

User's Guide



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**CL520 series
Software Packages**



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WARNING: These products are not designed for use in, and should not be used for, patient connected applications.

INTRODUCTORY NOTE

*This publication contains operating instructions for the Software Packages of **OMEGA CL520 series** calibrators to be used with an MS-DOS Personal Computer.*

*The information contained in this publication, is derived from proprietary and patent data of **OMEGA**. This information has been prepared for the sole purpose of assisting operating personnel, in the efficient use of the equipment.*

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IMPORTANT

CL520-SLS (LINMAN) AND CL520-LGM (LOGMAN) SOFTWARE, WORKS INDIFFERENTLY UNDER MS-DOS THAN WINDOWS OPERATING SYSTEMS. CL520-CPS (CALPMAN) IS A POWERFUL PROGRAM THAT WORKS UNDER WINDOWS OPERATING SYSTEM.

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1 GENERAL

The **CL520 series** software package allows to use the **CL520 series** at its best, using all its capabilities. Three separate programs are available:

- CL520-LGM (LOGMAN):** Allows the user a complete management of the data logged with the data logging option.
- CL520-SLS (LINMAN):** Allows the user to enter in the calibrator his own linearization, for a special sensor or for any other need of custom linearization.
- CL520-CPS (CALPMAN):** Allows to install in the calibrator the data to calibrate process instruments directly on field for a complete plant monitoring.

1.1 Demo software

A demo software package is supplied to better understand the **CL520 series** communication protocol. You can display **CL520 series** actual status, select input or output, select range, select engineering unit, Reference Junction, Temperature Scale, Output value.
The source code is written in Microsoft Qbasic / QuickBasic / PDS.
CL520 series software runs on IBM and compatible PC.

Minimum requirements: a 286 CPU with 640K RAM and 1 Megabyte of Hard Disk and one Floppy Disk Drive, Mono or Color Monitor and DOS 3.3 or later.

To set-up the computer for demo program run the following procedure:

Turn your computer "On" and create a new directory on your Hard disk:

```
C>MD MCAL200
```

Enter in the new directory:

```
C>CD MCAL200
```

Insert the disk into the floppy driver and copy programs in a new directory.

```
C>COPY A: MCAL200.*
```

Now you can run the program:

```
C> MCAL200
```

Directory **MCAL200** will contain:

```
MCAL200.EXE      Program
MCAL200.BAS     Source Code
```

2 LOGGING DATA MANAGER (CL520-LGM)

The **CL520-LGM (LOGMAN)** program is used to manage the data coming from the **CL520 series** memory. The data can be viewed, saved on disk, printed and exported to be used with the most common spreadsheets.

The program presents a list of options selectable in a simple way, by pressing the appropriate number on the keyboard. Also those who are not familiar with personal computer will find the use of this program easily achievable

When using the program, the **CL520 series** has to be connected to the PC by a serial cable, supplied as a standard accessory with the software package.

The communication port to be used is COM1. This port is generally located on the backside of the PC and it's marked with a label.

If, for any reason, your hardware is different, and you find it difficult to identify the PORT, refer to the handbook of your PC.

Type on DOS command line: LOGMAN/? in order to obtain info on how to modify hardware parameters.

In order to use **LOGMAN** from the supplied disk, you just need to:

- a) Insert the diskette in the disk unit.
- b) Select the disk unit (generally speaking, they are A or B)
- c) Type **LOGMAN** to execute the program.

2.1 Installation

OMEGA strongly recommends to copy LOGMAN on the hard disk to grant the user an higher speed and larger storage memory. To set-up the computer for demo program run the following procedure:

Turn your computer "On" and create a new directory on your Hard disk:

```
C>MD LOGMAN
```

Enter in the new directory:

```
C>CD LOGMAN
```

Insert the disk into the floppy driver and copy programs in a new directory.

```
C>COPY A:LOGMAN.EXE
```

```
C>COPY A:*.LOG
```

```
C>COPY A:COURB.FON
```

Now you can run the program:

```
C>LOGMAN
```

```
LOGGING DATA MANAGER                                     Press F10 to Exit
[ Port: COM1  Baud Rate: 9600  Printer: IBM Graphics ]

  1 - Receive data
  2 - Load data from file
  3 - Display data
  4 - Display MIN,MAX and AVG values
  5 - Save data to file   [.LOG]
  6 - Export data to Paradox [.TXT]
  7 - Export data to Excel [.TXT]
  8 - Print data
  9 - List .LOG and .TXT files
  0 - Exit

Select : _
```

2.2 Receive Data from calibrator

This option allows to download data from the **CL520 series** memory into the PC. The **CL520 series** has to be connected to the PC.

From the main menu, select "Receive data from CL520 series" function pressing the <1> key.

```
LOGGING DATA MANAGER                                     Press F10 to Exit
[ Port: COM1  Baud Rate: 9600  Printer: IBM Graphics ]

1 - Receive data
2 - Load data from file
3 - Display data
4 - Display MIN,MAX and AVG values
5 - Save data to file      [.LOG]
6 - Export data to Paradox [.TXT]
7 - Export data to Excel  [.TXT]
8 - Print data
9 - List .LOG and .TXT files
0 - Exit

Select : 1

Please wait...Receiving logging data
```

2.2 Load Data from File

This option allows to load data previously stored on disk. Only files with a .LOG suffix will be loaded, it won't be possible to load .TXT files.

From the main menu, select "Load data from File" function pressing the <2> key. When this option has been selected, a file name is asked; simply type in the name of the file where you stored the data and, by pressing <ENTER>, they will be loaded.

NOTE: TO LOAD A NEW FILE MEANS TO COMPLETELY DELETE THE ONE ALREADY PRESENT IN MEMORY, THEREFORE BE CAREFUL TO SAVE IT BEFORE LOADING.

```
LOGGING DATA MANAGER

Load file name [.LOG] ?
```

2.3 Display Data

This option allows to examine the logged data, whether they're coming from the **CL520 series** or from the disk. From the main menu, select "Display data" function pressing the <3> key.

All the data will be displayed on the screen as it follows:

LOGGING DATA MANAGER						
LOG DATA						
Type: mVL						
#	1:	+9.792	mU	20/10/95	09:40:17	OPEN
#	2:	+9.792	mU	20/10/95	09:40:18	OPEN
#	3:	+9.792	mU	20/10/95	09:40:19	OPEN
#	4:	+19.802	mU	20/10/95	09:40:20	OPEN
#	5:	+20.260	mU	20/10/95	09:40:21	OPEN
#	6:	+20.803	mU	20/10/95	09:40:22	OPEN
#	7:	+22.273	mU	20/10/95	09:40:23	OPEN
#	8:	+22.805	mU	20/10/95	09:40:24	OPEN
#	9:	+22.805	mU	20/10/95	09:40:25	OPEN
#	10:	+22.805	mU	20/10/95	09:40:26	OPEN
#	11:	+22.804	mU	20/10/95	09:40:27	OPEN
#	12:	+0.000	mU	20/10/95	09:40:28	OFS OPEN
#	13:	+0.000	mU	20/10/95	09:40:29	OFS OPEN
#	14:	+0.000	mU	20/10/95	09:40:30	OFS OPEN
#	15:	+0.000	mU	20/10/95	09:40:31	OFS OPEN
#	16:	+22.805	mU	20/10/95	09:40:32	OPEN
#	17:	+22.805	mU	20/10/95	09:40:33	OPEN
<F1>:Graph <F2>:Print Graph <1/4> <Pg↑/Pg↓> <ESC>:Menu						

By pressing <F1>, a graph will be displayed. The graph will be obtained basing the calculations upon the whole batch of data.

Pressing <F2>, it will be possible to have a hard copy of the graph on the selected printer.

2.4 Statistics

This option allows to obtain on screen the average, minimum and maximum values of the data present in the memory. The calculation will be executed on the whole batch of data.

From the main menu, select "Display MIN, MAX and AVG values" function pressing the <4> key.

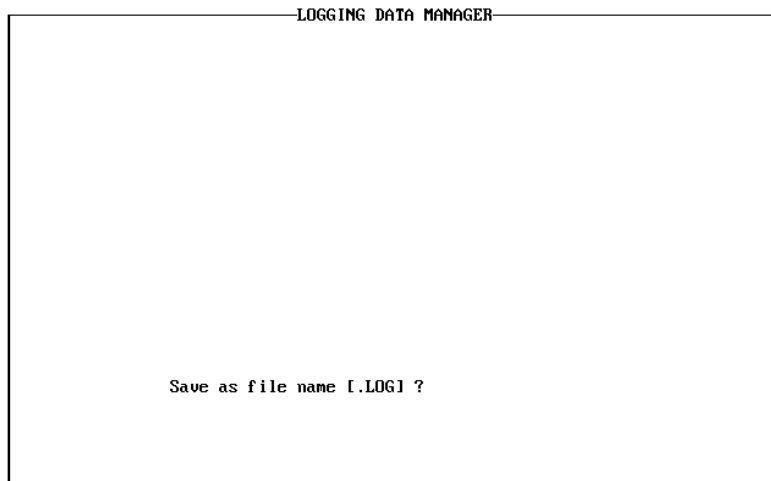
LOGGING DATA MANAGER						
MIN,MAX AND AVG VALUES						
Type: mVL						
MIN ->	#	12:	+0.000	mU	20/10/95 09:40:28	OFS OPEN
MAX ->	#	34:	+68.844	mU	20/10/95 09:40:50	OPEN
AVG ->	#	-----:	+23.005	mU	--/--/-- --:--:--	
<ESC>:Menu						

2.5 Save Data on Disk

This option allows to save the data in the memory of the instrument into a disk.

