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TITLE: OPERATION OF THE FLUKE HYDRA DATA BUCKET DATA ACQUISITION SYSTEM, WITH AND WITHOUT A PC INTERFACE

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PURPOSE: This document will detail the steps necessary to operate the Fluke Hydra Data Bucket in standalone mode and with a PC.

RESPONSIBILITY: It is the responsibility of the person(s) performing this procedure to be familiar with this procedure and references. It is the responsibility of the SNL WIPP SITE Data Acquisition System Coordinator, acting through existing SNL QA Channels, to approve the qualifications of any person prior to his becoming an operator of this system.

SAFETY: All voltages associated with this data acquisition unit are below 40 volts and should not be a hazard. If the unit is used underground all normal underground access and working rules will apply to persons using this procedure.

REFERENCES: (latest revision)

- I. Fluke Hydra Data Bucket User's Manual. Fluke Hydra Logger Package Application software users manual
- II. Appropriate test plan for whatever test the Fluke Hydra Data Bucket is to be used
- III. Cognizant Engineer's test documentation

FORMS: (latest revision)

SNL WIPP form SSSPT38, Computer Based Data Transmission Documentation

QA RECORDS:

- I. SNL WIPP form SSSPT38, Computer Based Data Transmission Documentation
- II. Floppy diskettes containing the resulting data files

PROCEDURE:

- I. Operating the Fluke Hydra Data Bucket in stand-alone mode for data acquisition
 - A. See section 2 of the users manual for guidance in using the front panel switches for operation.

NOTE: The Test Engineer must have provided the operator of this equipment proper documentation, which will identify gage configuration, expected voltage values, and alarm limits for each data channel. QA must have a copy of this documentation on file before the test can proceed.
 - B. Ensure that the gages to be used have been properly wired to the connector board on the back of the Hydra Data Bucket. There are 21 channels, 0 thru 20, however channel 0 can only be inputted from the front terminals, and will not support thermocouple measurements. Make sure the memory card has been properly installed in its slot. (See Figure 1-1 in users manual.)
 - C. Press power switch to "on". The unit will go thru an automatic self test and then "beep" when finished.
 - D. To select a channel for configuration: Press the function key. (Press the up/down arrows until the proper display points to channel to configure.) Press Enter.
 - E. Press function key then up/down arrow key until menu arrow points to type of measurement desired, VDC, VAC, Ω , HZ, °F, °C, Off. Press Enter.
 - F. Next select the measurement scale for the channel selected by toggling the up/down arrow key until proper set func for scaling, Auto, 300.00V, 150.00V, 30.00V, 3.0000V, 300.00mv, 90.000mv. Make selection and press enter.

- G. Press up/down arrow to choose next channel to be configured. Repeat steps A. thru G. until all channels are configured.

NOTE: If °F or °C are chosen an additional selection will need to be made for type of T.C. Use the up/down arrow keys to choose thermocouple type. J, K, E, T, N, R, b, S, C, Pt, are the selections available.

- H. To set the Scan Interval: Press the INTVL key to access the scan time menu. The format is HOURS:MINUTES:SECONDS. For example a scan of 1 hour, 25 minutes, 33 seconds would be formatted 1:25:33. After setting the desired scan interval, press Enter.
- I. To set the measurement rate: Press the Shift key then the right arrow key to access the measurement rate menu. Press the up/down arrow keys to select either SLO (slow) or FAST (Fast), then press Enter. (See Figure 2-12 in users manual). **WARNING! ACCURACY IS RATE DEPENDENT. YOU WILL LOSE ONE DIGIT OF RESOLUTION ON THE FAST RATE.** Slow is the default.
- J. SETTING THE ALARMS: To set alarm limits for any configured channel, the instrument must be in the inactive mode (not scanning or monitoring) and the desired channel must be configured with a measurement function and selected. To exit at any time, press the CANCL key; however, any alarm parameters previously entered will remain. Two alarm limits, alarm 1, and alarm 2, can be defined for each channel. If applied to a channel with MX+B scaling, the alarm is based on the scaled values. An alarm occurs when the measured value on the channel moves above the HI (high), or below the LO (low) value. Alarms can be made to start autoprinting, (Figure 5-3 in the users manual), start scanning with the Monitor-Alarm trigger option, or trigger other options via the digital outputs on the rear panel.
1. Press the alarm key. The limit #1 light will blink. Press return, and the OFF light will blink. Press the up arrow and LO will blink. Press Enter.
 2. Set the value of the limit using the up/down arrows. Press enter. The decimal will blink. Use the horizontal keys to set the decimal place.
 3. The set alarm limit #2 will now blink. Repeat for setting limit #2. For more information on alarm setups see Section 2-15 in the users manual.

