

OPERATING INSTRUCTIONS

EM61MK2 DATA LOGGING SYSTEM
FOR FIELD COMPUTER Allegro Field PC

EM61MK2A

Version 2.20

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1. Introduction

The Geonics EM61MK2 Data Logging System (DAS70/61MK2) consists of a field computer Allegro (or Pro4000), data logging program EM61MK2A (or EM61MK2P for Pro4000), and associated cable to connect the Polycorder to the Geonics EM61-MK2 instrument. The program EM61MK2A is designed for the Allegro field computer, although, if necessary it can be used with any other IBM compatible computer running a MS DOS operating system and equipped with serial port. The only disadvantage of using a standard laptop computer, will be small size of the display which is limited for the Allegro. This documentation describes the use of the EM61MK2A program used with the Allegro field computer, and the Geonics EM61-MK2.

The program EM61MK2A records data together with a time stamp at each station. Data files created with this program can be used to position a survey according to locations recorded separately by a Global Positioning System (GPS).

The EM61MK2A will also accept NMEA-0183 compatible data from a GPS receiver directly connected to an Allegro field computer. GPS data which are embedded in the EM61MK2 data file can be processed later in the Geonics DAT61MK2 program. The connected GPS must be able to stream NMEA-0183 compatible messages. The EM61MK2A uses two NMEA messages GGA and GSA. While message GGA is mandatory, the GSA string is used only to provide information related to the GPS signal quality.

Program EM61MK2A acquires and records survey data from the EM61-MK2 system, under the control of the operator. It also records various field information such as survey line number (line name), starting station, increment, comments, etc. Readings can be displayed in text or graphic mode. Readings are displayed in real time in mV. In addition, the program allows to monitor the instrument output while data are not recorded. The EM61MK2A also continuously monitors the condition of the instrument battery, without leaving the program. The EM61MK2A also provides the possibility of automatic nulling of the instrument output.

The program allows the user to set the EM61-MK2 into a specific instrument mode of operation: AUTO, Wheel, or Manual modes. In AUTO mode readings can be automatically recorded in desired time intervals. In WHEEL mode readings are triggered by a counter installed at the EM61-MK2 wheel assembly, and in MANUAL mode readings are triggered manually by the operator. The program allows you to record data while using the standard EM61-MK2 antennas (0.5 x 1 m, 1 x 1 m, or 0.5 x 0.5 m sensors) as well as Geonics EM61-MK2 Hand Held sensor.

Survey setup parameters are saved in a file, therefore they can be automatically used during subsequent data collection sessions. In addition, ten preset survey setups are provided. These setups are user selectable, they can be edited and saved for future use.

The EM61MK2A also continuously monitors the condition of the instrument battery, without leaving the program.

In addition to logging EM61-MK2 data, the EM61MK2A provides data file management tasks. The program allows you to upload data files to a PC running the DAT61MK2 program. It also has options allowing viewing and deleting data files. Data files are always saved to the programs current directory. Data file names, which can be set by the program based on the computer clock or they are user specified, have extension names R61.

Over 1,000,000 readings can be collected in the field computer Allegro with the standard memory of 8 Mb. The maximum speed of data collection is approximately 15 readings per second in text mode, and 12 readings per second in graphic display mode. In graphic display mode, the profile containing the last 140 (or 84 in Pro4000) data readings for each channel is displayed.

2. Program Requirements

To successfully use this software, you will need :

Computer

Field computer Allegro or Pro4000

or alternatively:

- IBM PC and compatibles,
- Minimum 640 Kbytes of available memory,
- DOS 3.1 or higher,
- Floppy drive or other mean to transfer files,
- CGA graphics capability,
- One Serial Port
- optionally, Two Serial Ports if directly connected GPS system is to be used.

Geonics EM61-MK2

The EM61-MK2 instrument with associated cables.

2.1 Contents of EM61MK2A disk

The program EM61MK2A is stored on DAT61MK2 CD disk or on one 3.5" floppy disk. All necessary initial files (with extension names .INI) are created in your computer after the program is run for the first time. Check that the file EM61MK2A.EXE (and EM61MK2P for Pro4000) is included on the CD or floppy disk.

3. Installing EM61MK2A

While using the Allegro, Pro4000, or other field computer which is not equipped with a floppy drive disk, the EM61MK2A.EXE file should be transferred from a PC computer using software and serial cable provided by manufacturer.

On other computers the EM61MK2A program can be installed by copying the EM61MK2A.EXE file to a directory on your hard disk. This can be performed by using Windows Explorer or at DOS prompt (described below). It is assumed that A: indicates floppy drive, and C: indicates hard disk drive.

A directory (i.e. EM61) can be created with the command MD from DOS.

C:\MD EM61

In order to access directory EM61, type:

C:\CD EM61

Once in EM61 directory the EM61MK2A.EXE file can be copied from the distribution disk.

C:\EM61\ COPY A:EM61MK2A.EXE

After you run the program for the first time it will create permanent initial files EM61MK2.INI, SURVEY0.INI, SURVEY1.INI, etc. which contain some of the program settings. If the above files do not exist on the default drive they will be created with default parameters during the first execution of the program.

The EM61MK2 data files with extension name R61 will be created in the program current directory.

4. Running EM61MK2A Program

The EM61MK2A is a menu-driven program designed to be simple to use.

Most of the menus contains (from the top):

- name of the menu,
- informative window (instrument type, file name, etc.),
- list of options and parameters,
- list of available commands.

Menu selections are made using the **Up/Down** arrow keys. The selected option is highlighted and can be executed by pressing **<ENTER>** key.

Left and **Right** arrow keys are used to edit selected parameter. When editing **Up** or **Down** arrow keys can be used to exit current parameter.

The carriage return key is described as **<ENTER>**, **<CR>**, or symbol. Where permitted by the program, the **<Esc>** key is used to quit the current menu and return to the former one.

In general, settings for most menus can be saved by the function key **F1**. The function key **F2** is used to cancel editing and to return to former settings.

While using the Allegro field computer the program can be started from the FileScout (or ProShell for Pro4000) utility program by selecting its name. Otherwise, the program is started from a copy on the working disk, by entering the name EM61MK2A in response to the DOS prompt, i.e.:

C:\EM61\EM61MK2A <CR>

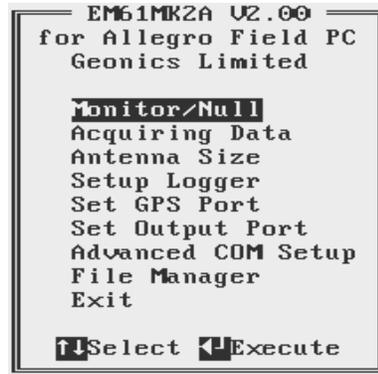
While using the Pro4000 ProShell DOS utility or FileScout DOS File Manager in Allegro Field PC, the computer system will prompt for parameters. Since there is no parameters required press simply **<ENTER>** key.

After name EM61MK2A is entered, the menu, presented in the next section and afterwards called MAIN MENU, is displayed.

5. Main Menu

The Main Menu appears always as the first menu after the program is started. It contains the name of the program, its version number, and list of available options. The EM61MK2A Main Menu is displayed below.

These options are selected by using the **Down** and **Up** arrow keys. Use **<ENTER>** to execute the highlighted item. Short description for each of the options follows.



5.1 Short description of Main menu options

Monitor/Null

This option allows to monitor the EM61-MK2 output and optionally to null the instrument, perform Internal and External QC coil calibration, and check available memory and battery level of the logger.

Acquiring Data

Executing this option leads to the Data Acquiring Menu which allows to set up survey options and logging parameters.

Antenna Size

This option allows to specify size of the standard sensor used for the EM61-MK2. It does not apply if the EM61-MK2 Hand Held sensor is used.

Setup Logger

Menu that is associated with this option is used to set the date and time of the computer, audio click, serial port number, type of pause key, and type of display (text or graphic).

Set GPS Port

This menu allows to disable and enable GPS data acquisition. This menu is also used to set the serial port number used for GPS input, and to specify necessary serial port communication settings.

Set Output Port

This menu allows to disable and enable optional output to other devices.. This menu is also used to set the format of the output string, serial port number used for output, and to specify necessary serial port communication settings.

Advanced COM Setup

This option allows you to set address and interrupt level for each used serial port. These parameters are necessary if more than two serial ports are used during data collection.

File Manager

This option contains three following items listed in File Manager menu:

Upload Files

This option allows to upload recorded data files to a PC computer running DAT61MK2 program.

View Files

The program will display list of available data files that can be reviewed.

Delete Files

This option allows to delete permanently not needed data files from the field computer disk.

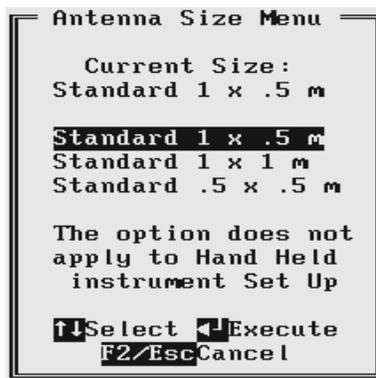
Exit

Selecting this option will terminate the program execution.

6. Antenna Size Menu

The Antenna Size menu allows to select the size of the EM61-MK2 sensor. If the EM61HH-MK2 Hand Held antenna is used this option can be ignored. If the standard antennas are used (1 x 0.5 m, 1 x 1 m, or 05 x 0.5 m) the size of the sensor must be specified before monitoring the instrument output. This menu is presented below.

To select proper instrument type use **Up** and **Down** arrow keys and when highlighted press **<ENTER>**. The currently selected instrument type will be displayed in the top portion of most menus.



7. Monitor/Null Menu

The Monitor/Null menu allows initial inspection of the range of the instrument readings at the particular site, monitoring the instrument performance, quick inspection of the condition of the instrument battery, and setting zero level of the instrument.

It is assumed that the instrument is turned ON prior to using this option. In case the instrument is OFF or the instrument console is not connected to the computer the following message will appear:

```
EM61MK2A V2.00
for Allegro Field PC
Geonics Limited

Monitor/Null
Acquiring Data
Antenna Size
Setup Logger
Set GPS Port

Instrument OFF
(Check also cable)
press any key
to continue
```

Check the connection or turn the instrument ON and select the Monitor/Null option again.

Assuming that the instrument works properly the program will display Monitor/Null menu and will start normalization session which lasts less than 10 seconds. At this stage the Monitor/Null menu will display the following message:

```
Monitor/Null Menu

Ch 1:          mU
Ch 2:          mU
Ch 3:          mU
Ch 4:          mU
GPS disabled
Bt:  U      Mkr:
Normalizing: 25%

Null Int Ex F2Exit ?
```

After the normalization is finished the layout of the Monitor/Null menu is as follows:

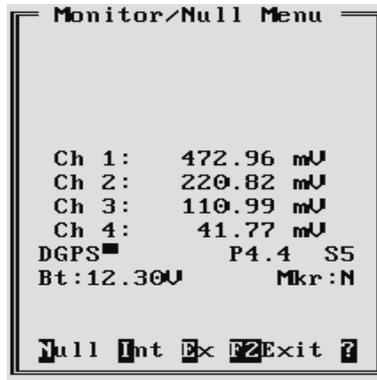
```
Monitor/Null Menu

Ch 1:  471.82 mU
Ch 2:  225.24 mU
Ch 3:  121.17 mU
Ch 4:   49.94 mU
GPS disabled
Bt:12.30U      Mkr:N

Null Int Ex F2Exit ?
```

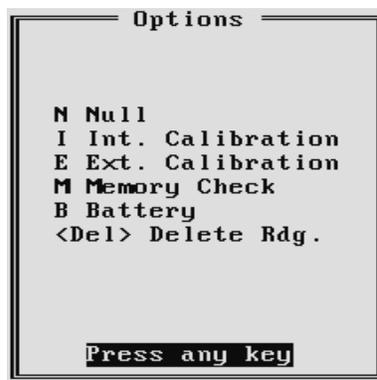
The EM61-MK2 readings are updated approximately 10 times per second during monitoring session. If **Mode 4** was selected on the instrument panel channels **1, 2, 3,** and **4** will be displayed, and when **Mode D** was selected (for Top and Bottom antennas) channels **1, 2, 3,** and **T** will be given in the Monitoring menu. The level of the instrument battery is continuously updated (Bt) in Volts. Battery voltage is followed by label Mkr: which indicates state of the fiducial marker. When fiducial marker is pressed then **Y** is displayed, otherwise label Mkr: is followed by **N**.

When GPS was Disabled in the Set Port for GPS menu a message GPS Disabled will be displayed. If the GPS port is Enabled and a working GPS system is connected to the field computer the Monitoring screen will display a few more parameters, as presented below.



In the above Figure one line of the display is dedicated to show the GPS status. A label **DGPS** (Differential Global Positioning System) indicates that GPS readings are differentially corrected in real time, while label **AGPS** (Autonomous Global Positioning System) indicates lack of differential correction. On the right side of **DGPS** or **AGPS** label small square is displayed. This square should move down and up with the frequency of GPS update rate (usually 1 second intervals). If the square is not moving for long periods of time it means that the GPS system is not working or that it is not connected to the field computer. The next label **P** with a value varying between 0 and 99.9 represents an index called Position Dilution of Precision (**PDOP**). The last label **S** and following number shows number of currently tracked satellites. Refer to section 9 (Set Port for GPS), Appendix A, and to GPS manuals for more information about GPS parameters.

