94,21.05,21.05,20.65,12.55
2005/04/16,21:59:58,1,12.94,21.02,21.05,20.65,12.55
2005/04/16,22:14:58,1,12.93,20.90,21.15,20.82,12.55
2005/04/16,22:29:58,1,12.93,20.95,21.15,20.82,12.54
2005/04/16,22:44:58,1,12.93,21.00,21.15,20.82,12.54
2005/04/16,22:59:58,1,12.93,21.00,21.15,20.82,12.53
2005/04/16,23:14:58,1,12.94,21.05,21.02,20.90,12.53
2005/04/16,23:29:58,1,12.93,20.96,21.02,20.90,12.53
2005/04/16,23:44:58,1,12.93,20.85,21.02,20.90,12.52
2005/04/16,23:59:58,1,12.93,20.60,21.02,20.90,12.52
2005/04/17,00:00:01,2,0.00,0.00,27.84,15.80,0.00
2005/04/17,00:14:58,1,12.93,20.50,21.15,20.59,12.51
2005/04/17,00:29:58,1,12.93,20.40,21.15,20.59,12.51
2005/04/17,00:44:58,1,12.93,20.25,21.15,20.59,12.51
2005/04/17,00:59:58,1,12.91,20.20,21.15,20.59,12.50
2005/04/17,01:14:58,1,12.94,20.00,20.50,20.14,12.50
2005/04/17,01:29:58,1,12.94,19.76,20.50,20.14,12.50
2005/04/17,01:44:58,1,12.94,19.55,20.50,20.14,12.49
2005/04/17,01:59:58,1,12.94,19.35,20.50,20.14,12.49

```

After you have examined the CSV file for proper dates and times to verify the full reporting month is present, you may wish to confirm the Message Numbers (i.e., 1, 2, 3 or 4) are consistent, and the 15-minute report (rainfall in hundredths of an inch) contain data and not ‘zeroes’, and you need not analyze the 24-hour report (Msg Num = 2) because it is not to be used by your office or the NCDC.

Date	Time	Msg Num	Rain Or Note	ThDegC	Tmax	Tmin	StrmLvl
Year/Mo/Day	HH:MM:SS	1 = 15min 2 = 24 hour 4 = Notation	Precip Bucket Level or 3-digit notation code	Temp C 15 min	Temp C Max	Temp C Min	Feet
2002/09/10	22:29:58	1	6.80	27.10	27.80	27.20	135.00
2002/09/10	22:44:58	1	6.80	27.10	27.80	27.20	135.00
2002/09/10	22:59:58	1	6.80	26.95	27.80	27.20	135.00
2002/09/10	23:14:58	1	6.82	26.65	27.15	26.94	135.00
2002/09/10	23:29:58	1	6.82	26.50	27.15	26.94	135.00
2002/09/10	23:44:58	1	6.81	26.05	27.15	26.94	135.00
2002/09/10	23:59:58	1	6.82	26.15	27.15	26.94	135.00
2002/09/11	00:00:01	2	0.02	0.00	32.85	26.05	0.00
2002/09/11	00:14:58	1	6.81	26.08	26.84	26.05	135.00
2002/09/11	00:29:58	1	6.81	26.25	26.84	26.05	135.00
2002/09/11	00:44:58	1	6.81	26.10	26.84	26.05	135.00
2002/09/11	00:59:58	1	6.81	26.00	26.84	26.05	135.00
2002/09/11	01:14:58	1	6.81	25.80	26.30	25.99	135.00
2002/09/13	04:14:58	1	6.73	26.85	26.90	26.10	135.00
2002/09/13	04:29:58	1	6.73	26.90	26.90	26.10	135.00
2002/09/13	04:44:58	1	6.74	26.90	26.90	26.10	135.00

2.2.7 Transfer CSV Files from Coastal-PC to AWIPS Workstation:

Do not transfer any CSV files from the Coastal-PC (i.e., Stand-alone/Laptop) until the 15-25th of the month. Only when you have received all Observers' reporting keys, as accounted for by the *Data Key Log Sheet* (Sec 2.1.1), go to the Coastal-PC's 'Programs' menu and select Windows Explorer. Locate the various drives and folders in the left pane of the Windows Explorer, and locate the (C:) drive to expand its folders, and click on the HPD folder icon to expand the sub-folder icons, then click on the 2005 folder icon to expand the 12 sub-folder icons, one for each month. Click on the JUN folder to display its data files within the right-side pane of Windows Explorer. Select all the CSV files you need to copy to the (A:) drive. Then press and hold the CTL key, press the mouse button, and drag the files to the (A:) drive icon to complete the copy to the diskette.

Remove the 3.5 inch disk from the Coastal-PC and insert it to the 3.5 inch disk port on the NWS-Network station. Locate any file directory manager on the Unix operating system that will allow you to copy the CSV files from the 3.5 inch disk to the NWS-Network station's C: drive. Prior to the copy-down, ensure the NWS-Network station's file structure was updated for the current collection month according to the convention stated in Section 2.2.4 of this manual (e.g., C:\HPD\2005\Month\).

Portable Media: For this procedure you will require one formatted, 1.44 MB high density 3.5 inch disk that is blank or empty of any files. Use the Coastal-PC's Windows Explorer program (Win 95/98/ME) to structure the blank diskette. Create an 'HPD' folder, followed immediately by a '2005' sub-folder and under the 2005 sub-folder, create a sub-folder for the collection month, i.e., 'June'.

Note: One formatted 3.5 inch disk can hold a maximum of only four (4) CSV files because each CSV file is approximately 250 kB large. Ensure your WFO always keeps an inventory of several 10-pack boxes of the formatted 1.44MB high density disks (i.e., Maxell brand) reserved specifically for the Fischer-Porter Upgrade (FPU) data transfer process. [Zipping the typical monthly CSV file will reduce its size from 266kB to 42kB. Be careful not to accidentally zip your entire folder (i.e., /hpd/2005/june) .]

Note: Never rename the CSV files when you copy them to disk, nor rename them when saving to other folders. See the note labeled 'Important:' back in Section, Sec 2.2.4.

2.2.8 Examine CSV on NWS-Network Station:

The best practice for handling a recently received Reporting Key, is to make a check of the CSV file contents, early on, right after uploading the key to Coastal's Key Reader. In that way, any problems with missing data, or a Reporting Key with internally corrupted date/time headings can be diagnosed soon enough for you to document the problem and phone the Observer if needed. The NWSREP with more than 20 FPU stations however, may need to conduct a second or follow-up check, of certain CSV files after he has transferred them to the NWS-network workstation.

To examine contents on the NWS-Network workstation you will not have the Coastal's Key Reader software as an application helper. In addition, you shall not open the CSV file at any time within an Excel application! So caution is advised, to use the Windows resident application

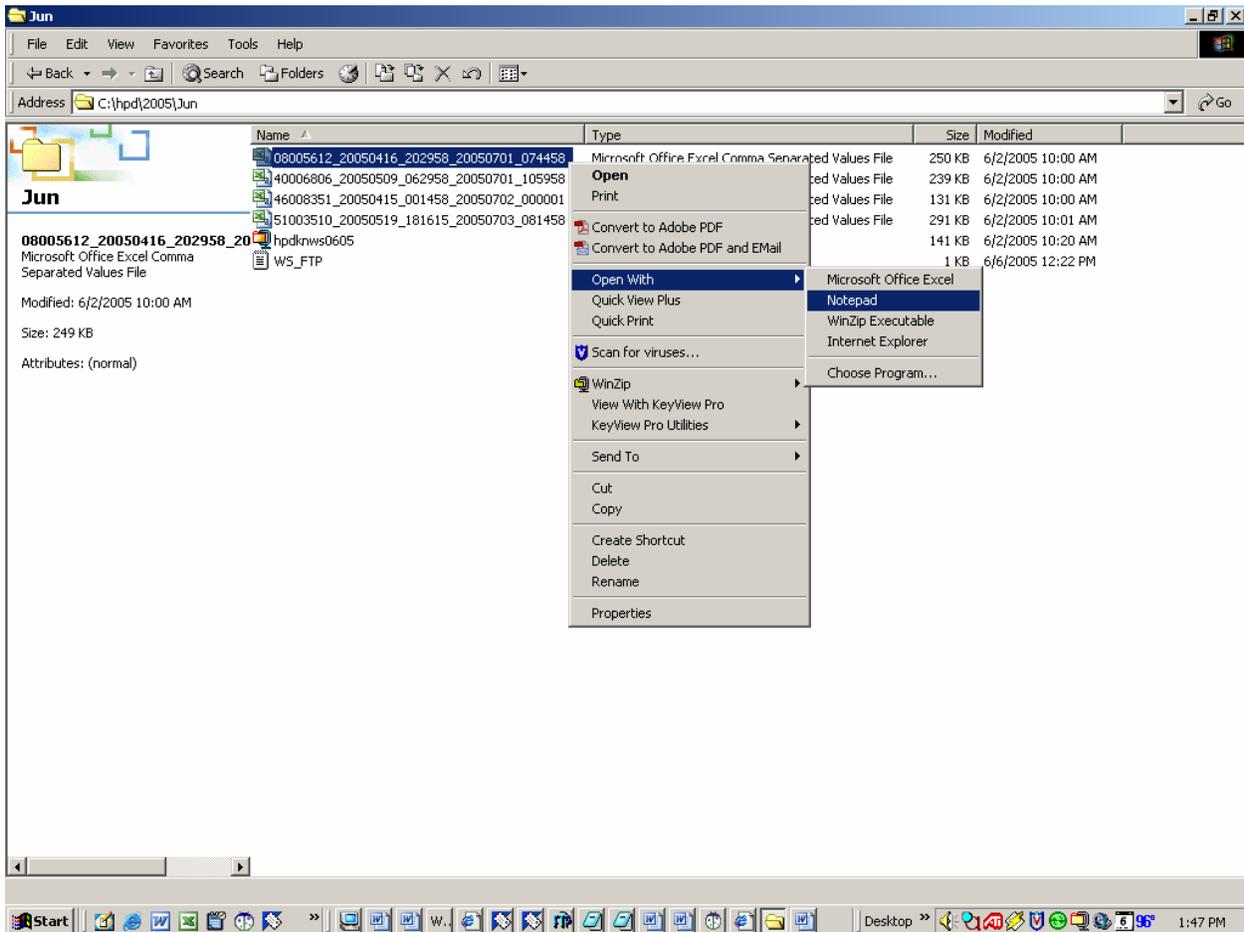
text file viewer “Notepad”, that should be resident on the NWS-Network workstation program files directory.

Follow these Windows procedures to call up the Notepad application to view the contents of any CSV data file.

Access your Network station’s file directory containing these FPU data files and carefully single click the right-mouse-button to select the CSV 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!

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 as you have done earlier in Section 2.2.7 of this manual.



2.2.9. Zip Compress FPU Data File :

On or about the 15th of the month, go to the Data Key Log Sheet and take inventory of the Data Keys you have transferred to the NWS-network workstation. When all the Observers have sent

their Data Keys, and you have transferred the data files from the Coastal-PC to the NWS-Network workstation, you are ready to 'zip' together all the CSV data files into a single file.

Use only the NWS-network workstation to zip together all CSV files from the observed 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 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., kmeg for Memphis, TN), and >MM= is the data-month (i.e., 06), and >yy= is the data-year (i.e., 05).

Keys Delivered Late to WFO: If any Observers have not yet sent you their Data Key, 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 CSV 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, 2005, is the absolute last day (i.e., the cut-off date) to transmit June 1-30, 2005, data to NCDC, for data to receive the necessary quality control for inclusion into the monthly publications and archive databases.

NCDC Advice on Zip Compression:

- a. The CSV data file must contain the **entire** month's data being reported in the file name of the zip file.
- b. For example, a ZIP file named **hpdkxxxMMyy.zip** must contain all data for the month of '**MM**'. The Observer shall download to his data key only after 12:00am local time on MM 01, 20yy. If certain notation codes are missing from the MM month's data, then NCDC might exclude valid data when it publishes its monthly precipitation almanacs.

Caution: Do not 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.

2.2.10. Transmit FPU Data to NCDC:

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

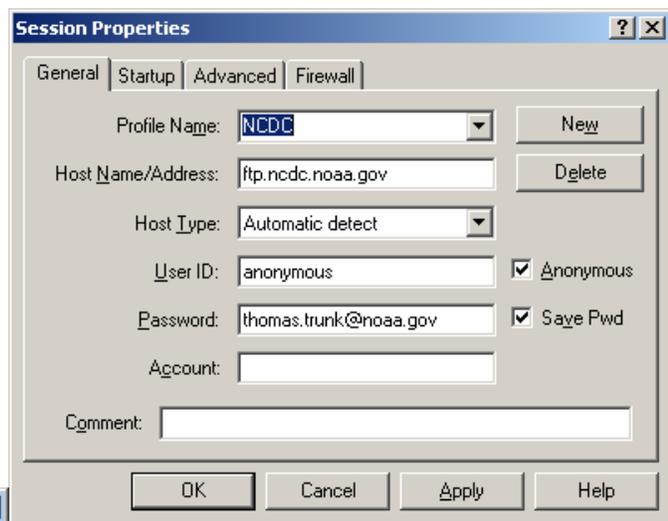
Double-click the desktop icon for WsFTPLE (i.e., Ipswich WSFTP95.exe) on your network workstation. If there is no icon, run the executable file that is located in C:\Program_Files\WS_FTP Windows\. The Session Properties ‘General’ panel will open immediately (graphic, below). Confirm it is configured 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.



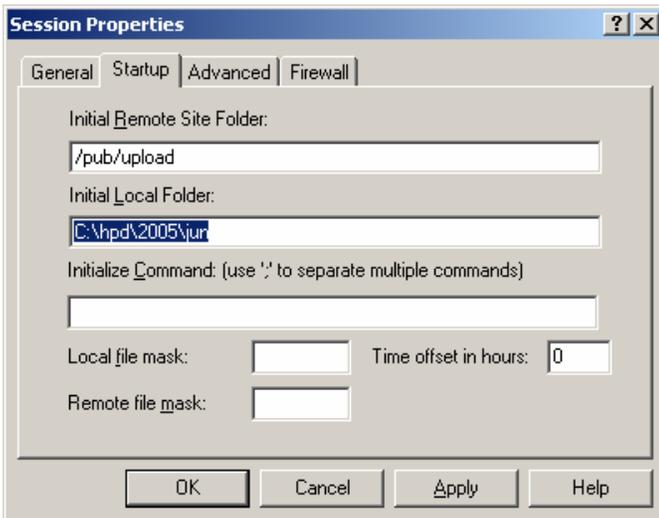
Host Name / Address: <ftp.ncdc.noaa.gov>
 anonymous
your.name@e-mail.address.

The general session properties do not change, except for the Password field, which most often will show the e-mail address of the worker who has transmitted Upper-Air data to NCDC (twice daily) most recently. So, now update the Password: dialogue box with your name.

Click on the Apply button on the lower portion of the ‘General’ panel to enter your password (do not click on OK, yet call-up the ‘Startup’ tab immediately to

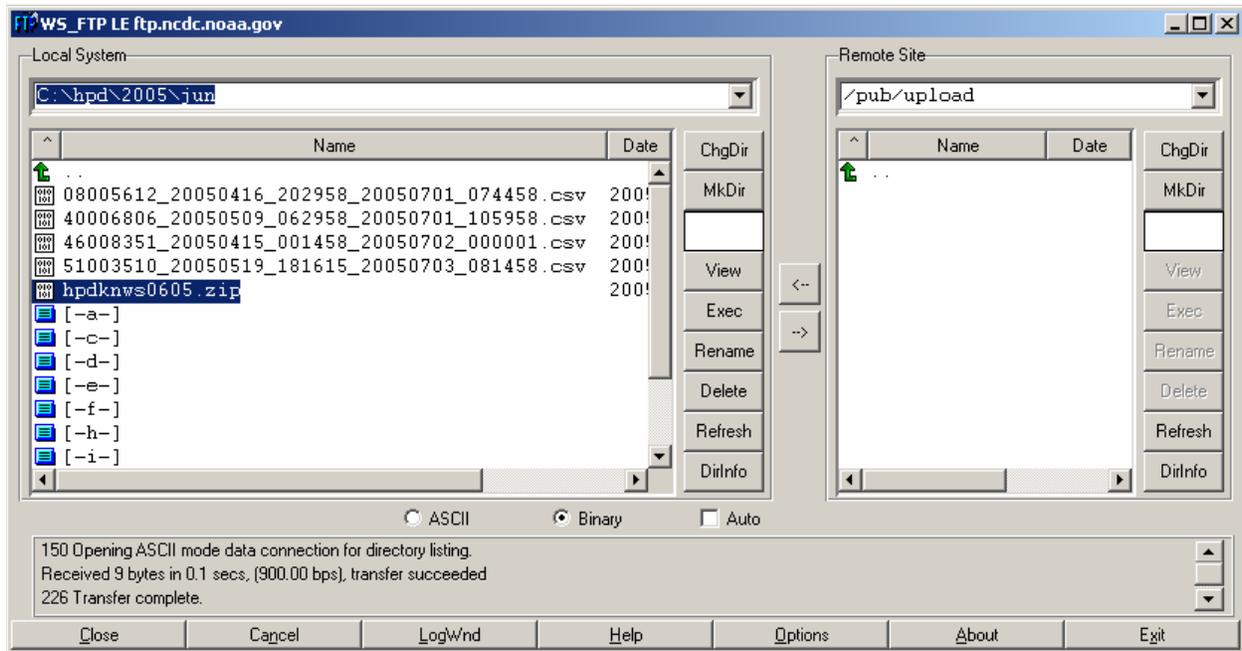


the right of ‘General’ in the same Session Properties screen.



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\2005\may, to C:\hpd\2005\jun , by typing in the letters ‘jun’ (below) and clicking on the button Apply.

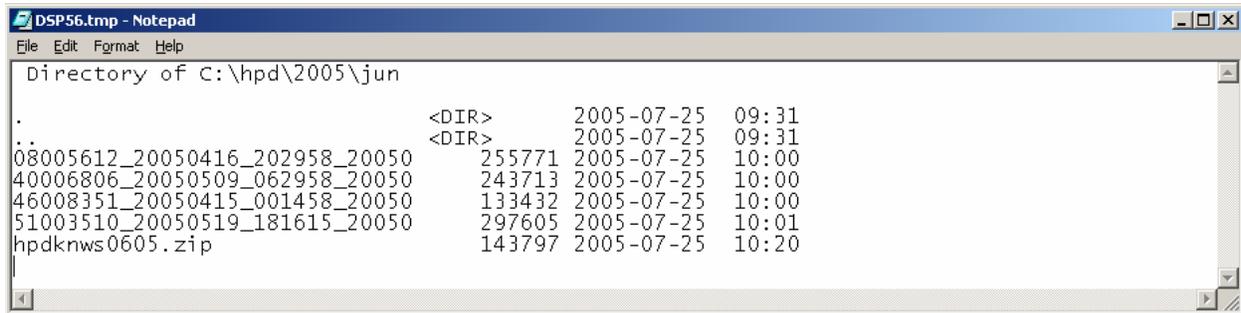
Finally, while still in ‘Session Properties’, click on the OK, expect sound-effects (i.e., train-whistle), and the program will quickly update your FTP user-control panel (see graphic, below) as the Session Properties windows closes shut.



The FTP twin-pane user-control panel (see, above) 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.

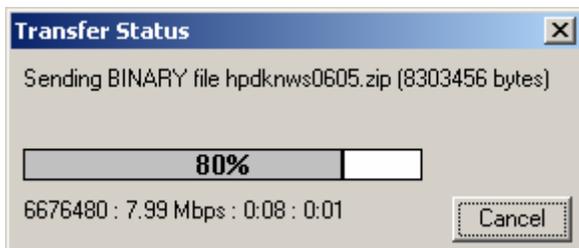
Note: Verify that your ZIP filename is properly coded and spelled: **hpdkxxxMMyy.zip** is the proper code, where ‘kxxx=’ is your 4-letter WFO identification (e.g., kmeg for Memphis, TN), and ‘MM’ signifies the data-month (i.e., 06), and >yy= signifies the data-year (i.e., 05). For zip files the year ‘yy’ is always on the end of the filename!

Note: Always ensure to give the ZIP filename the same month designation as the Collection Month of the newly observed data to be transmitted to NCDC! You may wish to call-up a full view of the filenames and properties of CSV and ZIP files. Now, click on the ‘DirInfo’ tab, it is the lowest tab in the vertical menu-bar of the median, to open the viewer (graphic, below).



Ensure that the Local System window displays the relevant month=s FPU zip files (e.g., hpdkxxx0605.zip) along with the CSV 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.

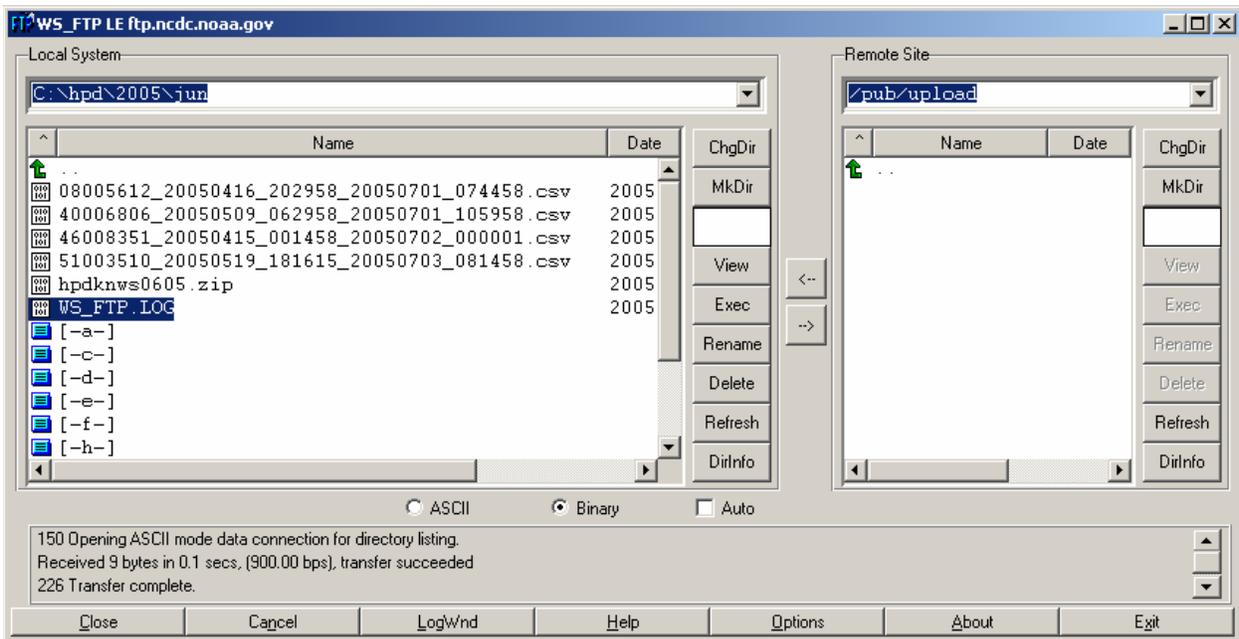
- A. **Select** the ZIP file (e.g., hpdknws0605.zip) you will send to NCDC. This is the one file that encapsulates all your FPU stations' precipitation data for the most recent collection month (e.g., June 1-30, 2005). Click (single click with left mouse button) the ZIP filename in the left-side window.
- 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 FPU-ZIP file to the NCDC's data ingest port. Your task is now completed.



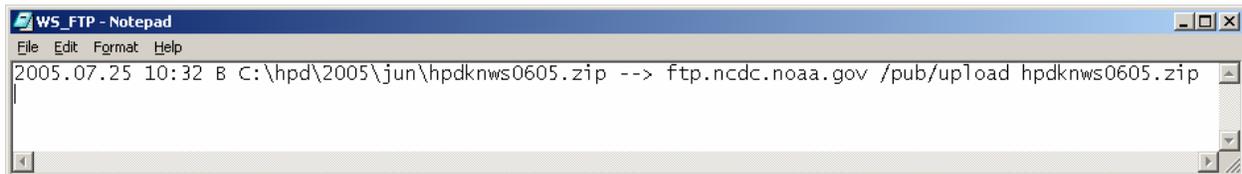
At the 100% transfer complete, audio effects will sound (i.e., several rapid chirps).

- 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).



Select the WS_FTP.LOG in your subfolder C:\hpd\2005\jun\ 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 10:32 July 25, 2005.



At NCDC an automated program (Cron job) will be looking for the "hpdknws0605" and the "zip" when it runs once each hour. Any files located will be automatically processed.

Note: If the FPU data is transmitted a second time (i.e., zip filename) the first transmitted file=s data will be overwritten.

Note: NWSREPs should e-mail or phone Stuart Hinson (NCDC), on 828-271-4437, if there are any questions on the prescribed FPU data compression and FTP transmission procedures.

Remember: If you have two or more COOP Stations who routinely send you monthly Data Keys, then Zip together the CSV files, one from each COOP Station, to form a single Zip file.

2.2.11 Confirm NCDC Has Ingested Your Monthly FPU Report:

At least one hour after you have transmitted your monthly ZIP file you must check for its receipt using this NCDC tracking site:

WEBSITE: http://www1.ncdc.noaa.gov/pub/data/hpd/inv/HPD_Received_200506.txt

Access the current month's web site (i.e., HPD_Received_200506.txt) and it will respond with a list of Zip files. Locate your WFO zip file (e.g., hpdkmeg0605.zip), and then ensure that all the

