

MODIFICATION RECOMMENDED

53220A-01A

S E R V I C E N O T E

Supersedes:
53220A-01

53220A 350 MHz Universal Frequency Counter/Timer

Serial Numbers: MY50000001 – MY50000426

Upgrading Instruments with Firmware Revision 1.05 to 1.08 and Greater

The Agilent 53220A Universal Frequency Counter/Timer with firmware revision **1.05** requires a *one-time Edge Calibration* following a firmware update from 1.05 to revision 1.08 or greater

The Edge Calibration routine should also be performed following replacement of the P500 processor board (53220-67001) or measurement board (53220-66101 / 53220-66102). See Service Note 53220A-02.

ADMINISTRATIVE INFORMATION

| | | | |
|---|---|--|---|
| SERVICE NOTE CLASSIFICATION: | | | |
| MODIFICATION RECOMMENDED | | | |
| ACTION CATEGORY: | <input type="checkbox"/> ON SPECIFIED FAILURE <input checked="" type="checkbox"/> AGREEABLE TIME | STANDARDS | LABOR: 1.0 Hours |
| LOCATION CATEGORY: | <input type="checkbox"/> CUSTOMER INSTALLABLE <input type="checkbox"/> ON-SITE <input checked="" type="checkbox"/> SERVICE CENTER <input type="checkbox"/> CHANNEL PARTNER | SERVICE INVENTORY: <input type="checkbox"/> RETURN <input type="checkbox"/> SCRAP <input checked="" type="checkbox"/> SEE TEXT | USED PARTS: <input type="checkbox"/> RETURN <input type="checkbox"/> SCRAP <input checked="" type="checkbox"/> SEE TEXT |
| AVAILABILITY: | PRODUCT'S SUPPORT LIFE | NO CHARGE AVAILABLE UNTIL: September 10, 2012 | |
| AUTHOR: | JD | PRODUCT LINE: SP | |
| ADDITIONAL INFORMATION: if unit is returned with 1.08 previously installed by the customer, proceed directly with the Edge Calibration. | | | |

© AGILENT TECHNOLOGIES, INC. 2011
PRINTED IN U.S.A.

October 5, 2011

Rev. 18



Parts Required

The following parts are provided by SPD – one kit per designated service center.

| Part Number | Description | Requirements |
|--------------|--|--|
| ZFRSC-42-S+ | Mini-Circuits Splitter DC-4200 MHz | ≥ 4 GHz group delay mismatch between outputs: <5ps average delay unbalance: <3 ps |
| 415-0028-006 | Qty. 2 – matching cables. STR SMA PL to STR BNC PLUG, RG 316 | Length: ≤ 6 in Length Δ between cables: <0.03 in |
| 415-0028-012 | Qty. 1 STR SMA PL to STR BNC PLUG, RG 316 | |

Equipment Required

The following equipment (or equivalent) is recommended for the Edge Calibration.

| Part Number | Description | Requirements |
|---|---|---|
| Agilent 81133A* | Pulse/Pattern Generator, 3.35 GHz -Single Channel | square wave: 1 MHz – 13 MHz amplitude: ≥ 1Vpp into 50Ω output impedance: 50Ω offset from 50% sym.: < 20 ps rise/fall time: < 100 ps |
| Agilent 81134A* | Pulse/Pattern Generator, 3.35 GHz – Dual Channel | |
| SRS CG635* | Synthesized Clock Generator | |
| * recognized and set up/controlled programmatically by the Edge Calibration utility | | |

Situation:

To meet all published time interval measurement (time interval, pulse width, duty cycle, rise/fall time, phase, single-period) specifications, all 53220A instruments with firmware revision 1.05 must have the Edge Calibration described in this service note **after** upgrading to firmware revision 1.08 or greater.

Following the Edge Calibration, 53220A “Performance Test 5: Time Interval” is used to verify accuracy. No other calibration of the 53220A is required following an Edge Calibration.

Solution/Action:

Determining the Firmware Revision

The firmware revision of the 53220A counter can be determined by sending the *IDN? command, or by pressing ‘Help’ → ‘About’ on the front panel. The revision is represented by the first four digits in the “Firmware:” string.