- K. **SETTING THE MX+B SCALING:** In preparation, the instrument must be in the inactive mode (not scanning or monitoring) and the desired channel must be configured with a measurement function and be selected. To exit at any time, press the CANCL key; however, any MX+B parameters previously entered will remain. To change to new parameters the function parameters will need to be re-entered.
1. Press the Mx+B key. The letter M will appear on the screen, use the up/down arrow key to set value for M. Press enter.
 2. The letter small b will appear on the screen. Use the up/down arrow keys to set the value for b.
- L. **MEMORY CARD AS DATA DESTINATION:** Measurement data is not automatically sent to the memory card. Measurement data can be sent to a printer/PC, to the memory card, to both printer/PC and memory card, or to neither. The memory card should only be used to take data for each test, and then the data should be transferred to floppy disk and 2 ea. floppies should be filed in QA. The data should be transferred using the CSV (comma separated value transfer) function in the memory card menu.

II. OPERATING MODES:

With the channels configured and operating conditions set, the instrument is ready for operation in one of the following modes:

- Using the scan mode (Figure 2-15 users manual)
- Using the monitor mode (Figure 2-17 users manual)
- Using the review mode (Figure 2-18 users manual)

A. USING THE SCAN MODE:

1. **Starting the Scan Mode.** Press the SCAN key to start scanning. If the data destination includes the memory card and a data file has not been opened, a dAtxx file will be displayed.
2. If an error message appears, refer to Figure 2-16 Memory card error messages. (**NOTE:** The below messages are not typographical errors, they are typed just as they are seen on the screen.) Basically the messages are:

Err 1 CARD

CARD ERROR. Card is missing, unformatted, full of data, or the write-protect switch is set to "read only". If error occurs when card is inserted, card is unformatted. To format a card, press the "Files" key, press up/down arrow until on init. Press enter. To verify press up/down key to yES and press Enter. If yes is chosen menu changes to SURE, press enter to proceed or NO and enter to cancel.

Err 2 FILE

FILE ERROR. Unable to open a file. The selected file name is already assigned or all file names have been used (00 to 99). Select another file name, erase files, or use another card.

Err 3

CARD PROBLEM (scans saved). Scanned data is being stored in internal memory (75 scans maximum). Take action or the internal memory will overflow and data will be lost. Insert a usable replacement card and stored scans will be automatically transferred to the new card. If action is delayed, the error message changes to Err 4.

Err 4

CARD PROBLEM (scans lost). The most recent 75 scans are being stored in internal memory and the oldest scans are being discarded. Insert a useable card and the stored scans will be transferred to the new card.

bAd

REPLACEMENT CARD ERROR. The replacement card is either unformatted, full of data, the identical file name used for the current scan already exists, or the write protect switch is in the wrong position.

FULL

ACTIVE CARD ERROR. The active card recording measurement data is full. Install a replacement card and stored scans will be transferred to the new card. Display alternates with Err 3 or Err 4.