A list of program functions available directly from the Monitor/Null menu is given at the bottom of the screen. The screen (presented below) containing all available options is displayed after key **?** or **H** is pressed. Available options are as follows: **N** - Nulling, **I** - Internal Q-coil calibration, **E** - External Q-coil calibration, **M** (or **V**) - displays field computer available memory, **B** - displays field computer battery level (may not work correctly for loggers other than Allegro or Pro4000), key **** is available only in StandBy mode (see section 12), the function key **F2** - exits the Monitor/Null menu.



7.1 Description of Monitoring/Nulling menu options

Nulling

To perform null of the instrument press the key **N**. At this moment the computer takes 25 readings and calculates the instrument offset.

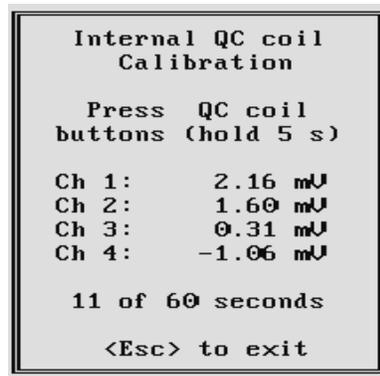


The calculated offset is applied to all the readings that follow this operation. If needed, this procedure can be repeated several times until satisfactory results are obtained. However, there is no associated "Undo" function. If original values (without calculated offsets) of the EM61-MK2 readings are needed, exit the EM61MK2A program and run it again. The EM61-MK2 instrument does not have to be turned OFF. Null operation can be also performed later during data collection.

Internal QC Coil Calibration

The Internal QC coil calibration is described in detail in the EM61-MK2 Operating Instructions.

To start the calibration using Internal QC coil press key **I**. This action begins by performing the automatic nulling which in this case is only in effect for the duration of the calibration process. It will not affect EM61-MK2 readings. After the nulling is completed (less than 5 seconds) the Internal QC coil Calibration screen is displayed.



This screen displays timer with elapsed seconds and EM61-MK2 readings. This display lasts for 60 seconds. During this time please follow the instructions provided on the Allegro screen.

Calibration can end in the following four ways:

The process can be stopped by an operator at any time by pressing key <Esc>.

The calibration may end by time out (60 seconds) if QC coil button was not pressed or this action did not activate QC coil. The following screen will then be displayed:

```
Internal QC coil
Calibration

Ch 1:      5.74 mJ
Ch 2:      1.88 mJ
Ch 3:      3.02 mJ
Ch 4:     -1.69 mJ

CALIBRATION TIME OUT

press any key
```

After pressing any key the program returns to Monitoring/Nulling manu. To repeat Internal QC coil calibration please press key **I** again.

The logger will determine if the instrument has passed test. If after activating the QC coil, the program determines that the reading is inside the standard values within +/- 10% tolerances then a message "CALIBRATION OK" will be displayed (see below).

```
Internal QC coil
Calibration

Ch 1:      1.00 mJ
Ch 2:     -1.81 mJ
Ch 3:      3.56 mJ
Ch 4:     -1.16 mJ

CALIBRATION OK

press any key
```

Otherwise, if the program determines that the reading is outside of the test values range the corresponding message "CALIBRATION FAILED" is displayed.

```
Internal QC coil
Calibration

Ch 1:     -4.31 mJ
Ch 2:      8.63 mJ
Ch 3:     -0.13 mJ
Ch 4:     -0.84 mJ

CALIBRATION FAILED

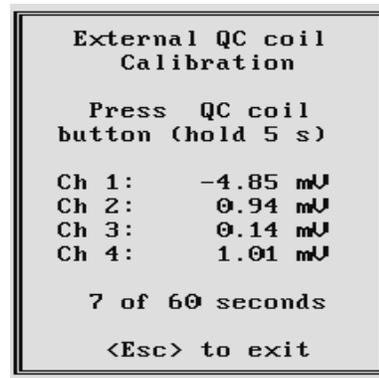
press any key
```

Regardless of the test result (OK or FAILED) the readings will be saved on screen. The program returns to Monitoring/Nulling menu after any key is pressed. Then the calibration process can be repeated.

External QC Coil Calibration

The External QC coil calibration is described in detail in the EM61-MK2 Operating Instructions.

The procedure for the instrument check using External QC coil calibration is very similar to the one described above for Internal QC coil calibration. To start the calibration process using External QC coil press key **E**. This action begins by performing the automatic nulling which in this case is only in effect for the duration of the calibration process. It will not affect EM61-MK2 readings. After the nulling is completed (less than 5 seconds) the External QC coil Calibration screen is displayed.



This screen displays timer with elapsed seconds and EM61-MK2 readings. This display lasts for 60 seconds. During this time please follow the instructions provided on the Allegro screen.

Calibration can end in the following four ways:

The process can be stopped by an operator at any time by pressing key <Esc>.

The calibration may end by time out (60 seconds) if QC coil button was not pressed or this action did not activate QC coil. After pressing any key the program returns to Monitoring/Nulling manu. To repeat External QC coil calibration please press key **E** again.

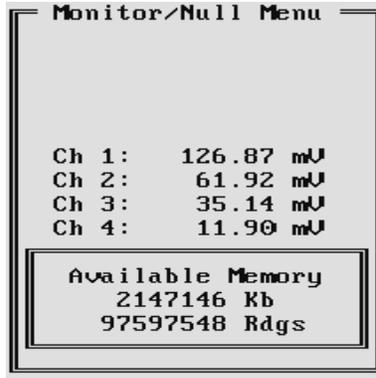
The logger will determine if the instrument has passed test. If after activating the QC coil, the program determines that the reading is inside the standard values within +/- 10% tolerances then a message “CALIBRATION OK” will be displayed.

Otherwise, if the program determines that the reading is outside of the test values range the corresponding message “CALIBRATION FAILED” is displayed.

Regardless of the test result (OK or FAILED) the readings will be saved on screen. The program returns to Monitoring/Nulling menu after any key is pressed. Then the calibration process can be repeated by pressing key **E**.

Memory Check

After key **M** (or **V**) is pressed a small window that shows the amount of available memory for data is displayed. The amount of available memory is given in Kbytes and in number of EM61-MK2 readings (one EM61-MK2 record is 22 bytes long). If GPS data is taken concurrently, one GPS record is equal to 5 or 6 EM61-MK2 readings (110 or 132 bytes).



Available memory is also checked automatically during data collection. In cases where the amount of available memory in the logger is less than 10 Kbytes, the program will stop, data file will close, and a proper message will be displayed.

Battery Check

After key **B** is pressed a small window that shows the voltage of Allegro or Pro4000 battery (in Volts) is displayed. If other than Allegro or Pro4000 field computer is used the displayed value may not be accurate (as shown in Figure below).

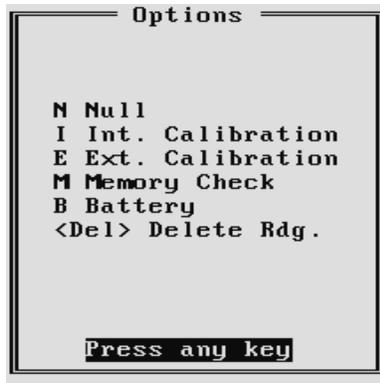


In addition Allegro and Pro4000 systems will also warn the user when battery voltage is too low.

Help Screen

When key **?** or **H** is pressed a help screen that list all available options is displayed.

Option " Delete Reading" is available only during data collection.



Exit Monitor/Nulling menu

To exit the Monitor/Null option press the function key **F2**.

8. Logger Setup Menu

This option allows you to set several parameters in the logger. The Logger Set Up menu is presented below.



Description of Parameters:

Date

This option allows you to change the date in the field computer clock. When the option is highlighted pressing the **ENTER**, or **Left** or **Right** arrow keys, enables editor that allows the operator to change day, month and year.

The new date is accepted (and set in the computer) after the function key **F1** is pressed.

Use **Down** or **Up** arrow key to exit the editor and cancel any changes.



Time

This option allows you to change time of the day in the field computer clock. When this option is highlighted pressing the **ENTER**, or **Left** or **Right** arrow keys, enables editor that allows the operator to change hour, minute, and second.



The modified time is accepted (and set in the computer clock) after the function key **F1** is pressed.

Use **Down** or **Up** arrow key to exit the editor and cancel any changes.

Units

Two selections are available: **Meters** or **Feet**.

COM Port

The number of serial port that is assigned to the EM61-MK2. Available selections: COM1 and COM 2. The program default is COM1. Communication parameters for the selected serial port are set by the program, since the EM61-MK2 operates Baud Rate (9600), Parity (N), Data Bits (8), and Bit Stop (1).

This port must be different than the port specified in the Set Port for GPS menu (see next), otherwise a message will be displayed and ports will have to be reassigned.

Audio

Two selections are available: **Yes** or **No**. The audible click will be generated at each reading when this option is enabled.

Pause key

Three selections are available: **Any key**, **Alt+F1**, and **Ctrl+F5**. This feature is used to pause data recording during logging session. Default setting **Any key** can be changed to one of the two key combinations for field conditions where a logger key can be accidentally pushed causing unwanted stop of data logging.

Display

This parameter specifies the display type during data collection. Two types of the display can be selected: Text mode or Graphic mode.

In the text mode data for four channels is displayed in digital form. This mode is recommended for the instrument AUTO mode when the highest possible frequency of data collection is used. The same applies to Wheel mode since the data triggering can be accelerated at any given moment (while passing a curb, downhill, etc.).

The graphic mode allows to display profiles for any selected channels in real time as well as simultaneous display of readings in digital form for all four channels. When the Display Graphic is selected, five additional parameters are activated (see menu below).



Parameters **Ch 1**, **Ch 2**, **Ch 3**, and **Ch 4** (applies to Ch T as well) allow you to enable (Yes) or disable (No) display of each channel separately, while the option **Amp**. (Amplitude Scale) can be selected as **Compressed** scale or **Linear** scale. The compressed amplitude allows you to display the high dynamic range of the EM61-MK2 data in a legible way and is recommended.

Regardless of which channels are chosen, data for all four channels will be displayed in digital form below profile display.

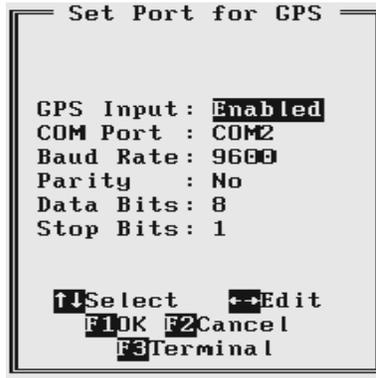
Please note, that readings in digital form are always given in mV (linear scale) regardless of the amplitude scale (compressed or linear) selection. Further, graphic display in the compressed scale does not affect readings saved in the data file. Data are always written to file in original form.

After all the parameters in the Logger Setup menu are updated press the function key **F1** to accept the displayed settings. The program will return to the Main menu.

To return to the original settings (state before this option was selected) press the function key **F2**. All parameters will be reset to the initial settings and the program will return to the Main menu.

9. Set Port for GPS Menu

After the Set Port for GPS option is selected in the Main Menu the Set Port for GPS menu appears on the screen. This menu allows you to enable and disable the GPS input, specify serial communication parameters matching GPS receiver settings, and to monitor the GPS output in terminal mode (key F3). The menu is presented below.



GPS Input

This option allows you to Enable/Disable a serial port for GPS input. When Disabled is chosen logging and monitoring screens will display message “GPS disabled” in place of GPS parameters.

The GPS Input can be Enabled even if there is no GPS system connected to the Allegro. In such case data file will contain proper sequence of EM61-MK2 readings without any GPS input.

COM Port

The number of serial port that is assigned to the GPS input. Available selections: COM1 and COM 2. The program default is COM2. Communication parameters for the selected serial port can be determined in options described below.

This port must be different than the port specified in the Logger Set Up menu (for EM61-MK2), otherwise a message will be displayed and ports will have to be reassigned.

Baud Rate

Specify Baud Rate for the output port, the selected value should much the Baud Rate of the GPS system, default is 9600.

Parity

Select Parity for the output port, the entered parameter should much the Parity set in the GPS serial port settings, default is N.

Data Bits

Specify Data Bits for the output port, the entered value should much settings in the GPS system, default is 8.

Stop Bits

Specify Stop Bits for the output port, the entered value should much settings in the GPS system, default is 1.

After all the parameters in the Logger Setup menu are updated press the function key **F1** to accept the displayed settings. The program will return to the Main menu.

To return to the original settings (state before this option was selected) press the function key **F2**. All parameters will be reset to the initial settings and the program will return to the Main menu.

To activate terminal mode which allows you to monitor GPS receiver output press the function key **F3**. The monitoring mode will work regardless of the GPS Input being Enabled or Disabled. This option is described in the following section.

