```
         ooo              ooo
         ooo              ooo

      ooooo      ooooo      oooooo
     ooooo    oooooooooo    oooooo
       ooo    oooo    oooo      ooo
       ooo    oooo                ooo
       ooo    oooo    oooo      ooo
       ooo    oooooooooo    ooooooo
   ooo ooo        oooooo    ooooooo
   ooo ooo
     oooo
```

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JCILOG: COMMUNICATIONS INTERFACE AND SOFTWARE FOR LINKING JCI FIELDMETERS TO MICROCOMPUTERS FOR DISPLAY, ANALYSIS AND STORAGE OF OBSERVATIONS.

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JCILOG: COMMUNICATIONS INTERFACE AND SOFTWARE FOR LINKING JCI FIELDMETERS TO MICROCOMPUTERS FOR DISPLAY, ANALYSIS AND STORAGE OF OBSERVATIONS.

1. INTRODUCTION

Hardware and software features are described for the proprietary serial data communications interface that is fitted as an integral option to the JCI 140|C Static Monitor or JCI 140CF instruments. It is also applicable to the JCI 178C Charge Measurement Unit.

The facilities of the interface and the software JCILOG enable instrument observations to be transferred directly into an IBM PC or compatible microcomputer for data display, storage and subsequent data analysis. The software may also be used with all JCI instruments fitted with a serial data communications interface. This includes the JCI 155v4 Charge Decay Test Unit, JCI 131 fieldmeter, JCI 111C electrostatic fieldmeter, the JCI 122 Display Module providing power supply and signal processing for the JCI 121 fieldmeter and the JCI 165 External Interface Unit for operation with the Model 404 fieldmeter.

2. ALLOCATION OF CONNECTOR PINS

Serial interface signals from JCI 140C, JCI 140CF and JCI 155v4 instruments are via an 8w miniature DIN socket connector. A cable is supplied linking an 8w miniature DIN plug to a 9w D type socket connector which is the usual serial interface on desktop and portable PC compatible microcomputers. The pin connections for the JC 131 are identified in the JCI 131User Manual.

Allocation of pins on 25 way 'D' type socket connector, 9 way D type connector and 8 way miniature DIN connector on JCI 140 for linking to serial data port of IBM PC and compatible microcomputers are as follows:

	25 way D type	**9 way D Type**	**8 way min DIN and cable**
Frame ground	1	5 (cable screen)	(cable screen)
Transmit data TD	2	3	4 yellow
Receive data RD	3	2	7 green
RTS	4	7	1 black
CTS	5	8	
earth	6, 8, 20	linked together	
signal ground	7	1	2 white

3. CABLE

A 2m cable is supplied with an 8w miniature DIN plug at one end and a 9w D type socket at the other end. Any extension to this cable for connection to the serial data port (RS232C) of the microcomputer should be a 'straight through' (DCE/DTE) multicore cable with no crossovers - and preferably screened. For linkage from the 9 way D connectors to a 25w D connector serial port is most simply made using a 25 to 9 way adaptor.

4. DATA COMMUNICATION ARRANGEMENTS

Receipt of an RTS signal from the computer initiates 12 bit analogue to digital conversion of the fieldmeter signal. The results of this conversion are communicated back directly to the computer as two bytes of information - the least significant 8 bits (the LO byte) followed immediately by the remaining 4 bits (HI byte). The additional 4 bits of the HI byte are used for sensitivity range information. The communication proceeds on receipt of the RTS signal with no

additional signalling from the computer and no preceding transmission of a CTS signal. This is done to provide the highest data transfer and acceptance rate. The data structure uses 1 stop bit and no parity.

5. DATA RATE
The baud rate is set by links on the communications interface circuit card at 9600 baud. The software accepts and handles data at this rate and can provide 400 fieldmeter readings a second. This gives 2.5 ms between readings.

6. MICROCOMPUTER AND SOFTWARE
The software for the transfer, storage and analysis of data has been written as Turbo Pascal 5.5 code with some assembler routines and is designed for use on all standard IBM PC and PC compatible microcomputers while operating in true MSDOS. CGA or better graphics capability is required (i.e. CGA, EGA, VGA or Super VGA graphics). The number of readings per second is independent of the computer processor clock rate, but other operations of the software will be a bit quicker with a higher clock rate.