From the main menu, select "Save data to File" function pressing the <5> key.

The program will ask for a filename, to which the suffix .LOG will be coupled to identify it as a file that can be used by LOGMAN.



If on the disk that filename is already existing, a warning message will appear asking if the existing file has to be deleted or the filename has to be changed.

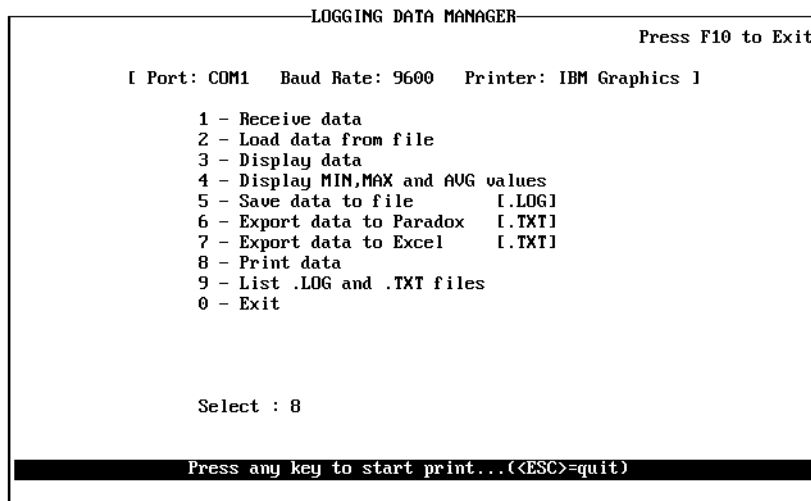
2.6 Saving Data in Paradox^(TM) or Excel^(TM) Formats

The options 6 and 7 allow to save data in formats different from the **LOGMAN** one. The available formats are referred to the most common database and spreadsheet: PARADOX (BORLAND) and EXCEL (MICROSOFT). With these packages it will be possible to manage the data in a really complete way. The files will have a .TXT suffix that identifies them as text files.

NOTE: To SAVE DATA IN THIS FORMAT DO NOT SUBSTITUTE THE .LOG FILES. THE .LOG DATA FILE SHOULD BE CREATED ANYWAY.

2.7 Data Printing

This option allows to obtain an hard copy of the data in memory on a printer. From the main menu, select "Print data" function pressing the <8> key. When selected, the operator will be asked to set-up the printer for operation. When the system is ready, data will be printed.



2.8 List Files

This option allows to see which .LOG and .TXT files are present on a particular directory on disk. From the main menu, select "List .LOG and .TXT files" function pressing the <9> key. When selected, a directory's name will be asked. The .LOG files will be displayed as first, while the .TXT as second.

```
Il volume nell'unità C è HD_ANALISI
Il numero di serie del volume è 1C67-65AB
Directory di C:\MCAL200

TEST   LOG      1242 20/10/95   9.41
       1 file      1242 byte
                          21463040 byte disponibili

Press any key to continue...
```

2.9 Exit from the Program

This option closes all the applications and make the system return to the DOS command line. From the main menu, select "Exit" function pressing the <0> key. All the information will be lost, so be careful when selecting this option.

3 LINEARIZATION DATA MANAGER (CL520-SLS)

As the **CL520 series** doesn't cover the whole range of sensors (thermocouple or resistance thermometers), but the main ones, **OMEGA** gives the user a possibility of creating its own sensor linearizations and to use them with the **CL520 series**.

With CL520-SLS (LINMAN) it is possible to enter °C/signal points for the thermocouples and °C/signal for the Rtd and also is possible to enter eng. unit/signal points.

LINMAN will provide the linearization by interpolating the inserted points. In this way, downloading data into **CL520 series**, it will be possible, by selecting Pt X or Tc X, to use the special linearized sensor both in simulation and measurement.

The program structure is the same as LOGMAN, with a list of options that are enabled by pressing the appropriate number on the keyboard.

Type LINMAN/? on DOS command line to obtain info on parameter modifying.

3.1 Installation

OMEGA strongly recommends to copy LOGMAN on the hard disk to grant the user an higher speed and larger storage memory. To set-up the computer for demo program run the following procedure:

Turn your computer "On" and create a new directory on your Hard disk:

```
C>MD LINMAN
```

Enter in the new directory:

```
C>CD LINMAN
```

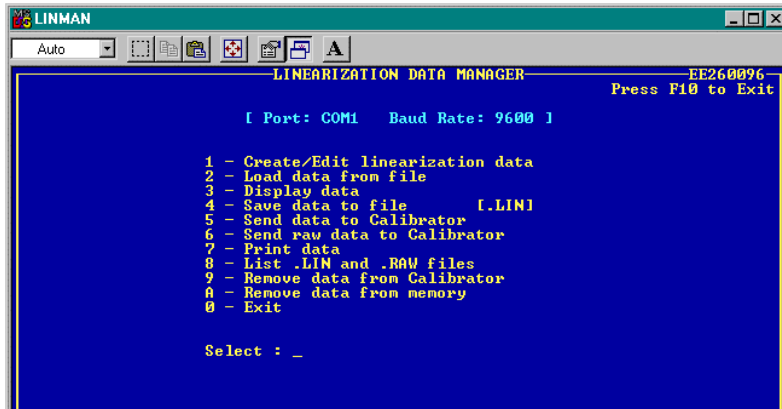
Insert the disk into the floppy driver and copy programs in a new directory.

```
C>COPY A:LINMAN.EXE
```

```
C>COPY A:*.LIN
```

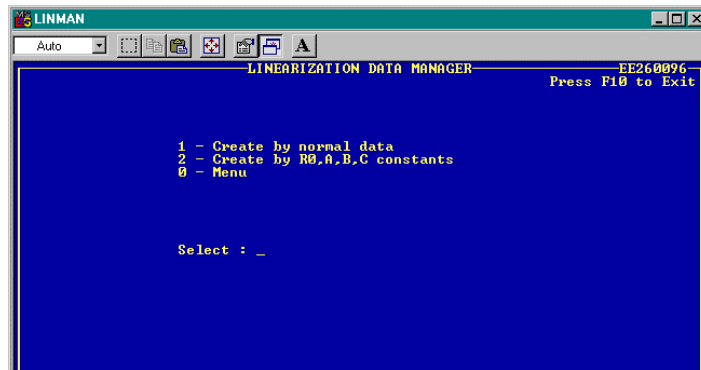
Now you can run the program:

```
C>LINMAN
```



3.2 Create Linearization Data

This is the option that allows the user the creation of a dedicated linearization by typing some values that will be interpolated by the software linearization polynoms.



The program will ask for some important pieces of information that will be used to define the kind of sensor to be linearized:

NORMAL DATA or
R0, A, B, C constants:

This option chooses between entering known points (and this is valid both for Tc and Rtd) or mathematical constants that will be used in the Rtd linearization polynoms. When data entering has been selected, other information will be asked: if the 'constant' option is selected, the R₀, A, B and C values must be typed in; if the 'normal data' is the choice selected, then this procedure has to be followed.

When the "Create by normal data" is selected, the procedure will ask the following information:

Tc X or Rtd X:

This option is selected if the sensor to be linearized is a thermocouple or a resistance thermometer. The difference is in the R_j compensation, that will be considered only for the thermocouples.

NORMAL / SPECIAL:

If NORMAL is selected, the instrument will use the linearization in a normal mode, i.e. with °C, °F or K eng. units; if special is selected the instrument will use the eng. unit specified later and will not perform any convers and no R_j compensation for Tc.

DESCRIPTION:

It is possible to enter four characters here to define the type of sensor. By pressing the <Alt> key, and then typing 144 or 135 on the numerical keyboard Pt or Tc character will appear on the **CL520 series** display.

mVL / mVH / V / mA / Ohm /
kOhm / Hz / pulse :

The sensor signal type to be linearized.

Eng. Unit
(only SPECIAL mode):

This procedure selects the technical unit that is going to be used in the values to be linearized.

OFFSET (only for Rtd):

The offset value of the sensor must be typed in.