9.1 Monitoring GPS Receiver Output

After the function key F3 is pressed in Set Port for GPS menu the program will display the screen in terminal mode. In this mode the screen is divided into three parts. The top portion of the screen, labeled Receive GPS Data, displays the GPS receiver output. The middle portion labeled NMEA Command is used to enter NMEA commands to be sent to the GPS receiver, and at the bottom, the screen menu with available options is displayed. This screen is shown below.

```
Receive GPS Data
$GPGGA,021512.00,4336.
$GPGSA,A,3,,,26,10,24,
$PASHR,SAT,06,26,165,5
$GPGGA,021513.00,4336.
$GPGSA,A,3,,,26,10,24,
$PASHR,SAT,06,26,165,5
$GPGGA,021514.00,4336.
$GPGSA,A,3,,,26,10,24,
NMEA Command
F1Stop F2Send F3Exit
```

As soon as the EM61MK2A screen is in terminal mode and the GPS is streaming data, the first 20 characters of each message will appear in the top portion of the display. The display is updated with the frequency the GPS receiver outputs data. This allows you to recognize the GPS update rate and type of messages being sent by the connected GPS. In cases where the GPS data is not received by the logger a message NO DATA and current time will appear in the top window of the display, as shown below.

```
Receive GPS Data
NO DATA 21:09:55
NO DATA 21:10:01
NO DATA 21:10:07
NO DATA 21:10:13
NMEA Command
F1Stop F2Send F3Exit
```

The message NO DATA is normally updated with a rate of 6 seconds. This may indicate the following: serial port number not correctly specified in Set Port for GPS menu, GPS receiver not

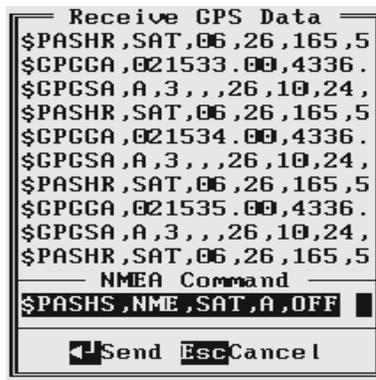
sending any data, and not working or not connected GPS receiver. If the message is updated more often than 6 seconds (i.e. every 1 or 2 seconds) or the display does not show legible characters, it is possible that the GPS is working correctly and is connected to the proper serial port, however communication parameters are not specified correctly. In most cases the Baud Rate or Parity must be adjusted.

The NO DATA message may also appear if the GPS data are received correctly, but the GPS receiver was set to send data with a time interval longer than 6 seconds. In this case the NO DATA message will be displayed in between GPS messages. This indicates that the GPS is working correctly, however the operator should consider adjustment of the GPS receiver output update rate. Most high resolution geophysical surveys require positioning update of 1 or 2 seconds, and a 5 seconds interval can be used only when the survey is carried out at an even pace and along relatively straight survey lines.

The monitoring display can be stopped any time by pressing the function key **F1** (labeled **Stop**). At that time scrolling of the GPS output will be stopped, and the function key **F1** will be labeled **Go**. The next pressing of this key will activate receiving and display of GPS data.

The function key **F2** allows you to send a NMEA command to the GPS receiver. It is preferable if the GPS receiver parameters are set using the GPS manufacturer software or controller (GPS logger or panel keys). However, **when the operator is familiar with NMEA protocol and structure of commands for a given GPS system**, this function can be very convenient and useful when the update rate and enabling or disabling messages in the data stream is required.

After the function key **F2** is pressed the portion of the screen labeled NMEA Command is activated and the beginning of the standard NMEA command, **\$PASHS**, is displayed. After the entire NMEA command is typed in, press the key **<ENTER>** to send the command to the GPS receiver. Pressing the **<Esc>** key will cancel the command and deactivate the NMEA Command window. An example of a command that will remove the NMEA message **SAT** is given in the below figure (it is assumed that the GPS receiver output serial port is A).



After this command is received by the GPS receiver, the confirmation message will be sent by the receiver (**\$PASHR,ACK*3D**) and data stream will not contain the message **SAT** (**\$PASHR,SAT,....** in the above figure).

Please note, that not every GPS system accepts and uses the same standard set of NMEA commands and messages. In addition, some GPS systems do not accept commands sent by the serial port at all. The configuration of these type of receivers can be updated only by the controlling device (usually GPS logger, controller, or the receiver panel keys).

10. Set Output Port

This option can be used to enable simultaneous output of collected data through selected serial port. Data can be sent to other logging devices, including remote computers connected by wireless modem or digital radio.

After the Set Output Port option is selected in the Main Menu the Set Output Port menu appears on the screen. This menu allows you to enable and disable the serial port output, specify format of the output, and to select serial communication parameters matching an external device settings. The menu is presented below.



Output

This option allows you to Enable/Disable a serial port output.

If the Output function is not used please select Disabled, otherwise the program performs this task unnecessarily.

Format

This option allows you to specify format of the output string: Raw Data or Converted. The Raw Data format indicates that the string will be sent in binary format (22 bytes long records) and the format is exactly the same as the raw data file format (R61) described in Appendix A. Data file collected in the external device may be converted to ASCII format using the option Convert in the data processing program DAT61MK2.

If Converted is selected then the string sent by the output serial port will contain converted data in mV and GPS NMEA message will be sent as it is received from the employed GPS receiver. The example of output data format is shown in Appendix B.

The Raw Data format is preferable since it is more than three times smaller.

COM Port

The number of serial port that is assigned to the serial output. Available selections: COM1, COM2, COM3, and COM 4. The program default is COM3. Communication parameters for the selected serial port can be determined in options described below.

This port must be different than the port specified in the Logger Set Up menu (for EM61-MK2 and GPS), otherwise a message will be displayed and ports will have to be reassigned.

Baud Rate

Specify Baud Rate for the output port, the entered value should much the Baud Rate of the GPS system, default is 9600.

Parity

Select Parity for the output port, the entered parameter should much the Parity set in the GPS serial port settings, default is N.

Data Bits

Specify Data Bits for the output port, the entered value should much settings in the GPS system, default is 8.

Stop Bits

Specify Stop Bits for the output port, the entered value should much settings in the GPS system, default is 1.

11. Advanced COM Setup

The Advanced COM Setup menu, presented below, allows for specifying parameters of each selected serial port.



To select any option use the **Down** and **Up** keys. To start the editing of any setting press **Left** or **Right** key. Parameter Irq (from 1 to 15) can be simply toggled by **Left** or **Right** keys, while Address must be typed in for each serial port.

The Allegro (or Pro4000) two serial ports have parameters:

- COM1 - base I/O address 3F8, IRQ 4
- COM2 - base I/O address 2F8, IRQ 3

These are standard settings in MS DOS operating system. Names for additional serial ports (COM 3 and COM4) have only identification meaning in DOS environment, and they are fully described by I/O address and interrupt level.

Please note, that in this menu, when i.e. port name COM4 is given the address 3F8 and IRQ 4, physically it will refer to Allegro COM1 port connector. At the same time the serial port name COM1 can be given different address and IRQ level.

The base I/O address of the extension card is given in hexadecimal notation and resides on an even 32-byte (20H) boundary. This address is assigned usually to the first serial port of the card. The following ports require 8 bytes of I/O space for each port.

Settings shown in the menu describe COM1 as a standard Allegro (or Pro4000) serial port COM1, and two ports COM3 and COM4 (associated with extension card) are set based on the assigned I/O Base Address 380H and IRQ 5 for the serial extension card. This base address is usually displayed during rebooting Allegro and Pro4000 (see Appendix D).

Please note that any names from COM1 to COM12 can be specified in proper menus, as long as correct parameters (address and IRQ level) will be assigned to these names in Advanced COM Setup menu.

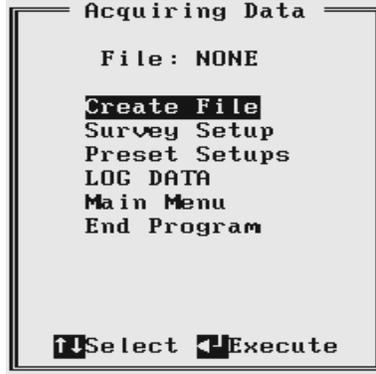
Please refer to Appendix D (PCMCIA Card Installation) of this manual or to serial extension card manufacturer documentation for more information regarding serial port settings.

After all the parameters in the Advanced COM Setup menu are updated press the function key **F1** to accept the displayed settings. The program will return to the Main menu. Updated settings will be written to the initial file and they will be given as default parameters in the subsequent System Setup menu display.

To return to original settings (state before this option was selected) press the function key **F2**. All parameters will be reset to initial settings and the program will return to the Main menu.

12. Acquiring Data Menu and Logging

After the Acquiring Data option is selected in the Main Menu the Acquiring Data menu appears on the screen. This menu is presented below.



At the top of the screen the current name of the data file is displayed. If data file is not created its name is displayed as NONE. The menu contains several options listed below.

Create File

This option creates data file.

Survey Setup

The Survey Setup menu will be displayed. Instrument mode and survey settings can be specified in this menu.

Preset Setups

List of 10 predesigned survey setups will be displayed. Each survey setup can be edited and saved by the user for later use.

LOG DATA

This option is used for actual monitoring and logging EM61-MK2 data.

Main Menu

The program returns to the EM61MK2A Main Menu.

End Program

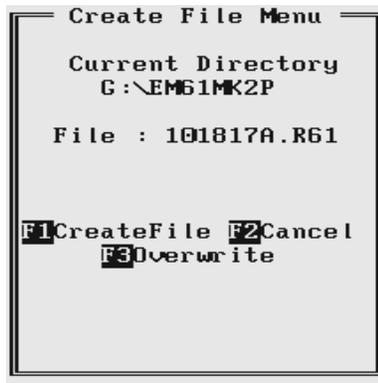
Executing this option will end the program.

12.1 Create File Menu

The Create File option can be executed before or after the Survey Setup parameters are specified.

The log file is created in the current directory (containing the EM61MK2A program). The name of the file is given by the field computer clock and it consists of month (2 digits), day (2 digits), hour (2 digits), and one alphabetic character A, B, C, etc. (If all letters during one hour are used use the Overwrite option). The Create File menu is presented below.

The file can be created by pressing the function key **F1**, this option can be skipped by pressing the



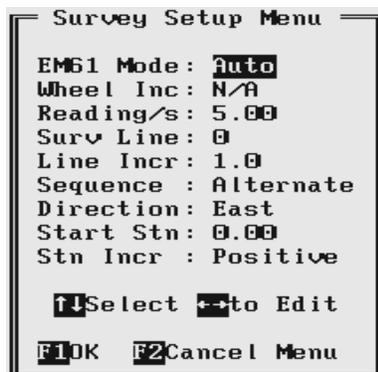
function key **F2**., or by pressing key **F3** the file name can be overwritten. After key **F3** is pressed the Create File menu will be displayed as follows.



Each data file in the field computer (raw data file) has an extension name R61 and it is created in the program current directory. The R61 files are created in the instrument binary format. They can be viewed using the Main menu option “View Files”. These files can be also converted to ASCII format and processed in the Geonics program DAT61MK2.

12.2 Survey Setup Menu

The Survey Setup menu, presented below, contains several parameters which affect two important procedures: instrument settings (instrument mode, frequency of data collection, etc.) and survey geometry layout (survey line names, line spacing, start station, station increment, etc.).



To select any option use the **Down** and **Up** keys. To start the editing of any setting press **Left** or **Right** key. Some parameters that have only a few possible options (e.g. EM61 Mode) can be simply toggled by **Left** or **Right** keys.

Description of the Survey Setup menu options and parameters.

EM61-MK2 Mode

Set the EM61MK2 mode of operation by pressing **Left** or **Right** arrow keys. Available modes are: Auto, Wheel, and Manual. These modes of operation are described below.

Auto Mode

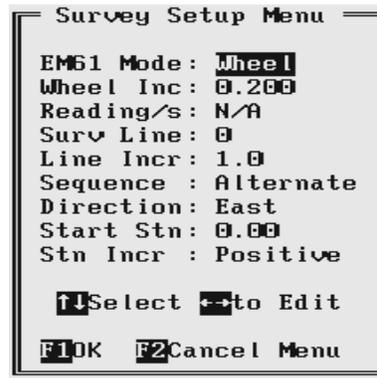
Readings will be triggered automatically at a specified frequency (see option Readings/s).

Please note that when Auto mode is selected parameter Wheel Inc. is not available, see figure above. At the same time the Stn Incr (station increment) has only two options: Positive or Negative.

Wheel Mode

Readings will be triggered automatically by a counter attached to the wheel. Wheel increment is approximately 20 cm (or 0.64 foot) for the EM61-MK2 equipped with 1 x 0.5 m or 1 x 1 m antennas. The Hand Held EM61HH-MK2 has two wheel increments 0.1 and 0.2 m. Check the wheel increment setting on the antenna assembly.

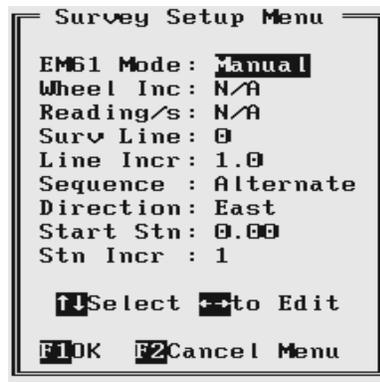
Please note that when Wheel mode is selected option Reading/s is not available, see figure below. At the same time the station increment (Stn Incr) has only two options: Positive or Negative.



Manual Mode

Readings will be taken only while the manual trigger (switch on the logger cable) is pressed. This mode may be used only in very specific applications since the highly dynamic EM61-MK2 response requires finely spaced data points.

Please note that when Manual mode is selected options Wheel Inc. and Reading/s are not available. In this mode any value can be entered for the station increment (Stn Incr) parameter.



Wheel Inc.

When this option is highlighted press **Left** or **Right** arrow key to activate editor and then enter desired value.

Wheel increment is approximately 20 cm (or 0.64 feet) for the EM61-MK2 equipped with 1 x 0.5 m, 1 x 1 m, and 0.5 x 0.5 m antennas. The Hand Held EM61-MK2 has two wheel increments 0.1 and 0.2 m. Check the wheel increment setting on the antenna assembly.