7. ARRANGEMENTS FOR LOADING AND RUNNING SOFTWARE
The program JCILOG is supplied on a 3½" disc, The software may be run from this disc in drive a: or loaded on to the computer hard disc - which is usually more convenient. It will be wise to make a backup copy of the source disc.

The arrangements for software installation are different for the following situations:
    a) Computers using Windows 95/8
    b) Computers using Windows 3.1
    c) Computers using MS-DOS only

In the following text characters or words in angle brackets refer to keys on the keyboard, e.g

  <N>   refers to the key marked N
  <Return>   refers to the return key

7.1 Computers using Windows 95 / 98
7.1.1 Windows 95/98 Installation
    Read this before installing:

If you wish to operate from an icon in the Start / Programs Menu, then when prompted select

        "Windows 95 / 98 Installation .... <9>"

    ON NO ACCOUNT should you select Windows 3.1 installation

    The JCILOG software requires the DOS operating system which exists
    "under" Windows 95, 98. This is normally accessed by selecting
    and confirming

        Start/shUtdown/Restart in Ms-dos mode/Yes

If you often run your computer in DOS Mode in this way, (NOT just using MS-DOS Prompt) then you can select:

"No Windows Installation .... <N>"

when prompted during installation.

Instructions for leaving Windows 95/98 and getting into DOS are repeated in the Program Run section below.

The installation provides only for colour monitors, there is no special mode for monochrome screens.

To start the installation:

The Installation disc should be in the A: drive.

Select and confirm Start / Run, and type into the Command Line:

   a:\INSTALL <Return>

  When prompted select No Windows, or Windows 95/8, Installation
  using <N> or <9> keys respectively

The installation will abort if it cannot be performed. The most
likely cause is insufficient disc space.

When the installation is complete, remove this installation disc
and store it carefully in a safe place.

In a Windows 95 / 98 installation, you should now

  1. Reboot computer.
  2. Select and confirm Start / Run / Programs
  3. Check that there is a JCI Programs Icon.

7.1.2 To run the program under Windows 95/98:

  1. Ensure that an instrument is connected and switched on.

  2. We recommend exit from all running programs.

  3. From the Program Manager, select

     Start / programs / jci / jcilog.

  4. You will be asked to confirm that you are happy to exit
     Windows.

  5. When you quit the program you return to Windows typing

at the DOS prompt:
  win <Return>

If using a DOS only installation:

  1. Ensure that an instrument is connected and switched on.
  2. Select and confirm Start/shUtdown/Restart in Ms-dos mode/Yes
  3. A DOS prompt will appear. Type the following (as required, to
     ensure that the current Directory is c:\):

     cd c:\ <Return>

  Then

     jcilog <Return>

  4. When you quit the program you return to Windows by typing
     at the DOS prompt:

     win <Return>

7.2 Computers using Windows 3.1
7.2.1 Installation under Windows 3.1

  Read this before installing:

  This software requires the DOS operating system which exists
  "under" Windows 3.1 to allow data collection to occur at the
  maximum rate of 400 samples/second, and giving the most accurate
  results. Therefore we recommend you choose

        "No Windows Installation .... <N>"

when prompted during installation. Instructions for leaving Windows 3.1 and getting into DOS
are given in the Program Run section below.

If you wish to operate from an icon in the Windows Program Manager, you will have to accept
reduced performance
    (100 samples/second). When prompted select

        "Windows 3.1 Installation .... <3>"

ON NO ACCOUNT should you select Windows 95/98 installation

There are 2 possible installations, one for colour monitors, and one for monochrome (e.g LCD)
screens.

To start the installation:

4

This Installation disc should be in the A: drive.

From the Program Manager, select File / Run, and type into the Command Line:

If a coloured display is available:

a:\INSTALL <Return>

When prompted select No Windows, or Windows 3.1, Installation using <N> or <3> keys respectively

If only a monochrome display is available:

a:\INSTALBW <Return>

When prompted select No Windows, or Windows 3.1, Installation using <N> or <W> keys respectively

The installation will abort if it cannot be performed. The most likely cause is insufficient disc space.

When the installation is complete, remove this installation disc and store it carefully in a safe place.