Updating the Firmware

The firmware must be updated **before** the Edge Calibration is performed. The firmware and update utility is available on the web at:

www.agilent.com/find/53220A

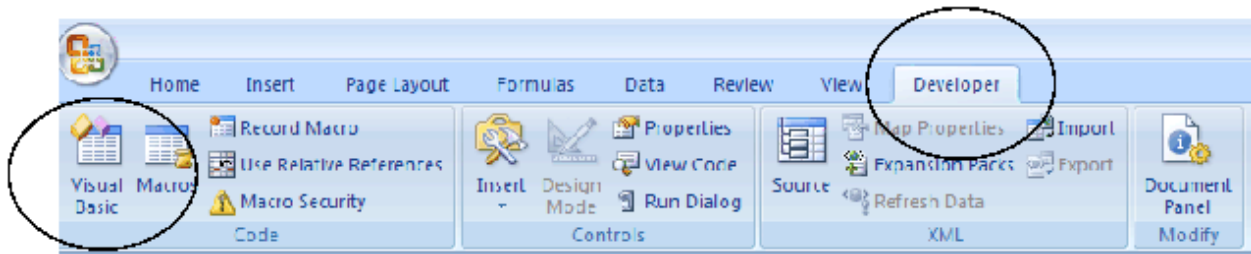
Configuring the Edge Calibration Program

Instrument control through the Edge Calibration Program requires the Agilent IO Libraries (Version 16.0 or greater). If necessary, the latest version of the IO libraries can be downloaded from the following site:

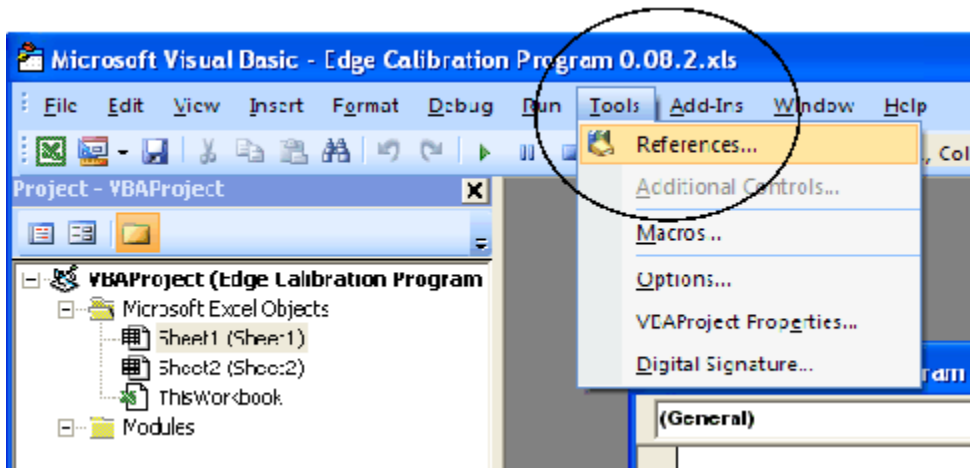
http://www.home.agilent.com/upload/cmc_upload/All/ADNHome.htm

The Edge Calibration program (Edge Calibration Program 1.0.xls) is a Microsoft® Excel 2007-based tool which uses Visual Basic for Applications to execute the program macros. To open and configure the program:

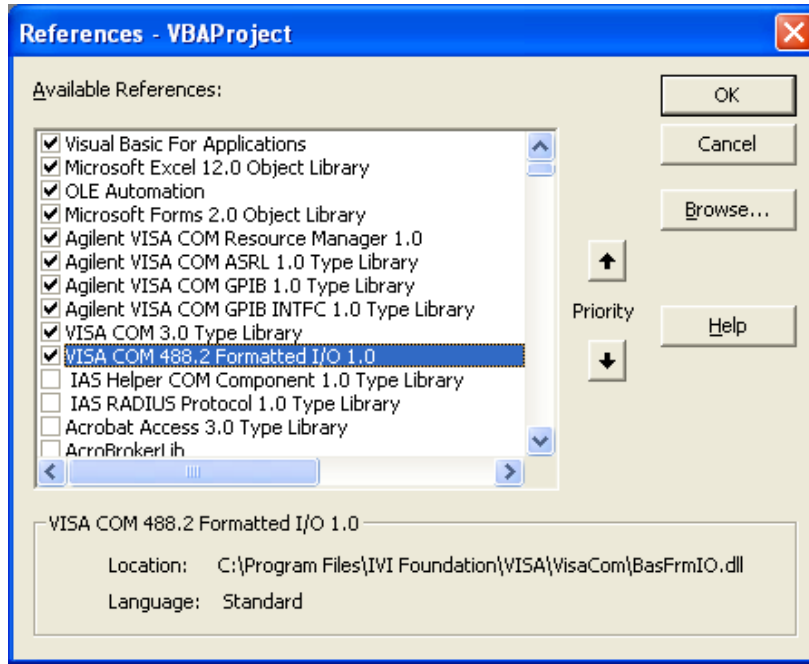
1. Start Excel and open **Edge Calibration Program 1.0.xls**.
2. From the menu line select 'Developer' followed by 'Visual Basic'.