```
Archive: /proc_sm/gtsnp/data_sm/jul/FThpd/hpdkmeg0605.zip
inflating: /proc_sm/gtsnp/data_sm/jul/FThpd/40005956_20050514_082958_20050706_125958.csv
inflating: /proc_sm/gtsnp/data_sm/jul/FThpd/40002680_20030409_201725_20050714_105958.csv
inflating: /proc_sm/gtsnp/data_sm/jul/FThpd/40005210_20030218_225745_20050701_071458.csv
```

sites that were zipped together, now appear explicitly on separate (by SID, e.g., 40005956) lines according to their CSV filenames. See the boxed example from Memphis (kmeg), above.

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

2.3. Inform the RCPM of any FPU Event Log item reported by Observer:

Phone the Observer and inquire into the nature of the event s/he reported on the *FPU Event Log Worksheet*. 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? E-mail or Fax your RCPM a scanned copy of the FPU Event Log Worksheet and propose the action you will take to resolve this issue.

See Chapter 4, Maintenance, of this *FPU Operations Manual*, for general policy on trouble shooting and procedures for ordering replacement parts.

2.4 Quality Assurance Checklist:

The following recommended 'best practices' were adapted from National Weather Service Training Center (NWSTC) instructor, Mike Wyatt's course materials.

2.4.1. Log-in the Data Keys that Arrive each Month

- a. Establish a Data Key Log Sheet template; update and print it monthly
- b. Consider a QA Log Sheet for broader, more general FPU responsibilities
- c. Establish firm time-table, routine
- d. Establish criteria for acceptance.

2.4.2. Transmit to NCDC

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

2.4.3. Set a 'Best Practice Policy' for your WFO to handle all the FPU stations.

- a. Establish expectations with Cooperative Institutions.
- b. Establish consistency.

- Schedule firm cut off for routine receipt
- Follow-up on missing Keys consistently.
- Establish deadlines, patterns with Observers

2.4.4. Perform Quality Assurance Review:

- a. Entered the proper notation codes (i.e., 150, 255) if measurements interrupted? Confirm the data possesses proper filename, station number, Year /Month/ Day ?
- b. Any data missing problems, any garbled data?, any zeros data filling the pages?
- c. If a problem in the data file does this problem fit a pattern from the same Observer?
- d. Have there been quality improvements (observer) for same site?
- e. Log problems at the WFO to establish patterns.
- d. Read and take action on any FPU Event Log Form that is submitted by the Observer. --- Do you need to check the File to confirm Notation codes are properly entered? (If they are not entered, then advise the NCDC via e-mail)
- f. Determine QC corrective procedures. Is there something NCDC can do, recover?
- g. Schedule QC-Does NCDC need to be specially notified about this Station's data?
- h. Follow-up with your Observer, and with NCDC if needed.

2.4.5 Records Retention Guidelines from OS7

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

- A. Electronic copy of the month=s FPU files (CSV) shall be stored for at least 12 months on an NWS-network workstation. Do build a primary storage folder or archive on a laptop PC.
- B. Print or electronic copy of the '*Data Key Log Sheet*' for 12 months.
- C. Print copy of Observer-submitted *FPU Event Log Worksheets* and print of any e-mail correspondence on subject matter shall be kept for 12 months.
- D. Print copy of any *FPU Trouble Report* forms and print of any e-mail correspondence on subject matter, shall be kept for 12 months.
- E. Print or electronic copy or electronic bookmark for each of the FPU documents that appear in Appendix E, of this *FPU Operations Manual*. This includes the relevant administrative and procedural directives for the FPU program (i.e., CSSA Manual, ILSP, CLS, NWSI 10-1315, Coastal Environmental Systems (CES) Technical Manual, CES CD-ROM for PC Reader, CES CD-ROM for Technical Manual, and Memos Issued by NWSHQ).

2.5 Monthly Timeline of FPU Tasks:

Day of Month	Countdown to FTP X-mission	Task to perform.
--------------	----------------------------	------------------

Jun 25th	T – 31 days	Access the <u>/hpd/oresites/inv/HPD_Received.txt</u> website to confirm NCDC has received your FPU stations' monthly CSV files. (Sec 2.2.11)
25th	T – 31	Mail each of your Observers a Data Key – completing the exchange.
July 1st	T - 24	Prepare a new Data Key Log Sheet for month ending June 30 th .
3rd	T – 22	Log first Data Key arrival into your <i>Data Key Log Sheet</i> . Did the Observer enclose any operational log-sheet or notes?
3rd	T – 22	Upload each Data Key to the non-Network PC, on same day it arrives. Examine CSV file's date/time headings to confirm proper month.
10th	T – 15	Upload any outstanding 'Reporting Keys' and update the <i>Data Key Log Sheet</i> . Identify any missing (late) keys. Check WFO mail station for mis-directed Data Keys. Phone the Observer to prompt for the missing (late) key.
15th	T – 10	Check WFO mail station for mis-directed Data Keys. Upload any outstanding 'Reporting Keys' and update the <i>Data Key Log Sheet</i> .
15th	T – 10	Take inventory of CSV files on the Stand-Alone PC. 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 'Reporting Keys' and update the <i>Data Key Log Sheet</i> . There should be no missing or late keys now. Check WFO mail station for mis-directed Data Keys. Phone the Observer a second time (first time was on the 10 th) to prompt them to mail it.
25th	T – 0	Confirm all Data Keys were received and accounted for in the stand-alone PC/laptop (then update the <i>Log Sheet</i> if necessary). Transfer all CSV files via 3.5" floppy from the isolation station (PC/laptop) to the NWS-Network Workstation.
25th	T – 0	ZIP all the CSV files submitted this month, to form a single bundled ZIP file.
25th	T – 0	<u>Important:</u> Ensure the filename is spelled properly. Example: <u>hpdkxxx0605.zip</u> Where the kxxx is the WFO site ID (e.g., kohx); the 06 is the data-filled month (June); and 05 represents year 2005.
July 25th	T – 0	FTP Transmit the June 2005 FPU-ZIP file to NCDC.
25th	T – 0	Access the <u>/hpd/oresites/inv/HPD_Received.txt</u> website to confirm NCDC has received your FPU stations' monthly CSV files. (Sec 2.2.11)
25th	T – 0	Mail each of your Observers his new Key.

T = Denotes your FTP monthly transmission to NCDC.

Annex for FTP Set-up Applies to Section 2.2.10:

1. Introduction to FPU Data File Procedures:

These step-by-step instructions are directed to WFO meteorologists and technicians so the FPU files will be routinely electronically transmitted to the National Climatic Data Center (NCDC) in Asheville, North Carolina. Questions may be directed to Mr. Stuart Hinson (NCDC), on 828-271-4437.

These procedures require the WFO workstation to have the **WS_FTPLE** utility installed and operational. Procedures use standard Windows operating system terminology.

In this Appendix the term Hourly Precipitation Data (HPD) refers to FPU data that was saved to a ZIP file.

2. Ensure Proper Zip Filename:

After all FPU data files for the month have been saved to the WFO=s designated archive directory, then zip all FPU data into one file with filename that contains the processing month, that is the month of transmission. For a file being transmitted in January 2003 use hpdxxxx0103.zip.

Use the ZIP filename convention. For example, WFO Ft. Worth uses: hpdkfdw0103.zip, where >xxxx= is your 4-letter WFO identification (e.g., kfdw for Ft. Worth, TX), and >mm= is for data month (Jan), and >yy= is for data year (2003).

2. Set-up FTP Profile in WS_FTPLE:

- A. After you setup WS_FTPLE, you need to set up an FTP Profile for NCDC:
- B. Double-Click the WS_FTPLE icon on the desktop
- C. Click "New"
- D. In the "General" Tab:
- E. Profile Name: FTP NCDC
- F. Host Name/Address: ftp.ncdc.noaa.gov
- G. Host Type: Automatic Detect
- H. User ID: anonymous

- I. Password: your.name@e-mail.address
- J. In the "Start-Up" Tab:
- K. Initial Remote Site Folder: /pub/upload
- L. Initial Local Folder: C:\[Folder with HPD File] (Ex: C:\hpd\2002\Jan\)
- M. In the "Advanced" Tab:
- N. Make sure the "Passive Transfers" box IS checked.
- O. VERY IMPORTANT! Make sure the Binary mode radio button is selected (Bottom-middle of window)
- P. CONNECT (at bottom left) <<<*from older WsFTP software (pre 2003).*>>>

3. FTP Transmit the Zip File to NCDC :

- A. Select (Highlight by left-single clicking) the file you want to send on the Left side
- B. "Push" the arrow (--->) buttons (in the middle) to "push" the data from the PC side (left) to the NCDC side (right).
- C. ALL DONE!

An automated program (Cron job) will be looking for the "hpdxxxx" (4-digit NWSFO ID) and the ".zip" when it runs twice daily. Any files found will be automatically processed

NOTES: You may FTP your HPD data file to NCDC anytime after the end of the month. If you send your data a second time, it will overwrite any existing data already sent. All ORE data are due at NCDC the 15th of month. (E.g., March 2002 data should be received by April 30.)

There might be more than one way to compress and FTP data to NCDC. Scripting allows automatic data handling and quicker data preparation with less manual work. Please contact NCDC if you plan to change procedures so the data can be monitored for quality.

CHAPTER 3 – OPERATIONS AND MAINTENANCE

3.1 System Familiarization:

FPU Equipment Cluster: The cluster is comprised of three components; the new precipitation sensor is located behind the door of the bucket housing (Fig 3.1) and the data logger is located inside the stainless steel box mounted on new pole. The new solar power panel is also mounted to this pole.



Fig 3.1

Data Logger Enclosure: This is the stainless steel box. It houses the data logger, battery, and the data key writing device (Fig 3.2). To open the box, unfasten the spring clip located on the right-hand side of the enclosure's front panel. Some sites might use a lock to secure it.

To aid the Observers, tape a clear plastic pouch to the inside door panel, and place a notation code reference card to it.



Fig 3.2

Data Logger Display: Press the <ENT> button on the data logger's keypad to wake-up the green fluorescent display. The user display is the small five inch glass panel seated on the top edge of the data logger's 16-button keypad (Fig 3.3).

Functional commands are possible when you press <Up-arrow> and <Down-arrow> buttons.



Fig 3.3

Here, the command menus let you: change the date and time, change the displayed units of measurement, and enter a note into the data like when you drew a line and entered the "ON date/time" to a new Punch Tape. To return to the default data display, continue pressing the <Up-arrow> button until the current readings appear.

Data is displayed for five seconds at a time in an alternating pattern to show the current bucket level and then the precipitation for the 24 hours ending last midnight. If the keypad is not used for 5 minutes, it will return to the 'sleep mode', and the green fluorescent characters will not appear on the display – the screen goes dark.

3.2. Purpose of Notation Codes:

Operation of the FPU system is essentially the same as the baseline F&P gauge because it requires the operator to synchronize its data recording to local standard time, and it requires the operator to interrupt the weighing measurements several times per year. These interruptions introduce ambiguity to the data record, and if the operator does not make a notation into the same data record, the data may be presumed bad and eliminated when quality control procedures are applied.

For this reason, you had been instructed for the F&P paper recorder to draw a straight line across the punch tape and write next to the line, “ON” or “OFF”, to indicate when the data collection was started or ended, respectively. The line serves as an unambiguous reference to indicate an action by the operator and not a break-down in the mechanical workings of the gauge.

While the FPU has no punch tape for you to enter “ON/OFF” times, it does have a user interface, the keypad, where you will enter a 3-digit code to remark how a certain action interrupted the continuity of the weighing measurements.

Any type of bucket draining or adding of antifreeze or oil will interrupt the continuity of data. For these actions you must first enter code 150, ‘End of Valid Data,’ prior to the task. This is analogous to the “OFF Date/Time” notation you entered on the F&P Punch Tape.

Note: When your tasks are concluded you must always enter code 255, ‘Start of Valid Data’. This is analogous to the “ON Date/Time” notation.

In his role, your Observer is *never* tasked with any action that routinely requires the entry of notation codes. The data logger continues to run un-interrupted during the time the Observer downloads the precipitation data to the red plastic data key. So, you do **not** need to account for an “OFF” time, and “ON” when you download to data key.

Nonetheless, should he conduct the routine draining of the precipitation collection bucket, then he will need to enter the codes referenced in the above paragraph. Likewise, **anytime** he partially drains the bucket, he must enter code 116, ‘partially emptied bucket.’ and **anytime** antifreeze is added, enter code “118,” and **anytime** oil is added, enter code “117.”

When you enter the relevant Notation Code to the keypad you insert a valuable, unchangeable, and permanent note for the record. The National Oceanic and Atmospheric Administration archives the Notation Code as it is embedded with the precipitation data.

Notation Code List: To review your list of appropriate 3-digit codes, see Appendix B, of this instruction guide, and read the descriptions for the ten codes 100 to 140.

How to Add a Notation: To enter a notation, first access the FPU data logger's keypad and press **<ENT>** button in lower-right corner. This wakes up the display.



Fig 3.4

Now press either **<Up-arrow>** or **<Down-arrow>** buttons to cycle through the four menus (Sensor Notation, Current Date & Time, Current Units, Data Readings Status) until you reach the one labeled (Fig 3.5) “New Sensor Notation:”.



Fig 3.5

For example: If you open the data logger enclosure to check on the health of the system, you should enter Code 104, ‘Routine Gauge Check’.



Fig 3.6

Press the buttons **< 1 >**, **< 0 >**, **< 4 >**, and observe the numbers appear in the display (Fig 3.6). Press **<ENT>** button, the display will show, ‘Value Accepted’.



Fig 3.7

This notation now becomes a permanent, irrevocable record embedded into the data file sent to NCDC.

Notice you did not have to enter a date and time like you did on the Punch Tape, because the FPU appends date/time to every sensor notation before each gets stored to memory. To return to the data readings display, a few presses of the **<Up-arrow>** button will cycle you back.

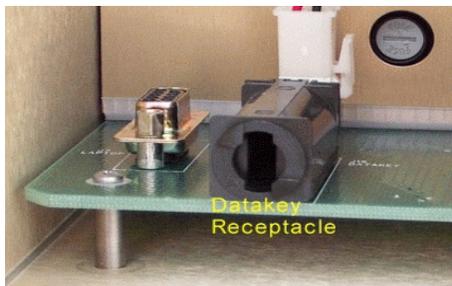
3.3. Observer Routine Tasks:

3.3.1 Monthly Download to Data Key: Your Observer should follow the instructions in section 4, of the, *FPU Observer Instructions*. He should have a printed copy at his site. For a current version see: <http://www.nws.noaa.gov/ops2/Surface/coopimplmentation.htm> .

Insert Data Key: Insert red plastic data key into the Data Key receptacle (Fig 3.8) while the green fluorescent display is active. Turn the data key one-quarter turn clockwise (Fig 3.9).

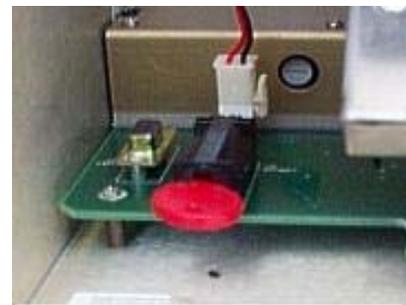
If Key Writer Does Not Respond: Conduct a Power Reset to resynch the data logger with the key writer receptacle.

Reference: COOP web site <http://www.nws.noaa.gov/ops2/Surface/coopimplmentation> and click on the document, titled, Lessons Learned.



Red datakey (right) is inserted into datakey receptacle (above) and turned to the right in order to transfer the rain data from the GMA into the datakey.

Fig 3.8



Red data key remains in this position for several minutes, until data logger download completes. When keypad instructs "Please Remove Data Key" turn to left and remove it.

Fig 3.9

Monitor the Display. When the system recognizes that the Data Key has been inserted and turned (Fig 3.10), it automatically loads the data to it.

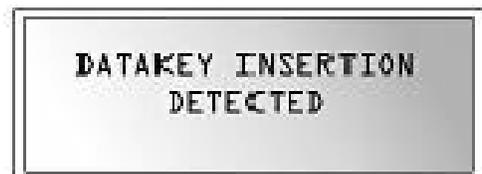


Fig 3.10

If the user display fails to give the message in Fig 3.10 'data key insertion detected', remove the red data key and wipe it clean with a paper towel, and then reinsert to the receptacle.

Note: If you entered the data key to the tumbler without having woken-up the keypad display, then first remove the key, then press the <ENT> button to wake up the display. Now reinsert the data key and turn the key one quarter turn to the right.

Verify the Start of Download: Monitor the display to verify a successful download to the data key. The display gives a running percentage (Fig 3.11) of the portion of data copied to the data key until 100% complete. This process might require five minutes to complete.



Fig 3.11

Remove Key: Monitor the display for a notice that key download is completed (Fig 3.12) and that it requests removal of the data key.



Fig 3.12

3.3.2. Status Checks

Encourage all Observers, institutions, and individuals, to check on the health of the FPU system following extreme weather events. Frequent cloud to ground lightning, hail, snow/ice storms, and gusty winds are a risk to the rain gauge. He should check the keypad display and press <ENT> to confirm the system wakes-up and gives valid numerical values for Rain and battery voltage.

A short circuit from a nearby lightning strike will be evident in Rain: readings that are 70 to 99 inches! Tree and leaf debris can clog the funnel cause an under-report of precipitation. The Observer may report 'Foreign Object in Bucket' (114), if inspection reveals a clogged funnel. Otherwise, these post-severe weather health checks can be accounted as 'Routine Gauge Check' (104).

Stress the importance of keeping the solar panel clean. The Observer should always brush off any snow, wet leaves to maintain proper electrical charging. Preventative maintenance is encouraged with the Observer making a monthly check of the solar panel he should wipe the panel clean of any dust, mildew, or residue that might have accreted.

Rain Parameter: This is the current level of liquid in the bucket, not just precipitation, from whenever the bucket was last serviced. The **Rain** display (Fig 3.13) is a data reading that updates every 10 seconds.



Fig 3.13

Note: The **Rain** parameter gives the total amount of liquid in the bucket, including any antifreeze or oil. Special instructions apply if you have emptied the gauge bucket in the middle of the month. See Section 7, 'FPU Bucket Draining'.

24RainDiff Parameter: This is the difference between the **Rain** reading of the most recent midnight, and the **Rain** reading from the preceding day's midnight. The **24RainDiff** display (Fig 3.14) is a data reading that updates once every 24 hours.

03 / 08 / 26	14:18:25
24RainDiff:	0.04 in
Temp:	89 F
Shaft:	135.00 ft

Fig 3.14

3.3.3 Checking Date or Time: At the keypad illustrated in Fig 3.6, wake up the green display by pressing the <ENT> button. View the current readings of precipitation they always appear underneath a date and time heading (see Fig 3.15, below).

Understand that the time is always kept in **Standard** time, this is also known as 'sun time'. So, do not adjust to daylight savings time. If you notice the **minutes** are off by more than 15 minutes, then enter the proper notation code, 158 (more than 15 minutes slow), or 159, more than 15 minutes fast). E-mail your RCPM and OS7 headquarters to report the FPU clock is drifting.

Caution: The date format is always **YEAR / Month / Day**. Data will become useless if you accidentally input some other combination of these values!

Example:

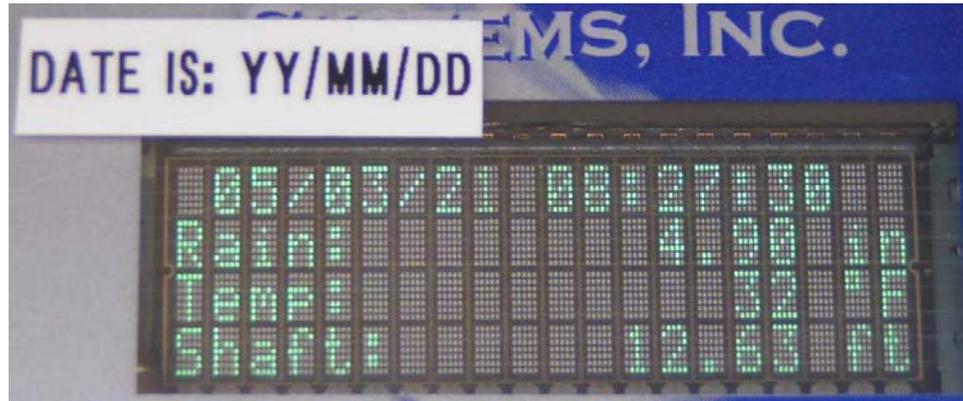


Fig 3.15

In this example, **05/02/21**, is the proper display for 2005, March 21, 2005. Specifically, the **05/** signifies year 2005; the **/03/** signifies month of March; and the **/21**, signifies the 21st day of March. The time, **08:27:30**, is the proper display for 8:27am local Standard time in the 24 hour convention.

3.4. Data Acquisition Requirement:

Your responsibility is to obtain from each Observer the monthly report of precipitation – and not permit your 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, on the

first day of the month! Have them refer to their printed copy of the *FPU Observer Instructions*, the most recent copy is on <http://www.nws.noaa.gov/osp2/Surface/coopimplementation> .

There is a small chance one of your data keys will not ‘read’ (i.e., upload) properly. If after diagnosis (see Chapter 4.2, of this manual) the key returns “Data Key is Blank” error, you will need to mail your Spare data key to the Observer who mailed you the faulty key. Remember, observers generally do not possess a spare data key. Dispose of the ‘bad’ key at your office. Then replenish your office’s spare. Order a new one: its NLSC part number is D111C-2A2.

3.5. Monthly Data Transmission:

See Chapter 2 of this manual for detailed instructions on monthly data transmission to NCDC.

- By 7th day of month phone your Observer if you do not have his data key.
- Read the key. If data key gives problem, phone Observer, tell him you are mailing a new key, and to download right away. Upon upload, scroll thru top and bottom lines of 15-minute data to ensure the full calendar-month of data was sent.
- By 15th of month, mail back your Observer one data key, per routine.
- By 25th of month, transmit to NCDC all of your sites’ FPU data in one Zip file.

3.6 Semi-Annual Site Visitation:

For background policy on site visits, access the NWSI 10-1309, *Visitation Procedures – Cooperative Observing Stations* (Feb 2005). The policy is located on the NWS web site: <http://www.nws.noaa.gov/directives/sym/pd01013009curr.pdf> .

3.6.1 Review CSSA Station Inspection Report: A day or two prior to your trip, call up this site’s CSSA Inspection Report and review the results of your last inspection. Review the ‘Remarks’ section to view the calibration coefficients, A, B, and C. Realize the all updates of these coefficients should be saved to CSSA Inspection Report, and that the B-44 Station Report, typically does *not* hold current values. Print out the calibration coefficients A, B, and C, and note the date the last time a calibration reset was performed. The calibration check shall be performed once per year, though you may check it any time you schedule a site visit.

Some NWSREPS have ten or more FPU 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 FPU Event Logbook. In it you might have journalled any operational anomalies or maintenance performed on the FPU that involved an interruption to the data logger of more than 15 minutes. See Appendix H, of this handbook, *FPU Event Log Sheet*, for an example of what to keep in an FPU Event Logbook.

Determine if you have already performed the FPU Modification Note #1, for the electrical grounding of the FPU sensor. If not yet, consider installing the grounding wire on this visit. Will the solar panel at this site require any special cleaning?

Phone the Observer and ask if his site requires any supplies, including mailing envelopes (e.g., Jiff #0), a spare data key, printed instructions, and if his solar panel requires any special cleaning.

Retrieve and review your Form B-23 (COOP Station Inspection Form) and the Station Information Report (SIR is the CSSA Workflow version of Form B-44) for this site, for relevant information.

3.6.2 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. A two-quart container of Propylene Glycol antifreeze might be consumed each year.
- c. One 5 gallon sealable plastic container available to discard bucket fluids.

3.6.3 Prepare for Cold Season: Partially drain the FPU bucket (code 162) so as to retain the oil layer in the bucket. Remember to recharge with two quarts of antifreeze (code 164). Then if necessary, add oil (code 163). 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.

Remove funnel: Remove the cone-shaped hood (Fig 1.1), 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. Enter notation 171, 'Removed Funnel.'

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. This will prevent freezing and possible equipment damage.

3.6.4 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 **Rain** 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 antifreeze 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). Enter operator notation 170, 'Installed Funnel.' and enter code 255 'Start of Valid Data'.

3.6.5 Rain Bucket Draining: The bucket's capacity is about 20 inches of precipitation or 4.9 gallons. Advise the Observer to daily monitor the **Rain** 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 to always enter the proper Notation Codes (i.e., 100 = End of Valid Data; 116 = Partially Emptied Bucket; 140 = Start of Valid Data), and ensure he has the current edition of the *FPU Observer Instructions* (see <http://www.nws.noaa.gov/ops2/Surface/coopimplementation>).

3.6.6. 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. FPU 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 loose objects.

Note: Always remind the Observer, he never needs to open the door to the rain gauge housing. This is where the electronic FPU sensor is located and only the *NWSREP* is permitted to open and inspect the weighing sensor.

3.6.7 Multiple Notation Codes: When you perform multiple actions, always enter 1 5 0 (end of valid data) before taking the first action. For all other entries, the best practice is to complete the action first, then enter proper 3-digit notation immediately after. Understand, the system allows you to successively enter several notations each separated by an <ENT> keystroke. Check Appendix C, of this handbook, for the list of valid notation codes.

Here is an example of eight notation code entries you might make on a Semi-annual visit:

Type the code, *nnn*, and press <ENT> key to log the action:

- 1 5 0 End of valid data.
- 1 5 2 Semi-annual Visit.
- 1 6 2 Partially emptied bucket.
- 2 2 0 Calibration Check – No Changes
- 1 6 4 Added antifreeze to bucket.
- 1 7 1 Removed Funnel for Winter.
- 1 8 1 Cleaned Solar Panel.
- 2 5 5 Start of valid data.

It is your responsibility to faithfully and accurately enter Notation Codes each time you visit a site. Without your notation codes the NCDC quality control algorithms cannot fully quality control the 15-minute minute data. Not only will valid data be excluded, but the adjacent data could also be excluded and result in ‘missing data’ reports in the published bulletins.

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 FPU Weighing Mechanism.	A casual glance will reveal the condition of all four horizontal flexures. If any are bent, broken, or binding it might effect gauge calibration. Horizontal flexures which are 'v-shaped' must be replaced. The <u>upper-rear flexure</u> is most susceptible to bending.	Use the smallest test weight of the D111-500TE set to ensure the Rain parameter shows a change in current reading. If it does not change, the flexure should be repaired. Under no circumstances should any flexures, except the <u>upper-rear flexure</u> be replaced at the observer site.
4. Collection Bucket	The collection bucket is to be emptied whenever the keypad Rain display gives a reading in excess of 15.00 inches .	Remove any foreign material in the collection bucket and clean. Enter notation 150, 'End of Valid Data,' before charging collection bucket.
A. Emptying and charging collection bucket	Collection bucket is charged for warm weather operation by adding approximately one half quart of SAE 10 non-detergent or multi viscosity oil to retard evaporation.	SAE10, non-detergent oil available. Enter notation 160 'Bucket completely emptied'; or enter 162, 'Partially drained bucket'. Then enter notation 163, 'Added oil to bucket'.

<p>B. Charging Collection Bucket – Cold Weather Operation</p>	<p>When collection bucket is emptied and charged for cold weather operation, add two quarts of pre-mixed antifreeze and oil.</p>	<p>Finally, enter notation 255, ‘Start of Valid Data,’ if you are done with all actions on the bucket.</p> <p>Antifreeze, propylene glycol base. Less antifreeze may be required if temperature is mild and precipitation is expected to be light. Enter notation 164, ‘Added antifreeze to bucket’, and then enter notation 163, ‘Added oil to bucket.’</p> <p>Then enter notation 255, ‘Start of Valid Data’, when you have completed all re-charging actions with the bucket.</p>
<p>5. Funnel</p>	<p>During the period of year when snow or freezing weather is expected, remove funnel from the conical upper housing and store.</p>	<p>Enter notation 171, ‘Removed Funnel’.</p> <p>Reinstall funnel after cold weather season ends.</p>

Table 3.1: Semi-Annual Maintenance (Refer to EHB-10; Section 4.2, April 1976)

3.7. Observer Delegated Activities:

Some offices have had a gentleman’s agreement with Institution Sites to have their Observers assist in basic works of maintenance for the F&P legacy gauge. You should give careful consideration as to which Institution Sites may be qualified to perform the following activities with the FPU gauges:

- a. Conducting a Power-On reset
- b. Resetting the Time and Date via the keypad

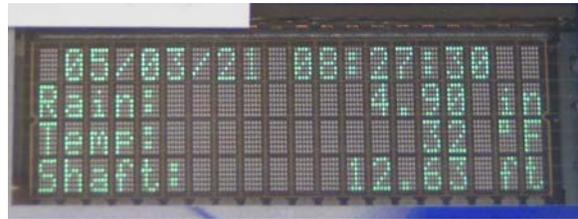
- c. Draining and recharging the collection bucket
- d. Installing/removing bucket funnel
- e. Cleaning the solar panel

If you have an Institution Site you are fully confident can assist you then advise them to avoid carrying any electrical instrument or tool that could interfere with the system performance. All check-ups and bucket discharges shall be conducted in dry weather only. Finally, stress to these Observers how only the NWSREP is permitted to access the FPU weighing assembly - there is no longer any need to open the white door on the lower housing assembly beneath the bucket.

CHAPTER 4 – RESTORATIVE MAINTENANCE

4.1 Display Screen Will Not Respond:

It is normal for the display to completely dim-out after a short period of inactivity. We refer to the display as being ‘asleep’. To wake-up the display, simply press the <ENT> button and it will illuminate. Then, within a few seconds readings will display (photo, right).



If you see three dashes rather than numerical values for **Rain**: this generally signifies the data logger was recently started and has been running for less than fifteen minutes. Likewise, if you have just calibrated the sensor, or installed the configuration code, or unplugged the battery cable for any testing, each of these results in an interruption that requires the data logger to rebuild its first 15-minute record. Realize you may see numerical values when the clock passes HH:15, HH:30, HH:45, or HH:00, yet it may take system 30 minutes to display *valid* numerical values.