This option is available only when the Wheel mode was selected.

Use **Down** or **Up** arrow key to leave editor.

Readings/s

When this option is highlighted press **Left** or **Right** arrow key to activate editor and then enter desired value.

This parameter describes number of readings per second that will be taken. Any number larger than zero can be entered, however the EM61-MK2 maximum frequency of data output is 16 readings per second.

At high frequencies (above 10 readings per second) obtained frequency may differ from the specified rate, however speed of data collection will be consistent for a given field computer. The real speed of data collection (in Auto mode) depends on the field computer used and display type. In general, displaying data in the text mode allows for faster data collection and while using fast computers the difference between specified and obtained frequency is very small.

This parameter is available only when the Auto Mode was selected.

Use **Down** or **Up** arrow key to leave editor.

Surv Line (survey line name)

When this option is highlighted press **Left** or **Right** arrow key to activate editor and then enter desired value. Use **Down** or **Up** arrow key to leave editor.

This is a user's tag number/name for the profile line. The length of the name can not exceed 8 characters. The line name is usually used as a coordinate perpendicular to the survey lines direction. For example, when survey lines are laid out along W-E direction stations describe W-E coordinate, while Line names may describe S-N (vertical on a map) coordinate.

Line Incr. (survey line name)

When this option is highlighted press **Left** or **Right** arrow key to activate editor and then enter desired value.

This parameter specifies the distance by which survey lines will be separated. This setting

will be used to determine number (name) of the next survey line.

Use **Down** or **Up** arrow key to leave editor.

Sequence

When this option is highlighted press **Left** or **Right** to toggle between two available settings: Alternate and One Way.

Alternate is used when neighboring lines are surveyed in the opposite direction, which is the most common procedure during field surveys.

One Way is used when each survey line is traversed in the same direction.

The choice of this parameter will affect the default start station, a signature of the station increment, and line direction when parameters for the next survey lines is determined.

Direction

When this option is highlighted press **Left** or **Right** to toggle between four available settings: East, West, South, and North.

This parameter indicates the heading of the survey line.

Use **Down** or **Up** arrow key to leave editor.

Start Stn (start station of a survey line)

When this option is highlighted press **Left** or **Right** arrow key to activate editor and then enter desired value.

This parameter specifies the starting station number for the selected survey line. This value is used in conjunction with Station Increment to calculate the current station number for display purposes.

Use **Down** or **Up** arrow key to leave editor.

Stn Incr (station increment)

When this option is highlighted press **Left** or **Right** arrow key to activate editor.

In case the EM61-MK2 Manual mode was selected enter desired value for the station increment. If Auto or Wheel modes were selected then, the **Left** and **Right** arrow keys will toggle between two available options: Positive and Negative.

This parameter specifies the station increment for the selected survey line. This value is used in conjunction with Start Station to calculate the current station number for display purposes.

In Auto mode the increment is assumed +1 (Positive) or -1 (Negative), while in Wheel mode it will be Positive or Negative value of the specified Wheel Increment.

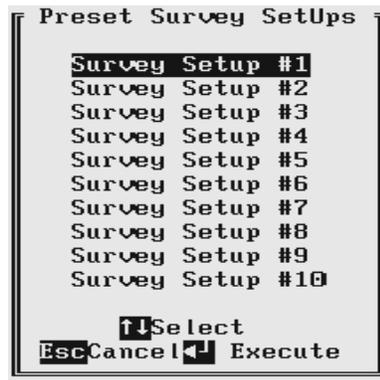
Use **Down** or **Up** arrow key to leave editor.

After all the parameters in the Survey Setup menu are updated press the function key **F1** to accept the displayed settings. The program will return to the Acquiring Data menu. Updated settings will be written to the initial file and they will be given as default parameters in the subsequent Survey Setup menu display.

To return to original settings (state before this option was selected) press the function key **F2**. All parameters will be reset to initial settings and the program will return to the Acquiring Data menu.

12.3 Survey Setups

The Preset Survey Setups menu, presented below, contains list of ten predesigned Survey Setup. Each Survey Setup can be configured and saved by the user for subsequent use. As a default surveys 1 to 4 are assigned for various settings of survey conducted in EM61-MK2 Wheel mode, surveys 5 to 8 contain settings for EM61-MK2 Auto mode, and surveys 9 and 10 are set for the EM61-MK2 Manual mode.



To select any survey set up number use **Down** and **Up** keys, and to start editing particular Survey Setup menu press <ENTER>. Press <Esc> key. to return to the Acquiring Data menu.

After a Survey Setup number (e.g. Survey Set Up #2) is selected the following screen will appear:



The survey parameters are updated in the exactly same way as in the Survey Setup menu (see section 12.2).

After all parameters are specified three options represented by function keys **F1**, **F2**, and **F3** are available :

F1 (OK)

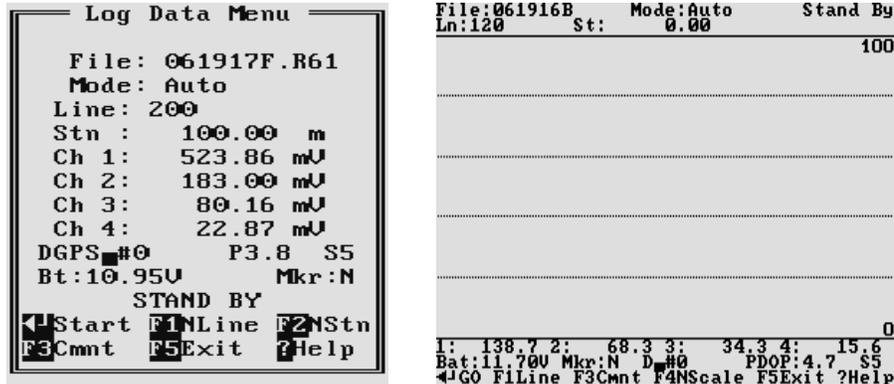
The display returns to Acquiring Data menu. The selection will become the current Survey Setup parameters, however settings will not be saved as a Survey Setup # for subsequent use.

are monitored with the update rate of approximately 10 times per second. In this mode the operator can monitor the instrument output (without recording the data), GPS parameters (if Enabled), as well as change the operation to the Logging mode, and access several field options. In the Logging mode when the EM61-MK2 data is recorded in the data file, field options can not be accessed.

When the Log Data menu is displayed for the first time it appears always in the Stand By mode.

Stand By mode

The Log Data menus in two display modes, in the text mode (on the left) and in the graphic mode (on the right) are presented below.



The main portion of the screen in the graphic mode is occupied by the plot area. Readings in the plot area can be displayed in compressed amplitude scale (recommended and shown in this manual figures), which corresponds to Square Root of the amplitude. In compressed amplitude scale 0 to 100 corresponds to 0 to 10,000 mV, and compressed range 0 to 200 corresponds to 0 to 40,000 mV. Plotting data in compressed amplitude allows to show details in the low range of amplitude, as well as relatively good resolution in the high range of data on the small screen. **Please note, that data displayed in the digital form are always given in the standard, linear scale.** The amplitude scale is divided by four or five dotted grid lines. In the case where the amplitude scale starts with a negative value, then the grid line corresponding to zero is always plotted as a solid line.

Readings for channels 1, 2, 3, and 4 (or T) are shown in digital form in the central portion of the screen in the text mode, and below plot area in the graphic mode. The EM61MK2A program prepared for the Allegro field computer, displays labeled channels in graphic mode. Units (mV) are not displayed in the graphic mode. If program EM61MK2P is used in graphic mode labels are not displayed due to smaller screen in Pro4000. Values of readings are displayed in the following order (from the left): Channel 1, 2, 3, and 4 (or T).

Both modes show the log file name and optional GPS parameters. Name of the Log Data menu mode is displayed in the text mode, and it is shown as an abbreviation in the top right corner of the screen in graphic mode, STB for Stand By mode, and LOG for logging mode. The instrument battery level (Bt) is updated continuously (in Volts) in both modes.

Current survey line name and station number is displayed at the top of the screen. In the Stand By mode the station number will not change. Stations in the EM61MK2A program are incremented by 1 or station increment value after each reading is written to the data file.

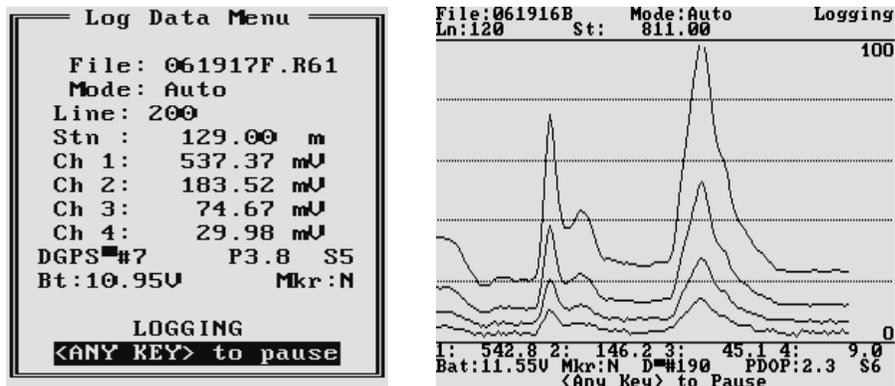
Similarly, the stations with the GPS readings (assuming that the GPS is connected to the logger) remain the same in the Stand By mode. Number of GPS positions is incremented by 1 after each

GPS reading is written to the data file. In the text mode number of GPS positions follows label **DGPS** (or **AGPS** positions are not differentially corrected), the corresponding label in graphic mode is **D** (or **A**). Small square moving up and down in Stand By mode indicates that the GPS system is monitored and it is working. Two other GPS parameters: PDOP (represented by label **P**) and Number of Tracked Satellites (label **S**) are updated continuously in Stand By mode.

Several available field options are listed at the bottom of the Stand By mode screen. They will be described in the following section 12.5.

Logging Mode

The Logging mode is enabled by pressing the **<ENTER>** key, which corresponds to label **Start** in the Text Display, and **GO** in the Graphic display mode. After this key is pressed the bottom portion of the screen will change and data will be logged in the mode corresponding to the selected EM61-MK2 mode in the Survey Setup menu. Log Data screens in logging mode in the text (on the left) and graphic (on the right) display modes are presented below.



After the screen changes to Logging mode current station (**Stn** in Text and **St** in Graphic display mode) is updated according to the station interval. Similarly, if GPS Input was enabled, total number of GPS positions in the data file is incremented every time (usually once a second) GPS position is written to the file. If the Graphic display mode is enabled profiles (or profile) curves are updated after each reading is written to the data file. The audible click sounds at each reading if Sound option was enabled in the Setup Logger menu.

There is only one option available in the Logging mode - pause logging. After a Pause key (any key, Alt+F1, or Ctrl+F5) selected in Logger Setup menu is pressed the recording is stopped and the Log Data menu returns to the Stand By mode. The EM61-MK2 data will be displayed with the update rate approximately 10 readings per second, however data will not be saved in the log file, audible click will stop if Sound option was enabled, and if graphic mode is used, profile curves will be not updated.

Exit from the logging session and access to field options are available only from the Log Data menu in the Stand By mode.

12.5 Field Options

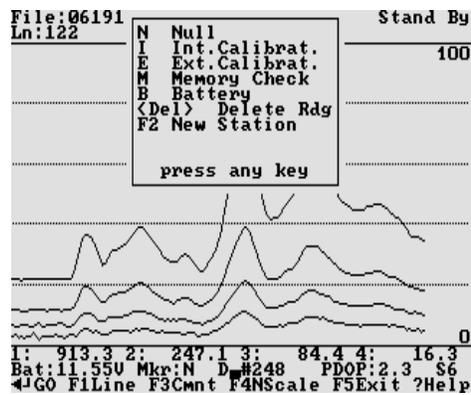
Several field options are available while the Log Data screen is in the Stand By mode. These options are listed at the bottom of the screen.

<ENTER>

This option is labeled **Start** in the Text display mode, and **GO** in the Graphic display mode. The Log Data screen changes from Stand By to Logging.

? or H (Help)

This option displays a window that lists additional, less frequently used options which are not visible on the main screen, however they are available while the program is running. These are: Nulling, Internal QC Coil Calibration, External QC Coil Calibration, Memory Check, Battery Level (for logger), Delete Reading, and New Station.



F1 (New Line)

This option is labeled **NLine** in the Text display mode, and **L** in the Graphic display mode. The New Line menu is displayed, which is the same for Text and Graphic display modes.

Selecting this option allows the operator to enter a new survey line number (name) and associated information (Direction, Start Station, and Station Increment). The new line number and associated parameters will be prompted by the program based on parameters specified in the Survey Setup menu.



At the top of the screen the last survey line name and the last station are displayed. Default name for the new line is given based on the Line Increment parameter. The default Start

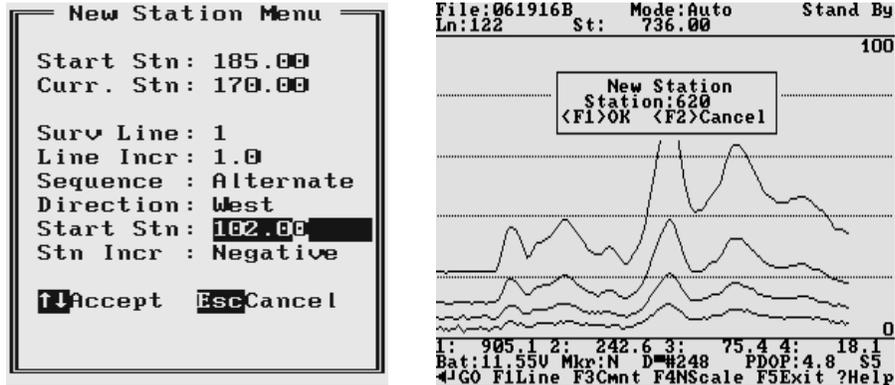
Station, direction of the Station Increment, and Direction are determined based on Sequence selection. All these parameters can be overwritten by the user as described in the Survey Setup menu description (section 10.2).