If a Windows 3.1 installation, you should now

1. Reboot computer.
2. Select and confirm Program Manager / Arrange / Icons
3. Check that there is a JCI Programs Icon.

7.2.1 To run the program under Windows 3.1:

If a DOS only installation:

1. Ensure that an instrument is connected and switched on.
2. From the Program Manager, select File / eXit Windows.
3. From the resultant Exit Windows Dialogue box select OK.
4. A DOS prompt will appear. Type the following (as required, to ensure that the current Directory is c:\):

cd c:\ <Return>

Then

jcilog <Return>

5. When you quit the program you return to Windows by typing at the DOS prompt:

win <Return>

NOTE: Under no circumstances should the program be run from within Program Manager \
Main   \ MS-DOS Prompt!

If a Windows 3.1 installation:

    1. Ensure that an instrument is connected and switched on.
    2. From the Program Manager, select JCI programs / jcilog.
    3. When you quit the program you return to Windows automatically

NOTE: Under no circumstances should the program be run from within Program Manager \
Main \ MS-DOS Prompt!

<u>7.3 Computers using MS-DOS only</u>
7.3.1 MSDOS Installation

Read this before installing:

You must select:

        "No Windows Installation .... <N>"

when prompted during installation.

    ON NO ACCOUNT should you select Windows 3.1 installation

    ON NO ACCOUNT should you select Windows 95/98 installation

There are 2 possible installations, one for colour monitors, and one for monochrome (e.g LCD)
screens.

To start the installation:

    This Installation disc should be in the A: drive.

    From the MS-DOS prompt, type:

    If a coloured display is available:

        a:\INSTALL <Return>

  When prompted select No Windows using <N> key.

    If only a monochrome display is available:

        a:\INSTALBW <Return>

  When prompted select No Windows using <N> key.

The installation will abort if it cannot be performed. The most likely cause is insufficient disc space.

When the installation is complete, remove this installation disc and store it carefully in a safe place.

7.3.2 To run the program under MSDOS:

    1. Ensure that an instrument is connected and switched on.
    2. Type the following (as required, to
      ensure that the current Directory is c:\):

      cd c:\ <Return>

    Then

      jcilog <Return>

    3. When you quit the program you return to DOS prompt.

7.4 Start-up configuration
A modifiable "startup" configuration file (\fmlog\jcifmgex.htx) supplied with the program sets parameters for data logging as follows.

    c: Drive
    "jcilog" directory for logging files
    64k file size limit
    "csv" dot extension to file names

    1 serial port number
    computer range control
    0.5 second reading interval
    0.5 second short averaging interval
    10kV short averaging threshold
    2.5 second medium averaging interval
    3kV medium averaging threshold
    50 second long averaging interval

This file is in read-only form in the directory of configuration files under the name "default(.htx)", and may be selected to restore the original configuration.

Please read the document "Software 'JCILOG'" for information on how to alter any of the above parameters and to save configuration files so that sets of parameters may be quickly recovered. Also on how to select between Computer and Manual gain control from the display screen during data logging.

Note: If a new version of JCILOG is installed to an existing system, or if log files are copied into the working directory with the same file extension as you are or will be using, then a 'filing error' may be encountered.   In the directory FMLOG there is a file FMLOGNUM.HTX with a single

line LLN #xxx - where xxx is a decimal number. This number is incremented for each new log file created. If a log file exists in the working directory with the same extension are requested with a number larger than the next LLN number then a filing error will occur. There are 3 ways to fix this:

1) change the directory you are using for storing obervations
2) change the file extension you are using
3) edit (in MSDOS) the number in FMLOGNUM.HTX to be larger than the largest number that has been used

We recommend trying 1) or 2) to avoid any risks of upsetting the basic software.

8. GENERAL PROGRAM OPERATION

8.1 To run JCILOG, go to the root directory within true MSDOS, c:\, and type JCILOG
    (Provision is made for operating under Windows but data collection is reduced to 200 samples per second, and the program MUST be run either from within the program manager
                (jci group, jcilog icon)
        or from the file manager
                (run \windows\jcifmgex.pif)
         It should NOT be run from within the MsDos Window in Main group).