3. From the Visual Basic 'Tools' menu select 'References'.



Verify that all of the checked references below are available on your system:



4. After the references have been verified, select 'Cancel' and then select 'File' from the Visual Basic menu line and select 'Close and Return to Microsoft Excel'.

Connecting the Splitter and Cables

Connect the cables to the splitter and the cable/splitter assembly between the counter and source as shown in Figure S1.

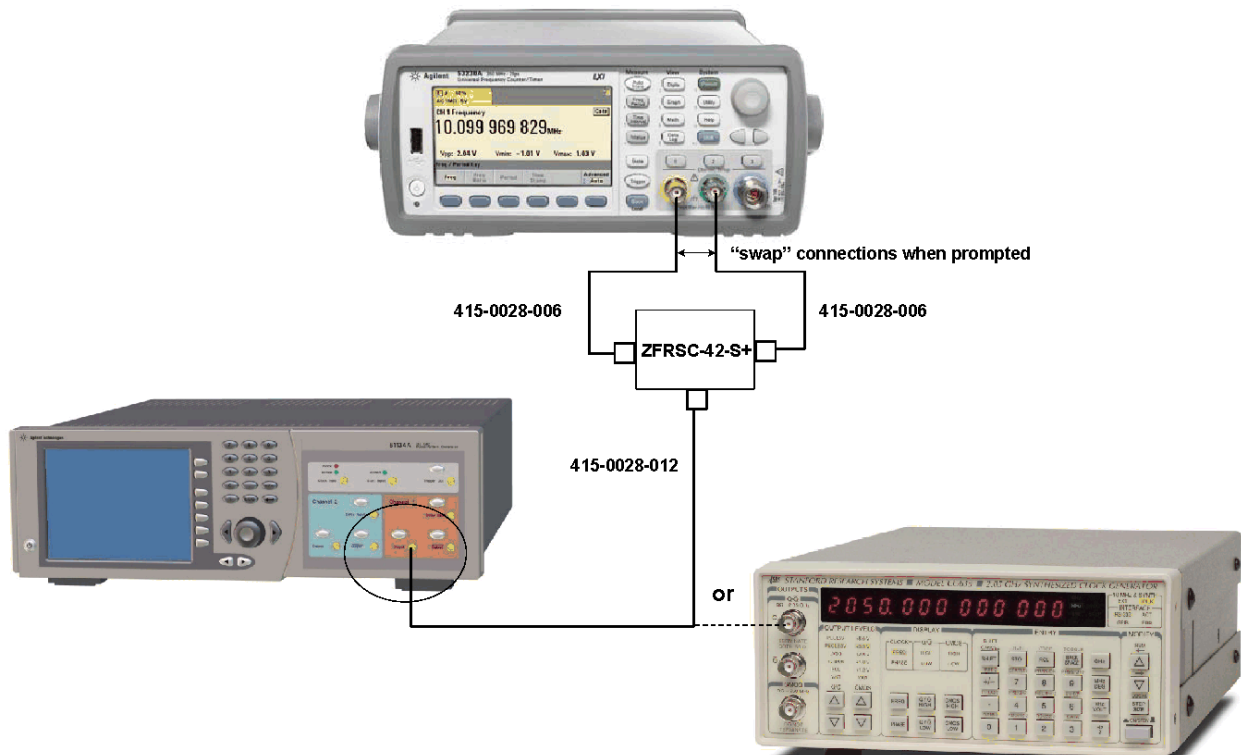


Figure S1. Cable/Splitter/Instrument Connections.

Note, if using the 81133A or 81134A, connect the cable from the splitter to **channel 1** of the source. If using the CG635A, connect the cable from the splitter to the '**Q**' output of the source.