After selection is updated, it can be accepted by pressing the function key **F1**. The display returns to the Log Data screen with new settings for the new survey line.

Pressing key **F2** or **<Esc>** will disregard any New Line menu changes and the program will return to the Log Data screen and measurements can be continued.

F2 (New Station)

This option is labeled **NStn** in the Text display mode, and **S** in the Graphic display mode. The New Station menus in two display modes, in the text mode (on the left) and in the graphic mode (on the right) are given below.



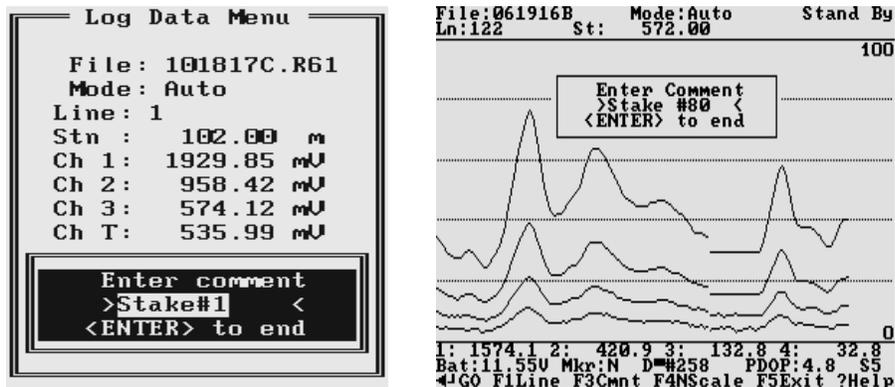
Selecting this option allows the operator to enter a new station number. In the Text mode Start Station and Current Stations are displayed at the top of the screen. In the Graphic mode only the Current Station is displayed. The New Station can be entered in the similar way as editing parameters in Survey Setup menu, and in the provided message box in the Graphic display mode.

After the New Station is entered, it can be accepted by pressing the function key **F1**. The display return to the Log Data screen with new station..

Pressing key **F2** or **<Esc>** will disregard new entry and the program will return to the Log Data screen and measurements can be continued.

F3 (Comment)

This option is labeled **Cmnt** in the Text display mode, and **C** in the Graphic display mode. Menus containing Enter Comment box in the text mode (on the left) and in the graphic mode (on the right) are given below.

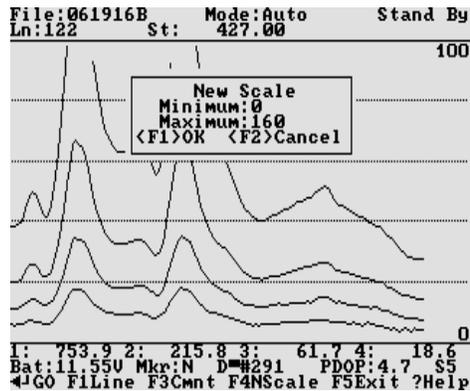


Selecting this option allows the operator to enter a comment at any point of the survey. A maximum of 11 characters can be entered as a comment. Text of the comment is saved in the file with a corresponding time stamp.

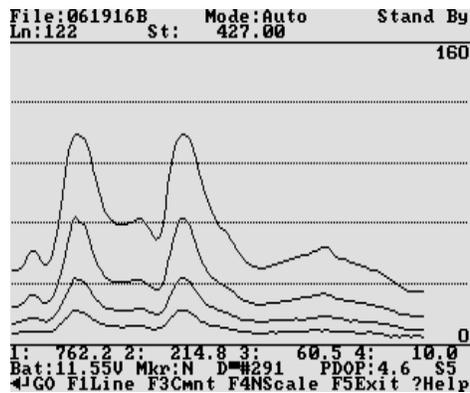
The user must exit the comment mode by pressing <ENTER> key.

F4 (New Scale) *only graphic display*

This option is available only in the Graphic display mode and it is labeled **N**. The Log Data screen with the entry box for New Scale parameters is given below.

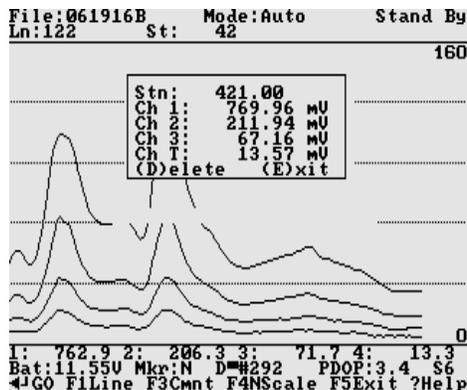
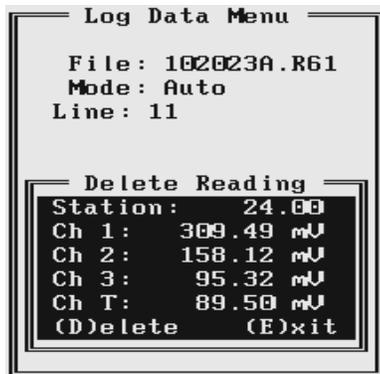


Selecting this option allows the operator to enter new scale parameters for the amplitude display. After minimum and maximum values are specified, the function key **F1** (OK) will accept new values and the display will be redrawn (see below). When the key **F2** (Cancel) is pressed the new entry is cancelled.



(delete reading)

This option is labeled **Rdg** in both display modes. The Delete Reading box that appears on the screen, in the text mode (on the left) and in the graphic mode (on the right) is shown below.

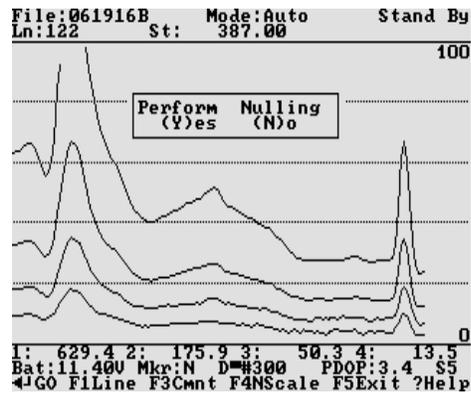
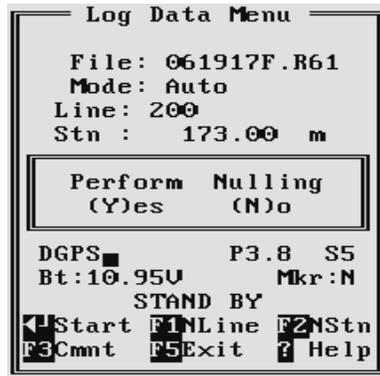


This function allows operator to delete previously recorded reading(s). The reading (station) to be deleted is displayed on the screen. The data will only be deleted when the key **D** is pressed. The program will then display the next previous station, and allow it to be deleted in a similar fashion. If there is no further data available, the program will provide related information.

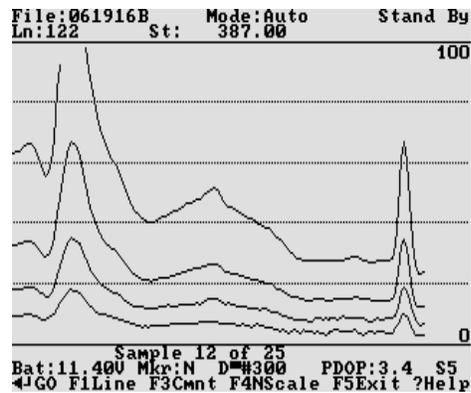
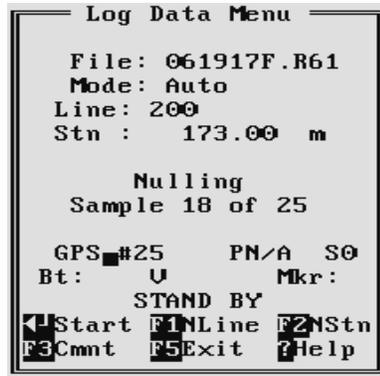
To exit delete reading mode press key **E**.

N (Nulling)

To perform null of the instrument press the key **N**. During data collection a confirmation message will be displayed (there is no such message if Nulling is performed in Monitoring/Nulling menu).



After above message is confirmed the program collects 25 readings and calculates the instrument offset.



The calculated offset is applied to all the readings that follow this operation. If needed, this procedure can be repeated several times until satisfactory results are obtained. However, there is no associated “Undo” function. If original values (without calculated offsets) of the EM61-MK2 readings are needed, exit the EM61MK2A program and run it again. The EM61-MK2 instrument does not have to be turned OFF.

I (Internal QC Coil Calibration)

The Internal QC coil calibration is described in detail in the EM61-MK2 Operating Instructions.

To start the calibration using Internal QC coil press key **I**. This action begins by performing the automatic nulling which in this case is only in effect for the duration of the calibration process. It will not affect EM61-MK2 readings. After the nulling is completed (less than 5 seconds) the Internal QC coil Calibration screen is displayed.

```

Internal QC coil
Calibration

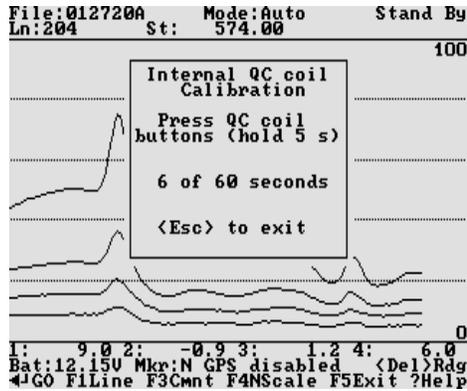
Press QC coil
buttons (hold 5 s)

Ch 1:    2.16 mJ
Ch 2:    1.60 mJ
Ch 3:    0.31 mJ
Ch 4:   -1.06 mJ

11 of 60 seconds

<Esc> to exit

```



This screen displays timer with elapsed seconds and EM61-MK2 readings. This display lasts for 60 seconds. During this time please follow the instructions provided on the Allegro screen.

Calibration can end in the following four ways:

The process can be stopped by an operator at any time by pressing key <Esc>.

The calibration may end by time out (60 seconds) if QC coil button was not pressed or this action did not activate QC coil (see following Figures). After pressing any key the program returns to Monitoring/Nulling manu. To repeat Internal QC coil calibration please press key **I** again.

```

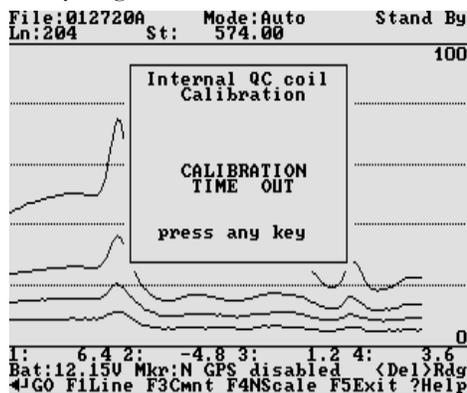
Internal QC coil
Calibration

Ch 1:    5.74 mJ
Ch 2:    1.88 mJ
Ch 3:    3.02 mJ
Ch 4:   -1.69 mJ

CALIBRATION TIME OUT

press any key

```



The logger will determine if the instrument has passed test. If after activating the QC coil, the program determines that the reading is inside the standard values within +/-10% tolerances then a message “CALIBRATION OK” will be displayed:

```

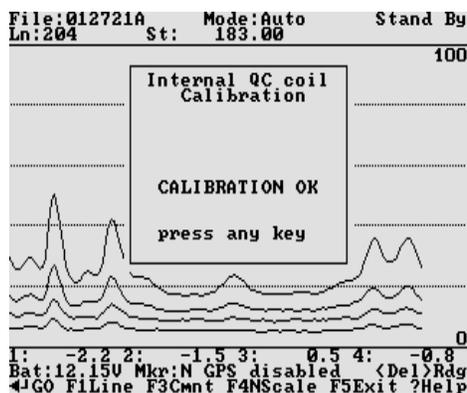
Internal QC coil
Calibration

Ch 1:    1.00 mJ
Ch 2:   -1.81 mJ
Ch 3:    3.56 mJ
Ch 4:   -1.16 mJ

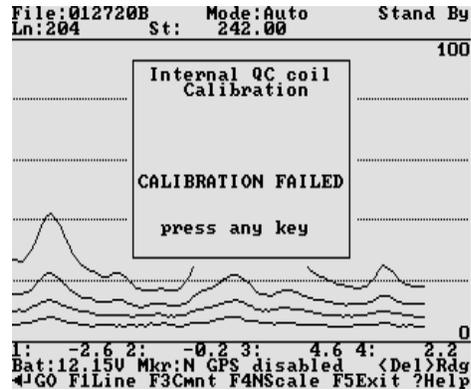
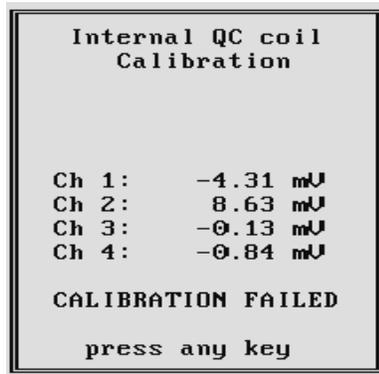
CALIBRATION OK

press any key

```



Otherwise, if the program determines that the reading is outside of the test values range the corresponding message “CALIBRATION FAILED” is displayed.