CArd

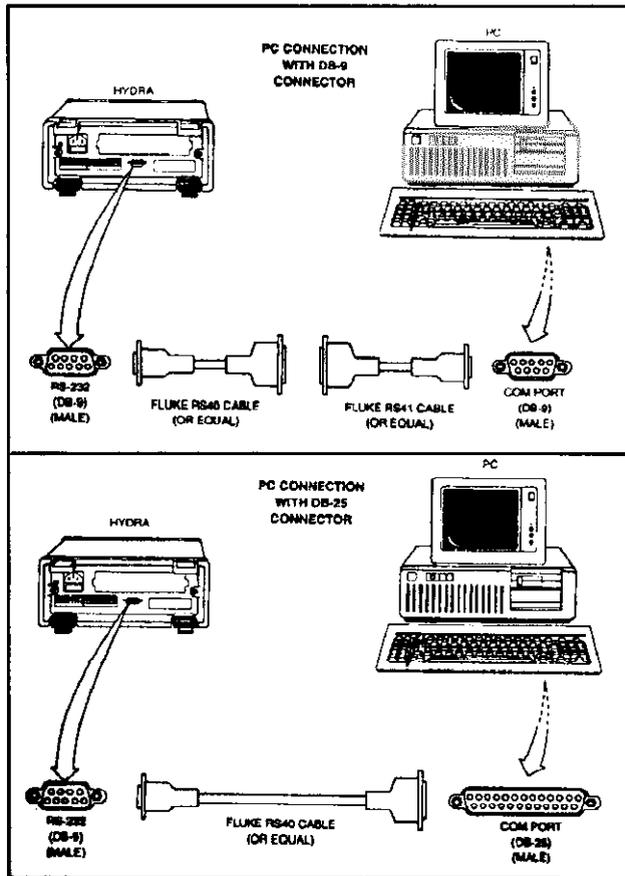
ACTIVE CARD ERROR. The active card has been removed during scanning. Reinsert the same card or install a replacement card. Display alternates with Err 3 or Err 4. Press the scan key again at any point to stop a scan.

- B. USING THE MONITOR MODE: The monitor mode can be started when the instrument is in the inactive mode or in the Scan Mode. The monitor mode commands the instrument to display the present measurement for any selected channel (except channels set to off), and to display the alarm information if the channel is in alarm. If the Monitor Mode is used without the Scan Mode, the instrument operates like a multimeter. If the Monitor Mode is used with the Scan Mode, the instrument also operates like a multimeter but measurements can be recorded into memory, printed out, and reviewed (maximum, minimum, last values). The Monitor-Alarm triggering option uses the Monitor Mode to start or stop scans when a selected channel goes into or out of alarm (see Figure 2-19 in users manual). If the instrument is in the Monitor Mode and scanning using the memory card, any illegal memory card operations are noted only with a double "beep". When you hear a double beep, exit the Monitor Mode and investigate the memory card error (see error codes listed above).
1. STARTING THE MONITOR MODE: Press the Mon key to start the Monitor Mode. Use the up/down arrow keys to select any configured channel and display the current measurement. Any monitored channel using autoranging will display AUTO. When the instrument is in the Monitor Mode, an internal relay closes every 10 seconds as part of the meter housekeeping activities. Relay closures are heard as a series of low-level audio "clicks" coming from the instrument.
 2. STOPPING THE MONITOR MODE: Press the Mon key again to stop the Monitor Mode (Off- will be displayed momentarily). If the meter is in the Scan Mode, the front panel changes to the scan channel/interval timer display.

- C. USING THE REVIEW MODE: The Review Mode is used any time during or after operation of the Scan Mode. Press the REVIEW key to start the Review Mode. Use the up/down arrow keys to select the channel for review, then use the right/left arrow keys to view the LAST, Min, and Max values recorded during the past scan intervals (scan can be active or inactive). Repeat for each channel of interest.
1. CLEARING THE REVIEW ARRAY: Press the Review key to start the Review mode. Press the SHIFT key and then the REVIEW key to clear all review data from all channels. If the scan mode is not active, the display will change to dashes (-----). If the scan mode is active, new values will appear. Press the REVIEW key again to exit the Review Mode.
- D. TOTALIZER OPERATION: The totalizer count can be monitored when the instrument is active or inactive.
1. To read the totalizer count: Press the Total key to view the contents of the totalizer counter. The maximum count is 65535. If the maximum count is exceeded, the display will show OL.
 2. TO ERASE THE TOTALIZER COUNT: Press the TOTAL key to view the contents of the totalizer counter. Press the SHIFT key and then the TOTAL key to reset the counter to zero. Press the TOTAL key again to exit.