DP max FOR °C, °F & K:

The maximum number of decimal places (dp) has to be selected here.

CREATE NEGATIVE
SEGMENT:

With this option the values to be considered for the linearization are typed in. The first value is the start of the segment expressed in the formerly defined technical unit, the second is its relative value in degrees. The other values are the other known points of the segment. To end data input, type "last". This option will consider all the negative values.

CREATE POSITIVE
SEGMENT:

This option is the same as above, but the values have to be positive.

LIMITS in °C:

This option asks for the low and high temperature working limit.

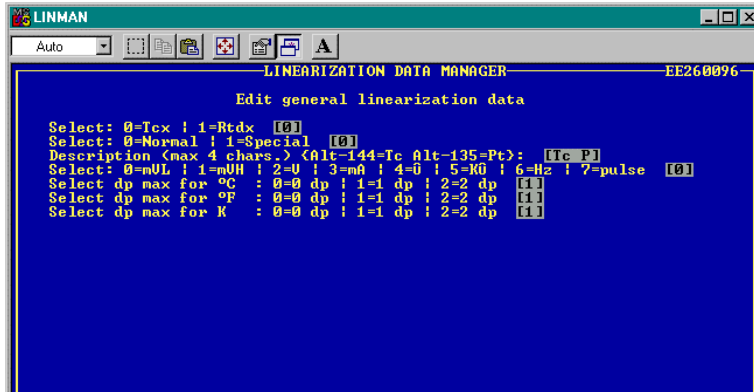
An example can be useful to understand how the whole procedure works:

"Tc P" linearization with points:

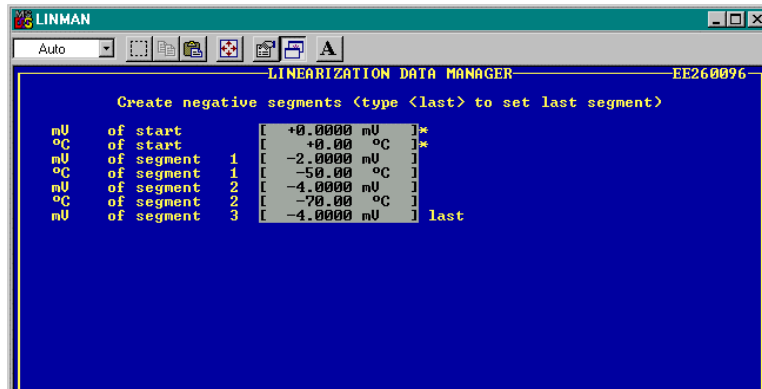
-4 mV	at	-70 °C
-2 mV	at	-50 °C
0 mV	at	0° C
10 mV	at	100 °C
20 mV	at	200 °C

with one decimal point.

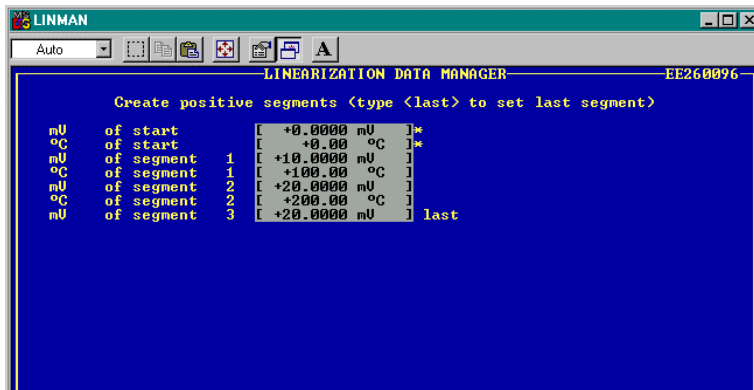
From the main page menu, select the "Create/Edit linearization data" option pressing the <1> key. Select the "Create by normal data" option and insert the data as shown in the following figure:



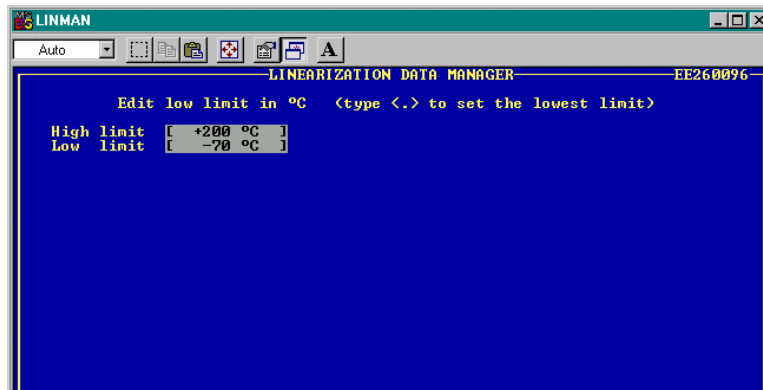
When the last required datum is inserted, the program will present the page to input the negative data segment. When the last segment data is inserted, write 'last' to finish.



When the last required datum is inserted, the program will present the page to input the positive data segment. When the last segment data is inserted, write 'last' to finish.



At this point the program will show the sensor working limits page input:

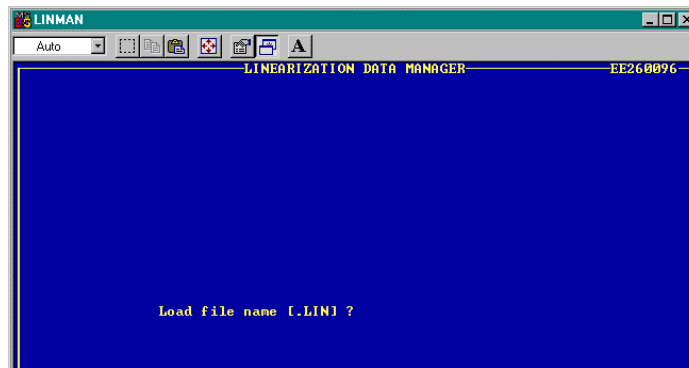


When the last datum is inserted, the procedure will show the main menu.

It is possible to save the data using the “Save data to file” option and then to download it in the CL520 series using the “Send data to CL520 series” option.

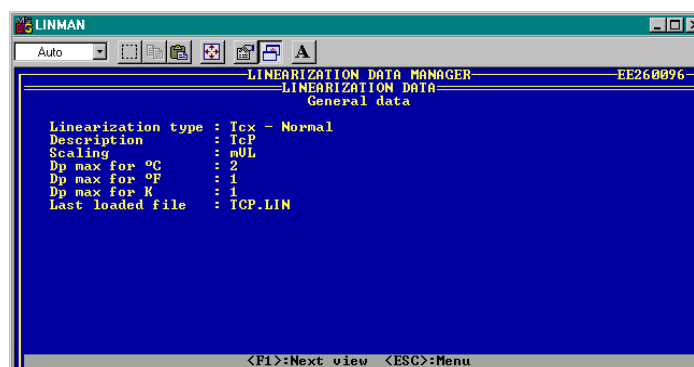
3.3 Load Data from File

This option allows to load in the PC memory disk-stored linearization files. The program will ask for the directory where the file and the filename are located. It's not possible to load files with a suffix different than .LIN. In order to have a list of the available files, use the “List .LIN and .RAW files” option.



3.4 Display Data

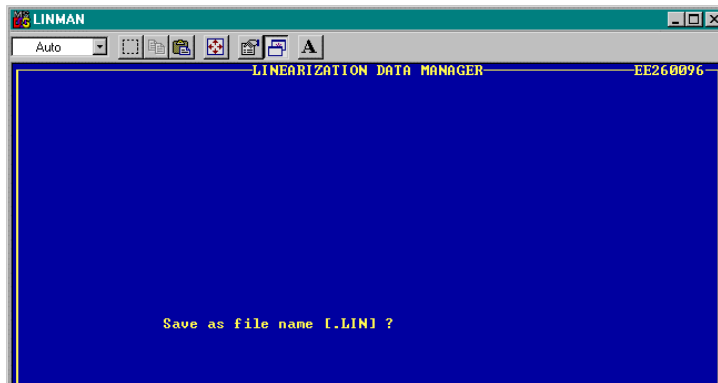
When a linearization has been loaded or edited, it's possible to study it using this option, that enables the user to look at all the parameters needed for its linearization.



Use the <F1> key to show the next page.

3.5 Save Data on File

This option transfers the linearization data stored into the PC memory to the disk. The file will be a .LIN type file, and it will be possible to recall it with the option "Load data from file".