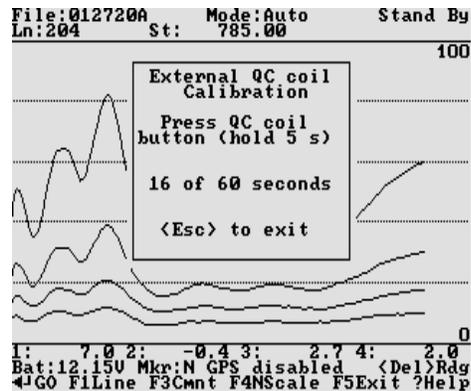
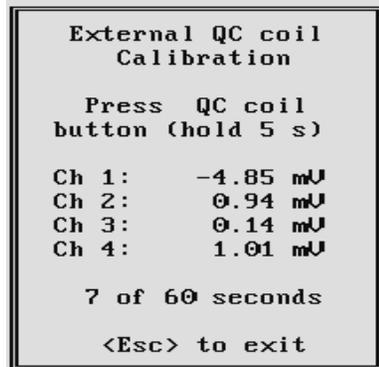


Regardless of the test result (OK or FAILED) the readings will be saved on screen. The program returns to Monitoring/Nulling menu after any key is pressed. Then the calibration process can be repeated.

E (External QC Coil Calibration)

The External QC coil calibration is described in detail in the EM61-MK2 Operating Instructions.

The procedure for the instrument check using External QC coil calibration is very similar to the one described above for Internal QC coil calibration. To start the calibration process using External QC coil press key **E**. This action begins by performing the automatic nulling which in this case is only in effect for the duration of the calibration process. It will not affect EM61-MK2 readings. After the nulling is completed (less than 5 seconds) the External QC coil Calibration screen is displayed.



This screen displays timer with elapsed seconds and EM61-MK2 readings. This display lasts for 60 seconds. During this time please follow the instructions provided on the screen.

Calibration can end in the following four ways:

The process can be stopped by an operator at any time by pressing key <Esc>.

The calibration may end by time out (60 seconds) if QC coil button was not pressed or this action did not activate QC coil. After pressing any key the program returns to Monitoring/Nulling manu. To repeat External QC coil calibration please press key **E** again.

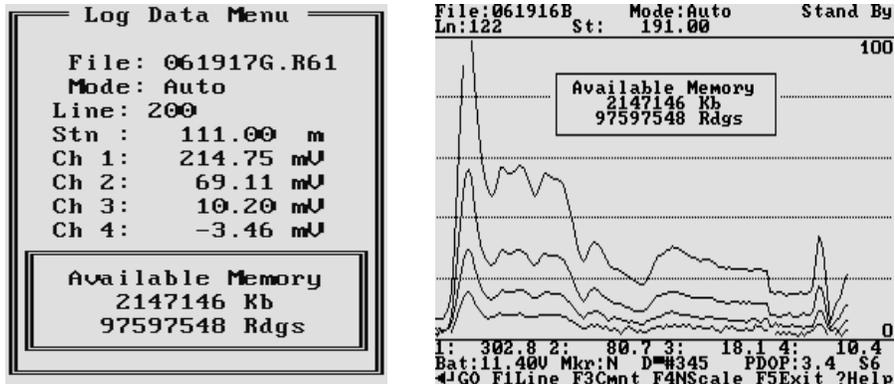
The logger will determine if the instrument has passed test. If after activating the QC coil, the program determines that the reading is inside the standard values within +/-10% tolerances then a message "CALIBRATION OK" will be displayed.

Otherwise, if the program determines that the reading is outside of the test values range the corresponding message "CALIBRATION FAILED" is displayed.

Regardless of the test result (OK or FAILED) the readings will be saved on screen. The program returns to Monitoring/Nulling menu after any key is pressed. Then the calibration process can be repeated by pressing key **E**.

M or V (memory check, no prompt on the screen)

This option is not shown on the screen. After key **M** or **V** is pressed a small window that shows the amount of available memory for data is displayed. The amount of available memory is given in Kbytes and in number of EM61-MK2 readings (one EM61-MK2 record is 22 bytes long). If GPS data is taken concurrently, one GPS record is equal to 5 or 6 EM61-MK2 readings (110 or 132 bytes).



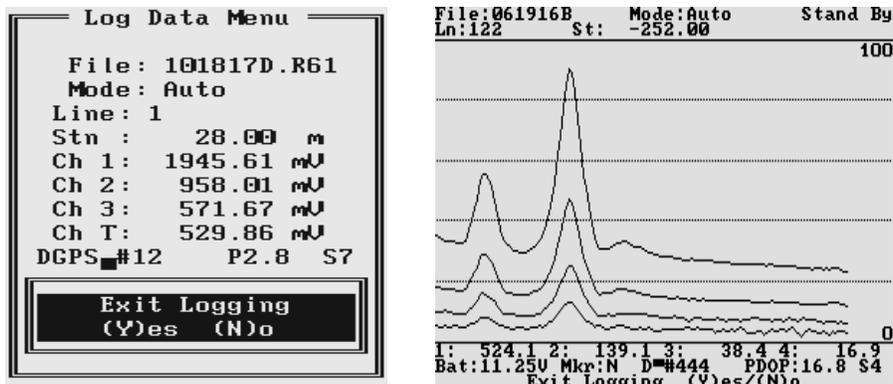
Available memory is also checked automatically during data collection. In cases where the amount of available memory in the logger is less than 10 Kbytes, the program will stop, data file will close, and a proper message will be displayed.

B (Battery Check)

After key **B** is pressed a small window that shows the voltage of Allegro or Pro4000 battery (in Volts) is displayed. If other than Allegro or Pro4000 field computer is used the displayed value may not be accurate. In addition Allegro and Pro4000 systems will also warn the user when battery voltage is too low.

F5 (exit LOG DATA mode)

This option is labeled **Exit** in the text display mode, and **X** in the graphic display mode. After key **F5** is pressed a confirmation prompt **Exit Logging Y(es)/N(o)** will appear:



When the key **Y** is pressed the data file is closed and the program returns to the Acquiring Data menu. In order to continue survey a new data file must be created.

If the key **N** is pressed the program returns to current logging mode.

13. File Manager

After the File Manager option is selected in the Main Menu the File Manager menu is displayed.



Three options Upload Files, View Files, and Delete Files are described in following sections 14, 15, and 16. Select and execute option Main Menu to return to the main menu of the EM61MK2A.

14. Data Transfer (Upload Files)

This chapter describes the transfer of data files from a field computer Allegro (or Pro4000) to PC computer using **Download EM61-MK2 Files** option of the DAT61MK2 program. Data files can be downloaded by alternative utilities (e.g. ProShell, Lynx, or FileScout in Allegro Field PC) and then these files can be converted to DAT61MK2 format using option **Convert | Allegro (R61) to DAT61MK2 (M61) Format** in the DAT61MK2 menu.

14.1 Data File Formats

Data files in the field computer are formatted in proprietary EM61MK2 format. The EM61-MK2 data is saved in one data file with the extension name R61.

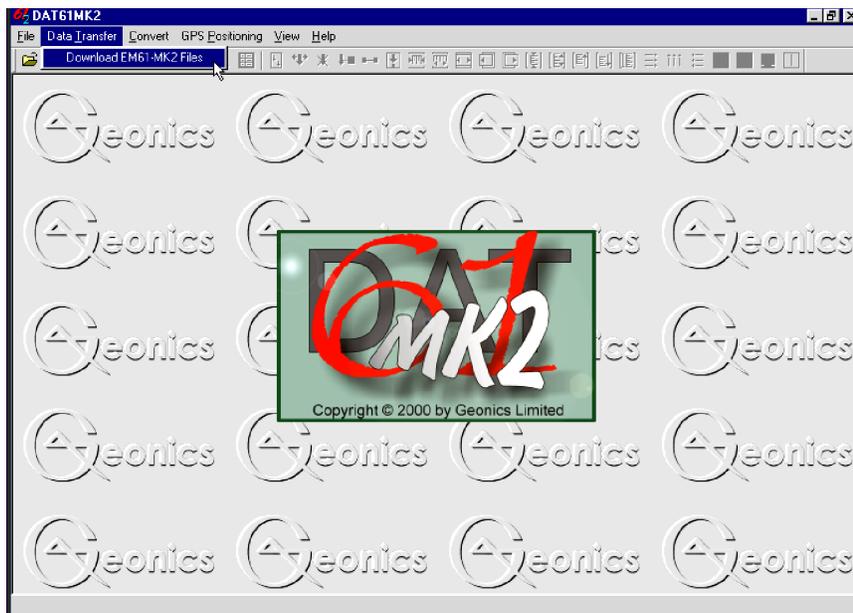
Files in the logger format are converted to the DAT61MK2 format during the downloading of data. These new files have same base name with an added extension name M61. Files in the DAT61MK2 format can be loaded and processed by the DAT61MK2 program.

While only the DAT61MK2 format is used in data processing, it is strongly advised that data in the raw (EM61MK2) format be saved as well. In the case of any hardware malfunction, i.e. a damaged instrument cable, only the file in logger format may indicate the source of the problem. Additionally, raw data files also contain useful information about the instrument settings used during field work. Files in the EM61MK2 format can be converted to the DAT61MK2 format at any time using the Convert Files option of the DAT61MK2 menu.

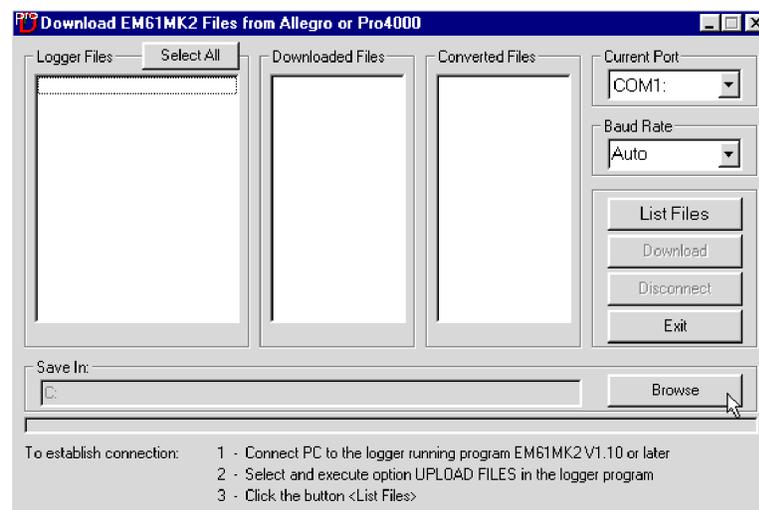
Description and sample of the EM61-MK2 files in the EM61MK2 format, as well as an example of a file converted to the DAT61MK2 format are placed in Appendix B.

14.2 Upload Files Procedure

To start downloading files from the field computer, select the **Data Transfer** item in the program menu and then click on **Download EM61-MK2 Files** from the menu item (Figure below).

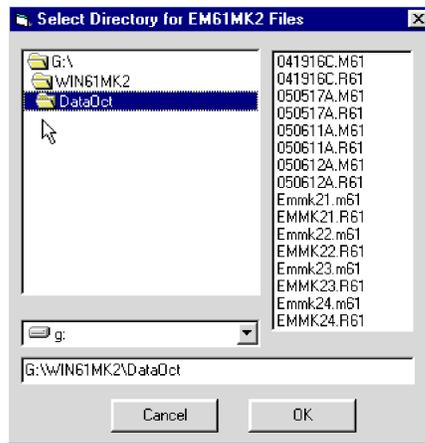


After you click the **Download EM61MK2 Files** item, the Download EM61MK2 File from Allegro or Pro4000 window will appear.



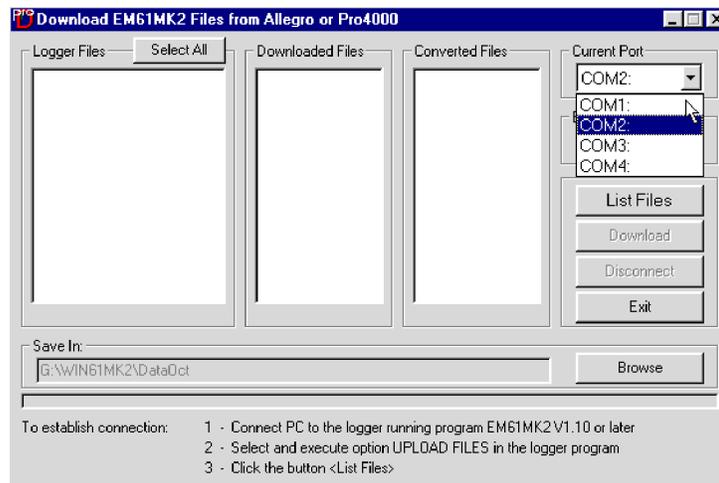
The Download window has three list boxes. The first from the left, labeled **Logger Files** will contain, after the **List Files** button is clicked, a list of data files located in the field computer and available to download. File names, with their size in bytes will be displayed as well. The second list box, labeled **Downloaded Files**, will list downloaded data files in the EM61MK2 format, and the third, **Converted Files**, will list files converted to DAT61MK2 format. If a file name already exists on the computer hard disk, an underscore followed by a letter will be added to the base name. (ie. file name ABC.R61 would be changed to ABC_1.R61, ABC_2.R61, and so on.)