III. CONFIGURING THE INSTRUMENT FOR COMPUTER OPERATIONS

NOTE: The PC which will be used with the Hydra Data Logger will have the Logger software already installed and configured by the DAS Coordinator. If the software is not installed on the computer which you are attempting to use with this procedure, call the DAS Coordinator before proceeding further.



CABLE HOOKUP TO PC

A. SETUP MENU

1. The Setup menu provides selections to set up the Hydra with the computer. To get into the setup menu type "logger".
2. The main menu for logger will come up. The main menu has across the top:

SETUP GO UTILS MEMCARD TERM DISPLAY QUIT

3. Use the down arrow to choose Inst1 and press return. Use the down arrow to "chans. config.". A new set of menus will appear to the right of the setup menu:

DONE
ALL
RESET

CH 0
CH 1
CH 2

CH 3
CH 4
|
THRU
CH 20

4. Choose each channel by down arrow and press return to choose channels to activate for this configuration. A checkmark will appear to the left of each channel activated. eg:

√CH 0

5. Choose only channels which are to be configured the same. (For example all VDC, or all TC, etc.) When done use up arrow to DONE. Press return. A new menu appears to the right of done:

DONE	FUNCTION	OFF	300MV
ALL	MX+B	VDC	3V
RESET	ALARMS	VAC	30V
		OHMS-2T	150/300V
		OHMS-4T	AUTO
		TC	90MV
		RTD-2W	900MV

B. FUNCTION

1. To set up a channel function: Press return to choose Function. A new menu appears to the right of Function. Use down arrow key to choose Off, VDC, ETC. Press return after the function has been chosen and then choose the voltage range, 300mv, 3v, 30v, etc. Press return.
2. When completed select done and press return. If another channel is to be configured a different way, these steps must be repeated for each configuration of a channel which is different.

C. Mx+B SCALING SELECTION

The Mx+B scaling menu enables or disables scaling, selects a Scale Factor (M), an Offset (B), Range code (1 through 16).

For example:

SETUP GO UTILS MEMCAR TERM DISPLAY QUIT
Scale Factor and Offset _____

Enable Mx+B (Y or N)Y

Scale Factor: 100
 Offset; 0

Range code: 6
 units string: PSI
 Tab to next field, Enter to accept: Esc to abort.

This example would enable Mx+B scaling for pressure.
 Range 6 = 99.999 max.

RANGE CODE TABLE:

Set Mx+B Scaling Values

Set the M and B scaling values for the indicated channel, and display the results of the Mx+B calculation in the indicated display range. Changing the Mx+B of any channel also clears the Review array, and resets ALARM OUTPUTS and DIGITAL I/O lines.

SCALE_MB <channel> <M_value> <B_value> <range>
 <channel> = 0, 1, 2, ... 20
 <M_value> = signed numeric quantity
 <B_value> = signed numeric quantity
 <range> = 1, 2, 3, ... 16

The range code for the display <range> is shown below:

RANGE CODE	DISPLAY OFFSET VALUE	MAX B	RANGE CODE	DISPLAY OFFSET VALUE	MAX B
1	0.0000 m	9.9999E-3	9	0.0000 k	9.9999E3
2	00.0000 m	99.9999E-3	10	00.0000 k	99.9999E3
3	000.000 m	999.999E-3	11	000.000 k	999.999E3
4	0000.000 m	9999.99E-3	12	0000.000 k	9999.99E3
5	0.0000 x1	9.9999	13	0.0000 M	9.9999E6
6	00.0000 x1	99.999	14	00.0000 M	99.999E6
7	000.000 x1	999.99	15	000.000 M	999.99E6
8	0000.000 x1	9999.9	16	0000.000 M	9999.9E6