The most common reason for an unresponsive display or ‘stuck’ display is a break in the synchronization of communications between the data logger and the display. The display system operates independently of the data logger system and is more prone to shutting down from under-voltage transients than the logger. If stuck, you must take action to unplug and then re-plug battery and solar cables, or the display will remain stuck in an ‘off’ state.

4.1.1 Power-On Reset:

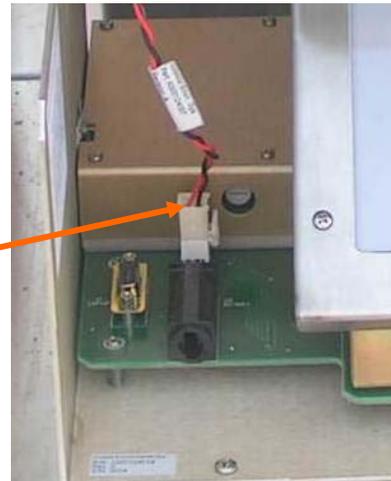
Perform this procedure to completely power-off and -on the FPU system to correct the de-synch problem, noted above.

With the solar panel connected and the 12V battery cable connected and powering the system, follow these steps:

- a. Disconnect the solar panel connector from the bottom of the steel box enclosure

Battery Cable Socket

- b. Disconnect the battery cable white plastic plug from the white receptacle on the circuit board



- c. Count to ten. The display should be totally dark. If it is not off, check again that the solar cable’s plug is fully disconnected from its socket on the enclosure box.
- d. After counting to ten with a dark display, insert the battery cable plug back into its white receptacle. Note: The four-sided battery connector fits into its socket only one way, do not force it. The display should illuminate, first with the Coastal company name, and then with the Date/Time Measurements screen. You will see dashes instead of

values for up to 15 minutes, depending on how close your real-time is to HH:15. You'll only need to wait one minute if the current time is HH:14.

- e. Insert the solar cable plug back into the socket at the bottom of the steel enclosure, if everything is working, you are done. The initial 'finished readings' will start to appear within 30 minutes.

For information on how the data logger runs independently of the display, see the first article in Lessons Learned: http://www.nws.noaa.gov/ops2/Surface/documents/A_PDFLessonFILE.pdf.

4.1.2 Persistent Display Problem, Trouble-Shooting:

If the above power-on reset does not return valid readings to the Keypad Display in 30 minutes, there are other hardware failures that can cause a completely blank and unresponsive display screen.

Completely Blank:

Check on the general health of the electrical power system. Ensure the solar panel is clear of any snow or dust; ensure the solar cable is connected to the enclosure socket; ensure the battery plug is connected to its white receptacle; ensure the battery reads between 11.5V and 13.4V across its terminals; finally move to the battery receptacle and probe it to see if it reads 12.4 to 13.8V. If this last test reads significantly below 12.4V, or the 5Amp fuse might have blown. Refer to section 4.4 of this chapter for guidance.

Unresponsive Display: There are a few reports of the GMA circuit board becoming unseated inside its assembly and this will result in a blank or unresponsive display. If you have fully diagnosed the display outage and believe the GMA assembly could be at fault, phone your RCPM to report this finding. You are authorized to replace the GMA (D111C-2A1).

Complete replacement is preferred to open-module inspection and repair. It is not advised to open the GMA assembly because it is sealed and contains desiccant to maintain dry environment for the electronics. This is very important to the measurement portion of the data logger, as a leakage path caused by excess moisture could easily provide as much signal as is produced by the load cell, causing completely false readings.

Equally risky is the fact that all the electronics inside the GMA are electrostatic discharge (ESD) sensitive and touching the wrong part with an unprotected finger will wipe out the data logger.

4.2 Data Key and Reader Problems:

In the event you receive an error message, 'Data Key Blank,' there are three system components each of which could malfunction to result in the Data Key Blank message. The three components are: Data Key; the Key Reader Software, and the Key Reader Device. Realize that nearly all the time, the key actually contains data in its memory cell, and technically it is not 'blank.'

Follow the trouble-shooting procedures in sections 4.2.1, through 4.2.6.

4.2.1 Re-Attempt to Read the Key:

Realize the Coastal Key Reader device is tasked with handing-off 1 million bits of information from the data key to your PC. It transmits the bits serially in a synchronous stream according to exacting terminal emulation process known as bit-banging. If a single bit becomes de-synched, or lost, the reader software will fail the process and report a 'blank key' error message. The risk of de-synch is high when your laptop's CPU is called upon to handle an extraneous application during a 'key reading'. Hidden background tasks and even standard desktop applications can cause interruptions. Search your system through Windows Task Manager to identify what else might be running on the laptop PC.

Close down Word, Excel, and Notepad or any Java scripts. Then close down screen savers, geoclock, electronic calendars, alarm clocks, and reduce the frequency of any backups to 15 minutes or longer. Check the status of the parallel port "LPT1" on control panel, check the physical connection at each end of the data cable; at the laptop and reader device.



After you have closed extraneous applications, re-insert the key and proceed to monitor the coastal key reader program.

If the same error message 'Data Key is blank' appears, then phone the Observer and request he use his back-up data key to download the precipitation data at his earliest convenience (same day). Direct him to mail you that key at his earliest convenience. Continue to next step, section 4.2.2.

4.2.2 Designate a 'Control Key':

Each office should have several spare Data Keys that are kept for use in situations where a key is lost in the mail, or a key is returned damaged. Designate one of your office's spare keys a 'Control Key' and make sure it is fully loaded (i.e., 55 days) with valid data stored to it. It is to be kept by the NWSREP, not for distribution. The purpose of reserving this key will be to trouble shoot for either a suspected bad data key or a suspected bad key reader.

If the operational data key still gives a 'blank key' message after you have shut down all extraneous laptop applications, there is perhaps one other component that is faulty. To test if it is, remove the 'blank' key, and insert the Control Key to the reader.

Now, if the reader unpacks, decodes and allows you to save the data from the Control Key you have validated the reader is good. This will be evident when the data retrieval panel becomes activated with a progress bar advancing in 'Step 2'. Refer to Section 12.4, p 53, of the *FPU Assembly Procedural*.

However, if the Control Key responds with the same 'Data Key blank' or another error message, as was the case with the operational key, then proceed to the next step, in section 4.2.3.

4.2.3. Check the Key Reader:

The Key Reader device relies on an external power source with a DC converter. Check the reader's power connections. First, between key reader and its power cable and then ensure the AC/DC converter is plugged into a power-strip/surge protector. If possible use a power strip that has a pilot lamp. Look down to the power strip and determine if its lamp is on. Ensure the surge protector has not tripped off, and if it has, then press its reset switch.

Note: The Key Reader may fool the user. It appears to work perfectly well even when there is no power because it will recognize the key when turned and the software will indicate 'Data Key Detected.' The key is detected by a mechanical switch closure, but with out power no electrical data can be read. When you see a 'data key is blank' message always check the AC/DC power converter to ensure it is plugged in and the power strip is active, with its pilot lamp lit.

Now insert the Control data key and see if the same message appears. If 'Data Key is blank' reappears, then suspect a bad reader.

Remove and install a replacement Key Reader. Order from NLSC, its ASN part number is D111C-6. If after all testing with the Control Key and use of the new Key Reader, the data key gives error messages or fails to 'retrieve, unpack, and decode' the contents of the Data Key, then phone and e-mail your RCPM to report the problem.

4.2.4 Label a Data Key, 'Bad':

When a Key Reader that tests good, is able to read the Control Key perfectly well (i.e., retrieves, unpacks, decodes), then you will make a second attempt to read the operational data key. If it fails to read, and responds with error messages you may consider the key 'bad.' The key may be considered internally damaged, or less likely, void of data.

Stick an adhesive label on the key, marked 'Bad Key 40-1234', writing the valid SID of the site from which data had most recently been downloaded.

Retain all Bad Data Keys for up to 6 months on station, in case headquarters seeks to research a possible problem. Discard the Bad Data Keys after 6 months as you would dispose of any electronic storage medium at your WFO.

Order a new data key from NLSC, its ASN is D111C-2A2.

4.2.5 Wipe-Down Data Key, Observer:

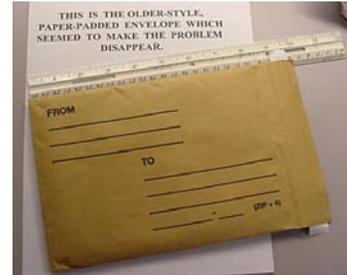
Occasionally dust or some other contaminant will adhere to any of the sixteen (16) metal contacts. When the Observer inserts the key the contacts will not make full contact inside the receptacle. Remind the Observer to wipe the red plastic surface and its 16 metal contacts with a damp paper towel, then dry, before the insertion for the monthly data download. Also,

Note: One data key was reported to download short with only 11 days' data, yet after the metal contacts were wiped off, the FPU successfully wrote and filled the key to its capacity (i.e., about 55 days).



4.2.6 Packaging and Mailing the Data Key:

The Jiffy No. 0 (zero) padded mailing envelope (photo, right) is the appropriate package for exchanging the Data Key between the Observers and the NWSREP. This is 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 Data Key being lost in the mail.



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 Data Key, you may write: **”Sensitive Magnetic Media, Handle Manually.”** on the front of the Jiffy No. 0 mailing envelope.

4.3 Rain Data Extreme Values (∇60 to 100 inches):

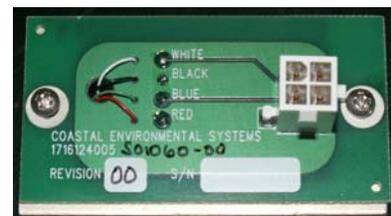
Electrical short circuits do occur and certain types will produce erroneous values for **‘Rain:’** both in the display and in the data logger records. Faulty values include values above 60 inches of rain (including negatively signed values), values that repeat a certain erroneous number, and values that are missing.

Before you order a replacement part, you will first need to test each of these components:

- a. Load Cell
- b. Load Sensor Cable

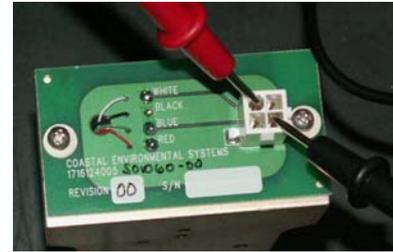
LOAD CELL: If a lightning surge burns out one of the 4 strain gauges in the Load Cell, the system will measure a large positive or negative signal, resulting in a \pm number in the 80 to 100 range for a typically calibrated rain gauge. (Prior to calibration for the initial deployment, when coefficients are A=0, B=1000, and C=0, the rain readings will be in the \pm 60 to 70 range.)

Check the Load Cell Sensor integrity with a voltmeter set to show 10K ohms (10,000 ohms). Touch one of the voltmeter probes to the head of the Phillips Screw (see photo, right) and touch the other probe to one of the pins in the white plastic jack (photo, right). The resistance should read infinity (i.e., **4**), anything less indicates one of the four strain gauges has shorted to the metal underneath the strain gauge’s clear laminate film.



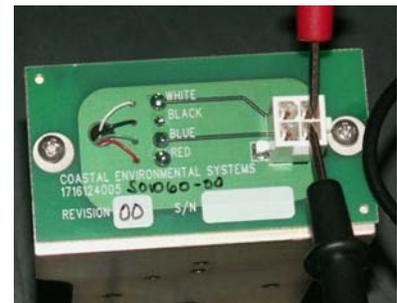
LOAD CELL TESTING:

Follow the probe positions in the photos below.



First check the diagonal pairs. Each pair should give a 10K ohm reading. The numbers may not be exactly 10K but it is very important that both diagonal pairs read very close to the same.

Then, probe corner-to-corner on each of side of the connector – there are 4 pairs, and each should give 7.5K ohms. The numbers may not be exactly 7.5K but it is very important that the 4 side pairs read very close to the same.



LOAD SENSOR CABLE: The most direct way to check for sensor cable integrity, is to use the ‘FPU Test Plug.’ The Test Plug, attaches to the sensor cable’s female socket. So, you first have to disconnect the cable from its jack on the green circuit board. Next, establish a laptop session with the Zeno software to get a view of the sensor values “S” with the FPU Test Plug connected.

Using the FPU Test Plug (D111C-1A1T1), follow these two steps:

1. Attach the FPU Test Plug to the white socket of the Load Sensor Cable, and from the Zeno’s *Test Menu* start the scrolling display of sensor values, “S”.

Uncalibrated System:

With Calibration Coefficient $C = 0$.

- **Rain:** should be within $\forall 0.05$ inches of 0.00 inches.

Calibrated System:

With Calibration Coefficient $C =$ a negative offset number (i.e., -3.5108)

- **Rain:** should be within $\forall 0.05$ of that same offset number (i.e., -3.5108).

2. If **Rain:** agrees with the value(s) above and the values are steady within a few tenths, then both the load sensor cable and the logger measuring circuit are operating properly.

Caution: This test plug does not test the Load Cell, nor test for calibration. It is *not* a calibration check device like the MMTS test plug! Its only purpose is to verify the logger connections are working as a first step in trouble shooting.

Load Cell Assembly: When your voltmeter grounding test between Phillips screw (photo) and receptacle pin indicates a shorted Load Cell strain gauge, order a replacement, D111C-1A1. Install the new Load Cell Assembly and determine if the **Rain:** values look reasonable for the quantity in the catch bucket. If values are still not correct, then inform your RCPM and OS7 by e-mail and phone. You may have to replace the Data Logger Assembly (GMA).

Important Mod-Note: To reduce risk of the load cell sensor's strain gauges being shorted, make certain you have implemented the **Mod-Note 01, Bond Gauge Assembly to FPU Assembly**. Follow the instructions located in Appendix H, of this manual, to ensure the load sensor is properly grounded.

For a discussion, see Lessons Learned: <http://www.srh.noaa.gov/ohx/dad/coop/fpulessons.html>

4.3.1 Persistent Rain Data Extreme Values, Trouble Reporting:

If you have conducted the diagnostic procedures for both the Load Cell and the Sensor Cable, and the **Rain:** values are still out of range, stuck, or missing, then phone and e-mail to report the problem to the RCPM and OS7 at headquarters.

You may be instructed to order a new part(s) as a means to test the operational unit.

Note: Do *not* conduct the trouble-shooting diagnostics as described by the manufacturer's *FPU Technical Manual* (Feb 2003).

4.4 Battery Voltage Too Low – Repeated:

The FPU 12V battery is a special high-capacity battery, rated at 84Amp-Hours and is the largest battery in the NWS. Battery voltage is a problem when it runs below 11.5V. Repeated battery discharge is defined as the battery needing a charge or replacement more than once every six months. Frequent recharge or replacement may be due to a failure to properly charge the battery or a battery-internal fault.

There are five (5) fault locations to check to determine if there is some type of battery-charging failure. Remove all power from system before starting this process. Disconnect the solar cable first, then the battery cable plug from the white plastic receptacle. Diagnose in the proper sequence: first the fuse, then solar panel, then solar cable, then solar panel circuit, and then the regulator board.

1. Solar Panel Shaded (B-44 Obstruction)
2. Solar Cable Shorted (D111C-3W1)
3. Solar Panel – Internally Shorted (D111C-3)
4. Bad Fuse (D111C-2A1F1)
5. Battery Voltage Regulator (Depot only – replace entire GMA data logger assembly)

SOLAR PANEL EXPOSURE PROBLEM: Are there any structures, trees, satellite-TV dishes, phone or utility cables that could cast a shadow onto the FPU solar panel? At your office call up the CSSA Form B-44 and review the obstructions information under ‘Equipment Exposure.’

Phone the Observer to ask if there are any new structures installed, or trees or shrubs that have grown into the area. Ask the Observer if the panel is ever partially shaded from a nearby wire, cable, or satellite dish, then inform him/her how the rain gauge performance is adversely affected. Discuss with Observer how you could remount the solar panel to a nearby fence or antenna mast, if possible, so it receives full sun in all seasons.

If necessary, and only when the solar cable presence would not become a safety hazard, relocate the panel by adding more cable. At the site always ensure the solar panel is securely mounted and properly angled toward the sun according to Section 17, *FPU Assembly Procedural* (Aug 2006).

SOLAR CABLE PROBLEM: Check the solar cable for faulty connections or a wiring short circuit at the solar panel junction box and at the enclosure’s port. Then check the cable’s connector plug for signs of bad pins. Then, when there is full sun on the solar panel, place one probe of the voltmeter to the plug receptacle marked ‘A’ (positive) and place the second voltmeter probe on plug’s receptacle marked ‘C’ (negative). Solar cable voltage should read 20V to 25V in full sun on a clean panel. If it does *not* give 20V to 25V in full sunshine, then replace the panel.

SOLAR PANEL INTERNAL SHORT CIRCUIT: Check the voltage in the Solar Panel’s black box. Open the small black box, and unthread the wire caps on each strand of the two wires. Then, with the Voltmeter place one lead on the white and black wire, and the other lead on the solid black wire. The voltage should read 15V to 26V in full sun. If it does not, and the voltage is significantly below 15V, then the solar panel has a problem. Replace the solar panel with a new unit, ASN=D111C-3.

BLOWN FUSE: This is a 5-Amp fuse is located underneath the cover of the ‘Battery Charger PCA’ (photo, above). Do not open this cover unless you have grounded yourself.



Inspect the fuse to see if it has a broken element. If it is broken, replace the fuse according to these instructions. Disconnect the battery cable from the white plastic receptacle, use a flat screwdriver to remove the fuse from its fuse-holder on the printed circuit board, install the new fuse into the fuse-holder. Reconnect the battery cable to its white plastic receptacle. Check the keypad display to ensure it is illuminated.

VOLTAGE REGULATOR PROBLEM: If all preceding points tested good, then proceed to the measure the voltage at the battery cable receptacle with solar panel in full sun, disconnect the battery. If data logger is operating normally (display is steady and not flashing with power fade-outs) then probe the back of the battery cable connector. It should measure 13.8V to 14.8V. If it does not then you need to prepare to replace the data logger (i.e., GMA).

DEAD BATTERY: Measure battery voltage at the terminal lugs. If voltage reads less than 9.0V, then it has one or more dead cells and you must replace the battery. Otherwise a good battery in field operation will read 10.0V to 14.8Volts.

Replace a dead battery with a new battery with ASN part number D111C-2B1. When you receive a new 12V battery at your WFO, use an AC battery charger and place the new battery on charge overnight or until it reads at least 13.0V. Follow the instructions in Section 4, of the *FPU Assembly Procedural*, pp 16-17.

Caution: The 12V battery weighs 57 lbs, so use a hand truck or dolly when moving it, and request the assistance of a co-worker when lifting or lowering the battery. For safety precautions see; 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 FPU is supplied with a 25 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.

Thanks to an optional configuration file, ‘BatV_Config’, the voltage levels in the system can be tracked through the days and months of seasonal operation. **Note:** These recorded voltage readings are saved in the precipitation data file, are actually not a measure of the 12V battery voltage, but the voltage at the data logger. These voltages should range 12.0V to 13.8V with the higher values recorded during daytime with solar charging.

For more information access the Lessons Learned web site, and read the third article; http://www.nws.noaa.gov/ops2/Surface/documents/A_PDFLessonFILE.pdf . “Battery Not Charging... Solar Panel All Okay?”

4.5 FPU Site Visitation – Restorative Maintenance:

When you visit a station to perform FPU restorative maintenance consider conducting preventative maintenance including a check on sensor calibration, and draining the collection bucket if needed. Follow the procedures given in Chapter 3.9, of this manual, for practical examples of tasks you perform while at the site.

When you replace any rain gauge parts with new stock remember to enter the proper 3-digit notation codes. Consider the notation codes available: ‘Replaced GMA data logger’ (210);

'Replaced Load Cell' (213); and 'Installed Configuration Code – Battery Voltage' (218), and you may consider high priority restorative maintenance or system modification work, an 'Emergency Visit' (154). Finally, when done with any action that began with a '150' code (i.e., End of Valid Data), to always follow-up and give the final entry; 'Start of Valid Data' (255).

Always journal the results of a maintenance visit to your *FPU Event Log Worksheet*, see Appendix F, of this manual.

Note: If you forget to remove the data key from the receptacle and 5 minutes have elapsed since the completion of the download, the Display will go to sleep. Understand that by pressing the <ENT> in this state, the display will not wake-up. So, first remove the data key, then press <ENT> to wake-up the display. Finally, confirm that alternating readings of **Rain** and **24RainDiff** appear every five seconds.

CHAPTER 5 – SENSOR CALIBRATION POLICY

5.1 Rain Gauge Accuracy: At least once per year, and preferably at the time of the semi-annual site visitation, conduct a Calibration Check-Up on the FPU rain gauge. This requires the use of the large brass test weights. You may use one, two, or three test weights, so long as each is the 4111 gram size. Each is equivalent to five inches of rain water.

If the rain gauge tests within the standard calibration range (Table 5.1) you will not have to conduct a full calibration reset of the load sensor.

Follow the steps in ‘Sensor Check-Up Procedures,’ given in section 5.2.1 through 5.2.9, below. If the keypad display returns you **Rain:** values that fall into the acceptable range as called for by Table 5.1 (below), then you will not need to re-calibrate the load cell sensor. If the display gives values outside the standards given in Table 5.1, then calibrate the sensor through the Zeno data logger’s Test Menu. The full calibration instructions are given in Appendix D, of this manual.

Remember, whenever you make a trip to your Observer’s site, bring your notes from the last time you saved calibration coefficients A, B, and C. A good practice would be to print an **FPU Log Sheet** (see example in Appendix H), to mark down the outcome of your Sensor Check-Ups and write the new values of A, B, and C coefficients when necessary. Realize you will have to reset the sensor if the Sensor Check-up fails to come into tolerance of $\forall 0.2$ inch of 15.0 inches. Otherwise, you should not perform a calibration reset.

5.2 Sensor Check-Up Procedures:

- 1 Enter Operator Notation, “150, End of Valid Data.”
2. Partially drain the bucket so the oil layer has lowered to a level below the top of the cone base of the center post. Enter notation, ‘162, Partially Drained Bucket.’
3. Wait one minute or so for the **Rain:** values to stabilize. Now take a reading of **Rain:** at the keypad display. Write down this un-weighted value.
- 4 Then place one, two, or three large brass weights (4111g each) in the bucket.
- 5 Now take a new reading of **Rain:** at the keypad display. Wait one minute or so for the **Rain:** values to stabilize. Write down this weighted **Rain:** value.
- 6 Subtract the first reading written in Step 3, from the second reading taken in Step 5. Write down this difference in hundredths of an inch.
- 7 If the difference falls into the acceptable range (below), the calibration is acceptable and full calibration is not needed. Then enter notation ‘220, Cal Check – No Changes.’ If any difference falls outside of its respective range listed below, then you will need to do a full calibration as described in Section 5.3, of this chapter. Then enter notation, ‘221, Cal Check – New Values.’

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"

Table 5.1 Calibration Standards for Load Cell Sensors

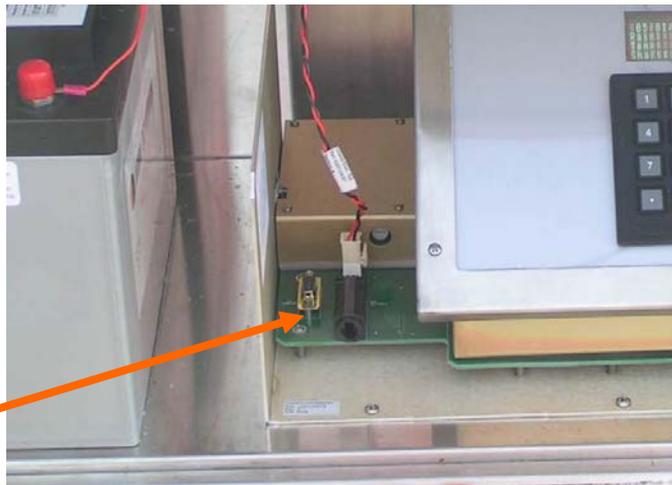
Note: Always take the un-weighted measurement first, and then place the weight in bucket to get the weighted **Rain:** value.

8. Remove the weight(s) from the bucket and dry them with a paper towel.
9. Remember to enter '164, Added Antifreeze' if you add antifreeze. Finally, conclude the calibration check by entering, '255, Start of Valid Data.'

5.3 Reset Calibration of Load Sensor:

When the **Rain:** reading in the display does not settle to within $\forall 0.25$ inches of a 5.00 in; 10.00 in, or 15.00 in on the keypad display in the Check-Up Procedure (section 5.2), then prepare to conduct a full calibration on this same visit.

You will need to connect your laptop PC (and Windows XP is appropriate) to connect to the maintenance port near the data key writer. You will need to call-up HyperTerminal, revise its settings from the default values, and establish a session with COM1 port. The HyperTerminal program comes as a standard application within MS Windows computers, a similar program may be used if necessary.



Laptop Access Port

Follow the detailed instructions given in Appendix D, of this, *FPU Operations Manual*. Remember to add antifreeze when appropriate for a cold climate site. When done resetting the calibration, remember to return to the keypad and enter code '221' to signify new values were entered. Realize that at the time you finish and exit the Zeno test menu, for up to 30 minutes the display readings will not be valid, and data key writer will not respond.

5.4 Keep a Record of Your Calibration Check:

On the same *FPU Log Sheet* you brought with you on this visit, mark down the outcome of the calibration check-up, and write “No Changes Needed” if the gauge responded within standards. Write the new values for coefficients A, B, and C, on the FPU Log Sheet, when you had to reset the sensor. You will need these 3 values to enter to CSSA, Station Inspection Report... and you should update the B44 Station Report if calibration reset was necessary.

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CHAPTER 6 – SYSTEM MODIFICATION POLICY

6.1 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.

As chief program office, the Observing Services Division (OS7), of OCWWS, will:

- a. Evaluate existing and new requirements for FPU systems.
- b. Delegate to the Office of Operational Systems, Engineering Design Branch, the creation of Maintenance Notes to keep systems properly working.
- c. Delegate to the Office of Operational Systems, Engineering Design Branch, the determination of costs for proposed changes.
- d. Authorize Maintenance Notes to be issued, coordinates FPU change actions with Regional Managers, and maintains change status information on-line on a NWS Headquarters site: <http://www.nws.noaa.gov/osp2/Surface/coopimplementation>
- e. Verify completion of maintenance actions with effected field offices through the Cooperative Station Service Accountability (CSSA) system B-44 reports.

6.2 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*.

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 to the FPU design 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 250 site project had to abide by the OIP's management and administrative instructions.

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

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

6.3 FPU System Modifications:

6.3.1 Hardware:

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

- Load Cell Sensor Assembly (including chassis)
- Zeno Data Logger
- DataKey Writer
- Keypad/Display Console
- Coastal Key Reader
- DataKey
- Solar Panel
- 12V Battery

Hardware modifications shall be issued as Mod-Notes by the NWS headquarters to be filed within this *FPU Operations Manual*. For example the first FPU Mod-Note, deals 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.

6.3.2 Software:

Software may be affected by upgrades issued by NWS Headquarters, refer to Chapter 2, of this manual to identify the version number. The significant software groupings in the FPU are:

- Zeno operating system in the data logger
- Coastal Key Reader dependent on Win95/98/ME (laptop)
- Zeno user application terminal (lap top)
- FTP (WinFTP) for monthly transmissions to NCDC

- WinZIP (WinZip81) for monthly file compression for transmission to NCDC

6.3.3 CSV Data Format: Each FPU system comes delivered with the manufacturer developed Configuration Code already installed. The Configuration Code defines the sequence of operations and timing for the data logger. It is not a program per se, as it does not contain any microprocessor instructions, but it does contain a list of definitions and parameters that the logger knows to look for, and uses to set up the sequence of operations that result in our data.

Configuration Code is standardized and configuration controlled. No one has authority to change the data logger configuration software without the express and written direction from the W/OS7, the Surface Program Office of the NWS.

Each FPU was delivered in 2005 with a factory installed 'Initial Configuration Code,' one that file should exactly match the code that appears in NWS Headquarters web site under "[FPU Initial Configuration File Code, June, 2005](http://www.nws.noaa.gov/ops2/Surface/coopimplementation.html)". You may access it on:
<http://www.nws.noaa.gov/ops2/Surface/coopimplementation.html>.