3.6 Send Data to calibrator

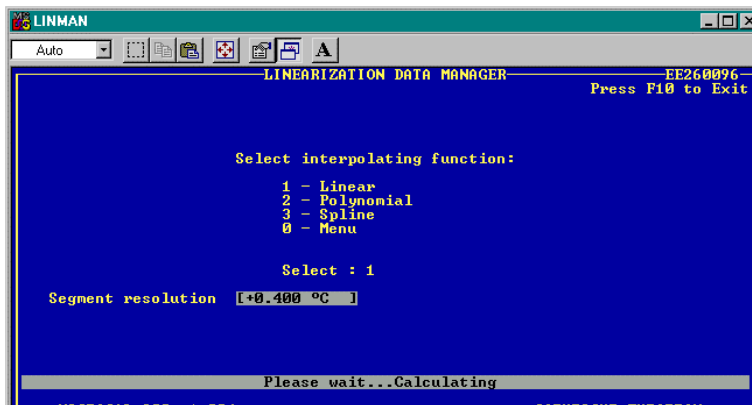
Once the linearization parameters have been inserted and checked, it's time to linearize them and send them to the calibrator.

When this option is selected, it will be asked what kind of linearization is needed. There are three possibilities:

- LINEAR: The linearization is obtained with a linear interpolation of the values.
- POLYNOMIAL: The linearization is obtained with an interpolation derived from a polynomial, definable in this option.
- SPLINE: The linearization is obtained using the spline mathematical function on the defined values.

When the linearization is complete, the raw data (it means data that can be used directly by the **CL520 series**, after all the calculations), are transferred to the MicroCal by the serial interface. The calibrator has to be connected, as described in LOGMAN chapter, to the communication port of the PC.

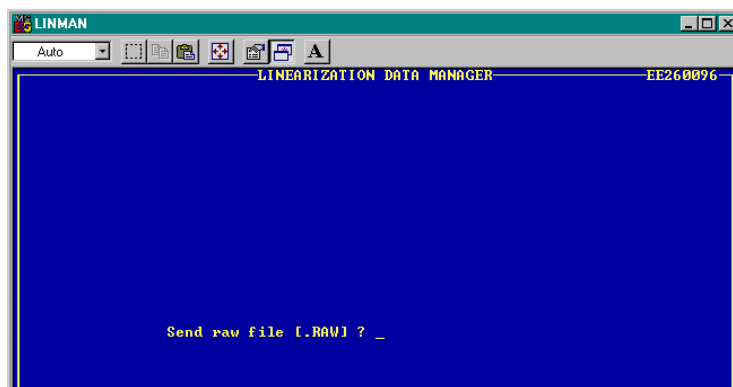
A file is then saved on disk, with the .RAW suffix and the identification defined when creating the linearization.



3.7 Send Raw Data to calibrator

This option asks for a raw data filename. When this name is typed, LINMAN will load the file from disk, and then it will transfer data on the **CL520 series**.

This option is particularly useful when lots of special sensors are used, and a library of them is present on disk.



3.8 Print Data

When this option is selected it will be necessary to have the printer correctly set, as all the linearization data will be sent to the printer to get an hard copy of them.

3.9 List .LIN and .RAW Files

When selected, this option asks for a directory where to look for the files with a .LIN or .RAW suffix. When the directory has been selected, that files will be listed as when the command DIR is used from the DOS command line.

```

Il volume nell'unità C è HD_ANALISI
Il numero di serie del volume è 1C67-65AB
Directory di C:\MCAL200

TCP      LIN      1881 25/10/95  11.21
         1 file      1881 byte
                   21463040 byte disponibili

Press any key to continue...

```

3.10 Remove Data from PC Memory or from calibrator

These two options are used to delete a previous linearization on the PC or on the calibrator. When old one is deleted, a new one can be inserted.

IMPORTANT:

**ALWAYS SAVE DATA BEFORE DELETING THEM FROM THE PC MEMORY !
OTHERWISE THEY WILL BE LOST.**

3.11 Exit from the Program

When this option is selected, the program ends and the system returns to the previous application. The same effect can be obtained by pressing the <F10> key.

NOTE: ALL DATA WILL BE LOST.

4 CALIBRATION PROCEDURE MANAGER (CL520-CPS)

Standard Agencies and Quality Auditors require the collection, organization and analysis of traceability documents. **CL520-CPS (CALPMAN)** is able to transfer a selection of calibration routines from a PC to the internal memory of the instrument in order to simplify field calibrations selecting the suitable tag number.

When a plant has a large number of process instruments, checks and field calibrations are really important in order to keep the compliance with ISO 9000 requirements.

OMEGA with **CALPMAN**, coupled with the powerful **CL520 series** calibrator, grants the possibility to keep these instruments under control.

The calibration data for the required instruments can be stored into the **CL520 series** memory following the instructions detailed in this manual.

The data of each calibration procedure can be stored together with the name of the TAG, with engineering units, process info, calibration points and a two allowed levels of error.

The calibrator can be used as a generator or as a recorder or both; its input and output terminals can be used to generate, receive and compare inf.

After the calibration check, **CL520 series** will indicate if the checked instrument is within its specifications or if it has to be verified; and a decision can be made by the plant technicians. The status of every instrument before and after its calibration can be recorded and recalled later.

Benefits to be gained from this system are:

- Optimisation of the Maintenance period. By keeping a record of the time required between necessary adjustments, the optimum maintenance period can be determined.
- Print of the Report of Calibration. A calibration report can be printed for each TAG.
- Aid in maintenance planning. Data can be used to analyse the time and cost required for instrument calibrations and can aid in planning manpower, specifying supplier, etc.

ATTENTION

THE CL520-CPS (CALPMAN) VER. 4.000 CAN RUNNING ONLY WITH CL520 SERIES FIRMWARE VERSION 4.000 OR THE FOLLOWING ONE. THE TAG SET-UP FILES OF CL520-CPS V. 4 ARE NOT COMPATIBLE WITH THE PREVIOUS VERSION. THE CL520-CPS VER. 4 IS ABLE TO UPGRADE THE OLD TAG SETUP AND THE RESULTS FILES: MAKE A COPY OF THE OLDER ONES IF YOU NEED TO USE THE OLD VERSION AGAIN.

Test and calibration data can be memory stored and downloaded to a PC to document the calibration activity that allows to build a quality control chart/data bank from a single calibration sheet to a detailed historical report.

Each instrument, called "Tag", to be calibrated/inspected is identified by 16 alphanumeric characters.

Three additional lines of 16 characters are available for a more detailed description of the instrument to be calibrated. A typical example is shown below :

Tag = Pressure Trx 128
Auxiliary information = High temp trap
Area n.21T68
Stafford Station

The overall capabilities of the combination between **CL520 series** + **CALPMAN** software are the following :

- **CL520 series** can store up to 50 Tags
- Each Tag can be tested in different calibration steps (Test Point)
- Each Tag can be identified with an alphanumeric code of 16 characters
- Plant location/Plant section can be identified with three additional lines every 16 alphanumeric characters
- The Operator/Inspector's name can be written with up to 16 alphanumeric characters
- The Test procedure can be prepared in a PC and downloaded into a **CL520 series** when required
- The Test procedure can be eventually directly loaded on the field and downloaded into the PC
- Direct test of analog / digital signal and pressure indicators
- Direct test of Signal and Pressure Transmitters with comparison between input and electrical signal output
- Direct test of Pressure Transmitters at actual programmed test points or with an automatic calculation of actual errors with inlet pressure in an acceptable deviation band from the Test Point level.

4.1 Installation

CALPMAN runs on IBM PC under WINDOWS 3.1. Minimum requirements are a 486 CPU with 8Mb Ram and 4 Megabyte on hard disk, color monitor and a Microsoft mouse or a compatible one.

In order to install **CALPMAN** for Windows, follow the below procedure:

- Place the **CALPMAN** disk in a 3.5" diskette drive;
- From the Windows Program Manager's File Menu, select **<RUN>**;
- Enter the filename A:SETUP.EXE (substitute the letter A for the disk drive that contains **CALPMAN** diskette)
- Follow on screen instructions making sure to provide the correct path to your **CALPMAN** directory when prompted.

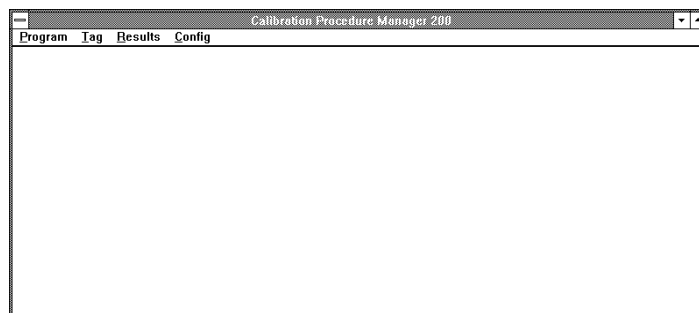
IMPORTANT

IF YOU NEED TO USE YOUR OLD VERSION OF **CALPMAN** AGAIN, SPECIFY A DIFFERENT DIRECTORY FROM THE SUGGESTED ONE DURING THE SET-UP PROGRAM.