When M=1 and B=0, there is no Mx+B scaling. The entries for M and B must be between ±0.0001E-3 and ±9999.9E+6. An Execution Error is generated by invalid entries, a channel set to OFF, if the instrument is scanning, or if the range code is too low for the selected B value. For example, the minimum display range for B=1000 is code 8. Mx+B scaling values for a channel are automatically reset to 1 (M) and 0 (B) when the function for that channel is changed. Returned measurements for a channel with Mx+B scaling has a function identifier of MX+B (when FORMAT 2 has been asserted).

Example: SCALE_MB 18,+.55555,-17.777,6 [For channel 18, M=+.55555, B=-17.777, and the display range is 00.000 x1.]

To exit Mx+B scaling selection use left arrow key to return to previous menu.

D. ALARM SELECTION

If alarms are to be used during testing, the Alarm Menu configures the two alarms that can be applied to any chosen channel. Any Combination of HIGH, LOW, or OFF can be

applied. To set the alarm values for channel 5 for instance to a high value of 75.875 and low value of 25.225 see the setup example below:

SETUP GO UTILS MEMCARD TERM DISPLAY QUIT

ALARMS INFORMATION _____

ALARM #1 (HIGH,LOW, OR OFF) HIGH
ALARM VALUE #1: 75.875
ALARM #2 (HIGH,LOW, OR OFF) LOW
ALARM VALUE #2: 25.225
ALARM #2 DIGITAL OUTPUT (0-7 or OFF): 5

TAB TO NEXT FIELD, ENTER TO SELECT, ESC TO ABORT

If you have questions about this operation look at Figure 2-5 in the HYDRA Applications software manual or call the DAS Coordinator.

E. INST. CONFIG. MENU

The "Inst. Config." menu provides global instrument configurations.

SETUP GO UTILS MEMCARD TERM DISPLAY QUIT
✓Inst1
Inst2
chans. config.
Inst. Config. Data Storage Config.
✓ Slow (High Res.) Rate
Fast Rate
Monitor

Celsius Temp. Units
✓ Fahrenheit Temp. Units

✓ Open TC Detect
✓ Totalizer debounce
Alarm Bell
Front Panel Lock

In the above example the Instrument has been configured to take data at the slow data rate, reading out in Fahrenheit, a TC with open TC Detection activated, and Totalizer Debounce activated. After making choices press Enter. Receive the Data Storage Config. Menu.

F. DATA STORAGE CONFIGURATION:

The "Data storage Config." menu determines the conditions

under which Hydra scan data is to be stored or printed. This is not a PC-related storage, but an integral Hydra data storage media such as logging to the memory card.

```
SETUP  GO  UTILS  MEMCARD  TERM  DISPLAY  QUIT

Inst. Config.  Data Storage Config.  Disable Store/Print
To Memory
Print
To Mem & Print
✓To Card File
To Card & Print

-----
✓Store All
Store alarms
Store Alarm Trans.
```

The above example shows the menu for saving scan data to the memory card and to save all scans. This will be the most often used setup for the Data Storage Configuration on most tests at WIPP. See The Hydra Logger Package Applications Software Manual for other Configuration information, or call the DAS Coordinator. Use left arrow to return to previous menu.

G. UTILS MENU

The Utils Menu contains file translation commands, DOS commands, configuration commands, and related functions for convenient file and configuration handling operations.

H. GO MENU

The "GO" menu controls instrument scanning, simulates data collection, and verifies the Logger Instrument Configuration compatibility.

1. Use the down arrow to choose from this menu:

```
GO
START SCANNING WITH CONFIGURATION UPLOAD
START SCANNING WITH CONFIGURATION DOWNLOAD
SIMULATED DATA COLLECTION
VERIFY CONFIGURATION
```

2. To start scanning with the configuration loaded into the Hydra from front panel switches use "start scanning with configuration upload".