```

08005612_20031010_051458_20031202_081458.csv - Notepad
File Edit Format Help
Zeno Version String: V1.966-2637-GMA
Primary/Secondary Station IDs: 800/5612
Date,Time,Msg Num,RainOrNote,ThDegC,Tmax,Tmin,StrmLvl
6-4-1,-----,2-1-2,8-4-3,8-4-4,8-4-5,8-4-6,8-4-7
2003/10/11,20:29:58,1,0.89,25.60,25.36,25.05,135.00
2003/10/11,20:44:58,1,0.89,25.59,25.36,25.05,135.00
2003/10/11,20:59:58,1,0.89,25.75,25.36,25.05,135.00
2003/10/11,21:14:58,1,0.89,25.75,25.75,25.55,135.00
2003/10/11,21:29:58,1,0.89,25.70,25.75,25.55,135.00
2003/10/11,21:44:58,1,0.89,25.65,25.75,25.55,135.00
2003/10/11,21:59:58,1,0.89,25.75,25.75,25.55,135.00
2003/10/11,22:14:58,1,0.89,25.95,25.77,25.65,135.00
2003/10/11,22:29:58,1,0.89,25.85,25.77,25.65,135.00
2003/10/11,22:44:58,1,0.89,25.75,25.77,25.65,135.00
2003/10/11,22:59:58,1,0.89,25.55,25.77,25.65,135.00
2003/10/11,23:14:58,1,0.89,25.50,25.95,25.55,135.00
2003/10/11,23:29:58,1,0.89,25.30,25.95,25.55,135.00
2003/10/11,23:44:58,1,0.89,25.10,25.95,25.55,135.00
2003/10/11,23:59:58,1,0.89,24.76,25.95,25.55,135.00
2003/10/12,00:00:01,2,0.00,0.00,29.65,21.40,0.00
2003/10/12,00:14:58,1,0.89,24.30,25.50,24.72,135.00
2003/10/12,00:29:58,1,0.89,24.05,25.50,24.72,135.00
2003/10/12,00:44:58,1,0.89,24.10,25.50,24.72,135.00
2003/10/12,00:59:58,1,0.89,23.92,25.50,24.72,135.00
2003/10/12,01:14:58,1,0.89,23.20,24.45,23.88,135.00
2003/10/12,01:29:58,1,0.89,22.95,24.45,23.88,135.00
2003/10/12,01:44:58,1,0.89,22.60,24.45,23.88,135.00
2003/10/12,01:59:58,1,0.89,22.45,24.45,23.88,135.00
2003/10/12,02:14:58,1,0.89,22.35,23.65,22.43,135.00

```

The Initial Configuration Code will produce a CSV file that resembles the data file format illustrated above. Note: the value of 135.00 appears in the last field of each line record.

What does the Initial Configuration Code look like?

```
* Zeno 3200 System Setup File
* Program Version And Date: ZENO-3200 (GMA) using ZENOSOFT V1.966-2637-GMA-1.3 May 9 2002
10:33:50 CS 2BAE
* (C)opyright 1995-2002, Coastal Environmental Systems, Seattle, WA, USA.
* Setup File Date And Time: 02/10/31 11:08:05
PARAM1 900 0 898 2 12 20 6 6 9600 9600
PARAM2 9600 0 0 0 0 2 1 0 0 0
PARAM3 16777 0 60 18 0 0 0 0 0 2
PARAM4 2 2 0 0 1 3276804 0 -1 5 0
PARAM5 2 0 0 0 100 0 0 0 0 0
PARAM6 0 0 0 1015660800 50336144 151 196608 0 1 0
PARAM7 151 0 1280 0 10000 -1 -1 0 10 1
PARAM8 42 0 0 0 0 0 0 0 0 0
PARAM9 0 0 0 0 0 0 5 0 0 0
PARAM10 0 0 0 0 1200 -1 0 5 100 0
PARAM11 8 1 1 1 0 8 1 1 0 8 1
PARAM12 1 0 3
PARAM13 "NONE" "NONE" "NONE" "NONE" "NONE" "NONE" "" "ZENO" "" "NONE"
PARAM14 "" "ZENO-3200-Reset" "Real-Time-Clock-Suspect" "Logging-Memory-Initialized" "Serial-Sensor-
COM-Failure" "EEP" "" ""
"" ""
PARAM15 "" "" "" "" "" "" "" "" "" ""
PARAM16 "" "" "" "" "" "" "" "" "" ""
PARAM17 "" "" ""
REPEAT1 -1 -1 -1 -1 -1 -1 -1 -1
CONSTANT1 0 0 0 0 0 0 0 0 0 0
CONSTANT2 0 0 0 0 0 0 0 0 0 0
GSI 1 NO_COMMAND
SENSOR 3 "RainWeight" 1 1 0 0 3 0 0 1 0 3 0 2077.36 -8.0757 0 0 0 0 0 0 0 0 0 S0.1 "SN:XXXXXXXXXXXXXXXX"
""
SENSOR 2 "AirTemper" 9 0 2 0 2 0 0 1 0 3 0 0.4 0 0 0 0 0 0 0 0 0 0 S0.1 "SN:YYYYYYYYYYYYYYY" ""
SENSOR 14 "ShaftEncoder" 2 0 0 0 0 0 0 1 0 1 0 1 0 0 0 0 0 0 0 0 0 0 S0.1 "SN:ZZZZZZZZZZZZZZZZ" ""
SENSOR 8 "DataKey" 1 0 0 0 0 0 0 1 0 2 0 -1 1 0 0 0 0 0 0 0 0 0 S0.1 "" ""
PROCESS 4 1 "AirTDegC" S2.1 0.000969368 0.000232959 7.98213e-08 18700 100 -100 0
PROCESS 5 16 ".05degT" P1.1 2 5
PROCESS 7 2 "Tmptures" P2.1 0
PROCESS 7 3 "Rains" S1.1 0
PROCESS 5 8 "StrmLv1" S3.1 0 0.01 135
PROCESS 7 1 "" S1.1 P2.1 S3.1 P5.1 P4.4
PROCESS 7 4 "KeyDatTx" S4.1
PROCESS 7 5 "SensrNtn"
PROCESS 3 10 "LogSnNt" P8.2 0.5 3 1
PROCESS 3 10 "24hrMSG" P4.5 0.5 2 1
PROCESS 3 13 "ExtraTx" 0 384 1 3A51C2B2
PROCESS 3 10 "Transmit" P11.1 0.5 1 0
DATA 6 1,2,3,4 "<0D><0A>" P1.1 0 0 1 P1.1 P1.1 P1.1
DATA 6 1 "GMA:" P1.1 0 0 1 P1.1 P1.1 P1.1
DATA 16 1,2,3,4 "" P1.1 0 0 1 P1.1 P1.1 P1.1
DATA 15 1,2,3,4 "RainOrNote" P4.2 2 11 8 P4.4 P8.1 P4.1
DATA 15 1,2,3,4 "ThDegC" P3.6 2 7 8 C1 C1 P3.5
DATA 15 1,2,3 "Tmax" P3.1 2 7 8 P3.3 C1 C1
DATA 15 1,2,3,4 "Tmin" P3.2 2 7 8 P3.4 C1 C1
```