Once installed, the **CALPMAN** icon will appear on your Windows screen and it will be possible to boot it by clicking on the icon as usual.

4.2 Program Architecture

CALPMAN has a typical Windows structure with a series of menu and options that can be recalled by clicking on the name, or on the icon which represents the action the user wants to carry out.



The main menu program is structured as it follows:

PROGRAM	TAG	RESULTS	CONFIG
---------	-----	---------	--------

These menu are subdivided in:

PROGRAM

ABOUT : Shows the program version
EXIT : Returns to WINDOWS

TAG

NEW : Allows to enter a new tag
OPEN : Opens a previously stored tag (this option is further subdivided as it will be described later)
LIST TAGS : Shows the tags already installed in CL520 series and allows to replace or delete one or more tags

RESULTS

LIST : Lists the available results stored into the instrument
OPEN : Opens a Result file in order to study it
FIND : Finds a Result file by Tag name

CONFIG

SERIAL : Allows to modify the communication parameters (baud rate, communication port, ID number)
HEADER/FOOTER : Allows to set a default header and footer that will be saved together with the tag results. You can individually modify the header and/or the footer for every resulting datum loaded in order to print different certified texts.

Note : a multiple selection of tags is available by pressing <CTRL> and selecting the desired parameters. In this way, all the highlighted items will be selected.

When a tag window is loaded the new menu is:

TAG	SERIAL	WINDOW
-----	--------	--------

TAG

- NEW : Opens a new tag
- OPEN : Allows to look and modify a formerly saved tag
- SAVE : Saves the current tag with its current name
- SAVE AS : Saves the current tag coupled with a new name
- CLOSE : Closes the current tag
- CLOSE ALL : Closes all the opened tags
- ABOUT : Shows the program version
- EXIT : Returns to WINDOWS

SERIAL

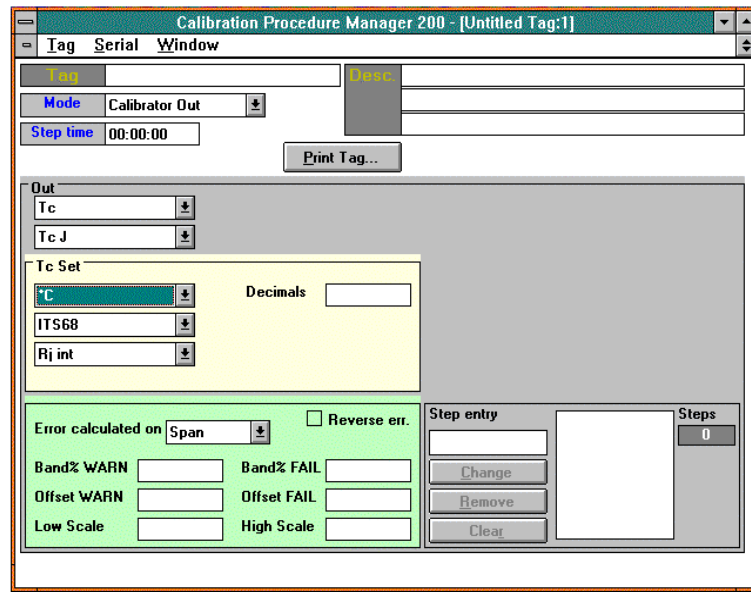
- APPEND : Appends the current (or the whole set of) tag on CL520 series
- REMOVE ALL TAGS : Removes all the tags currently installed on CL520 series
- LIST TAGS : Shows the tags installed on CL520 series and allows to replace or delete one or more of them.

WINDOW

- CASCADE : Allows to show the actual window open tags in a cascade mode
- TILE : Allows to show the actual window open tags in a tile mode
- ARRANGE ICONS : Allows to arrange icon tags when the window is in the minimum state

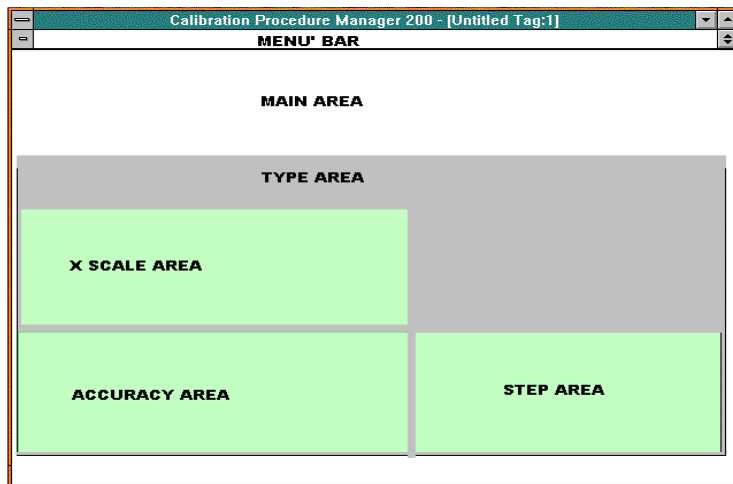
4.3 New Tag

This is the core of **CALPMAN** with this option: a new tag can be defined with all the parameters requested to calibrate and to check the equipment.



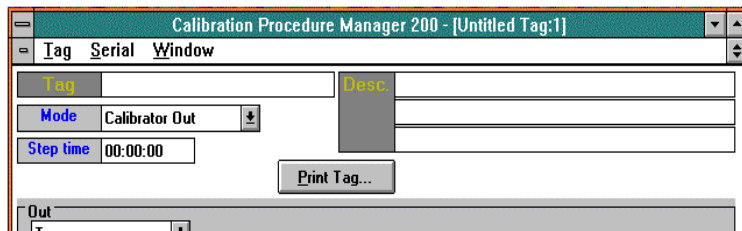
Using a keyboard and a mouse it's possible to set the desired parameter.

For a better understanding, the Tag option window could be divided into different areas as follow :



Main area :

This area contains the main information for the current Tag.



TAG (NAME) : This is the name of the TAG. With this name the tag will be managed both from **CL520 series** and the disk;

DESC(RIPTION) : In this lines a description of the instrument under test can be typed in;

MODE : This option allows to select the way the calibrator has to work:

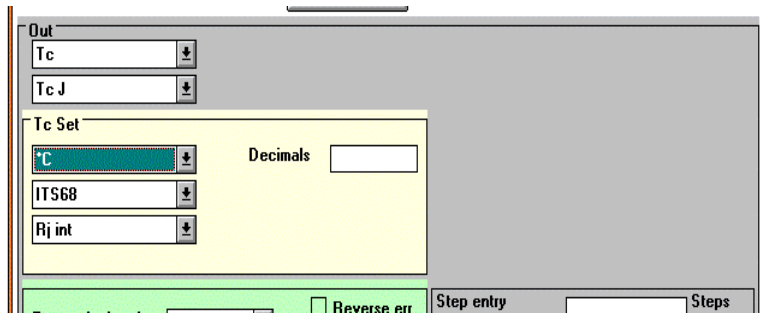
- CALIBRATOR OUT : **CL520 series** generates a signal. This function is used to calibrate and test signal indicators, recorders, etc.
- CALIBRATOR IN : **CL520 series** reads a signal. This function is used to calibrate and test signal generators (eg. Tc, Rtd, etc.)
- CALIBRATOR IN/OUT : The calibrator generates a signal and reads another one simultaneously. This function is used to calibrate and test signal Trx.

STEP TIME : Sets the time between one step and the next one. Note that a null time indicates a manual selection of the step in **CL520 series**;

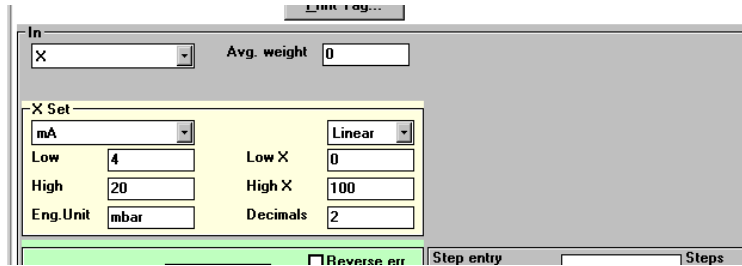
Type area :

In this area it is possible to select the type of signal to be generated, measured or both of them according to the selected "MODE" option. For every particular type of signal, other pieces of information have to be typed in.

In the following figure, for example, are shown the Tc output parameters : the Tc type, the temperature scale, the engineering unit, decimal numbers, the compensation type.