The Edge Calibration Program Main Window

All functions associated with the Edge Calibration program are accessed from the program's main window shown in Figure S2. These functions include:

- Set up Verification (one time procedure)
- Edge Calibration check
- Archiving Edge Calibration data
- Edge Calibration routine
- Restoring archived Edge Calibration data

Note that each of the functions listed need not be performed every time an Edge Calibration occurs.



Figure S2. Edge Calibration Program Main Window.

Set Up Verification (one time procedure)

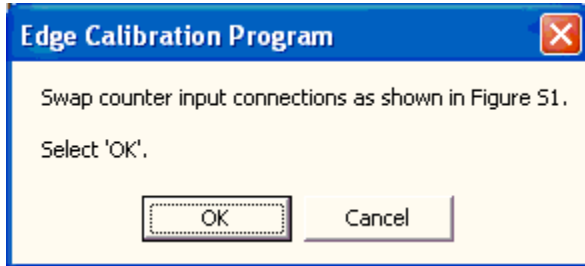
With the cables and splitter connected between instruments, the degree to which the 415-0028-006 cables are a matched set must be verified to insure the accuracy of subsequent Edge Calibrations. **This is a one-time verification of the cabling using the Edge Calibration program that does not have to be repeated for each instrument on which an Edge Calibration is performed.**

From the program main window (if the program has not been opened and configured previously, see “Configuring the Edge Calibration Program”), enter the address (IP, GPIB, or USB) of the counter and source and select:

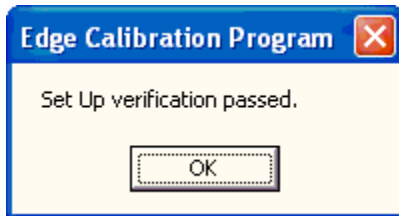


If not done previously, connect the cables and splitter between the instruments as prompted and select '**OK**'.

The program configures the source and counter as required, and starts the set up verification process. The '**Status update**' section of the main window indicates the progress. When prompted:



swap the input connections to the counter and select '**OK**'. If the mismatch between cables is determined to be acceptable, the set up verification passes and the following is displayed:



The cables can remain swapped if proceeding to the Edge Calibration Check or the calibration itself.

If the verification does not pass, swap the cable connections **on the splitter** and run the set up verification again. If the verification continues to fail, obtain another set of cables (415-0028-006).

Edge Calibration Check

Any 53220A counter with firmware revision 1.05 returned for an upgrade to revision 1.08 or greater requires the Edge Calibration. To determine if a 53220A counter has previously received this calibration, a verification can be performed by selecting:

Verify Edge Calibration
(see notes)

Once the verification is started, the status update bar provides an estimated completion time and visual indication that the verification is in progress. If a subsequent Edge Calibration **is not** required, the following message is displayed:



If the verification fails, the Edge Calibration must be performed.

Archiving Edge Calibration Data

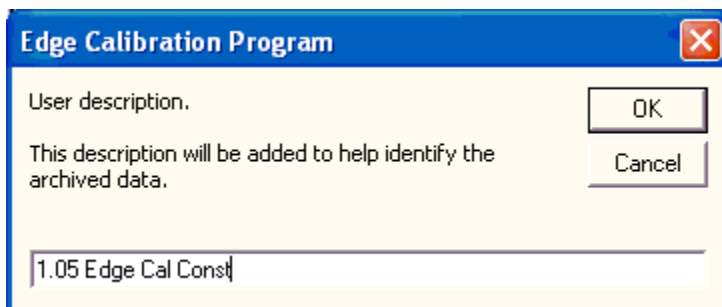
When an Edge Calibration is performed, **existing** Edge Cal data within the instrument is overwritten. However, existing data can be archived within the program and restored in the instrument if required.

It is recommended that the Edge Cal data associated with firmware revision 1.05 be archived prior to performing the Edge Calibration routine. Once the “original” Edge Cal data is archived, the Edge Calibration can be performed. Following the calibration, the new Edge Cal data can also be added to the archive.

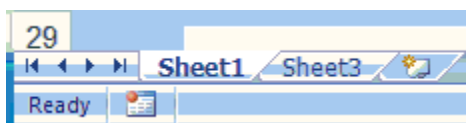
To archive Edge Cal data, select:

Perform Archive

on the program main window. The program will prompt you for a description to identify the set of archived data.