To select the directory where transferred files will be placed click the **Browse** button. The Select Directory for EM61MK2 Files window will be displayed (Figure below).

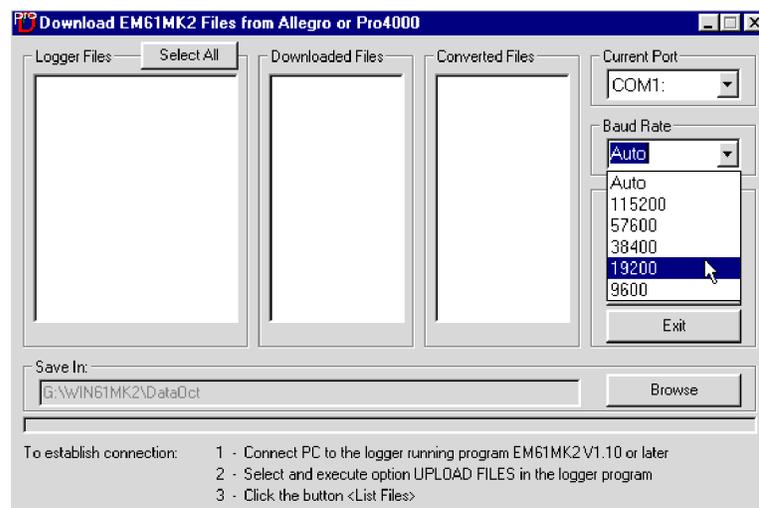


After the directory is selected, it will be displayed in the text box labelled **Save In** at bottom part of the Download EM61MK2 Files window. The selected directory will be saved and it will be used as the default directory during subsequent DAT61MK2 executions. If this directory is removed the C:\ directory will be used instead.

Change of the port assignment can be done by clicking the Down arrow button in the field labeled Current Port. The pull down list box will be displayed, as shown in Figure below. Select required COM port number.



Selecting Baud Rate can be done by clicking the Down arrow button in the field labeled Baud Rate. The pull down list box will be displayed. Select Auto setting or specify one of the given Baud Rates.



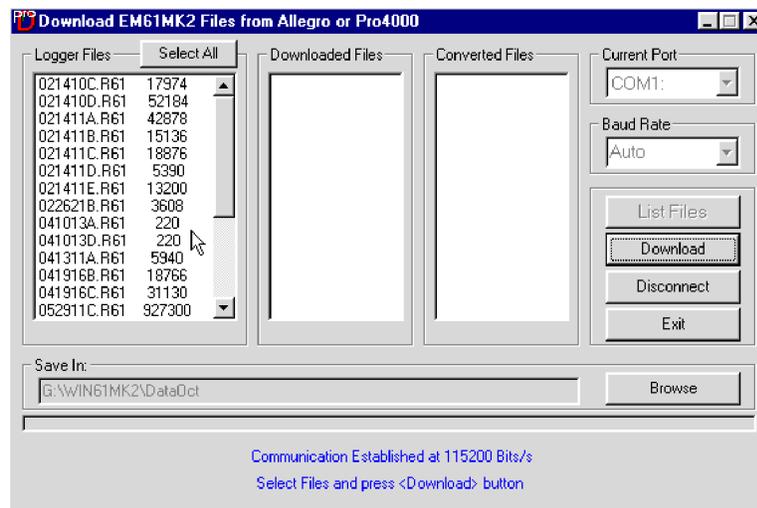
The **Auto** setting will cause the program to establish and test the highest possible speed for data transmission for particular computer and logger. This setting is adequate for most computers. However if the program will prompt that one or more bytes were lost during transmission click on the **Disconnect** button, select a lower Baud Rate, and then repeat downloading.

To start downloading the data files, connect the field computer (Allegro or Pro4000) and PC computer with the serial cable.

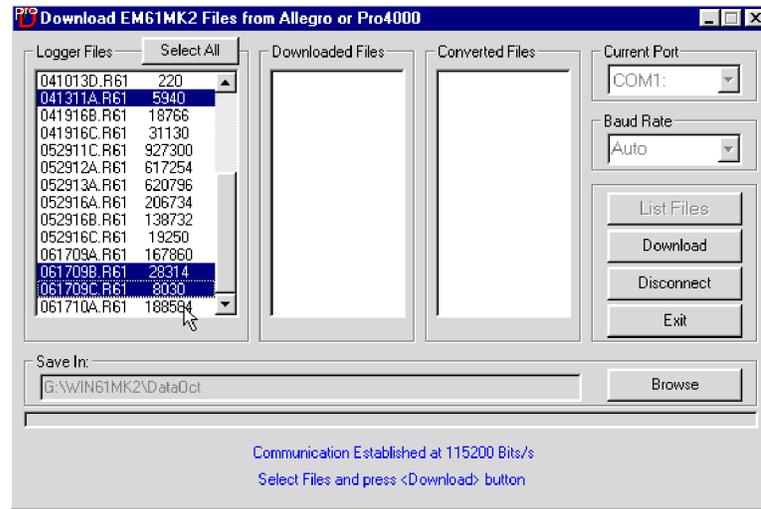
Run the EM61MK2A program in the logger. In the Main menu of the program select **Upload Files** option, and press <ENTER>. The logger screen will display the message “**Waiting for PC**” (shown in Figure below) for up to 1 minute (if time elapses repeat the procedure). On the



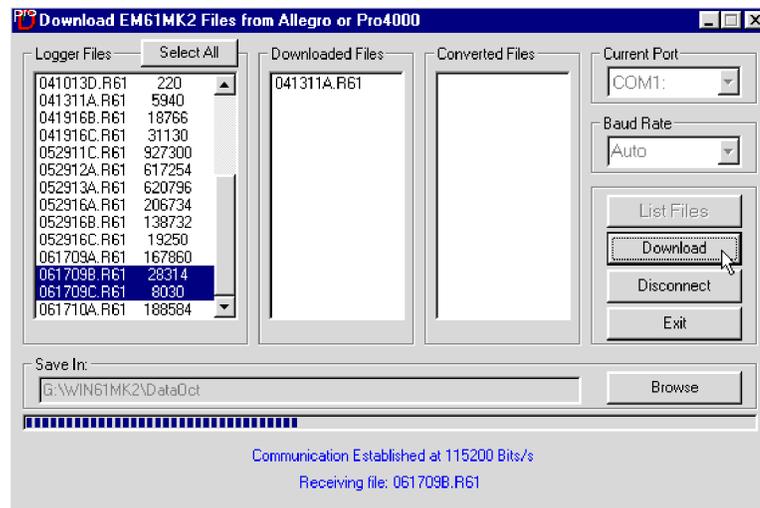
computer click the **List Files** button in the Download EM61MK2 Files window. At that time both programs (EM61MK2A and DAT61MK2) will establish and test the communication at the highest possible (if Auto was selected) or selected speed of data transfer. After several seconds the Logger Files list box will be updated with the names and sizes of data files available for download (see Figure below). At the same time, the **Download** and **Disconnect** buttons will be activated, and the **List Files** button will be deactivated. To start downloading the data files, connect the Allegro (or Pro4000) and computer with the serial cable.



Select the files to be downloaded from the logger by clicking on individual file names in the list box (Figure below) or click the **Select All** button to select all available files. When all files are selected the **Select All** button will change to the **Unselect All** button.



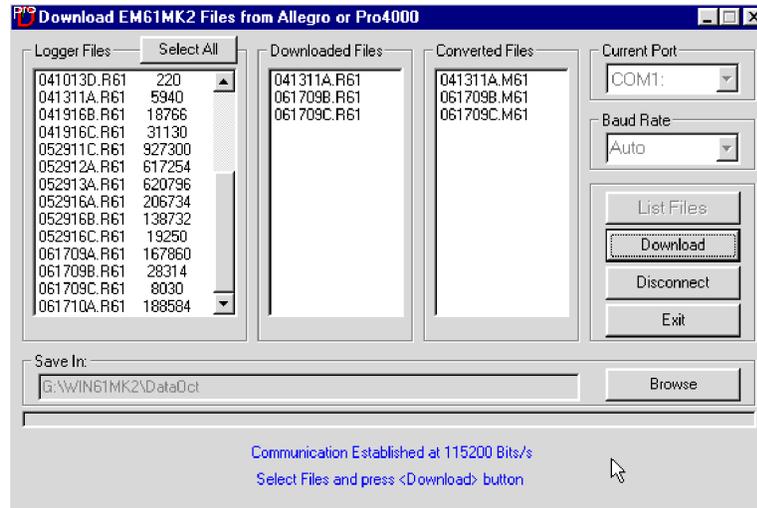
When file selection is complete click the **Download** button. The name of each transferred file is displayed at the bottom of the window as it transfers and a progress bar indicates the percentage completed, as shown in the following Figure.



At the same time the logger screen displays transmitted file name and percentage of completed uploading (Figure below). The transfer procedure can be stopped at any time by pressing <Esc> key on the logger keypad.



Transferred files (in EM61MK2 format) will be displayed in the centre list box. After the transfer of all selected files is complete, files in the EM61MK2 format are automatically converted to the DAT61MK2 format (with extension name M61). Converted files will be displayed in the Converted Files list box (see Figure below). Converted files (with extension name M61) can be loaded and processed further in the program.

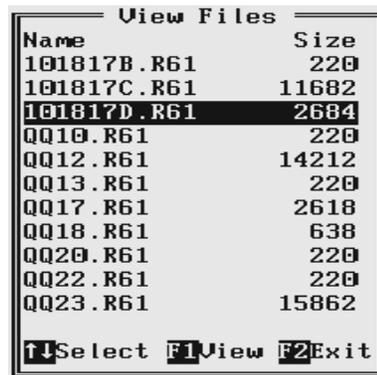


Click the **Disconnect** button to cancel communication with logger. The Download EM61MK2 Files window will remain on the screen and next data transfer session (i.e. from another logger) can be performed. Clicking the **Exit** button will stop Data Transfer function and the Download EM61MK2 Files window will disappear.

15. View Files

This option allows to view recorded data files. After the View Files option is selected in the File Manager menu the View Files menu with a list of data files and their size appears on the screen. This menu is presented below.

Select the file by using **Down** and **Up** arrow keys. When the desired file is highlighted press function



key **F1** to view contents of this file. Pressing key **F2** will return the program to the EM61MK2A File Manager menu.

After key **F1** is pressed the View File menu with readings taken at the first station of the first survey line in the file is displayed, as shown below.

```

File: 102023B.R61
Mode: Auto
Line: 11
Stn :      5.00 m
Ch 1: 398.67 mV
Ch 2: 204.01 mV
Ch 3: 124.92 mV
Ch T: 112.34 mV

Dir:E           Mkr:N

NextStn  PrevStn
NextL    PrevL  F2Exit

```

At the top of the screen name of the data file and the EM61 mode are displayed. Then the Line Name, Station, and readings for four channels **1, 2, 3, 4** or **T** are shown. The survey line direction (Dir) and the fiducial marker (Mkr) presence **Y(es)** or **N(o)** are displayed as well. If the file contains comments, the text will be displayed between neighbouring stations.

The **Right** arrow key is used to show next station (NextStn) and the **Left** arrow key will move display to previous station (PrevStn) readings. Survey lines can be changed by pressing **Down** and **Up** arrow keys. The **Down** arrow key will switch the display to the first station of the next survey line (NextL), and the **Up** arrow key will show the first station readings of the previous survey line (PrevL). If the last or first station of a survey line will be reached, or the last survey line in the file will be encountered, the program will provide appropriate information.

16. Delete Files

This option allows you to delete data files from the field computer memory. After the Delete Files option is selected in the Main Menu the Delete Files menu with a list of data files and their size appears on the screen. This menu is presented below.

```

Delete Files
Name      Size
ZX1.R61   220
LG.R61    518386
101720B.R61 220
ZX2.R61   220
ZX3.R61   4004
ZX4.R61   4488
ZX5.R61   1188
HH50.R61  49588
HH20.R61  137720
HH100.R61 42130
101900A.R61 2794

F1Select F2Delete F3Exit

```



Select the file by using **Down** and **Up** arrow keys. When the file to be deleted is highlighted press function key **F1** to delete the file. Pressing key **F2** will return the program to the EM61MK2 File Manager menu.

After key **F1** is pressed a confirmation prompt appears on the screen, as shown below.

If key **Y** will be pressed the file will be permanently deleted from the field computer memory. When key **N** is pressed the confirmation prompt disappears and display shows the list of available data files.

Exit the Delete Files menu by pressing the function key **F2**. The program will return to the EM61MK2A File Manager menu.

17. End Program

To end the program highlight the Exit option in the Main Menu and press the **<ENTER>** key. The program will stop, and it will return to the DOS prompt.

Appendix A

A.1 Using the EM61MK2A with a GPS Receiver

The EM61MK2A program accepts input from GPS receiver that stream NMEA-0183 compatible data. through their output port. The program uses two NMEA messages: GGA and GSA. The entire GGA message is written to the EM61MK2 data file, while the GSA message is used only to display PDOP index on the logger screen.