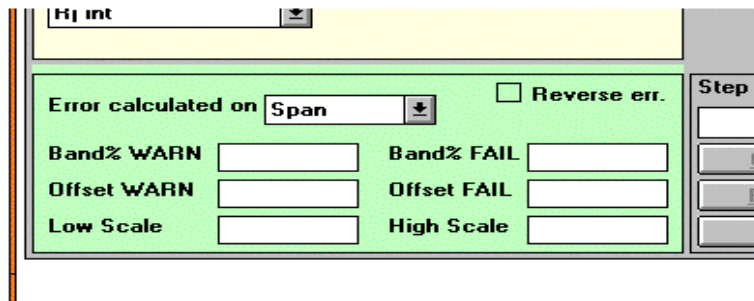
In the following figure, for example, are shown the X input parameters : the electrical signal type, the scale type (linear or square), the low and high values of the electrical signal, the lowX and highX value of the engineering scaled unit, the engineering scaled unit and decimal numbers.



AVG. WEIGHT : This parameter permits to set the average weight to program the digital low pass filter. This parameter, if it isn't set on zero, allows measurements of an unstable input signal. See par. 8.10 in CL520 series instruction manual.

Accuracy area :

In this area it is possible to set the error parameters of the instrument to be checked.



REVERSE ERR(OR) : Activating this function, the resultant error has the sign changed.

The error can be checked in two ways:

SPAN: The error is calculated on the instrument range : In this case, the low scale and full scale values of the instrument to be checked have to be typed in.

READING : The error is calculated on the instrument reading

In both cases, four values are to be inserted :

WARN(ING) : If the error of the instrument should exceed the WARNING value, **CALPMAN** considers the instrument calibrated. Anyway it is equally suggested to check it. The values to be specified are BAND % and OFFSET:

$$\text{WARNING} = \pm (\text{BAND\% WARN} + \text{OFFSET WARN})$$

If the error is comprised within the WARNING band, set in by the above formula, **CL520 series** will mark the measure with a WARN message.

FAIL :

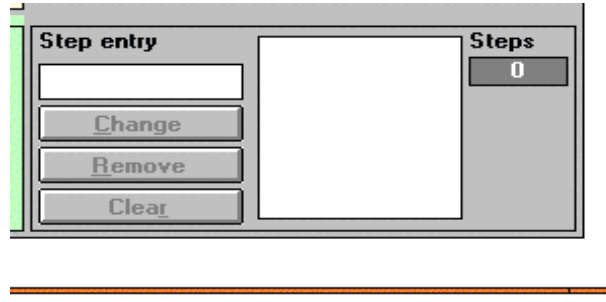
If the instrument error exceeds the FAIL value, **CALPMAN** will consider the instrument out of calibration. The values to be inserted are BAND % and OFFSET, using the same formula:

$$\text{FAIL} = \pm (\text{BAND}\% \text{ FAIL} + \text{OFFSET FAIL})$$

If the error is in the fail band, or higher than it, **CL520 series** will mark the measure with a FAIL message.

Step area :

This option allows to set the steps value for programming the calibration procedure.



Example

The following example will be useful for a better understanding:

Tag name: "EE1234"

Descr. : It is a Tc indicator with accuracy $\pm(1\% \text{ of rdg} + 1^\circ\text{C})$

MODE:	Calibrator out	(CL520 series as Tc generator)
STEP time:	00.00.00	(manual setting of the steps)
OUT:	Type : Tc	
	Subtype : Tc K	
	Eng. unit : °C	
	ITS 68	(temperature scale)
	Decimals: 1	(decimal visualised)
	Rj type : Ext.	

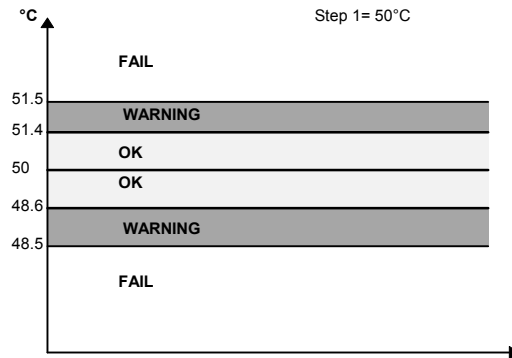
Error calculated on :	Reading
Band % WARN:	0.8
OFFSET WARN:	1
Band % FAIL:	1
OFFSET FAIL:	1

STEP NUMBER:	4
step 1:	50 °C
step 2:	100 °C
step 3:	200 °C
step 4:	300 °C

For example, at step 1 , the calculated warning and fail errors will be:

WARN : $\pm (50^\circ\text{C} \times 0.8\% + 1^\circ\text{C}) = \pm 1.4 \text{ }^\circ\text{C}$
 FAIL : $\pm (50^\circ\text{C} \times 1\% + 1^\circ\text{C}) = \pm 1.5 \text{ }^\circ\text{C}$

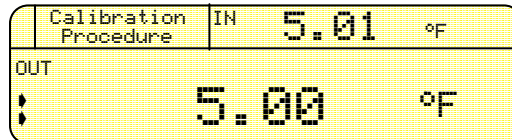
The above formula will be simplified in the following diagram:



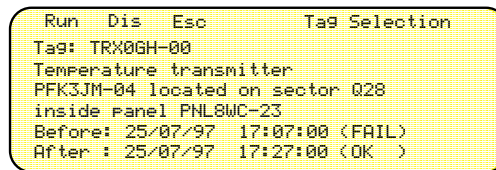
4.4 CL520 series calibration procedure

Once the tag has been completed and appended (use the SERIAL menu) in **CL520 series**, the calibrator has to be brought on field, and all the connections are to be made.

- Press the **<MENU>** key until the "Calibration procedure" message appears on the menu bar :



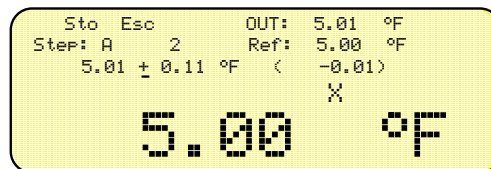
- Press the **<Calibration Procedure>** key. You will see your tag name and its description displayed (if more than one tag has been stored into memory, by pressing the numerical arrow you'll display the tags in sequence: once you're on the desired one, simply stop pressing).



Now it will be possible to:

- dis** : Display the tag parameters
- esc** : Return to the normal working mode
- run** : Start the calibration procedure
- ⊙** : Show the previous Tag
- : Show the next Tag

Once the desired Tag procedure is selected and the **<RUN>** key is pressed, the calibration procedure will be running. Then the following page will appear:



When a tag is running, you'll have to set it in different ways according to the calibration mode:

- CALIBRATOR OUT:** type in the value read on the target instrument, and press **<STO>** to confirm the value.
- CALIBRATOR IN, InP or IN/OUT:** wait for the read value to be stable, then press **<STO>**.
- CALIBRATOR InP/IN:** wait for the read value to be stable and in the reference band, then press **<STO>** (the **<STO>** key lits only if the measured value is in the reference band).

You'll see that the reported value will be comprised between two parentheses:
If the parentheses appear inverted on the display (green into a black square), it means that the value is in the WARN band. If, instead, the whole value is inverted, it is a FAIL value.

A normal displayed value is accepted as correct (OK value).

Once the process is ended, **CL520 series** will go back to the tag description page, and the BEFORE mark will report the results: WARN, FAIL or OK.

It's now that a decision has to be made:

- if the result is OK, the procedure can be ended, if the result is warn a check is suggested,
- if it is a Fail message, the instrument has to be recalibrate.

It is possible to repeat or to jump a calibration step pressing the <Shift>+<5> and <Shift>+<0> keys.

When the checking operations on the instrument has been completed, it's possible to start with the AFTER (calibration) procedure.

Note: The calibration data will not be saved if some calibration step was jumped. Anyway a warning message will appear on the display.

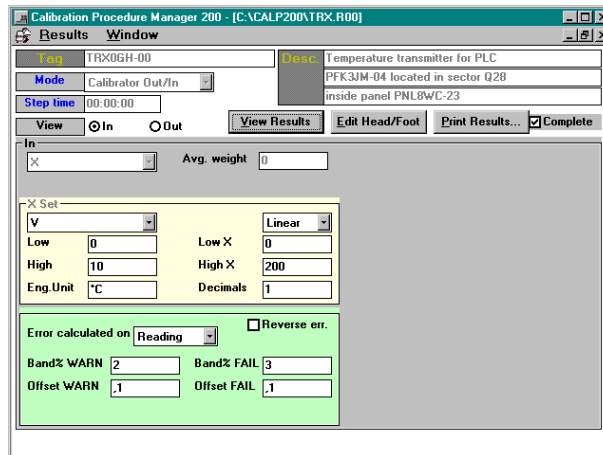
To begin the AFTER calibration procedure press the <ENTER> key and the <5> key then press the <RUN> key to begin the calibration procedure.

The AFTER procedure works in the same way as the BEFORE one.

4.5 Analyze the results

When also the AFTER procedure has been completed, the process results can be achieved by CALPMAN using the LIST RESULTS option.