```

DATA 15 1,2,3,4 "StrmLvl" P5.1 2 5 8 C1 C1 P5.1
DATA 7 1 "P24d->DCOM" P4.4 2 5 1 P1.1 P1.1 P1.1
DATA 6 1 "!" P1.1 0 0 1 P1.1 P1.1 P1.1
*  !! SYSTEM TRANSFER COMPLETE.
*  Turn Off File Capture Now.
*  Enter Any Key to Continue.
EOF

```

Note: For additional information on Configuration Code, refer to section 6.4, Battery Voltage Tracker, below.

6.3.4 Priority of Mod-Note Implementation:

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

- a. Routine: 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.

6.4 What is the Configuration Code?

The FPU as deployed has only three inputs: the precipitation (load cell) input, the thermistor input, and the shaft encoder input. While these inputs could be used for different things, they are configured by the software of the Gauge Modification Assembly (GMA) specifically for the load cell application with the F&P gauge, the MMTS thermistor for temperature, and for a 436A shaft encoder as used in stream gauge applications. The software matches the electrical outputs of these particular sensors to NWS accepted measurement methodologies for the weather element, and converts the result to maintain consistency across the nation and to provide uniformity in the meaning of the reported numbers, now and in the future.

In June 2005, OS7 released the '*FPU Assembly Instructions*,' and gave the option for field sites to install the BatV modification to the Configuration Code. The change simply redirects the system from looking at the shaft-encoder input to look at the internal battery monitor point, processes the new information to scale it to xx.x Volts and put the new number in the output and logging messages where the stream level data used to be. The GMA display is not part of the data logger and is hardwired to say stream level, but the data displayed with that label will be the BatV number generated by the logger.

You will notice that the BatV measurement will be less than what you measure at the battery. This is normal, as the logger measures the voltage inside the logger, which includes all the losses associated with the regulator, wiring, etc. In some cases you may see up to a 1.3V difference, typically 0.8V.

6.5 How to Install a Configuration Code:

These procedures are also located in the *FPU Assembly Procedural*, dated Aug 2006, because the NWSREP might need to reload the configuration software should the data logger lose its programming for any reason, and because the Engineering Division (OPS11) advised battery voltage tracking be enabled. This Section 6.5 identifies where to get the approved configuration file and how to load it into the GMA.

Caution: Before installing a configuration code, save the full contents (12 months) of the data base to your laptop and bring back to your office. Before uploading, have a ready reference of this system's current calibration coefficients A, B, and C. You will enter these coefficients and the SID (i.e., 41-3456) through the system function menu (F) after you have uploaded the configuration code to the system load menu (L).

Starting with the April 2005 deployment, only the precipitation data is certified for operational use. If the other sensors become certified, updates to this appendix and the configuration software will be announced and provided.

For the initial deployment, W/OS7 has determined that it would be advantageous to monitor system performance data and has authorized the use of another configuration which replaces the uncertified stream gauge data with the system's battery voltage. W/OPS11, Engineering, has developed the alternate configuration and certified it through a year's actual use. The alternate configuration file, FPU_ConfigFile_PrecipBattVolt.txt, is available on:

<http://www.nws.noaa.gov/ops2/Surface/coopimplementation> .

The NWSREP will decide whether to use the BatV file at any deployment site and note that decision in the site meta data. The BatV file should be installed and checked out in the WFO when the gauge and the FPU are prepared for deployment.

To view the configuration file that contains the Battery Voltage Tracking program, see Section 6.5.7, of this chapter.

The NWSREP may download the authorized, named: FPU_ConfigFile_PrecipBattVolt.txt, from the NWS Headquarters webpage: <http://www.nws.noaa.gov/ops2/Surface/coopimplementation>.

Save this TXT file to an easy to remember location on the computer that will connect to the GMA data logger.

Note: After you have saved the file you must not open the file! The configuration files are Text files, you may view them in Notepad, but do not change them in any way or they will not work. Do not use a word processor because it will add considerable formatting and control characters when it opens the file. It will be rendered useless for the update of the GMA configuration.

Before you start, save off all the data in the data logger to a text file by using file capture of HyperTerminal and Show all Data (*) of the Data menu in the ZENO users menu.

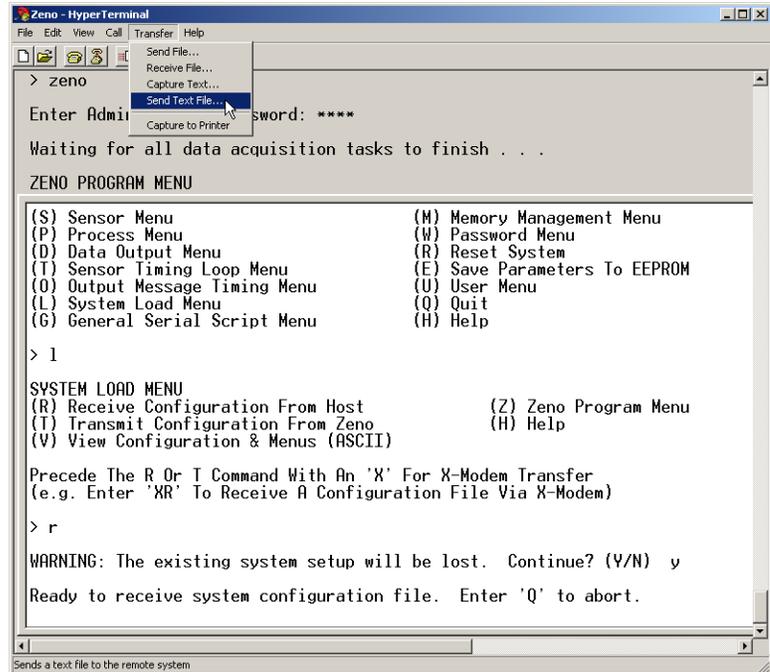
Caution: Installing a new Configuration Code erases all 12 months' data in the logger, so save all precipitation data records to laptop and bring back to WFO – you will not be able to return this to the logger! Installing a new configuration will also wipe-out all calibration settings, and

wipe-out the SID numerical code for (i.e., 41-3456). So have a ready reference of this system's current Cal Coefficients A, B, and C.

If it asks for a password, it is ZENO.

Follow these step by step instructions to install the BatV code to the GMA as the new configuration.

Access the GMA User Menu as first described in Chapter 4, of this manual.

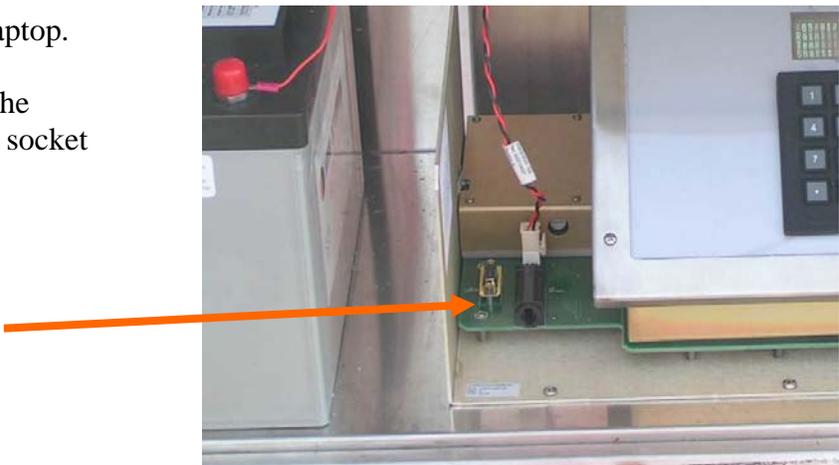


6.5.1 Connect Laptop Cable into Data Logger's Maintenance Port.

Locate a serial cable with your laptop.

Plug the cable's 9-pin plug into the GMA data logger's maintenance socket (photo, right).

Port for Laptop Serial Cable



6.5.2 Start HyperTerminal

Enter the following commands (see example, below)

U (user menu)

Z (ZENO menu)
Use password: ZENO

L (system load menu)

R (receive configuration from host)

Y (Yes, continue)

At this point the ZENO is waiting for the computer to start sending the configuration file.

6.5.3 Send the File as Text:

Locate the 'Transfer' tab on the Menu Bar at very top of the window, on the control bar, and select 'Send Text File', as illustrated above where, at top of illustration, the mouse cursor highlights this selection from the Transfer menu options.

A Windows 'OPEN' dialogue box will appear where you locate and select the configuration file you wish to send. Click 'OPEN', and the file will start sending to the ZENO. When done, the ZENO will reset, and start sampling with the new configuration.

Caution: Do not use 'Send File' from Hyperterminal, always use "*Send Text File.*"

6.5.4 Verify the Change in Configuration was Successful:

Wait until the first data is available (could be 15 minutes) to verify that everything was successful. You need to return to the User Menu, select 'D', for Data Retrieval Menu, and then type **L3<enter>** to display the most recent three data records. Are the measurements the same as has been on the display for the last 45 minutes? If the new configuration works to log the battery voltage, then you will see 'BatV' replace the 'StrmLvl' field name. For instructions on how to examine data logger records in 'real-time', see Chapter 4, of this manual.

6.5.5 Save the Configuration to EEPROM:

Save the new configuration into flash memory with the E command , 'Save parameters to EEPROM'.

6.5.7 What does the Battery Voltage Tracking Configuration (BatV) File look like?

```
* Zeno 3200 System Setup File
* Program Version And Date: ZENO-3200 (GMA) using ZENOSOFT V1.966-2637-GMA-1.3 May 9 2002
10:33:50 CS 2BAE
* (C)opyright 1995-2002, Coastal Environmental Systems, Seattle, WA, USA.
* Setup File Date And Time: 02/11/01 10:26:30
PARAM1 900 0 898 2 12 20 6 6 9600 9600
PARAM2 9600 0 0 0 0 2 1 0 0 0
PARAM3 16777 0 60 18 0 0 0 0 0 2
PARAM4 2 2 0 0 1 3276804 0 -1 5 0
PARAM5 2 0 0 0 100 0 0 0 0 0
PARAM6 0 0 0 1015660800 50336144 151 196608 0 1 0
PARAM7 151 0 1280 0 10000 -1 -1 0 10 1
PARAM8 42 0 0 0 0 0 0 0 0 0
PARAM9 0 0 0 0 0 0 5 0 0 0
PARAM10 0 0 0 0 1200 -1 0 5 100 0
PARAM11 8 1 1 0 8 1 1 0 8 1
PARAM12 1 0 3
PARAM13 "NONE" "NONE" "NONE" "NONE" "NONE" "NONE" "" "ZENO" "" "NONE"
```

```

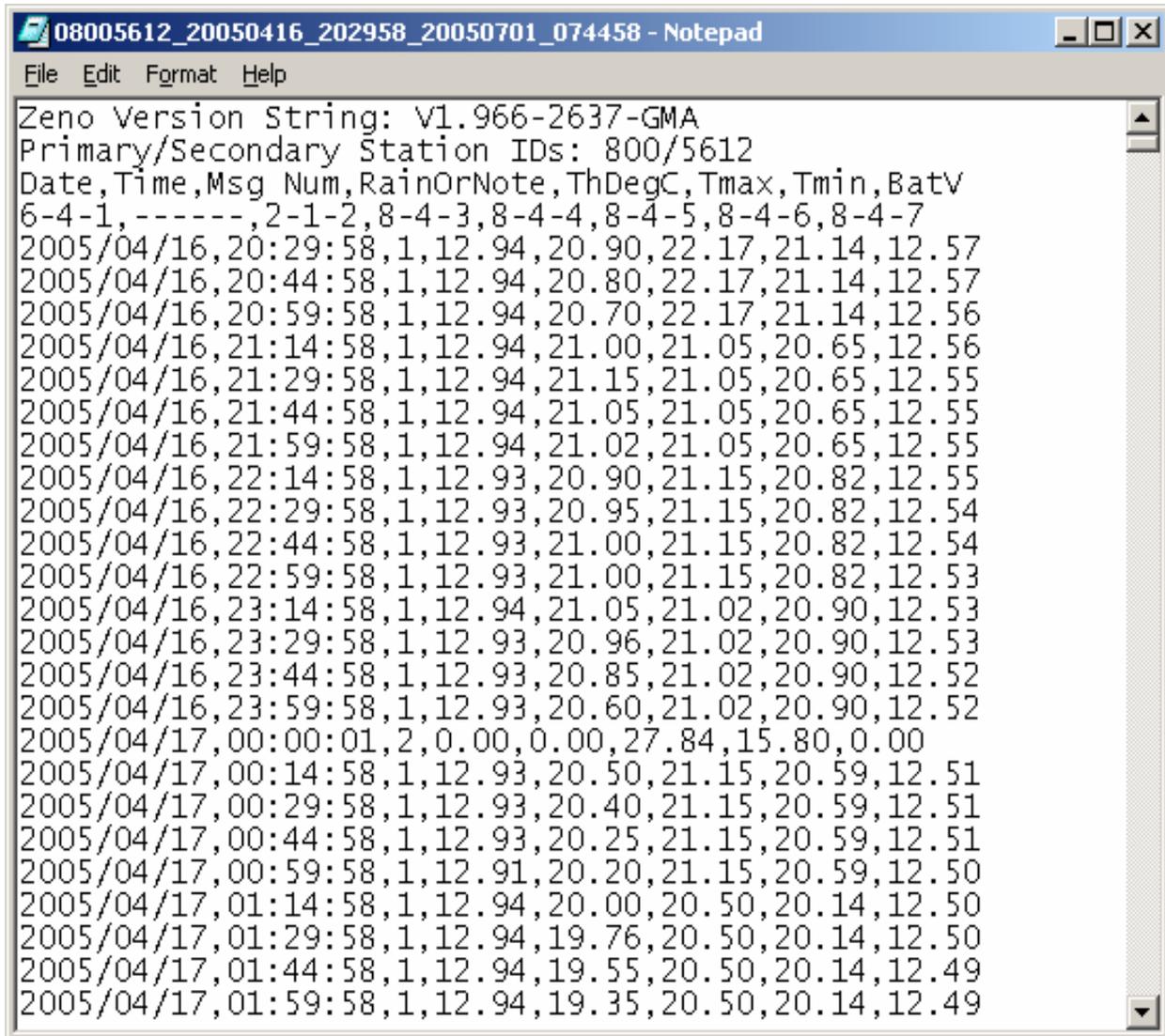
PARAM14 "" "ZENO-3200-Reset" "Real-Time-Clock-Suspect" "Logging-Memory-Initialized" "Serial-Sensor-
COM-Failure" "EEP" "" ""
"" ""
PARAM15 "" "" "" "" "" "" "" "" "" ""
PARAM16 "" "" "" "" "" "" "" "" "" ""
PARAM17 "" "" ""
REPEAT1 -1 -1 -1 -1 -1 -1 -1 -1
CONSTANT1 0 0 0 0 0 0 0 0 0
CONSTANT2 0 0 0 0 0 0 0 0 0
GSI 1 NO_COMMAND
SENSOR 3 "RainWeight" 1 1 0 0 3 0 0 1 0 3 0 2077.36 -8.0757 0 0 0 0 0 0 0 0 S0.1 "SN:XXXXXXXXXXXXXXXX"
""
SENSOR 2 "AirTemper" 9 0 2 0 2 0 0 1 0 3 0 0.4 0 0 0 0 0 0 0 0 0 S0.1 "SN:YYYYYYYYYYYYYYY" ""
SENSOR 1 "Battery" 2 0 0 0 0 0 0 1 0 3 0 1 0 0 0 0 0 0 0 0 0 0 S0.1 "SN:ZZZZZZZZZZZZZZZ" ""
SENSOR 8 "DataKey" 1 0 0 0 0 0 0 1 0 2 0 -1 1 0 0 0 0 0 0 0 0 0 S0.1 "" ""
PROCESS 4 1 "AirTDegC" S2.1 0.000969368 0.000232959 7.98213e-08 18700 100 -100 0
PROCESS 5 16 ".05degT" P1.1 2 5
PROCESS 7 2 "Tmptures" P2.1 0
PROCESS 7 3 "Rains" S1.1 0
PROCESS 1 2 "AvgBat" S3.1
PROCESS 7 1 "" S1.1 P2.1 S3.1 P5.1 P4.4
PROCESS 7 4 "KeyDatTx" S4.1
PROCESS 7 5 "SensrNtn"
PROCESS 3 10 "LogSnNt" P8.2 0.5 3 1
PROCESS 3 10 "24hrMSG" P4.5 0.5 2 1
PROCESS 3 13 "ExtraTx" 0 384 1 3A51C2B2
PROCESS 3 10 "Transmit" P11.1 0.5 1 0
DATA 6 1,2,3,4 "<0D><0A>" P1.1 0 0 1 P1.1 P1.1 P1.1
DATA 6 1 "GMA:" P1.1 0 0 1 P1.1 P1.1 P1.1
DATA 16 1,2,3,4 "" P1.1 0 0 1 P1.1 P1.1 P1.1
DATA 15 1,2,3,4 "RainOrNote" P4.2 2 11 8 P4.4 P8.1 P4.1
DATA 15 1,2,3,4 "ThDegC" P3.6 2 7 8 C1 C1 P3.5
DATA 15 1,2,3 "Tmax" P3.1 2 7 8 P3.3 C1 C1
DATA 15 1,2,3,4 "Tmin" P3.2 2 7 8 P3.4 C1 C1
DATA 15 1,2,3,4 "BatV" P5.1 2 5 8 C1 C1 P5.1
DATA 7 1 "P24d->DCOM" P4.4 2 5 1 P1.1 P1.1 P1.1
DATA 6 1 "!" P1.1 0 0 1 P1.1 P1.1 P1.1
* !! SYSTEM TRANSFER COMPLETE.
* Turn Off File Capture Now.
* Enter Any Key to Continue.
EOF

```

The NWSREP may download the authorized file, named “FPU_ConfigFile_PrecipBattVolt.txt”, from NWS Headquarters webpage: <http://www.nws.noaa.gov/ops2/Surface/coopimplementation>

The Battery Voltage Tracking Code will produce a CSV file that resembles the data file format illustrated above. Note: the last field of each line, give approximately 12.53, this is the voltage measured by the data logger at the regulator board.

Caution Reminder: Before installing a configuration code, save the full contents (12 months) of the data base to your laptop and bring back to your office. Before uploading, have a ready reference of this system's current calibration coefficients A, B, and C. You will enter these coefficients and the SID (i.e., 41-3456) through the system function menu (F) after you have uploaded the configuration code to the system load menu (L).