8.2 The parameters for operating the software are set via menus (see Section 9 below). The user is guided through the various options available and can select the options desired using the TAB key.
    When operating parameters have been selected which are appropriate for a particular set of measurements these settings may be saved to a configuration file and recalled for subsequent similar runs. Some or all of these settings may be changed before, or during, any set of observations - and these may be saved if desired to the same or another configuration file. This arrangement is designed to provide the simplest and quickest route to start 'standard' sets of measurements. In addition, any one of these configuration files may be made standard so that configuration is automatically installed at program start

8.3 The main features available in the sequence of menus relate to the following main menus:

        Menu 1: Configuration load

        Menu 2: Log file

        Menu 3: Logging parameters

        Menu 4: Graph axes

    Throughout the menus to options are selected using the TAB key (or shift+TAB to reverse direction of selection). Each menu may be reset before moving on if the selection is not as desired. The instructions for action are presented in a reverse video box which is below the selection to be made.
    The program is exited to the operating system by selecting 'Quit' (or typing 'Q') when the quit option appears.
    The facilities available in individual menus are outlined below.

9. THE MENUS IN DETAIL
9.1 Initial menu: 'Change Configuration?'.

9.1.1 The top line of the menu shows the name of the fieldmeter or instrument that is assumed by the software to be connected at the top left hand position. At the top right hand position there is the name of the configuration file that is in use. Under this line there is the question "Change configuration/description (Yes/No)? If both the fieldmeter name and the configuration name are as required, then no change is needed, and the default option 'No' offered on the line may be taken by pressing <RET>. Otherwise the 'Yes' option may be selected using the <TAB> key, and confirmed by the <RET> key.

9.1.2 The user is next prompted to enter (or edit) a description which may contain up to 40 characters. This description is optional. Whether a description is entered or not press <RET> to proceed.

> **Note**: Initially typing a character in the description will obliterate any previous description which may have appeared; if it is required to edit an existing description, then press the <INS> key, or an arrow key to move the editing cursor. (Note that on portable and some older machines the Num Lock Indicator must be off to allow the use of arrow keys). The editing mode may be toggled between insert and overtype by the <INS> key. The insert cursor shows a non flashing character, while the overtype cursor has a flashing character. <BackSpace>, <Del>, <Home>, and <End> keys have their normal functions, while <ESC> restores the original description, if any.

9.1.3 If no configuration change was selected, and all is well, then the graphical display will appear and the program will start logging data. The display will show values appropriate to the instrument readings – e.g. 'voltage' for a JCI 140. The display settings will be to the values held in the configuration file. If there is a filing problem another press of <RET> will enable operation to proceed – but without filing of data. If there is disc or comms link problem, the appropriate menu will appear instead, but the user should be aware that a wrong identity instrument cannot be detected!

The display shows a graph of the variation of observed signal with time and just above the display the numerical value of the reading. The numerical value is useful when the reading is too close to zero for easy viewing or is off the screen but still within instrument operating range.

During the graphical display the sensitivity range of the instrument is shown at the top right hand coroner of the display. When the sensitivity control is in the 'Computer Manual' mode this box will show, for example,: 'Range Up:U Down: D 20k'. The U and D keys can be used at the keyboard to select instrument operating sensitivity.

The reading moves from left to right over the display at the time rate selected. When the reading reaches the right hand boundary the display wraps round to restart at the left hand side and the graph is shown in reversed colour. In a black/white display a reverse video display is used.

9.1.4 The display and data logging may be interrupted at any time by pressing <ESC>.

9.1.5 If a configuration change was selected, then the opportunity to enter the menus below will be presented in sequence.

9.2 Config Load Menu

The configuration load menu offers the following options in the order shown:

9.2.1 'Configure from file? (Yes/No)?'

The default option is 'No'; if 'No' is selected, then no action is taken, and the user is moved to the next menu line: 'Set disc/directory for logging? (Yes/No)'. See 9.3 Log File Menu below.

If No has been selected the next line asks: 'Set datalogging parameters? (Yes/No):' See 9.4 Datalogging parameters menu below.

If No has been selected the next line asks: 'Program (Continue/Quit)'. If the <TAB> is used to select Quit then the program stops and exits to MSDOS.

9.2.2 If the answer is Yes to 'Configure from file? (Yes/No)?' then a scrollable list showing up to 8 of the available configuration file names appears. The selection is made by using the up/down arrow keys, <PgUp> or <PgDn> etc. as advised by the instructions below. In particular, it will be found that <HOME> and <END> keys select the first and last items in the list respectively.