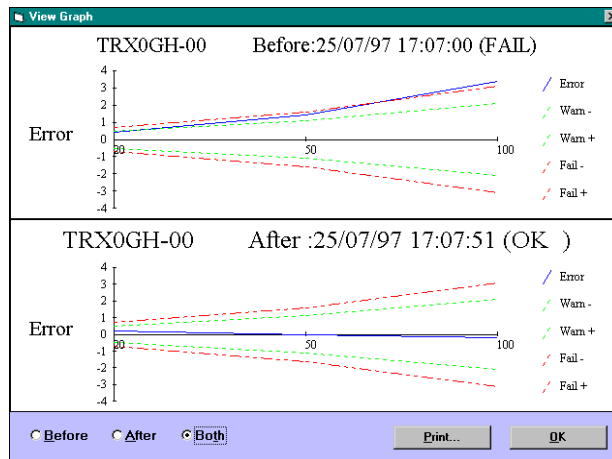
- Switch the calibrator on and run the **CALPMAN** procedure on the PC. Connect the CL520 series serial port to the RS232 port of the PC using the TTL/RS232 adapter.
- In the menu bar select the "Result" from the main bar menu and, then the "List" option.
- The CL520 series Tag data files will be displayed. Select, with the mouse the desired tag to be downloaded and press the <GET> button. Note that you'll have the results printed as BEFORE and AFTER:



A header and a footer can be attached to each tag result in order to have a detailed comment about the process. Select the "View Result" button ; the following page will be displayed :

Step	Reference	Value	Error	Bnd. WARN/	FAIL	Res.	Gener.	Value
Before: 25/07/97 17:07:00 (FAIL)								
1	20,0	20,4	0,4	0,5/	0,7 °C	()00		20,0 °C
2	50,0	51,4	1,4	1,1/	1,6 °C	(W)00		50,0 °C
3	100,0	103,4	3,4	2,1/	3,1 °C	(F)00		100,0 °C
After : 25/07/97 17:07:51 (OK)								
1	20,0	20,2	0,2	0,5/	0,7 °C	()00		20,0 °C
2	50,0	50,0	0,0	1,1/	1,6 °C	()00		50,0 °C
3	100,0	99,8	-0,2	2,1/	3,1 °C	()00		100,0 °C

Select the "Export" option to export your data in ASCII format.
 Select the "Graph" option to display your data in a graphical mode :



4.6 How to operate

Some typical procedures to check and to calibrate the most common instruments are shown in the following paragraphs.

4.6.1 Checking a thermocouple

The following procedure, shows how to operate to check a thermocouple connected to the input of CL520 series calibrator.

If, for example, we need to calibrate a thermocouple type K temperature range between 50 - 500 °C.

To operate, we should need a CL520 series multifunction calibrator, a PC with the **CALPMAN** software installed and a temperature calibrator (eg. a MicroCal T500).

- Run the **CALPMAN** software package and select a NEW TAG from the bar menu.
- Set the parameters for the calibration procedure as follows:

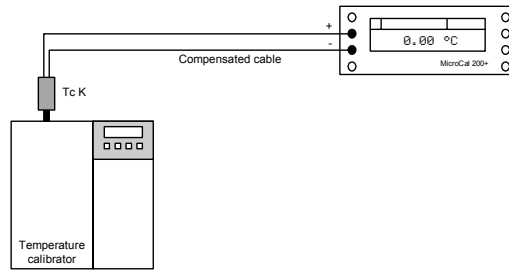
Note : refer to par 4.3 (New Tag) for all parameter meanings.

- Save the Tag configuration on the hard-disk using the Tag menu
- Switch CL520 series on
- Connect the PC to CL520 series using the TTL/RS232 adapter cable
- Select the "Append Tag" option from the "Serial" menu to download the calibration procedure into CL520 series.
- Disconnect the serial communication cable. If necessary, it is possible to switch CL520 series off.

The following operation could be executed in laboratory or also in field :

- Switch CL520 series and the temperature calibrator on.
- Insert the thermocouple type K in the hole of the temperature calibrator equalizing block

- Connect the thermocouple compensated cable to CL520 series



- Program the temperature set point on the temperature calibrator for the step 1 value (50 °C) and wait for the stabilizing time.
- To run the calibration procedure on CL520 series make reference to par. 4.4
- When the temperature value indicated on CL520 series is stabilized, press the <STO> key to accept the measurement and to go to the following step.
- Program the temperature calibrator for the next step value and wait for the correct temperature.
- Press the <STO> key on CL520 series to accept the value and to go to the next calibration step.
- Repeat the two above operations for all the calibration steps. It is possible to repeat or jump a calibration step pressing the <Shift>+<5> and <Shift>+<0> keys.

Note: The calibration data will not be saved if some calibration step was jumped. Anyway a warning message will appear on the display.

- All the calibration data are memory stored in CL520 series and, if necessary, it is possible to switch the calibrator off.
- Use the par. 4.5 procedure to download the calibration data and prepare the thermocouple calibration report for the PC.

4.6.2 Calibrating an indicator

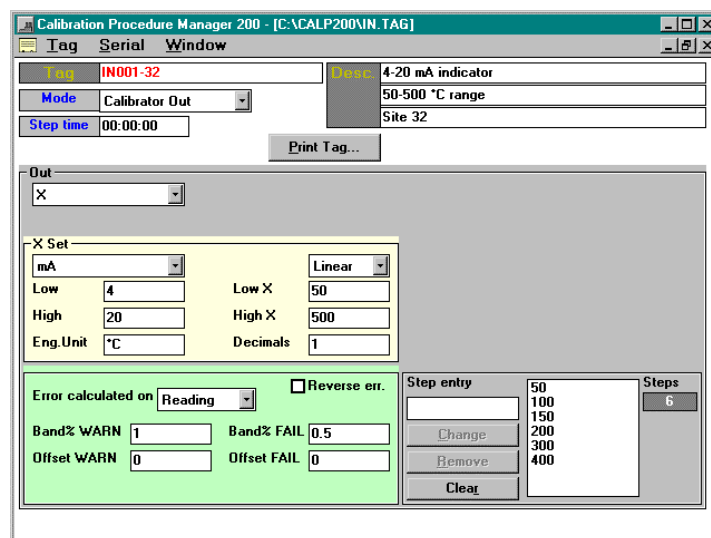
The following procedure, shows how to operate to check or calibrate a 4-20 mA indicator connected to the output of CL520 series.

If, for example, we need to calibrate 4-20 mA input indicator scaled between 50 - 500°C.

To operate, we should need a CL520 series multifunction calibrator and a PC with the **CALPMAN** software installed.

- Run the **CALPMAN** software package and select a NEW TAG from the bar menu.
- Set the parameters for the calibration procedure as follows:

Note : refer to par 4.3 (New Tag) for all parameter meanings.



- Save the Tag configuration on the hard-disk using the Tag menu
- Switch the calibrator on
- Connect the PC to CL520 series using the TTL/RS232 adapter cable
- Select the "Append Tag" option from "Serial" menu to download the calibration procedure into CL520 series.

- Disconnect the serial communication cable. If necessary, it is possible to switch CL520 series off.

The following operation could be carried out in laboratory or also in field :

- Switch CL520 series on.
- Connect the indicator to the calibrator.



- To run the calibration procedure on CL520 series make reference to par. 4.4
- When the value indicated on CL520 series is stabilised, insert the displayed value and press the <STO> key to accept the measurement and to go to the following step.
- Repeat the two above operations for all the calibration steps. It is possible to repeat or jump a calibration step pressing the <Shift>+<5> and <Shift>+<0> keys.

Note: The calibration data will not be saved if some calibration step was jumped. Anyway a warning message will appear on the display.

- All the calibration data are memory stored in CL520 series and, if necessary, it is possible to switch CL520 series off.
- Use the par. 4.5 procedure to download the calibration data and prepare the indicator report for the PC.

4.6.3 Calibrating a signal Trx

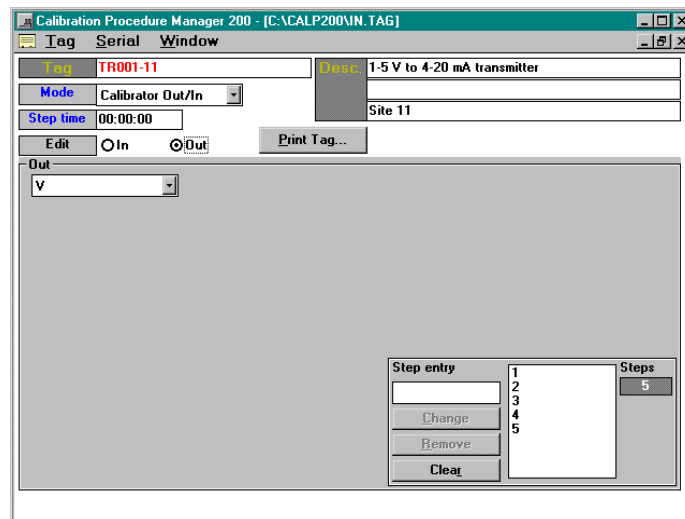
The following procedure, shows how to operate to check or calibrate a 1-5 V to 4-20 mA signal transmitter connected between the output and the input of CL520 series.