```

08005612_20050416_202958_20050701_074458 - Notepad
File Edit Format Help
Zeno Version String: V1.966-2637-GMA
Primary/Secondary Station IDs: 800/5612
Date,Time,Msg Num,RainOrNote,ThDegC,Tmax,Tmin,BatV
6-4-1,-----,2-1-2,8-4-3,8-4-4,8-4-5,8-4-6,8-4-7
2005/04/16,20:29:58,1,12.94,20.90,22.17,21.14,12.57
2005/04/16,20:44:58,1,12.94,20.80,22.17,21.14,12.57
2005/04/16,20:59:58,1,12.94,20.70,22.17,21.14,12.56
2005/04/16,21:14:58,1,12.94,21.00,21.05,20.65,12.56
2005/04/16,21:29:58,1,12.94,21.15,21.05,20.65,12.55
2005/04/16,21:44:58,1,12.94,21.05,21.05,20.65,12.55
2005/04/16,21:59:58,1,12.94,21.02,21.05,20.65,12.55
2005/04/16,22:14:58,1,12.93,20.90,21.15,20.82,12.55
2005/04/16,22:29:58,1,12.93,20.95,21.15,20.82,12.54
2005/04/16,22:44:58,1,12.93,21.00,21.15,20.82,12.54
2005/04/16,22:59:58,1,12.93,21.00,21.15,20.82,12.53
2005/04/16,23:14:58,1,12.94,21.05,21.02,20.90,12.53
2005/04/16,23:29:58,1,12.93,20.96,21.02,20.90,12.53
2005/04/16,23:44:58,1,12.93,20.85,21.02,20.90,12.52
2005/04/16,23:59:58,1,12.93,20.60,21.02,20.90,12.52
2005/04/17,00:00:01,2,0.00,0.00,27.84,15.80,0.00
2005/04/17,00:14:58,1,12.93,20.50,21.15,20.59,12.51
2005/04/17,00:29:58,1,12.93,20.40,21.15,20.59,12.51
2005/04/17,00:44:58,1,12.93,20.25,21.15,20.59,12.51
2005/04/17,00:59:58,1,12.91,20.20,21.15,20.59,12.50
2005/04/17,01:14:58,1,12.94,20.00,20.50,20.14,12.50
2005/04/17,01:29:58,1,12.94,19.76,20.50,20.14,12.50
2005/04/17,01:44:58,1,12.94,19.55,20.50,20.14,12.49
2005/04/17,01:59:58,1,12.94,19.35,20.50,20.14,12.49

```

Example: Data file produced with 'Battery Voltage Tracking' code.

6.5.6 What if System Will Not Save Configuration Data?

The way to tell that you do not have your configuration data loaded is to observe the following on the lap top connection to the User interface:

“Sensor Record #1 type is not specified.” Or “Sensor Name: -blank- (returns no text after the colon symbol). Without a configuration file the Zeno has no knowledge of anything connected to sensor #1 input.

Another direct result of a ‘lost/missing’ configuration file is the inoperability of the data key writer at the keypad. The Zeno works the writer as a type of ‘sensor’ (e.g., Sensor #8) and Zeno will not know what to do when it gets the interrupt signal upon the key being turned in the receptacle.

There are only a few ways a Configuration file will get ‘lost’ and most of them involve damage to the unit. Common examples include: forgetting to save it, memory failure, lightning strike, electromagnetic interference, or possibly a second technician with laptop inadvertently saved a corrupted file in its place.

To recover you simply need to reload the Configuration file to the flash memory (EEPROM), as described in Section 6.5.5, above.

Note: After you reload the configuration, you will need to re-enter your site data (e.g., COOP Site Number), and re-enter the calibration coefficients if you have them documented. Again, use the E command at this point to save these new site-specific parameters into the flash memory.

6.6 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: FPU site unique properties, difficult site exposures, harsh climates, difficult electrical grounding, temporary interruption to institutional site activities, and interruptions to Observer 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 Design 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	09/2008

Table 6.1 Status of all FPU Maintenance Notes, as of Sep 1, 2006:

Implementation of a Maintenance Note must be completed by the ‘Complete-by Date’ specified in Table 6.1, in this *FPU 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 FPU 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 Modification XX, to reduce the risk of _____ to FPU.”

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

6.6.1 Records Retention - Modification Notes:

The Appendix F, ‘Modification Notes, of this *FPU 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 FPU system as authorized by the NWS Headquarters, Office of Climate, Water, and Weather Services (OCWWS).

6.6.2 Electrical Grounding – Bond FPU Chassis to Gauge Chassis:

The first Modification Note (FPU Mod-Note 01) was authorized in September 2006, as a routine maintenance action for the NWSREP to install a grounding wire between the data logger enclosure and the weighing sensor assembly. This modification is necessary to ensure proper grounding to prevent an electrical surge from destroying the load cell sensor. This modification should be carried out as soon as practical, certainly before the next thunderstorm season, but does *not* warrant emergency status priority.

The material required for this “Bond FPU Chassis to Gauge Chassis,” change is locally provided. The material is a bonding wire. The bonding wire will be installed between the FPU enclosure and the F&P platform that the load cell is mounted upon, will keep these two at the same potential and eliminate the problem.

The modification will require one person to work about two hours of work at the Observer’s site. No special tools are required,

When configured, the Mod will reduce damage to load cells from surges, including lightning strikes one mile distant.

6.6.3 Reporting Instructions:

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

https://ops13web.nws.noaa.gov - CSSA Site Inspection - Microsoft Internet Explorer

COOPERATIVE STATION SERVICE ACCOUNTABILITY (CSSA) SITE INSPECTION REPORT

Station Name: PAINTER 2W **Station Number:** 44-6475 **Climate Division:** 01

INSPECTION DATA

Inspector: HYDRO-MET TECHNICIAN **Per Diem:** N

Inspection Type: EMERGENCY **Trip Number:** _____

Inspection Date: 01/04/2006 **Supplies Cost:** _____

Staff Hours: 8.0 **Trip Cost:** _____

Miles Driven: 225

EQUIPMENT	Maintenance Performed - More than one may be chosen				
MMTS-1	<input checked="" type="checkbox"/> Not Serviced	<input type="checkbox"/> Painted	<input type="checkbox"/> Modified	<input type="checkbox"/> Replaced	<input type="checkbox"/> Moved/Relocated
	<input type="checkbox"/> Routine Maintenance	<input type="checkbox"/> Calibrated	<input type="checkbox"/> Repaired	<input type="checkbox"/> Installed	<input type="checkbox"/> Removed
FPU	<input type="checkbox"/> Not Serviced	<input type="checkbox"/> Painted	<input checked="" type="checkbox"/> Modified	<input type="checkbox"/> Replaced	<input type="checkbox"/> Moved/Relocated
	<input type="checkbox"/> Routine Maintenance	<input type="checkbox"/> Calibrated	<input checked="" type="checkbox"/> Repaired	<input type="checkbox"/> Installed	<input type="checkbox"/> Removed
SRG	<input checked="" type="checkbox"/> Not Serviced	<input type="checkbox"/> Painted	<input type="checkbox"/> Modified	<input type="checkbox"/> Replaced	<input type="checkbox"/> Moved/Relocated
	<input type="checkbox"/> Routine Maintenance	<input type="checkbox"/> Calibrated	<input type="checkbox"/> Repaired	<input type="checkbox"/> Installed	<input type="checkbox"/> Removed
CRS	<input checked="" type="checkbox"/> Not Serviced	<input type="checkbox"/> Painted	<input type="checkbox"/> Modified	<input type="checkbox"/> Replaced	<input type="checkbox"/> Moved/Relocated
	<input type="checkbox"/> Routine Maintenance	<input type="checkbox"/> Calibrated	<input type="checkbox"/> Repaired	<input type="checkbox"/> Installed	<input type="checkbox"/> Removed

https://ops13web.nws.noaa.gov - CSSA Site Inspection - Microsoft Internet Explorer

Inspection Date: 01/04/2006 **Supplies Cost:** _____

Staff Hours: 8.0 **Trip Cost:** _____

Miles Driven: 225

EQUIPMENT	Maintenance Performed - More than one may be chosen				
MMTS-1	<input checked="" type="checkbox"/> Not Serviced	<input type="checkbox"/> Painted	<input type="checkbox"/> Modified	<input type="checkbox"/> Replaced	<input type="checkbox"/> Moved/Relocated
	<input type="checkbox"/> Routine Maintenance	<input type="checkbox"/> Calibrated	<input type="checkbox"/> Repaired	<input type="checkbox"/> Installed	<input type="checkbox"/> Removed
FPU	<input type="checkbox"/> Not Serviced	<input type="checkbox"/> Painted	<input checked="" type="checkbox"/> Modified	<input type="checkbox"/> Replaced	<input type="checkbox"/> Moved/Relocated
	<input type="checkbox"/> Routine Maintenance	<input type="checkbox"/> Calibrated	<input checked="" type="checkbox"/> Repaired	<input type="checkbox"/> Installed	<input type="checkbox"/> Removed
SRG	<input checked="" type="checkbox"/> Not Serviced	<input type="checkbox"/> Painted	<input type="checkbox"/> Modified	<input type="checkbox"/> Replaced	<input type="checkbox"/> Moved/Relocated
	<input type="checkbox"/> Routine Maintenance	<input type="checkbox"/> Calibrated	<input type="checkbox"/> Repaired	<input type="checkbox"/> Installed	<input type="checkbox"/> Removed
CRS	<input checked="" type="checkbox"/> Not Serviced	<input type="checkbox"/> Painted	<input type="checkbox"/> Modified	<input type="checkbox"/> Replaced	<input type="checkbox"/> Moved/Relocated
	<input type="checkbox"/> Routine Maintenance	<input type="checkbox"/> Calibrated	<input type="checkbox"/> Repaired	<input type="checkbox"/> Installed	<input type="checkbox"/> Removed
MXMN	<input checked="" type="checkbox"/> Not Serviced	<input type="checkbox"/> Painted	<input type="checkbox"/> Modified	<input type="checkbox"/> Replaced	<input type="checkbox"/> Moved/Relocated
	<input type="checkbox"/> Routine Maintenance	<input type="checkbox"/> Calibrated	<input type="checkbox"/> Repaired	<input type="checkbox"/> Installed	<input type="checkbox"/> Removed

106 characters left

Remarks
LOAD SENSOR FAILURE DUE TO SUSPECTED LIGHTNING STRIKE. 1ST REPLACEMENT WAS BAD. NWS ENGINEERING RECOMMENDED BONDING THE TWO FPU STRUCTURES TOGETHER.

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CHAPTER 7 – METADATA REQUIREMENTS

7. Metadata Requirements:

The Cooperative Station Service Accountability (CSSA) system is the single authoritative source for COOP station information for all the FPU sites in the cooperative network. 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.

When an FPU instrument is implemented, an extra element of metadata is added to CSSA station reports. This element is the sensor calibration coefficient that will be saved in the equipment description field of the Station Report, Form B-44. Thereafter, routine site inspections will result in a check of these calibration values. The outcome of the check shall be reported in the CSSA site inspection report as secondary metadata. Secondary metadata is not required to be reported to Workflow nor does it require Form B-44 to be updated.

Policy on how metadata shall be accounted by the NWSREP is spelled out in the *Cooperative Station Service Accountability (CSSA) Manual* (NDS 10-1313). It is useful to review the changes the FPU program brought to the CSSA terms of reference in 2005. To view an online copy, access: <http://www.nws.noaa.gov/directives/sym/pd01013013curr.pdf>.

7.1. FPU Actions Accounted by Metadata:

The NWSREP shall produce metadata to account for these FPU actions:

- a. Initial installation of FPU system accounted by Form B-44.
- b. Equipment Modification Note implementation accounted by Form B-44.
- c. Seasonal Maintenance (draining) accounted by CSSA Inspection Report and B-23.
- d. Routine check of calibration accounted by CSSA Inspection Report and B-23.
- e. Restorative Maintenance accounted by CSSA Inspection Report and FPU Logbook.

7.2. Filing Locations for Metadata:

- a. Form B-44 is updated through CSSA Station Information Report (SIR)
- b. Site Inspection Report is located within your office’s CSSA local database.
- c. Form B-23, Station Inspection Form is the old-fashioned COOP form.
- d. FPU Logbook, External to CSSA, see Appendix H for an example.

Secondary metadata that is tracked in an FPU Logbook, is saved and updated because it is essential for HMTs who service the units and it eliminates repetitive or unnecessary calibration resets.

7.2 CSSA Station Report, Form B-44:

Access and print a copy of the *Cooperative Station Service Accountability (CSSA) Manual* (NDS 10-1313), effective date, March 18, 2005, for current policy on B-44 updates. Access: <http://www.nws.noaa.gov/directives/010/010.htm> .

*Items in Red indicate required fields

COOPERATIVE STATION SERVICE ACCOUNTABILITY (CSSA)

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

Station Name: **SPEARFISH** Station Number: **39-7882** Climate Division: **04** Rendition: **22** Other Obs

Observed Element: HOURLY PRECIPITATION REPORT

EQUIPMENT

Equipment Code	Serial Number	Owner	Exp	Tel	Equipment Description	Azimuth	Distance
FPU	210	NWS		N	CALIBRATION: A=0 B= 1346.8134 C=-2.6255	180	10

REPORTING/PAY

Ob Time	Rept Method	Recipient	Sponsor	Paid	Data Ingest Via	Special Network	Mode	Relay	When?
MID	ADP	UNR,NCDC	S&E(A)		DATAKEY				MONTHLY

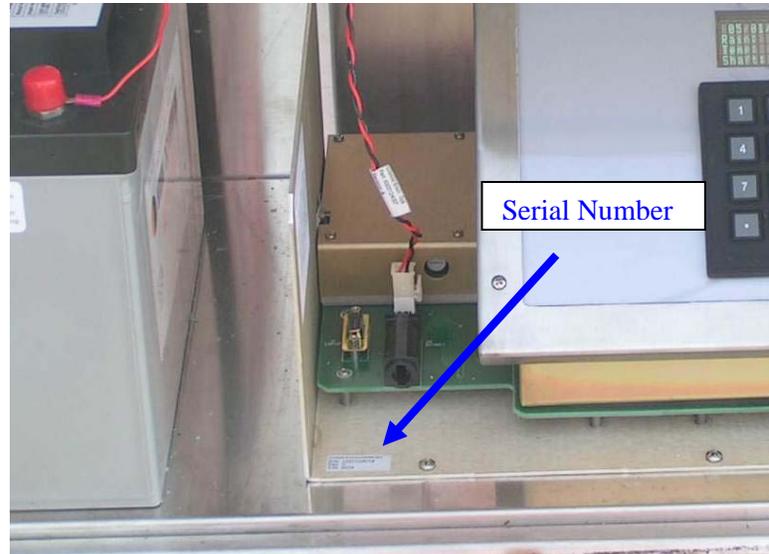
** To delete an observation detail record, set the Ob Time to 'DEL'.

Add Element Previous Element 3 of 3 Next Element Delete Element

Save Work in Progress Submit for Approval Clear Changes Cancel Form

First, under *Equipment Code*, enter ‘FPU’, then to its right under *Serial Number* (see, above example) enter your data logger’s serial number (i.e., 0210). Then under *Equipment Description* enter values for CALIBRATION: A= 0; B= xxxx.xxxx; C= -x.xxxx .

Note: This is the serial number that appears on the inside of the steel enclosure, about several inches in front of the Data Key Receptacle.) Look for a small white one inch decal on the brushed sheet metal floor board upon which the Data Key Receptacle is mounted.



Next, on the same *Observed Element* page, access the Reporting/Pay portion on the bottom of the screen. For ‘Ob Time’ always use, ‘MID’. For ‘Rept Method’ always use, ‘ADP’.

For ‘Recipient’ use your three-letter WFO identifier, followed by, ‘NCDC’ (i.e., UNR, NCDC).

For ‘Sponsor’, if there is none, use the default ‘FC-1’ as it signifies the basic NWS S&E funded recording rain gauge network. 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.

For ‘Paid’, ensure its ‘N’ for none, or ‘Y’ if the Observer receives pay from the federal government for this observation.

For ‘Data Ingest Via’, ensure ‘DATAKEY’ appears.

For the field, ‘Special Network’, ensure you recognize a Climate Reference Network (CRN) or Historical Climate Network (HCN) site with the appropriate abbreviation, otherwise leave this field blank.

For the next two fields, ‘Mode’, and ‘Relay’, leave these blank.

For the last field ‘When’, enter the word ‘MONTHLY.’

Before submitting the revised B-44 to NCDC, ensure you have updated the Remarks section to state, “**Updated equipment, changed F&P to FPU.**” See figure, below.

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

7.3 CSSA Site Inspection Report:

When you have completed the FPU site installation 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 total hours of work and total dollars of expense you incurred to install the FPU system.

Be sure to mouse click the Equipment category F&P under Maintenance Performed. Finally, in the bottom of the CSSA Site Inspection Report, in the free text field, always remember to write in the following information: **“Replaced F&P with the FPU.”**

“FPU Calibration Coefficients on May 6, 2005: A = 0; B = 1346.8134; and C= -2.6255”

Note: These values are for example only, and will differ for each FPU system.

Note: Coefficient A should always equate to zero.

Be sure to complete all these fields to account for your FPU installation work!

Inspector:..... Network Program Manager
Inspection Type:..... Annual
Inspection Date:..... 05/06/2005
Staff Hours:..... 6
Miles Driven:..... 183
Per Diem:..... N
Trip Number:..... 2WT0B3804&05
Supplies Cost:..... 75.50
Trip Cost:..... 113.75

7.4 FPU 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 FPU Logbook (electronic), particularly if you have more than ten COOP sites with FPU equipment.

The FPU 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 FPU system and Observer correspondence, and not be limited to the 250 characters in the Site Inspection Report's 'Remarks' box.

APPENDIX A – ACRONYMS AND ABBREVIATIONS

AWIPS	Advanced Weather Interactive Processing System
CDCS	Climate Data Continuity Study
CES	Coastal Environment Systems, Inc.
CMIS	Configuration Management Information System
COOP	Cooperative Observer Program
CSSA	Cooperative Station Service Accountability
CWA	County Warning Area
DAPM	Data Acquisition Program Manager
EMRS	Engineering Management Reporting System
ESD	Electro-static Discharge
ET	Electronics Technician
F&P	Fischer & Porter Recording Rain Gauge (1960 design)
FPU	Fischer-Porter/Belfort Upgrade (load cell sensor)
FTP	File Transfer Protocol
FY	Fiscal Year
GMA	Gauge Modification Assembly (specifically, the Data Logger module)
HMT	Hydrometeorological Technician
LST	Local Standard Time
MIC	Meteorologist-In-Charge
MIRS	Management Information Reporting System
MTBF	Mean Time Between Failure
NCDC	National Climatic Data Center
NLSC	National Logistics Support Center
NRC	National Reconditioning Center
NSN	National Stock Number
NWS	National Weather Service
NWSI	National Weather Service Instruction (e.g., NWSI 10-1307, NWS COOP Weather Observer Program)
OI	Operational Implementation
OIP	Operational Implementation Plan
OPR	Office of Primary Responsibility
OPL	Observations Program Leader
ORE	Operational Readiness Evaluation
PC	Personal Computer
PCA	Printed Circuit Board Assembly

POC	Point of Contact
PPI	Planned Product Improvement
RAM	Random Access Memory
RCPM	Regional COOP Program Manager
RDM	Removable Data Media (the red plastic turn key)
REL NOTE	Release Note
RFP	Regional Focal Point
SIR	Station Information Report (CSSA form in Workflow, for B-44 updates)
SRG	Standard Rain Gage (non-mechanical, 8" aperture)
TF	Transform Function
WFO	Weather Forecast Office
WSH	Weather Service Headquarters
WSOM	Weather Service Operations Manual

APPENDIX B- FPU AUTHORIZED SITE LIST

WFO	ST	OFFICIAL COOP SITE NAME	COOP SID	START OF FPU OPS.	NOTES:
ABR	SD	OAHE DAM	39-6170	05/19/05	
ABR	SD	LAKE SHARPE PROJECT	39-4766	07/27/05	
ABR	SD	WAUBAY NATL WILD LIFE	39-8980	07/28/05	
ABR	MN	WHITE ROCK DAM	21-8947	09/01/05	
ABR	SD	MC INTOSH 6 SE	39-5381	09/06/05	
ABR	SD	MURDO	39-5891	09/07/05	< HCN >
ABR	SD	ISABEL	39-4268	09/23/05	
AKQ	NC	ELIZABETH CITY	31-2719	07/20/05	< HCN >
AKQ	VA	PAINTER 2W	44-6475	08/02/05	
ALY	CT	THOMASTON DAM	06-8330	06/16/06	
ALY	NY	HUDSON COR.FACILITY	30-4025	7/5?/06	
ALY	NY	SCHUYLERVILLE	30-7549	7/7?/06	
ALY	NY	TRIBES HILL	30-8586	7/?/?/06	
APX	MI	GRAYLING	20-3391	06/10/05	
APX	MI	GLADWIN	20-3170	07/06/05	
APX	MI	TROUT LAKE 2WNW	20-8293	08/17/05	
APX	MI	DETOUR VILLAGE	20-2094	08/24/05	
APX	MI	TRAVERSE CITY	20-8246	09/01/05	
BGM	NY	NEWARK VALLEY 1N	30-5682	TBD	
BGM	NY	WHITNEY POINT DAM	30-9442	TBD	
BTV	NY	CANTON 4 SE	30-1185	03/28/06	< HCN >
BTV	NY	WANAKENA RANGER SCHL	30-8944	10/14/05	< HCN >
BTV	VT	HIGHGATE FALLS	43-3914	10/11/05	
BTV	VT	MORRISVILLE	43-5366	03/03/06?	
BUF	NY	FREDONIA	30-3033	05/27/05	< HCN >
BUF	NY	GENEVA RESEARCH FARM	30-3184	06/20/05	
BUF	NY	WELLSVILLE	30-9072	07/13/05	
BUF	NY	MOUNT MORRIS DAM 2 W	30-5597	08/23/05	
BUF	NY	JAMESTOWN 4ENE	30-4207	09/02/05	
CLE	OH	AKRON WPCS	33-0059	05/17/06	
CLE	OH	GALION WATER WORKS	33-3021	05/22/06	
CLE	OH	RAVENNA 2 S	33-6949	06/15/06	
DDC	KS	SUBLETTE 5E	14-7922	06/08/05	
DDC	KS	COLLYER 10 S	14-1730	11/18/05	
DDC	KS	ELKHART	14-2432	12/13/05	
DDC	KS	ENGLEWOOD 1 NW	14-2560	10/26/05	
DDC	KS	GARDEN CITY EXP STA	14-2980	10/25/05	
DDC	KS	HEALY	14-3554	10/27/05	
DDC	KS	KIOWA	14-4341	11/16/05	
EAX	MO	ELM	23-2568	06/15/05	
EAX	MO	SMITHVILLE LAKE	23-7862	07/13/05	
EAX	KS	STANLEY 3S	14-7756	08/08/05	
EAX	KS	HILLSDALE LAKE	14-3686	11/21/05	
EAX	MO	GLADSTONE	23-3219	12/19/05	
EAX	MO	KIRKSVILLE	23-4544	10/19/05	
EAX	MO	LONG BRANCH RESERVOIR	23-5050	10/19/05	

EAX	MO	MOBERLY	23-5671	11/16/05	
EAX	MO	NEW FRANKLIN 1 W	23-6012	11/10/05	
EAX	MO	RICHMOND 3S	23-7116	11/21/05	
EAX	MO	SWEET SPRINGS	23-8223	01/09/06	
EAX	MO	UNITY VILLAGE	23-8524	12/23/05	
EAX	MO	WARRENSBURG 4 NW	23-8712	11/02/05	
FGF	ND	LEEDS	32-5078	09/19/05	
FGF	ND	ADAMS 7SSW	32-0022	08/10/05	
FGF	MN	BRECKENRIDGE MN	21-0973		
FGF	MN	CAMP NORRIS DNR	21-1250		
FGF	MN	ORWELL DAM	21-6228	08/30/05	
FGF	MN	FRAZEE	21-2964		
FGZ	AZ	PETRIFIED FOREST NP	02-6468	07/21/05	
FGZ	AZ	ASH FORK 3	02-0487	08/23/05	
FGZ	AZ	CHEVELON RS	02-1574	08/31/05	
FGZ	AZ	MONTEZUMA CASTLE NM	02-5635	09/15/05	
FGZ	AZ	CROWN KING	02-2329	10/28/05	
FGZ	AZ	FLAGSTAFF AP	02-3010		
FGZ	AZ	KEAMS CANYON	02-4586	12/05/05	
FGZ	AZ	MAYER NO. 2	02-5344	11/02/05	
FGZ	AZ	SEDONA	02-7708	11/03/05	
FGZ	AZ	SIERRA ANCHA	02-7876	11/08/05	
FGZ	AZ	WALNUT CREEK	02-9158	11/02/05	
GGW	MT	FORT PECK POWER PLANT	24-3176	06/10/05	
GGW	MT	WESTBY	24-8777	06/16/05	
GGW	MT	BREDETTE	24-1088	07/22/05	
GGW	MT	CONTENT 3 SSE	24-1984	08/11/05	
GGW	MT	DODSON 11 N	24-2441	10/18/05	
GYX	ME	AUGUSTA	17-0273	05/10/06	
GYX	ME	JACKMAN	17-4086	06/14/06	
GYX	NH	NORTH STRATFORD	27-6234	06/09/06	
GYX	NH	HOPKINTON LAKE	27-4218	05/21/06	
GYX	NH	HANOVER	27-3850	06/08/06	<HCN>
IND	IN	INDIANAPOLIS ZOO	12-4286	05/19/05	
IND	IN	SHELBYVILLE SEWAGE PL	12-7999	08/09/05	
IND	IN	MARTINSVILLE 2 SW	12-5407	09/28/05	
IND	IN	FRANKFORT DISPOSAL PL	12-3082	11/15/05	
IND	IN	LEBANON WATER WORKS	12-4908	10/26/05	
IWX	MI	COLDWTR WASTEWTR PLT	20-1680	06/04/05	
IWX	OH	DEFIANCE	33-2098	08/26/05	
IWX	IN	PORTLAND 1 SW	12-7069	09/06/05	
IWX	IN	LAKEVILLE	12-4782	10/05/05	
IWX	OH	LIMA WWTP	33-4551	09/27/05	
LWX	MD	ABERDEEN PHILLIPS FLD	18-0015	04/07/06	
LWX	VA	PIEDMONT RESEARCH STA	44-6712	11/18/05	
LWX	WV	ROMNEY 1 SW	46-7730	07/28/06	
MEG	TN	MEMPHIS WFO "BETA SITE"	40-5956	05/01/05	
MEG	TN	LEXINGTON	40-5210	05/27/05	
MEG	TN	DYERSBURG	40-2680	06/10/05	
MEG	TN	SAVANNAH 6 SW	40-8108	08/01/05	
MEG	MO	HORNERSVILLE	23-3999	08/05/05	
MEG	MO	MALDEN MUNICIPAL AP	23-5207	08/11/05	

MEG	MS	HOUSTON	22-4265	09/09/05	
MEG	MS	SAREPTA 1 NNE	22-7820	09/09/05	
MEG	AR	ALICIA 2NNE	03-0064	11/10/05	
MEG	AR	WYNNE	03-8052	11/10/05	
MEG	MS	ARKABUTLA DAM	22-0237	01/25/06	
MEG	MS	CALHOUN CITY	22-1314	11/21/05	
MEG	MS	CLARKSDALE	22-1707	07/19/06	< HCN >
MEG	MS	ENID DAM	22-2773	03/08/06	
MEG	MS	HICKORY FLAT	22-4001	11/21/05	
MEG	MS	MOUNT PLEASANT 4SW	22-6084	03/24/06	
MEG	MS	RIPLEY	22-7467	04/14/06	
MEG	MS	SARDIS DAM	22-7815	02/06/06	
MEG	TN	BOLIVAR WATER WORKS	40-0876	02/03/06	
MEG	TN	BROWNSVILLE SEWER PLANT	40-1150	03/02/06	
MEG	TN	GREENFIELD	40-3697	12/15/05	
MEG	TN	MASON	40-5720	01/20/06	
MEG	TN	MUNFORD	40-6358	01/20/06	
MEG	TN	SAMBURG W. L. REFUGE	40-8065	12/15/05	
MHX	NC	MOREHEAD CITY 2 WNW	31-5830	09/01/05	
MHX	NC	GREENVILLE	31-3638	11/02/05	
MHX	NC	MANTEO AIRPORT	31-5303	11/03/05	
MQT	MI	MARQUETTE WSO AP	20-5184	05/26/05	
MQT	MI	MANISTIQUE	20-5073	06/09/05	
MRX	TN	ERWIN 1 W	40-2934	08/18/05	
MRX	TN	MORRISTOWN WFO	40-6272	06/17/06	
MRX	TN	SPRING CITY	40-8540	08/18/05	
MRX	TN	MONTEAGLE	40-6162	10/12/05	
MRX	TN	SUNBRIGHT 1 W	40-8766	11/25/06	
MRX	VA	WISE 3E	44-9215	11/14/06	
MTR	CA	GILROY 8NE	04-3419	06/30/05	
MTR	CA	BOULDER CREEK	04-1005	08/10/05	
MTR	CA	ANGWIN PAC UNION COL	04-0212	06/07/06	
MTR	CA	BIG SUR	04-0790	05/15/06	
MTR	CA	MORGAN HILL	04-5853	05/16/06	
MTR	CA	LUCIA WILLOW SPRINGS	04-5184	09/27/05	
MTR	CA	MOUNT TAMALPAIS 2 SW	04-5996	06/13/06	
MTR	CA	PETALUMA AIRPORT	04-6826	05/02/06	< HCN >
MTR	CA	SAINT HELENA 4 WSW	04-7646	06/06/06	
MTR	CA	SEBASTOPOL	04-8072	05/02/06	
MTR	CA	THE GEYSERS	04-8885	06/22/06	
OHX	TN	LIVINGSTON RADIO WLIV	40-5332	05/06/05	
OHX	TN	PORTLAND SEWAGE PLANT	40-7359	05/16/05	
OHX	TN	CELINA	40-1561	06/15/05	
OHX	TN	CHEATHAM LOCK & DAM	40-1663	05/18/05	
OHX	TN	LEBANON	40-5108	08/05/05	
OHX	TN	LAWRENCEBURG FILT PLANT	40-5089	08/09/05	
OHX	TN	CARTHAGE	40-1480	09/23/05	
OHX	TN	CENTERVILLE WATER PLANT	40-1587	10/06/05	
OHX	TN	MONTEREY	40-6170	11/01/05	
OHX	TN	ROCK ISLAND 2 NW	40-7811	11/03/05	
OHX	TN	SPRINGFIELD EXPERIMENT STATION	40-8562	11/18/05	
OHX	TN	WAVERLY AIRPORT	40-9493	10/28/05	
PDT	OR	WESTON	35-9213	07/20/05	
PDT	WA	WHITMAN MISSION	45-9200	09/01/05	

PDT	OR	LA GRANDE	35-4622	09/02/05	
PDT	WA	EASTON	45-2384	09/20/05	
PDT	OR	ARLINGTON	35-0265		
PDT	OR	MONUMENT #2	35-5711	06/26/06	
PDT	OR	MORO	35-5734	05/12/06	
PDT	OR	TBD (Aberdeen20, WA)	SS-cccc		
PDT	OR	BEND	35-0694	06/14/06	< HCN >
PDT	WA	SUNNYSIDE	45-8207	06/30/06	< HCN >
PHI	PA	BLUE MARSH LAKE	36-0785	05/22/06	
PHI	NJ	CAPE MAY 2NW	28-1351	???	
RAH	NC	CLINTON 2 NE	31-1881	???	
RAH	NC	ROANOKE RAPIDS	31-7319	???	
RLX	WV	ELKINS 1N	46-2717	05/20/05	
RLX	WV	SOUTHSIDE 3 NNW	46-8351	07/13/05	
RNK	NC	GALAX WATER PLANT	44-3272	05/12/06	
RNK	NC	PULASKI 2E	44-6955	05/10/06	
RNK	VA	WYTHEVILLE 1S	44-9301	05/09/06	
SGF	MO	BOLIVAR 1 NE	23-0789	05/20/05	
SGF	MO	ALLEY SPRING RGR STA	23-0088	01/17/06	
SGF	MO	CASSVILLE RANGER STA	23-1383	01/03/06	
SGF	MO	LICKING 4N	23-4919	01/19/06	
SGF	MO	OZARK BEACH	23-6460	10/11/05	
SGF	MO	POMME DE TERRE DAM	23-6777	12/07/05	
SGF	MO	SENECA 1W	23-7656	01/12/06	
SGF	MO	STOCKTON DAM	23-8082	11/17/05	
SGF	MO	TABLE ROCK DAM	23-8252	10/12/05	
SGF	MO	TRUMAN DAM & RESERVOIR	23-8466	12/06/05	
SGF	MO	WEST PLAINS	23-8880	01/24/06	
SHV	LA	RED RIVER RESEARCH STATION	16-7738	05/11/05	
SHV	LA	MINDEN	16-6244	06/15/05	
SHV	LA	MANSFIELD	16-5874	06/22/05	
SHV	AR	MAGNOLIA	03-4548	07/08/05	
SHV	AR	PRESCOTT	03-5908	07/11/05	
SHV	TX	CLARKSVILLE 1W	41-1773	12/09/05	
SHV	AR	DE QUEEN DAM	03-1952	07/26/05	
SHV	AR	MILLWOOD DAM	03-4839	07/26/05	
SHV	AR	LEWISVILLE	03-4185	08/02/05	
SHV	AR	CALION LOCK & DAM	03-1140	12/02/05	
SHV	AR	DIERKS	03-2015	12/20/05	
SHV	AR	FOREMAN	03-2544	12/05/05	
SHV	TX	PITTSBURG 5SSE	41-7066	10/29/05	
SHV	AR	NASHVILLE	03-5112	12/05/05	
SHV	LA	STERLINGTON	16-8785	12/20/05	
SHV	LA	JENA 4 WSW	16-4696	11/14/05	
SHV	LA	MONROE ULM	16-6314	11/14/05	
SHV	LA	NATCHITOCHE	16-6582	11/08/05	
SHV	LA	WINNFIELD 2 W	16-9803	11/08/05	
SHV	OK	CARTER TOWER	34-1544	12/09/05	
SHV	TX	GILMER 4 WNW	41-3546	10/29/05	
SHV	TX	LONGVIEW 11 SE	41-5348	11/18/05	
SHV	TX	MOUNT PLEASANT	41-6108	12/09/05	
SHV	TX	NACOGDOCHES	41-6177	11/08/05	
SHV	TX	NEW BOSTON	41-6270	10/29/05	
SHV	TX	NEW SUMMERFIELD 2W	41-6335	11/30/05	

SHV	TX	SAM RAYBURN DAM	41-7936	11/04/05	
SHV	TX	SWAN 4 NW	41-8778	10/29/05	
SHV	TX	TEXARKANA	41-8942	10/18/05	
SHV	TX	WRIGHT PATMAN DM & LK	41-9916	10/17/05	
SJU	PR	CAYEY 1 E	66-1901-5	06/24/05	
SJU	PR	ADJUNTAS SUBSTATION	66-0061-6	12/02/05	
SJU	PR	BOTIJAS 1 - OROCOVIS	66-0984	01/21/06	
SJU	PR	BOTIJAS 2 - OROCOVIS	66-0988	02/27/06	
SJU	PR	CERRO MARAVILLA	66-2336-6	12/02/05	
SJU	PR	COROZAL SUBSTATION	66-2934-6	12/02/05	
SJU	PR	CUBUY	66-3113-5	10/15/05	
SJU	PR	DOS BOCAS	66-3431-6	12/08/05	
SJU	PR	FAJARDO	66-3657-3	10/15/05	
SJU	PR	GURABO SUBSTATION	66-4276-5	08/15/05	
SJU	PR	LAS PIEDRAS 1 N	66-5258-5	12/08/05	
SJU	PR	MARICAO 2 SSW	66-5908	02/22/06	
SJU	PR	NEGRO - COROZAL	66-6514-6	12/08/05	
SJU	PR	PARAISO	66-6805-5	12/08/05	
SJU	PR	PENA POBRE-NAGUABO	66-6942	01/21/06	
SJU	PR	PONCE 4 E	66-7292-2	12/12/05	
SJU	PR	SAN LORENZO 2 ESE	66-8816	02/14/06	
SJU	PR	SAN SEBASTIAN 2 WNW	66-8881-6	12/12/05	
SJU	PR	YABUCOA 1 NNE	66-9829-4	12/12/05	
SJU	VI	BETH UPPER NEW WORKS	67-0480	03/16/06	
SJU	VI	CANEEL BAY PLANTATION	67-1316	TBD	
SJU	PR	Site To Be Determined (TBD)	TBD	TBD	
SJU	PR	PICO DEL ESTE	66-6992-5	12/12/05	
UNR	SD	PACTOLA DAM	39-6427	05/26/05	
UNR	SD	EDGEMONT 23 NNW	39-2565	08/03/05	
UNR	SD	EDGEMONT	39-2557	08/11/05	
UNR	SD	CAMP CROOK	39-1294	08/31/05	
UNR	SD	LEMMON	39-4864	09/01/05	
UNR	SD	FAITH	39-2852	09/09/05	
UNR	SD	INTERIOR 3 NE	39-4184	01/27/06	
UNR	SD	LA CREEK NATL WILDLIFE REFUGE	39-4651	05/31/06	
UNR	SD	MILESVILLE 5 NE	39-5544	10/21/05	
UNR	SD	MISSION	39-5620	06/02/06	
UNR	SD	ORAL	39-6304	10/05/05	
UNR	SD	PLAINVIEW 4 SSW	39-6636	01/27/06	
UNR	SD	SPEARFISH	39-7882	10/06/05	
UNR	SD	WIND CAVE	39-9347	02/02/06	
UNR	WY	MOORCROFT 3S	48-6395	10/28/05	
UNR	WY	NEWCASTLE	48-6660	10/27/05	< HCN >
UNR	WY	OSAGE	48-6935	11/01/06	
UNR	WY	RECLUSE	48-7545	10/26/05	

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APPENDIX C – NOTATION CODES TO MARK DATA

Use the numeric keypad in the enclosure to enter 3-digit codes to account for the checks and maintenance activities you perform on the FPU.

Notations made by **Observer** range from **100 to 140**.

Notations made by **NWSREP** range from **150 to 255**.

Codes the Observer May Enter:

Code	Meaning of Observer Maintenance Codes
100	END of Valid data
103	Time is more than 15 minutes fast/slow
104	Routine Gauge Check
114	Foreign Object Found in Bucket
115	Emptied Bucket – Bucket completely emptied
116	Partially Emptied Bucket – Some liquid left in bucket
117	Added Oil to Bucket
118	Added Antifreeze to Bucket
125	Installed Funnel
126	Removed Funnel
140	START of Valid Data

Codes the NWSREP May Enter:

Code	Meaning of NWSREP Maintenance Codes
150	END of Valid Data
151	Annual Visit
152	Semi-Annual Visit
153	Liaison Visit
154	Emergency Visit
156	Data from GMA copied to data key
158	Time is more than 15 minutes slow.
159	Time is more than 15 minutes fast.
160	Emptied bucket
161	Emptied and cleaned bucket
162	Partially drained bucket – some liquid remains in bucket
163	Added Oil to bucket
164	Added Antifreeze to bucket
166	Installed new bucket to replace damaged bucket
169	Foreign Object Found in Bucket
170	Installed Funnel
171	Removed Funnel
174	Installed Auto-Syphon
175	Removed Auto-Syphon

180	Cleaned F&P Case
181	Cleaned Solar Panel
182	Cleaned MMTS sensor
183	Cleaned GMA
190	Replaced one or more Flexures
201	Replaced MMTS sensor
210	Replaced GMA – A completely new GMA was installed
211	Replaced GMA battery
213	Replaced Load Cell in FPU
217	Installed Configuration Code * – Initial Issue with FPU Kit
218	Installed Configuration Code * – Battery Voltage Tracker
219	Installed Configuration Code * – Future Potential (i.e., Precip Data QC)
220	Calibration Check – No changes to previous values
221	Calibration Check – New values were entered
230	Gauge moved to a compatible location – equipment move
231	Gauge moved to a non-compatible location – station relocation
232	Gauge removed from service – placed in storage
233	Gauge put back in service after being in storage
255	START of Valid Data

* CAUTION: First make a copy of the data logger contents (i.e., 12 months' records) before you install any Configuration Code file. Configuration code replacement erases all data in the logger!

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APPENDIX D: CALIBRATION RESET INSTRUCTIONS

Whenever you make a trip to your COOP site, bring your notes from the last time you saved calibration coefficients A, B, and C. You should also bring an FPU Log Sheet to record the outcome of the Calibration Check-Up and the values of new coefficients, should you need to reset the sensor. Realize you will have to reset the sensor if the Calibration Check-up fails to come into tolerance of ± 0.2 inch of 15.0 inches. Otherwise, you should not perform a calibration reset.

The load cell is calibrated via the Zenosoft user menus which are accessed by the laptop computer at the data logger enclosure, using the HyperTerminal program.

The HyperTerminal is already resident in your MS Windows operating system. Yet, each time you connect to the Zeno data logger port, you need to re-establish the communications settings for the COM1 port. Here's a ready reference: Set up your laptop's Hyper Terminal program, first.

From the Windows desktop, press:

**Start,
Programs,
Accessories,
Communications, and
Hyper Terminal.**

At the prompt enter a **name** for the connection, (e.g., FPU_Link) and select an **icon** (e.g., red umbrella picture).

Press OK.

At the 'Connect To' prompt select **COM1** and

Press OK.

Enter the following Port Settings:

Baud rate: 9600 bits per second.

Data bits: 8.

Parity: none.

Stop bits: 1.

Flow Control: none. ← *Important! This is a required change from default!*

Press OK.

The Hyper Terminal screen will appear and you will be connected to COM1.

At this point the ZENO is waiting for you to enter the appropriate user menu.

1. Start Calibration:

From the Zeno Menu, type **u** and press **<enter>** to enter the User Menu.

Type **t <enter>** to enter the Test Menu.

This will display the Test Menu as illustrated, here.

2. Calibrate Sensor One:

Type **c1** and press **<enter>**

- The unit will request a PASSWORD, type **zeno** and press **<enter>**. Do not change password.

- The sensor name should be RainWeight .

3. Set the Initial Gain to 1000:

Hitting **<enter>** without entering anything leaves the existing number in place.

3.1 Enter **0** (zero) and press **<enter>** for “A”

3.2 Enter **1000** and press **<enter>** for “B”

3.3 Enter **0** and press **<enter>** for “C”

Now the screen will return to the Test Menu. The last three inputs, above, were necessary to establish a stable, known, condition where the gain is 1000, with no offset, so that we can use the Zeno’s input like a voltmeter to obtain accurate response measurements for the next steps.