To start scanning with configuration download from the computer use "Start scanning with configuration download".

To make a simulated data run use "Simulated data collection".

To verify configuration use "verify configuration".

I. QUIT MENU

1. To quit scanning move the curser to QUIT and press Return.
2. The computer will ask "Do you want to stop scanning?" The default is "NO". Type Y to stop scanning.

IV. DATA STORAGE AND QA REQUIREMENTS

A. Data Stored on the Solid State Fluke Card

1. Store all data on the Hydra memory card until transferred by Comma Separated Value file to either PC floppy disks, PC Hard Disk, or (both). (The logger program will generate this file by a menu driven routine in the logger package.) The interim data will be stored on floppy disks, copied from the hard card and verified, (2 copies) in QA.
2. All Storage files will have a filename, which is a unique identifier to each individual test and test date.

The files will be named as follows:

Hard Card Files: The file names are automatically chosen by the logger program and they are in the following format:

DAtxx.HYD The first file being: DAt00.HYD
 The second being: DAt01.HYD
 Etc.

Care must be taken to ensure that when the files are copied off onto a floppy disk that a unique format for each test file is followed:

DAXxyyzz.prn for Data Files

yWhere xx= the Month: 01,02,03...,12
yy= the day of the Month: 01,02,03,...,31
zz= Sequence Number: 01,02,03,...,99.

The sequence number is necessary to distinguish between files from different runs on the same day.

For example: The files run for the first run on Jan. 13th would be:

DA011301.prn

NOTE: No year information is contained in the file names. Make sure all floppy diskettes are correctly labeled. Each Floppy will be labeled with:

Date (include day, month, year)
Test Plan name or number
Test Type
Operator's Name

Using Form SSSPT38 transfer two copies of all diskettes to QA for each test ran on a daily basis.

B. Data Stored on the Controlling Computer Hard Disk

1. Scan data from the Fluke can be stored to the controlling personal computer as described in Section III.F. This data will be stored to a file in the C:\Logger subdirectory. The name of the data file will be that specified in the "Data File" portion of the "Setup" menu of Logger software.
2. At the conclusion of a series of tests, use the DOS Copy command to transfer and label the files to a floppy disk as defined in the procedure governing test conduct if specified. Otherwise label the files as described in the preceding Section IV.A. Make two identical copies of the data on two floppy disks.
3. Write the following information onto the disk labels as follows:

Date (Day, Month, Year format)
Test Plan Title
Test Type
Operator's Name
Data collected with Fluke Hydra Data Bucket
Data written in CSV format by Fluke Logger software
Data collected in Association with SNL WIPP Procedure XXX
(Where XXX is the number of the procedure used for governing test conduct and data collection.)

4. Transmit the data to the SNL WIPP Records Office and document the transfer using SNL WIPP Form SSSPT38.

REVISION SUMMARY

To be completed by procedure's author before final revision is circulated for signatures.

I. Revisions made: Added section on how to retrieve files on the controlling computer hard disk.

II. Personnel effected:

(Check appropriate ones)

MOC Craftsman
Drilling _____
Shop _____
Mechanical _____
Electrical _____
Gage _____
Cable/TC _____
U/G DAS X
Geotech _____

SNL JOB AREA
DAS General _____
DAS B49 Trailer _____
DAS Sheds _____
DAS Equip. Cal. & Inv. _____
Thermocouple _____
Cables _____
Drilling _____
Gage Installation _____
Gage Cal. & Removal _____
Plugging & Sealing X
Brine Transport _____
QA _____
General _____
Principal Investigator X
Bin Leak Tester _____
Permeability Testing X

III. Retraining required:

(Circle One)

Read/Re-read procedure

Practical demonstration

Other (explain)

Signature of
Procedure's Author

[Handwritten Signature]

Date 1/3/95