Before the menu is left an option is provided to reselect a suitable configuration file.

At confirmation of configuration selection the menu returns to the question: 'Set Log disc/directory (Yes/No):' At Yes the Log File Menu is entered – see 9.3 below

9.2.3 After selection, or not, of the Log disc/directory the next line is: 'Set datalogging parameters? (Yes/No):' See 9.4 Datalogging parameters menu below.

9.2.4 If no selection of Log disc/directory or Datalogging parameters is made next option is Program Continue/Quit? If continue is selected then the graphical display is shown as 9.1.3 above.

9.3 Log File Menu.
This menu controls the filing of the logged data. The drive, directory, filename extension and maximum file size can be set, in the order given below:

9.3.1 'Enter or edit the logging drive letter'
The drive letter can be entered or edited at this point. The user should just type the new letter if required, and then use <RET> to confirm the displayed letter. This will normally be 'a' or 'b' for a floppy disc drive, and 'c' for a fixed disc drive. The advantage of using a floppy disc drive is that the disc can be transferred to another computer for examination, and if reasonably quickly replaced by another no data will be lost.

If a 'filing error' message is encountered see section 7.4 above.

If filing on the selected drive is not possible, then the following sub menu message will appear:

(a) 'Drive not ready (Retry/Abandon)-?
The retry option returns the user to the line 11.3.1 above, and the opportunity can be taken as required to replace a faulty disc or change the drive name selected.

The abandon option allows the user to proceed without filing the data; the graphical display can still be used.

If the selected drive is OK for filing, then the following sub menu message will appear:

(b)'Space for log NNNN kB (Retrv/Continue)?'
The user must judge the time this will last knowing the intended logging interval, and that 50 lines need 1kB of space. If a new disc is inserted, select the retry option, otherwise continue.

9.3,2 'Enter/edit logging directory'.

If no directories are required, delete any existing. A single backslash'\' will ensure that files are stored in the root directory, even if the current directory on this disc, set before program start, is not the root. Up to 4 levels of directory may be specified, and the last only will be created automatically if this requirement is confirmed. The separator between the directory names must be a backslash, and an initial backslash is required to override any current directory setting. A final backslash will be added automatically where appropriate.

9.4 Data logging parameters

The first line asks for confirmation or selection of instrument type. The available types may be scanned using the <TAB> key.

Selection of the items that follow are fairly self-evident.

10. MANIPULATION OF GRAPHICAL DISPLAY

The graphical display can be controlled by the following key actions:

<ESC> - leaves the graphical display for the menu, for example to change the logging disc, to prepare to leave the program or to change either of the graph axes.

<Spacebar> - freezes/un-freezes the progress of the graphical display.

<ctrl F> - toggles the free running of the graph so that the display stops at the right hand margin.

<ctrl R> - restarts a display stopped at the right hand margin

<left arrow> - restarts the graph one major graph division earlier than that active. The graph will stop at the right hand margin and can be restarted with ctrl R.

<ctrl (left arrow)> - restarts the graph one whole screen earlier than above, etc.

<home> - restarts the graph at the beginning of the run or at the earliest point available on the circular buffer used for active data storage.

<END> or <right arrow> - returns to the current time for display.

None of the above actions stops the collection of data and this proceeds in the background according to the conditions set.

11. NUMERICAL ANALYSIS OF STORED DATA

The data is stored in a form that can be directly imported as numbers into a spreadsheet such as Lotus123, MS Works or Excel. The data of the .csv file is presented in the first 6 columns of the spreadsheet so if a worksheet has been prepared with built in replicated algebra this should not start before column 7. JCILOG data should be loaded from the top left hand corner of the sheet.

The name of the logging files is generated automatically as LOGnnnnn.xxx - where nnnnn is an automatically incremented 5 digit number, and xxx is a user defined extension, normally chosen to suit the software (e.g. spreadsheet) used for processing the file. The logging files may be stored on any suitable drive, and in any chosen directory of that drive.

Data is presented in successive columns as: hours, minutes, seconds (to the nearest 0.01s), the values of the electric field at that time in kV m^{-1}, and the number of readings contributing to that value. The

first two lines give as a heading the description which was used for the run and the date as day, month, year.