```
[Note! Menus abbreviated for clarity!]
> u
USER MENU
(C) Comms                (T) Test Menu
(F) Sys Func            (Z) ZenoProgM
(S) SampPer            (Q) Quit
(D) DataRetr           (H) Help

> t
TEST MENU
(Rx,y) Sens x-y RAW    (Ex) x Err Codes
(Sx,y) Sens x-y SCALED (P) Pass-Thru
(Cx)  CalSens x        (U)  User Menu
(Vx)  ViewProc x       (Q)  Quit
(D)   ViewDataCntrs   (H)  Help
(B)   BIT Status

> c1
Enter Administrator Password: ****

Sensor Name: RainWeight

Conversion Coefficient A: 0
Enter new Conversion Coefficient
A: <ent>

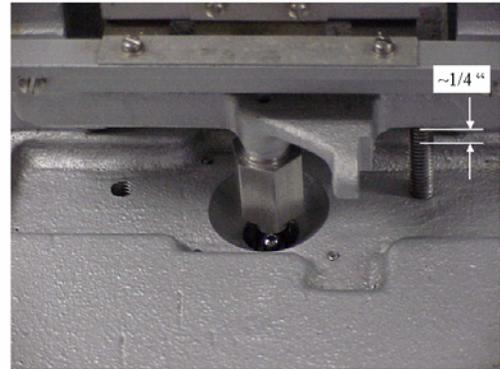
Conversion Coefficient B: 1256.6
Enter new Conversion Coefficient B:
1000

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

TEST MENU
(Rx,y) Sens x-y RAW    (Ex) x Err Codes
(Sx,y) Sens x-y SCALED (P) Pass-Thru
(Cx)  CalSens x        (U)  User Menu
(Vx)  ViewProc x       (Q)  Quit
(D)   ViewDataCntrs   (H)  Help
```

3.4. Calculate the Actual Gain by using the FPU measuring system:

3.4.1 Start with an empty bucket. Lower the shipping bolt so that there is a visible gap (~ 1/4 inch) between the top of the bolt and the front support. Verify that the plunger is touching the load cell ball bearing and that the weight of the empty bucket assembly is on load cell.



Note: The load cell is very sensitive. Use care to not bump the gauge during the following steps.

3.4.2 At the test menu prompt type **s1,1** and press **<enter>**. This will result in the output of sensor measurements for the first sensor (precipitation weighing sensor) every second:

3.4.3 The displayed value should change every six seconds (six readings) or so.

- Allow this to run for at least 30 seconds for the readings to stabilize.
- Then, as the numbers scroll by, jot down 10 different values and average them (add all ten values together and divide the total by 10).
- For example:

Add:

```

3.9043
3.9006
3.9021
3.8980
3.9006
3.9018
3.9051
3.9037
3.9029
+3.9024
-----
39.0215
    
```

Then Divide:

```

TEST MENU
(Rx,y) Sens x-y RAW      (Ex) x Err Codes
(Sx,y) Sens x-y SCALED  (P)  Pass-Thru
(Cx)  CalSens x         (U)  User Menu
(Vx)  ViewProc x       (Q)  Quit
(D)   ViewDataCntrs   (H)  Help
(B)   BIT Status

> s1,1
Note: Hit any key to halt output.
RainWeight
3.9043
3.9006
3.9006
3.9006
3.9006
3.9006
3.9021
3.9021
3.9021
3.9021
3.9021
3.9021
3.8980
3.8980
3.8980
3.8980
3.8980
3.9006
RainWeight
3.9006
3.9006
3.9006
3.9006
3.9018
3.9018
3.9018
3.9018
3.9018
3.9018
3.9051
3.9051
    
```

$$\begin{array}{r} 3.90215 \\ 10 \overline{)39.0215} \end{array}$$

Averaged value = 3.9022

Label the averaged value, B1, for use in instruction 3.4.8, below. Typical numbers should range from 0.8xxx to 5.xxxx. If you are not getting numbers near this range, recheck and reseal all load cell cables' connections, and try again.

3.4.4 When done, press <enter> on the laptop to halt the update. The Test Menu will return.

3.4.5 Place exactly 15 inches of equivalent weight in the bucket. If using the F&P calibration weight set (D111-TE500), add the three large weights to the bucket. Be careful not to drop the weights as it could damage the load cell.

3.4.6 At the prompt of the Test Menu:

- type **s1,1** and press <enter>.
- Allow time for the readings to stabilize, then as the readings scroll by, record 10 different values and average them as you did in instruction 5.4.3, above.
- Label the averaged value, B2, for use in instruction 5.4.8, below.
- B2 should range from **11.xxxx** to **17.xxxx**. B2 for the example numbers = 15.2007

If you are not getting numbers near this range, recheck that 1000 was accepted for conversion coefficient B (instruction 3.3.2, above) and re-start there if necessary.

3.4.7 When done, press <enter> to halt the update. The Test Menu will return.

```

TEST MENU
(Rx,y) Sens x-y RAW      (Ex) x Err Codes
(Sx,y) Sens x-y SCALED  (P)  Pass-Thru
(Cx)  CalSens x         (U)  User Menu
(Vx)  ViewProc x        (Q)  Quit
(D)   ViewDataCnts     (H)  Help
(B)   BIT Status

> s1,1
Note: Hit any key to halt output.
RainWeight
15.2018
15.2059
15.2059
15.2059
15.2059
15.2059
15.2059
15.2018
:      [abbreviated to show more #s]
15.1893
:
15.1900
:
15.1938
:
15.2297
:
15.2215
:
15.2121
:
15.1787
:
15.1846
:
    
```

3.4.8 Calculate new gain coefficient B; let B = 15000 / (B2 - B1).

Example using the numbers above:

$$(B2 - B1) = (15.2007 - 3.9022) = (11.2985)$$

then:

$$11.2985 \overline{)15000.0000} \begin{array}{r} 1327.6098 \\ 112985 \\ \hline 15000.0000 \end{array}$$

therefore: B = 1327.6098

This equation represents the Actual Gain: (15" x Gain) divided by the difference in weight between bucket full and bucket empty. You should obtain a number between **925.xxxx** and **2500.xxxx**. If you are not getting numbers near this range and B1 and B2 were within range, recheck your calculations.

Now go back to Calibrate Sensor 1 and enter the new B value:

Type **c1**<enter> at the prompt,

Press <enter> to leave 'A' at zero.

Enter the B value from above by typing **1327.6098** and press <enter>

Press <enter> to leave 'C' at zero.

The test menu will return.

```

TEST MENU
(Rx,y) Sens x-y RAW           (Ex)  x Err Codes
(Sx,y) Sens x-y SCALED       (P)   Pass-Thru
(Cx)  CalSens x              (U)   User Menu
(Vx)  ViewProc x             (Q)   Quit
(D)   ViewDataCtrs          (H)   Help
(B)   BIT Status

> c1
Sensor Name: RainWeight

Conversion Coefficient A: 0
Enter new Conversion Coefficient A:<ent>

Conversion Coefficient B: 1000
Enter new Conversion Coefficient B: 1327.6098

Conversion Coefficient C: 0
Enter new Conversion Coefficient C: <ent>

TEST MENU
(Rx,y) Sens x-y RAW           (Ex)  x Err Codes
(Sx,y) Sens x-y SCALED       (P)   Pass-Thru
(Cx)  CalSens x              (U)   User Menu
(Vx)  ViewProc x             (Q)   Quit
(D)   ViewDataCtrs          (H)   Help
(B)   BIT Status
    
```

4. Determine the Offset, Coefficient C:

- 4.1 Remove all weights from the bucket. The bucket must be empty of all fluid and as dry as you can practically get it. If this bucket has any detachable parts, like an auto-siphon, leave them installed.

4.2 From the Test Menu

- type **>s1,1=** and press **<enter>**.
- Allow this to run for at least 30 seconds for the readings to stabilize.
- Jot down 10 different values and average them as you did above.

The example #s average to 5.1823. Label it C3 in your notes. C3 = 5.1823

Your C3 should fall between **2.xxxx** and **5.xxxx**. This weight will depend on the actual weight of your bucket. Remember your bucket should have been empty and dry as possible.

If you are not getting numbers near this range your bucket is either extremely heavy or light. Is it? Is this a non-standard bucket? Or perhaps you did not empty the bucket of the metal calibration weights? Or there were problems in the previous steps, if so, go back and fix the earlier problem.

4.3 When done, press **<enter>** to halt the update.

4.4 Type **c1<enter>**

- press **<enter>** to leave A at zero
- press **<enter>** to leave B as it is
- type a **minus C3** to update C as required
- Type **-5.1823** and press **<enter>** but use your C3, making sure you enter the minus sign.
- The Test Menu will return.