Once the archiving is complete, the data is stored in ‘Sheet2’ (hidden) of the spreadsheet. To view the hidden sheet, right-click on the ‘Sheet1’ tab and select ‘Unhide...’. Click ‘OK’ to view Sheet2.



A partial listing of the archived Edge Cal data is shown below. Note that prior to each set of data is the instrument serial number and firmware revision, the date and time the Edge Calibration completed, the user description, and the time of the first archive performed.

| | 1 | 2 | 3 | 4 |
|----|--|-----------------|--------------------|----------------|
| 1 | Agilent Technologies,53230A,MY00000048,01.08-1118.841-1.19-3.85-111-129-35 | 7/19/2011 12:01 | 1.05 Edge Cal Cons | 7/19/2011 9:32 |
| 2 | Loc = 170, Val = -9.46647547 | | | |
| 3 | Loc = 168, Val = 14.2420515 | | | |
| 4 | Loc = 171, Val = -3.25139686 | | | |
| 5 | Loc = 169, Val = -13.1959553 | | | |
| 6 | Loc = 175, Val = -165.309471 | | | |
| 7 | Loc = 174, Val = 179.083329 | | | |
| 8 | Loc = 201, Val = -49.8080869 | | | |
| 9 | Loc = 200, Val = -229.040064 | | | |
| 10 | Loc = 199, Val = 99.6535675 | | | |

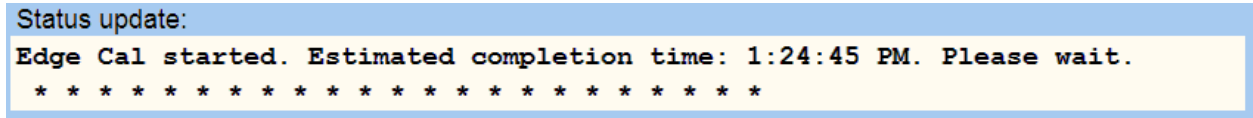
Over 2000 archive sets can be stored with the program workbook. Once the limit is reached, the oldest archives are overwritten first (with no user notification).

Edge Calibration Routine

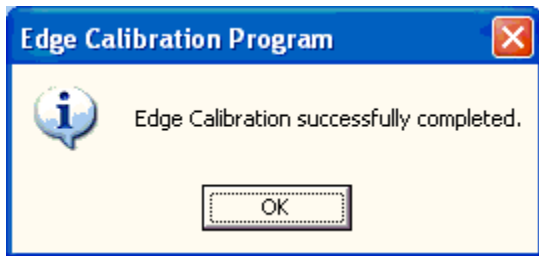
With the instruments connected as shown in Figure S1 and the set up verified (see ‘Set Up Verification’), start the Edge Calibration routine by selecting:

Perform Edge Calibration

Once the calibration is started, the status update bar provides an estimated completion time and visual indication that the calibration is in progress.



When the calibration is complete, the following message is displayed:



Archive the new Edge Calibration data within the program by selecting:

Perform Archive

Provide a descriptive name when prompted. An example of how Edge Calibration data is appended to the archive follows:

| | | | |
|----|--|-----------------|--------------------|
| 1 | Agilent Technologies,53230A,MY00000048,01.08-1118.841-1.19-3.85-111-129-35 | 7/19/2011 12:01 | 1.05 Edge Cal Cons |
| 2 | Loc = 170, Val = -9.46647547 | | |
| 3 | Loc = 168, Val = 14.2420515 | | |
| 4 | Loc = 171, Val = -3.25139686 | | |
| 5 | Loc = 169, Val = -13.1959553 | | |
| 6 | Loc = 175, Val = -165.309471 | | |
| 7 | Loc = 174, Val = 179.083329 | | |
| 8 | Loc = 201, Val = -49.8080869 | | |
| 9 | Loc = 200, Val = -229.040064 | | |
| 10 | Loc = 199, Val = 99.6535675 | | |
| 11 | Loc = 198, Val = -55.6693162 | | |
| 12 | Loc = 205, Val = 35.6797617 | | |
| 13 | Loc = 204, Val = -112.694076 | | |
| 14 | Loc = 203, Val = 201.474733 | | |
| 15 | Loc = 202, Val = 41.5780756 | | |
| 16 | Loc = 177, Val = -171.361996 | | |
| 17 | Loc = 176, Val = 175.503115 | | |
| 18 | Loc = 188, Val = 149.741026 | | |
| 19 | Loc = 189, Val = -177.098373 | | |
| 20 | Loc = 190, Val = 146.896324 | | |
| 21 | Loc = 191, Val = -159.608324 | | |
| 22 | Loc = 183, Val = -6.15473544 | | |
| 23 | Loc = 184, Val = -5.64142205 | | |
| 24 | Loc = 185, Val = -2.109418 | | |
| 25 | Loc = 186, Val = -10.9550346 | | |
| 26 | Loc = 178, Val = -4.71654964 | | |
| 27 | Loc = 179, Val = -6.07786541 | | |
| 28 | Loc = 180, Val = -4.75270718 | | |
| 29 | Loc = 181, Val = -6.05067 | | |
| 30 | Agilent Technologies,53230A,MY00000048,01.08-1118.841-1.19-3.85-111-129-35 | 7/19/2011 13:26 | 1.08 Edge Cal |
| 31 | Loc = 170, Val = -10.7449688 | | |
| 32 | Loc = 168, Val = 8.02017405 | | |
| 33 | Loc = 171, Val = -16.2832526 | | |
| 34 | Loc = 169, Val = -10.1256552 | | |

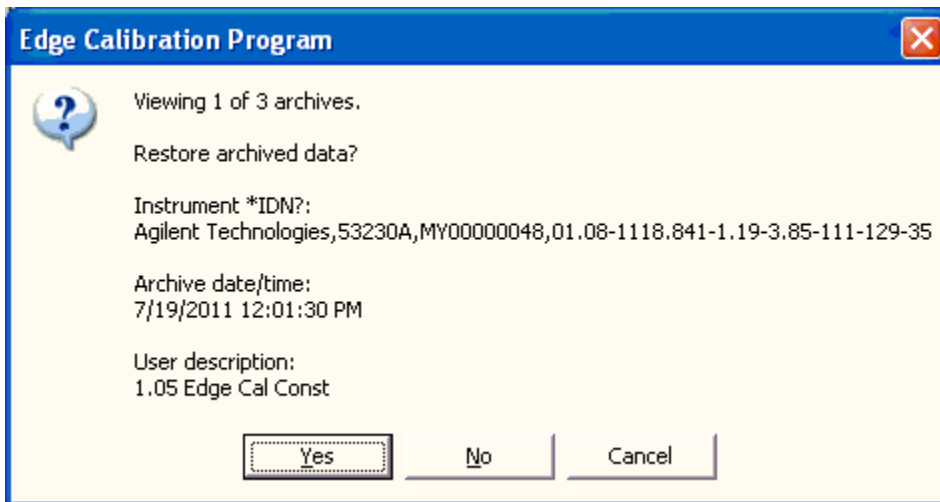
Following the Edge Calibration, use 53220A “Performance Test 5: Time Interval” to verify accuracy. Edge Calibrations do not affect the internal reference oscillator or DC voltage calibrations of the instrument.

Restoring Edge Calibration Data

Although not likely to be required, any set of an instrument’s Edge Calibration data stored in the program archive can be restored within the instrument by selecting:

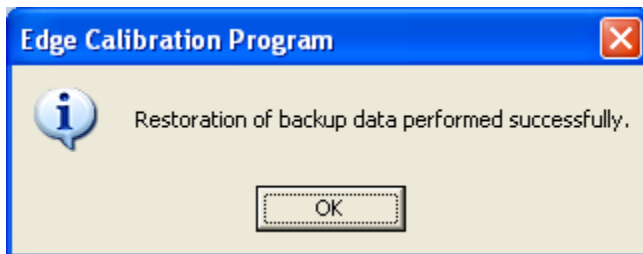
**Restore archived Edge Cal data
(see notes)**

The Edge Calibration program steps through (views) each archived set of the instrument’s Edge Calibration data. A ‘set’ is identified by the instrument serial number, archive date and time, and by the user description provided. An example is shown as follows.



Selecting '**No**' proceeds to the next set in the archive. Only the archives for the 53220A counter currently "connected" to the program are listed. If no matching serial number in the archive is found, no data set(s) are presented.

Selecting '**Yes**' restores the data from the archive set shown. Once restored, the following message is displayed:



Restored data also remains in the archive.