To operate, we need a CL520 series multifunction calibrator and a PC with the **CALPMAN** software installed.

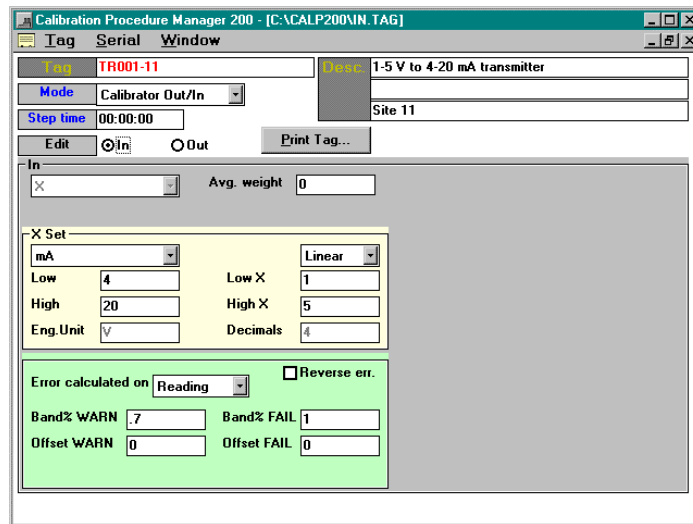
- Run the **CALPMAN** software package and select a NEW TAG from the bar menu.
- Set the parameters for the calibration procedure as follows:

Note : refer to par 4.3 (New Tag) for all parameter meanings.

- 1) Set the *output parameters* for voltage generation and to program the voltage step :



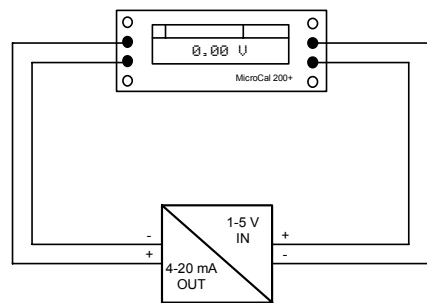
- 2) Set the *input parameters* for 4-20 mA signal and 1-5 V reading:



- Save the Tag configuration on the hard-disk using the Tag menu
- Switch the calibrator on
- Connect the PC to CL520 series using the TTL/RS232 adapter cable
- Select the "Append Tag" option from the "Serial" menu to download the calibration procedure into CL520 series.
- Disconnect the serial communication cable. If necessary, it is possible to switch CL520 series off.

The following operation could be executed in laboratory or also in field :

- Switch CL520 series on.
- Connect the Trx to the calibrator as follows :



- To run the calibration procedure on CL520 series make reference to par. 4.4
- When the value indicated on CL520 series is stabilized, press the <STO> key to accept the measurement and to go to the following step.
- Repeat the two above operations for all the calibration steps. It is possible to repeat or jump a calibration step pressing the <Shift>+<5> and <Shift>+<0> keys.

Note: The calibration data will not be saved if some calibration step was jumped. Anyway a warning message will appear on the display.

- All the calibration data are memory stored in CL520 series and, if necessary, it is possible to switch CL520 series off.
- Use the par. 4.5 procedure to download the calibration data and prepare the indicator report for the PC.

WARRANTY/DISCLAIMER

OMEGA ENGINEERING, INC. warrants this unit to be free of defects in materials and workmanship for a period of **13 months** from date of purchase. OMEGA Warranty adds an additional one (1) month grace period to the normal **one (1) year product warranty** to cover handling and shipping time. This ensures that OMEGA's customers receive maximum coverage on each product.

If the unit should malfunction, it must be returned to the factory for evaluation. OMEGA's Customer Service Department will issue an Authorized Return (AR) number immediately upon phone or written request. Upon examination by OMEGA, if the unit is found to be defective it will be repaired or replaced at no charge. OMEGA's WARRANTY does not apply to defects resulting from any action of the purchaser, including but not limited to mishandling, improper interfacing, operation outside of design limits, improper repair, or unauthorized modification. This WARRANTY is VOID if the unit shows evidence of having been tampered with or shows evidence of being damaged as a result of excessive corrosion; or current, heat, moisture or vibration; improper specification; misapplication; misuse or other operating conditions outside of OMEGA's control. Components which wear are not warranted, including but not limited to contact points, fuses, and triacs.

OMEGA is pleased to offer suggestions on the use of its various products. However, OMEGA neither assumes responsibility for any omissions or errors nor assumes liability for any damages that result from the use of its products in accordance with information provided by OMEGA, either verbal or written. OMEGA warrants only that the parts manufactured by it will be as specified and free of defects. OMEGA MAKES NO OTHER WARRANTIES OR REPRESENTATIONS OF ANY KIND WHATSOEVER, EXPRESSED OR IMPLIED, EXCEPT THAT OF TITLE, AND ALL IMPLIED WARRANTIES INCLUDING ANY WARRANTY OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE HEREBY DISCLAIMED. LIMITATION OF LIABILITY: The remedies of purchaser set forth herein are exclusive and the total liability of OMEGA with respect to this order, whether based on contract, warranty, negligence, indemnification, strict liability or otherwise, shall not exceed the purchase price of the component upon which liability is based. In no event shall OMEGA be liable for consequential, incidental or special damages.

CONDITIONS: Equipment sold by OMEGA is not intended to be used, nor shall it be used: (1) as a "Basic Component" under 10 CFR 21 (NRC), used in or with any nuclear installation or activity; or (2) in medical applications or used on humans. Should any Product(s) be used in or with any nuclear installation or activity, medical application, used on humans, or misused in any way, OMEGA assumes no responsibility as set forth in our basic WARRANTY/DISCLAIMER language, and additionally, purchaser will indemnify OMEGA and hold OMEGA harmless from any liability or damage whatsoever arising out of the use of the Product(s) in such a manner.

RETURN REQUESTS / INQUIRIES

Direct all warranty and repair requests/inquiries to the OMEGA Customer Service Department. BEFORE RETURNING ANY PRODUCT(S) TO OMEGA, PURCHASER MUST OBTAIN AN AUTHORIZED RETURN (AR) NUMBER FROM OMEGA'S CUSTOMER SERVICE DEPARTMENT (IN ORDER TO AVOID PROCESSING DELAYS). The assigned AR number should then be marked on the outside of the return package and on any correspondence.

The purchaser is responsible for shipping charges, freight, insurance and proper packaging to prevent breakage in transit.

FOR **WARRANTY** RETURNS, please have the following information available BEFORE contacting OMEGA:

1. P.O. number under which the product was PURCHASED,
2. Model and serial number of the product under warranty, and
3. Repair instructions and/or specific problems relative to the product.

FOR **NON-WARRANTY** REPAIRS, consult OMEGA for current repair charges. Have the following information available BEFORE contacting OMEGA:

1. P.O. number to cover the COST of the repair,
2. Model and serial number of product, and
3. Repair instructions and/or specific problems relative to the product.

OMEGA's policy is to make running changes, not model changes, whenever an improvement is possible. This affords our customers the latest in technology and engineering.

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Where Do I Find Everything I Need for Process Measurement and Control? OMEGA...Of Course!

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- Wire: Thermocouple, RTD & Thermistor
- Calibrators & Ice Point References
- Recorders, Controllers & Process Monitors
- Infrared Pyrometers

PRESSURE, STRAIN AND FORCE

- Transducers & Strain Gauges
- Load Cells & Pressure Gauges
- Displacement Transducers
- Instrumentation & Accessories

FLOW/LEVEL

- Rotameters, Gas Mass Flowmeters & Flow Computers
- Air Velocity Indicators
- Turbine/Paddlewheel Systems
- Totalizers & Batch Controllers

pH/CONDUCTIVITY

- pH Electrodes, Testers & Accessories
- Benchtop/Laboratory Meters
- Controllers, Calibrators, Simulators & Pumps
- Industrial pH & Conductivity Equipment

DATA ACQUISITION

- Data Acquisition & Engineering Software
- Communications-Based Acquisition Systems
- Plug-in Cards for Apple, IBM & Compatibles
- Datalogging Systems
- Recorders, Printers & Plotters

HEATERS

- Heating Cable
- Cartridge & Strip Heaters
- Immersion & Band Heaters
- Flexible Heaters
- Laboratory Heaters

ENVIRONMENTAL MONITORING AND CONTROL

- Metering & Control Instrumentation
- Refractometers
- Pumps & Tubing
- Air, Soil & Water Monitors
- Industrial Water & Wastewater Treatment
- pH, Conductivity & Dissolved Oxygen Instruments