```

TEST MENU
(Rx,y) Sens x-y RAW      (Ex) x Err Codes
(Sx,y) Sens x-y SCALED (P) Pass-Thru
(Cx)  CalSens x         (U)  User Menu
(Vx)  ViewProc x        (Q)  Quit
(D)   ViewDataCntrs    (H)  Help
(B)   BIT Status

> s1,1
Note: Hit any key to halt output.
RainWeight
:
5.1829
5.1829
5.1829
5.1829
5.1842
:
5.1805
:
5.1808
:
5.1857
:
5.1829
:
5.1818
:
5.1800
:
5.1836
:
5.1808
:

TEST MENU
(Rx,y) Sens x-y RAW      (Ex) x Err Codes
(Sx,y) Sens x-y SCALED (P) Pass-Thru
(Cx)  CalSens x         (U)  User Menu
(Vx)  ViewProc x        (Q)  Quit
(D)   ViewDataCntr s    (H)  Help
(B)   BIT Status

> c1
Sensor Name: RainWeight

Conversion Coefficient A: 0
Enter new Conversion Coefficient A: <ent>

Conversion Coefficient B: 1327.61
Enter new Conversion Coefficient B: <ent>

Conversion Coefficient C: 0
Enter new Conversion Coefficient C: -5.1823

TEST MENU
    
```

5. Verify a Correct Calibration:

5.1 With the plunger resting on the load cell ball and the weight of the empty bucket assembly on the load cell, at the test menu

- type **>s1,1=** and press **<enter>**.
- Verify that these values are 0.0 \forall 0.2. If not within the above range, redo the calibration from instruction 5.2.

5.2 Now, place the equivalent weight of 15 inches of precipitation into the weighing bucket. (Add the three large weights of D111-TE500.)

After the data stabilizes, verify that the values are 15.0 \forall 0.2 inches. If not within the above range, redo the calibration from step 5.3.

Press **<enter>** when done to stop the scrolling data and return to the test menu.

```

TEST MENU
(Rx,y) Sens x-y RAW      (Ex) x Err Codes
(Sx,y) Sens x-y SCALED (P) Pass-Thru
(Cx)  CalSens x         (U)  User Menu
(Vx)  ViewProc x        (Q)  Quit
(D)   ViewDataCntrs    (H)  Help
(B)   BIT Status

> s1,1
Note: Hit any key to halt output.
RainWeight
-0.0013
:
-0.0007
:
0.0026
:
0.0013
:
-0.0005
:
0.0003
:
:
15.0088
:
15.0402
:
14.9720
:
14.9546
:
15.0158

TEST MENU
(Rx,y) Sens x-y RAW      (Ex) x Err Codes
(Sx,y) Sens x-y SCALED (P) Pass-Thru
(Cx)  CalSens x         (U)  User Menu
(Vx)  ViewProc x        (Q)  Quit
(D)   ViewDataCntrs    (H)  Help
(B)   BIT Status
    
```

6. Save the load cell calibration coefficients to memory:

If calibration was successful and you have entered the Cal Coefficients, the Site ID numerals, and finished any other changes that need to be saved into the default start-up memory of the GMA, use the E command to save all the new stuff to EEPROM.

6.1 While at the Test Menu, type **u**<enter> for the user menu

- and then type **c** <enter> to enter the communications menu.

6.2 Type **e** <enter> to save the calibration values to EEPROM. The display should appear as below and then return to the communications menu.

- these numbers may be different in your save, but you are looking to see that there are no ERROR statements and that it completed normally as shown here.

7. Exit the Zenosoft Menus:

When done and everything is satisfactory, type **q** <enter> to quit the Zenosoft menus.

8. Journal the Coefficients to Log Sheet

Ensure you write down the numerical values for A, B, and C, to some type of FPU Log Sheet, for entry into the CSSA Station Inspection Report, back at your forecast office.

```

TEST MENU
(Rx,y) Sens x-y RAW           (Ex) x Err Codes
(Sx,y) Sens x-y SCALED       (P)  Pass-Thru
(Cx)  CalSens x              (U)  User Menu
(Vx)  ViewProc x             (Q)  Quit
(D)   ViewDataCntrs         (H)  Help
(B)   BIT Status

> u

USER MENU
(C) Comms                    (T) Test Menu
(F) Sys Func                  (Z) ZenoProgM
(S) SampPer                   (Q) Quit
(D) DataRetr                  (H) Help

> c

COMMUNICATIONS MENU
(Cn/m) Change n To m        (R) Repeater
(M)   Modem Menu            (Tn) TerminalMde
(P)   PowerContr            (E) SaveToEEPROM
(G)   GOES Menu             (U) User Menu
(A)   ARGOS Menu            (Q) Quit
(D)   DigitContr            (H) Help

Item 1:  9600                (COM1 Baud Rate)
:
Item 20: NO                  (EnableCSAIL)

> e

Verifying param be stored in EEPROM
Saving param to EEPROM . . .
Saving sensors to EEPROM . . .
Saving processes to EEPROM . . .
Saving data lists to EEPROM . . .
Saving repeater lists to EEPROM . . .
Saving serial scripts to EEPROM . . .
Saving constants to EEPROM . . .
1060 out of 8192 bytes used in EEPROM.
EEPROM Writes=24, EEPROM Checksum=115.

COMMUNICATIONS MENU
(Cn/m) Change n To m        (R) Repeater
(M)   Modem Menu            (Tn) TerminalMde
(P)   PowerContr            (E) SaveToEEPROM
(G)   GOES Menu             (U) User Menu
(A)   ARGOS Menu            (Q) Quit
(D)   DigitContr            (H) Help

Item 1:  9600                (COM1 Baud Rate)
:
Item 20: NO                  (EnableCSAIL)

> q
Exiting user interface.
    
```

APPENDIX E – POLICY DIRECTIVES AND RESOURCES

1. Engineering Handbooks (NWS):

The following content in EHB-10 is superseded by the, *FPU Operations Manual* (Sep 2005), and, *FPU Assembly Procedural* (August 2006), issued by the NWS, Observing Services Division (W-OS7):

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

EHB-10, 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 Upgrade (FPU) equipment

EHB-1; 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 description of the FPU equipment for the EHB-1, Sec D.

2. Vendor’s Manual Supplied with the NLSC Kit:

The Coastal Environmental Systems (CES) handbook, ‘*FPU Technical Manual*, version 3.2 (Feb 5, 2003), is part of the contract deliverables to the Government. Caution is advised because version 3.2, contains several instances of erroneous instructions. You are advised to use the NWS headquarters issued “*FPU Operations Manual*,” dated June 2005.

- a. *FPU Technical Manual v3.2* (Feb 5, 2003), delivered with kit on CD-ROM and print. **Note:** Do not use this document to calibrate the FPU load sensor.

Use only ‘*FPU Assembly Procedural* (Aug 2006)’ or the OPS11 edited version of the contractor’s *FPU Technical Manual, version 2.2*, it is dated December 4, 2003. Access either on:

<http://www.nws.noaa.gov/ops2/Surface/coopimplementation>.

- b. *Fischer Porter Upgrade User Manual for PC Key Reader*, Ver 2.0 (May 17, 2002). No known deficiencies were reported as of June 2005.

3. Official NWS Policy and Procedure Manuals required for the Fischer Porter Upgrade (FPU) :

- a. *FPU Assembly Procedural* (W-OS7, web posted Aug 2006) *
- b. *FPU Observer Instructions* (W-OS7, web posted April 2005) *

- c. *FPU Operations Manual* (W-OS7, web posted Sep 2005) *
- d. *CSSA User Manual* (NDS 10-1313; dated Mar 18, 2005) *
- e. *NLSC Supplies Memo* From Mike Campbell (Mar 3, 2005) to Al Wissman. *
- f. *EHB-1: Instrumental Equipment Catalog*
<http://www.ops1.nws.noaa.gov/ehbs/ehb1.htm>
- g. *NWSM 50-1115: Occupational Safety and Health Manual*
https://www.ops1.nws.noaa.gov/Secure/SAFETY/Safety_manual.htm
- h. *Integrated Logistics Support Planning* NDS 30-3102
<http://www.nws.noaa.gov/directives/030/030.htm>
- ii *Supply Manual and Catalog* NDS 30-3101
<http://www.nws.noaa.gov/directives/030/030.htm>
- j. *Public Information Statement (PNS) Template* (for each effected WFO) *

* 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>.

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FPU MODIFICATION NOTE 01

SUBJECT: Bond FPU Chassis to Gauge Chassis, Installation Instructions

PURPOSE: Reduce damage to load cell from surges

EQUIPMENT : Used with:
AFFECTED D111C

Replaces:
N/A

PARTS REQUIRED: Locally supplied

SPECIAL TOOLS: None
REQUIRED

MODIFICATION : None
PROCUREMENT

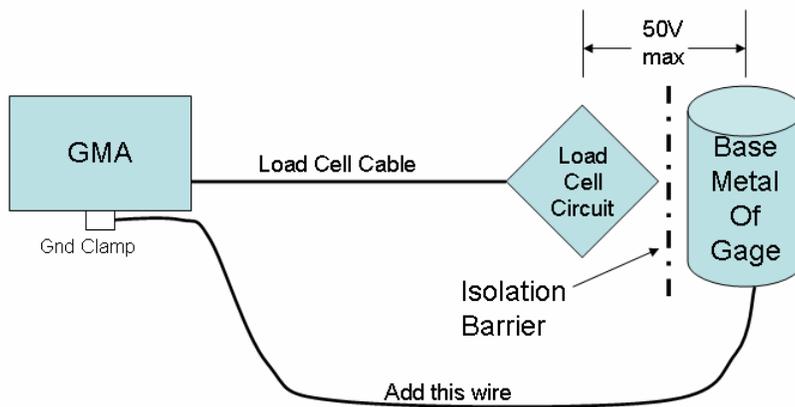
EFFECTIVITY: All FPU sites

ESTIMATED TIME: 2 hours
REQUIRED

EFFECT ON : None.
OTHER
INSTRUCTIONS

GENERAL:

This Modification Note authorizes and instructs the NWSREPs to change the physical configuration of all installed and to be installed Fischer & Porter Upgrade (FPU) Units. This modification is necessary to provide protection to the FPU load cell sensor and prevent damage caused by surges or static charges. This modification should be carried out as soon as practical, certainly before the next thunderstorm season, but does not warrant emergency status priority.

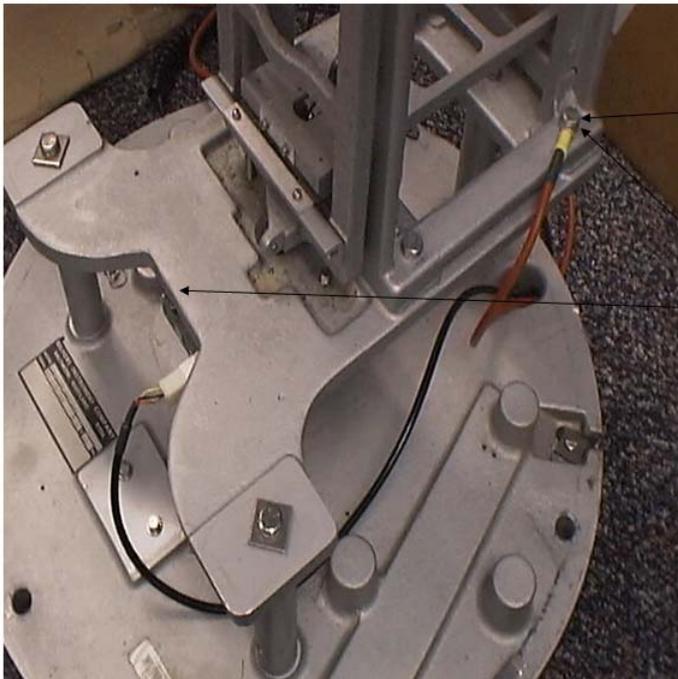


Problem: Lightning ground surge can raise Gauge well above 50V max.

Solution: Bond GMA chassis to gauge to keep Both at same potential.

As illustrated above, the load cell circuit floats within the body of the F&P shell. Because the gauge and the FPU enclosure are typically mounted with some separation, wind generated static charges and/or lightning induced ground surges can generate large differential voltages between the two devices. These large voltages will overcome and puncture the delicate isolation barrier under the strain gauges in the load cell, causing current leakage that renders the sensor inoperable.

Adding a bonding wire between the FPU enclosure and the F&P platform that the load cell is mounted upon, will keep these two at the same potential and eliminate the problem.



Attach bonding wire Here.

Check for good conductivity between Bolt and PCB mounting screw.

Installation:

- First check for low resistance (less than 1 ohm) between one of the PCB mounting screws on the face of the load cell, and the rear bolt as shown above. If more than one ohm, abrade the paint under the bolt head to get a good connection.
- Then crimp a ring lug onto at least 10 AWG stranded wire and secure the lug under the bolt. The ring lug must be suitable for a 1/4" stud.
- Run the wire out the wire port, and over to the FPU enclosure.



- Cut to length, and strip ½” insulation from the end. Attach the bare end to the Gnd clamp under the center back of the enclosure.
- Dress the wire as necessary to secure it in place.



This completes the modification.

Acronyms:

AWG 10 – American Wire Gage, 2.59mm diameter
CSSA – COOP Station Service Accountability
D111C – Fischer Porter Upgrade Rain Gauge
FPU – Fischer Porter Upgrade
GND – Ground
GMA – Gage Modification Assembly
HMT – Hydro-Met Technician
PCB – Printed Circuit Board

REPORTING INSTRUCTIONS:

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

Equipment code of FPU in the EQUIPMENT block.

Check "Modified" in the Maintenance Performed section.

In the Remarks section, enter: Completed Modification XX, to bond FPU chassis to gauge chassis.

**COOPERATIVE STATION SERVICE ACCOUNTABILITY (CSSA)
SITE INSPECTION REPORT**

Station Name: **PAINTER 2W** Station Number: **44-6475** Climate Division: **01**

INSPECTION DATA

Inspector: HYDRO-MET TECHNICIAN Per Diem: N
 Inspection Type: EMERGENCY Trip Number:
 Inspection Date: 01/04/2006 Supplies Cost:
 Staff Hours: 8.0 Trip Cost:
 Miles Driven: 225

EQUIPMENT	Maintenance Performed - More than one may be chosen					
MMTS-1	<input checked="" type="checkbox"/> Not Serviced	<input type="checkbox"/> Painted	<input type="checkbox"/> Modified	<input type="checkbox"/> Replaced	<input type="checkbox"/> Moved/Relocated	
	<input type="checkbox"/> Routine Maintenance	<input type="checkbox"/> Calibrated	<input type="checkbox"/> Repaired	<input type="checkbox"/> Installed	<input type="checkbox"/> Removed	
FPU	<input type="checkbox"/> Not Serviced	<input type="checkbox"/> Painted	<input checked="" type="checkbox"/> Modified	<input type="checkbox"/> Replaced	<input type="checkbox"/> Moved/Relocated	
	<input type="checkbox"/> Routine Maintenance	<input type="checkbox"/> Calibrated	<input checked="" type="checkbox"/> Repaired	<input type="checkbox"/> Installed	<input type="checkbox"/> Removed	
SRG	<input checked="" type="checkbox"/> Not Serviced	<input type="checkbox"/> Painted	<input type="checkbox"/> Modified	<input type="checkbox"/> Replaced	<input type="checkbox"/> Moved/Relocated	
	<input type="checkbox"/> Routine Maintenance	<input type="checkbox"/> Calibrated	<input type="checkbox"/> Repaired	<input type="checkbox"/> Installed	<input type="checkbox"/> Removed	
CRS	<input checked="" type="checkbox"/> Not Serviced	<input type="checkbox"/> Painted	<input type="checkbox"/> Modified	<input type="checkbox"/> Replaced	<input type="checkbox"/> Moved/Relocated	
	<input type="checkbox"/> Routine Maintenance	<input type="checkbox"/> Calibrated	<input type="checkbox"/> Repaired	<input type="checkbox"/> Installed	<input type="checkbox"/> Removed	

Attachment A Inspection Report Sample

https://ops13web.mws.noaa.gov - CSSA Site Inspection - Microsoft Internet Explorer

Inspection Date: 01/04/2006
Staff Hours: 8.0
Miles Driven: 225

Supplies Cost:
Trip Cost:

EQUIPMENT	Maintenance Performed - More than one may be chosen				
MMTS-1	<input checked="" type="checkbox"/> Not Serviced	<input type="checkbox"/> Painted	<input type="checkbox"/> Modified	<input type="checkbox"/> Replaced	<input type="checkbox"/> Moved/Relocated
	<input type="checkbox"/> Routine Maintenance	<input type="checkbox"/> Calibrated	<input type="checkbox"/> Repaired	<input type="checkbox"/> Installed	<input type="checkbox"/> Removed
FPU	<input type="checkbox"/> Not Serviced	<input type="checkbox"/> Painted	<input checked="" type="checkbox"/> Modified	<input type="checkbox"/> Replaced	<input type="checkbox"/> Moved/Relocated
	<input type="checkbox"/> Routine Maintenance	<input type="checkbox"/> Calibrated	<input checked="" type="checkbox"/> Repaired	<input type="checkbox"/> Installed	<input type="checkbox"/> Removed
SRG	<input checked="" type="checkbox"/> Not Serviced	<input type="checkbox"/> Painted	<input type="checkbox"/> Modified	<input type="checkbox"/> Replaced	<input type="checkbox"/> Moved/Relocated
	<input type="checkbox"/> Routine Maintenance	<input type="checkbox"/> Calibrated	<input type="checkbox"/> Repaired	<input type="checkbox"/> Installed	<input type="checkbox"/> Removed
CRS	<input checked="" type="checkbox"/> Not Serviced	<input type="checkbox"/> Painted	<input type="checkbox"/> Modified	<input type="checkbox"/> Replaced	<input type="checkbox"/> Moved/Relocated
	<input type="checkbox"/> Routine Maintenance	<input type="checkbox"/> Calibrated	<input type="checkbox"/> Repaired	<input type="checkbox"/> Installed	<input type="checkbox"/> Removed
MXMN	<input checked="" type="checkbox"/> Not Serviced	<input type="checkbox"/> Painted	<input type="checkbox"/> Modified	<input type="checkbox"/> Replaced	<input type="checkbox"/> Moved/Relocated
	<input type="checkbox"/> Routine Maintenance	<input type="checkbox"/> Calibrated	<input type="checkbox"/> Repaired	<input type="checkbox"/> Installed	<input type="checkbox"/> Removed

106 characters left

Remarks
 LOAD SENSOR FAILURE DUE TO SUSPECTED LIGHTNING STRIKE. 1ST REPLACEMENT WAS BAD. NWS ENGINEERING RECOMMENDED BONDING THE TWO FPU STRUCTURES TOGETHER.

Attachment A, Cont'd: Inspection Report Sample

APPENDIX G - FPU PARTS AND AGENCY STOCK NUMBERS (ASN)

General Name	Short Desc.	Long Desc	ASN	SMR *
Load Cell Assembly	Load Cell Assembly, FPU	Load Cell Assembly, FPU, complete with load cell PCB, block, post, cell, ball, and 4 long machine screws with washers and lockwashers.	D111C-1A1	PADDD
Load Cell Cable	Load Cell Cable, FPU	Load Cell Cable, FPU, 8 feet long, with connectors and integral strain relief.	D111C-1W1	PAOZZ
Anvil	Post, FPU, load cell.	Anvil or post for FPU load cell, mates F&P gauge to load cell ball.	D111C-1A2	PAOZZ
GMA	ZENO-GMA, FPU	Gauge Modification Assembly for Fisher & Porter Gauge Upgrade, includes Zeno datalogger, solar panel regulator, display, keypad, data key interface, and housing.	D111C-2A1	PAODD
- Regulator	Regulator PCB for Solar Panel, GMA, FPU	Regulator PCB for Solar Panel, GMA, FPU	D111C-2A1A3A1	PADDD
- Fuse	Fuse, Glass Tube, 250V, 3AG, Normal, 5-Amp	5 Amp fuse for solar panel regulator of GMA. Place holder. Pointer to ASN: 017-F-4-35 for real stock number.	D111C-2A1F1	PAOZZ
- DataKey	DataKey, serial memory key, 1Mb, SFK series	DataKey, serial memory key, 1Mb, SFK series flash memory, Datakey Electronics, Inc, PN 611-0083-002, Red color.	D111C-2A2	PAOZZ
- Battery	Battery, 12V, 84AH, Sealed Lead Acid	Battery, 12V, 84AH, Deep Cycle, AGM, Sealed Lead Acid, Bolt terminals, 54 lbs, wide temperature range, for solar panel applications, Concorde Battery Corporation, PVX-840T, Sun Xtender Series.	D111C-2B1	PAOZZ
- Cable, battery	Cable, Battery, internal to GMA, FPU	Battery Cable for inside GMA enclosure.	D111C-2W1	PAOZZ
- Enclosure	Enclosure, SSteel, GMA, FPU.	Stainless Steel Enclosure, GMA, FPU, with mounting hardware and parts.	D111C-2A4	PAOZZ

Solar Panel	Solar Panel, 20W, 12V nom. @ 1.5A, reverse diode included, no regulator.	Solar Panel, 20W, Siemens ST20, 12V nom. @ 1.5A, reverse diode included, no regulator, metal frame, with pole mounting bracket.	D111C-3	PAODD
- Cable, Solar Panel	Cable, Solar Panel to GMA, FPU.	Solar Panel Cable, with connector and junction box, use between FPU GMA and ST20 solar panel	D111C-3W1	PAOZZ
FPU External Parts	Cable, Thermistor to GMA, FPU	Thermistor cable, direct burial, use between MMTS beehive and GMA.	D111C-4W1	PADDD
FPU Off-Site Parts	DataKey reader, power supply, and application CD-rom.	DataKey reader, power supply, and application CD-rom , for use with FPU written Datakeys.	D111C-6	PAOZZ
FPU Test Plug	Testing instrument to isolate the rain gauge load sensor.	FPU Load Sensor Test Plug	D111C-1A1T1	PAOZZ

* The FPU 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.

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APPENDIX H

FPU EVENT LOG SHEET

COOP Station Number : i.e., 23-4377 **Your Name :** i.e., John Williams **If Organization, then Name :** i.e., U.S. Army Corp of Engineers

LOG DATE	DATA TO KEY	BUCKET LEVEL	ANTIFREEZE / OIL	FUNNEL IN / OUT	SPECIAL NOTES:
Today's Date : i.e., Apr 15, 2005	Date and time of your last <u>Data Key</u> download.	Date and time <u>bucket</u> was last partially or completely <u>drained</u>.	Date and time <u>antifreeze</u> and or <u>oil</u> was last added.	Date and time <u>funnel</u> was removed for winter ; or installed for summer.	Any <u>anomaly</u> or <u>outage</u> event? Give date and the elapsed time of outage. Describe the problem.
Apr 15, 2005	9:15am Apr 6, 2005	2pm Mar 14, 2005	11am Oct 9, 2004, for antifreeze	Installed 2pm Mar 14, 2005	None to report. Routine gauge check (i.e., Code 104) done on Wed Apr 6 th .

NWSREP Name : _____ **NWSREP Phone :** _____.

Instructions: Write the significant events that happen each month. Always phone your NWSREP if there is an FPU system outage or an anomaly that might adversely affect the integrity of the power system, the data logger, or the data itself. Your Observing Station may design its own worksheet to suit its needs with the intention to account for the same areas of operation as indicated above. If NWSREP approves, you may regularly mail your Observer Log Sheets to your NWSREP.



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