The GPS system means (control device, receiver panel, or manufacturer software) must be used to set GPS receiver communication parameters, to specify frequency of GPS output, and number and type of NMEA messages sent by the GPS system output port. Any GPS system can send various NMEA messages. **It is important to select only two messages (GGA and GSA) that are actually used by EM61MK2A.** The program will accept any GPS string sent by the GPS receiver, however it uses time to process GPS data that is not being used. Therefore, selecting a larger number of NMEA messages for GPS output will result in slower data acquisition of EM61MK2A. Normally, the EM61MK2A running in Allegro (or EM61MK2P in Pro4000) logger uses less than 100 ms to process and record GPS data from two NMEA messages, GGA and GSA.

Only message GGA is necessary to position EM61MK2 data. If message GSA is not available in a particular system, the EM61MK2A will function and record position data based on GGA message. Lack of GSA message will result in PDOP index displayed as Not Available (N/A) on the logger display. Using message GGA alone will also result in slightly faster operation of the program. The speed can be further improved by setting higher Baud Rate (if it is supported by the employed GPS receiver) in Set GPS Port menu.

The EM61MK2A dedicates one line of the display to show GPS status. A label **DGPS** (Differential Global Positioning System) in text mode or **D** in graphic mode indicates that GPS readings are differentially corrected in real time. Label **AGPS** (Autonomous Global Positioning System) or **A** in graphic mode indicates lack of differential correction. On the right side of **DGPS** or **AGPS** (**D** or **A** in graphic mode) a label small square is displayed. This square should move down and up with the frequency of GPS update rate (usually 1 second intervals). If the square is not moving for longer period of time it means that GPS system is not working or that it is not connected to the field computer. Number of recorded GPS positions are displayed on the right side of the small square. This number is updated only in the logging mode, when the data are recorded. (In Stand By mode or during Monitoring only the moving square, and updated values of PDOP and number of tracked satellites, indicate presence of GPS input).

Two more GPS parameters are displayed on the logger screen. These are index PDOP shown by label **P** and number of tracked satellites represented by label **S**. The index called PDOP (Position Dilution of Precision) measures the strength of satellite coverage for a given area. PDOP is affected by the number of satellites visible and their relative positions in the sky. The smaller the number of PDOP the stronger the satellite coverage is. When there are more than 5 satellites widely spaced visible, the PDOP is 4 or less. However, when there are less satellites visible, or they are unevenly spaced in the sky, PDOP values can be 6 or higher. In most cases, the PDOP in an open sky is less than 3, and most accuracies given for many GPS systems are given for this norm. Refer to GPS documentation and literature for more information related to error sources of GPS positioning.

A.2 Description of GGA and GSA Data Messages

GGA Data Message

The GGA message contains the GPS position information and it is the most widely used NMEA data message. This message takes the following form:

```
$GPGGA,hhmmss.ss,ddmm.mmmmm,s,dddmm.mmmmm,s,n,qq,pp.p,saaaaa.aa,u,  
±xxxx.x,M,sss,aaaa*cc<CR><LF>
```

Definition of GGA message component:

hhmmss.ss	UTC time in hours, minutes, seconds of the GPS position
ddmm.mmmmm	Latitude in degrees, minutes, and decimal minutes
s	s=N or s=S, for North and South latitude
dddmm.mmmmm	Longitude in degrees, minutes, and decimal minutes
s	s=E or s=W, for East and West longitude
n	Quality indicator, 0 = no position, 1 = raw, no differentially corrected position, 2 = differentially corrected position, 9 = position computed using almanac information
qq	Number of satellites used in position computation
pp.p	HDOP = 0.0 to 99.9
saaaaa.aa	Antenna altitude
u	Altitude units, M=meters
±xxxx.x	Geoidal separation (requires geoidal height option)
M	Geoidal separation units, M = meters
sss	Age of differential corrections in seconds
aaaa	Base station identification
*cc	Checksum
<CR><LF>	Carriage return and Line feed

GSA Data Message

The GSA message contains active satellites and PDOP value. The GSA message is given in the following form:

```
$GPGSA,c1,d1,d2,d3,d4,d5,d6,d7,d8,d9,d10,d11,d12,d13,f1,f2,f3*cc<CR><LF>
```

Definition of GSA message components:

c1	Mode, M = manual, A = automatic
d1	Mode, 2 = 2D, 3 = 3D
d2-d13	Satellites used in position computation (range 0 to 32)
f1	PDOP (range 0 to 99.9)
f2	HDOP (range 0 to 99.9)
f3	VDOP (range 0 to 99.9)
*cc	Checksum
<CR><LF>	Carriage return and Line Feed

Appendix B

B.1 Description of Data File in EM61MK2 Format

Each record contains 22 characters, including line feed at the end of each record.

Header of the file (contains six records starting with characters E, H, O, O, O, and O)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
E	M	6	1	M	K	2		V	2	2	0	Survey Type	UT	IT	IM						10
H		File Name									Time Increment [s] (F7.3)								10		
O	Offset for Ch1 (F9.2)								IC	QC coil value Ch1 (F9.2)								10			
O	Offset for Ch2 (F9.2)								IC	QC coil value Ch2 (F9.2)								10			
O	Offset for Ch3 (F9.2)								IC	QC coil value Ch3 (F9.2)								10			
O	Offset for Ch4/T (F9.2)								IC	QC coil value Ch4/T (F9.2)								10			

EM61MK2	-	identification of program file
V220	-	version number (V2.20)
Survey Type	-	GPS (if GPS Input Enabled) or GRD (grid)
UT	-	unit type (0 = meters, 1 = feet)
IT	-	instrument type
IM	-	(0 = sensor 1x0.5m, 1 = 1x1m, 2 = 0.5x0.5m, 3 = HH61)
File Name	-	instrument mode (0 = Auto, 1 = Wheel, and 2 = Manual)
File Name	-	file name, maximum 8 characters
Time Increment	-	time increment (Auto Mode) in seconds
Offset	-	offset for indicated channels in mV
IC	-	QC coil calibration (=N not performed, <>N otherwise)
QC coil value	-	value of QC coil calibration for indicated channels in mV
10	-	Line Feed character

Header at the start of survey line (contains four records starting with L, B, A, and Z)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22		
L	Line Name - 8 characters																						10
B	Start Station (Format F11.2)																					10	
A	Dir							Increment (Format F11.2)															10
Z	D	D	M	M	Y	Y	Y	Y		H	H	:	M	M	:	S	S					10	
O	Offset for Ch1 (F9.2)									Former Offset for Ch1 (F9.2)								10					
O	Offset for Ch2 (F9.2)									Former Offset for Ch2 (F9.2)								10					
O	Offset for Ch3 (F9.2)									Former Offset for Ch3 (F9.2)								10					
O	Offset for Ch4/T (F9.2)									Former Offset for Ch4/T (F9.2)								10					

- Line Name - Line Name, maximum 8 characters
- Start Station - Start Station for the Line, format F11.2
- Dir - Direction of the Line (E, W, N, or S)
- Station Inc. - Station Increment, format F11.3
- Date - Date when Line was created, format DD-MM-YYYY
- Time - Real Time when Line was created, format HH:MM:SS
- Offset - Offset for indicated channels in mV at the start of Line
- Former Offset - Former offset for indicated channels in mV
- 10 - Line Feed character

Reading

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
I	Gn	1h	1l	2h	2l	3h	3l	4h	4l	5h	5l	6	H	H	M	M	S	S	h	h	10

I - indicator T, D, E, F, M, N, P, or Q. Each record representing reading starts with one of the following character, which indicates type of reading:

- T** - Standard, Mode 4, channels 1, 2, 3, 4
- D** - Standard, Mode D, channels 1, 2, 3, T
- E** - Hand Held, Mode 4, channels 1, 2, 3, 4
- F** - Hand Held, Mode D, channels 1, 2, 3, T
- M** - Standard, Mode 4, channels 1, 2, 3, 4 +Marker
- N** - Standard, Mode D, channels 1, 2, 3, T +Marker
- P** - Hand Held, Mode 4, channels 1, 2, 3, 4 +Marker
- Q** - Hand Held, Mode D, channels 1, 2, 3, T +Marker

- Gn - one character parameter (Hex format), contains Gain, see table of ranges at the end of this section.
- 1h - higher byte of the 2's complement Hex number of Channel 1
- 1l - lower byte of Channel 1
- 2h - higher byte of the 2's complement Hex number of Channel 2
- 2l - lower byte of Channel 2
- 3h - higher byte of the 2's complement Hex number of Channel 3
- 3l - lower byte of Channel 3
- 4h - higher byte of the 2's complement Hex number of Channel 4
- 4l - lower byte of Channel 4
- 5h - higher byte of the 2's complement Hex number of TX current
- 5l - lower byte of TX current
- 6 - fraction of current (5h 5l), Hex number
- HH - time stamp, contains hour
- MM - time stamp, contains minutes
- SS - time stamp, contains seconds
- hh - time stamp, contains hundredths of second (**hh**)
- 10 - Line Feed character

Comment

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
C	Comment (maximum 11 characters)											Time Stamp (HH:MM:SS.hh)					10				

New Station

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
S	New Station (Format 11.2)											Time Stamp (HH:MM:SS.hh)					10				

B.2 Conversion Factors

EM61MK2 has four channels. Channels 1, 2, and 3 are common for Mode 4 and Mode D. Channel 4 in Mode D is named Channel T (it corresponds to Top coil).

The instrument response is converted to output voltage in mV for each sampling channel as given below.

- Channel 1 to 4 - converted data
- DATA1 (to 4) - instrument output for each channel as recorded in logger
- RANGE - range is controlled by the EM61MK2, it can be 1, 10, 100

Standard Unit - Mode 4 (One Sensor 1 x 0.5 m or 1 x 1 m)

$$\text{Channel 1} = (\text{DATA1} \times 4.8333 \times 2) / \text{RANGE}$$

$$\text{Channel 2} = (\text{DATA2} \times 4.8333 \times 2) / \text{RANGE}$$

$$\text{Channel 3} = (\text{DATA3} \times 4.8333 \times 2) / \text{RANGE}$$

$$\text{Channel 4} = (\text{DATA4} \times 4.8333 \times 2) / \text{RANGE}$$

Standard Unit - Mode D (Two Sensors 1 x 0.5 m or 1 x 1 m, Top and Bottom coils))

$$\text{Channel 1} = (\text{DATA1} \times 4.8333 \times 2) / \text{RANGE}$$

$$\text{Channel 2} = (\text{DATA2} \times 4.8333 \times 2) / \text{RANGE}$$

$$\text{Channel 3} = (\text{DATA3} \times 4.8333 \times 2) / \text{RANGE}$$

$$\text{Channel T} = (\text{DATA4} \times 4.8333 \times 4) / \text{RANGE}$$

if coil is 1 x 0.5 m Channel T is further multiplied by a factor 1.114.

Hand Held Unit - Mode 4 (One Sensor)

$$\text{Channel 1} = 0.902500 \times (\text{DATA1} \times 4.8333) / \text{RANGE}$$

$$\text{Channel 2} = 1.363000 \times (\text{DATA2} \times 4.8333) / \text{RANGE}$$

$$\text{Channel 3} = 2.026795 \times (\text{DATA3} \times 4.8333) / \text{RANGE}$$

$$\text{Channel 4} = 3.018856 \times (\text{DATA4} \times 4.8333) / \text{RANGE}$$

Hand Held Unit - Mode D (Two Sensors, Top and Bottom coils))

$$\text{Channel 1} = 0.9025 \times (\text{DATA1} \times 4.8333) / \text{RANGE}$$

$$\text{Channel 2} = 1.3630 \times (\text{DATA2} \times 4.8333) / \text{RANGE}$$

$$\text{Channel 3} = 2.0430 \times (\text{DATA3} \times 4.8333) / \text{RANGE}$$

$$\text{Channel T} = 12.152 \times (\text{DATA4} \times 4.8333) / \text{RANGE}$$

Further each channel is normalized by current following formula:

Standard Unit

$$\text{Channel} = \text{Channel} \times 3000 / \text{Current}$$

Hand Held Unit

$$\text{Channel} = \text{Channel} \times 1800 / \text{Current}$$

where, current is a value represented by **5h**, **5l**, and **6** in EM61MK2 data file (see section B.1)

Table of Ranges Determined by the EM61MK2 Microprocessor

HEX	Ch1	Ch2	Ch3	Ch4	HEX	Ch1	Ch2	Ch3	Ch4	HEX	Ch1	Ch2	Ch3	Ch4
0	1	1	1	1	40	10	1	1	1	C0	100	1	1	1
1	1	1	1	10	41	10	1	1	10	C1	100	1	1	10
3	1	1	1	100	43	10	1	1	100	C3	100	1	1	100
4	1	1	10	1	44	10	1	10	1	C4	100	1	10	1
5	1	1	10	10	45	10	1	10	10	C5	100	1	10	10
7	1	1	10	100	47	10	1	10	100	C7	100	1	10	100
C	1	1	100	1	4C	10	1	100	1	CC	100	1	100	1
D	1	1	100	10	4D	10	1	100	10	CD	100	1	100	10
F	1	1	100	100	4F	10	1	100	100	CF	100	1	100	100
10	1	10	1	1	50	10	10	1	1	D0	100	10	1	1
11	1	10	1	10	51	10	10	1	10	D1	100	10	1	10
13	1	10	1	100	53	10	10	1	100	D3	100	10	1	100
14	1	10	10	1	54	10	10	10	1	D4	100	10	10	1
15	1	10	10	10	55	10	10	10	10	D5	100	10	10	10
17	1	10	10	100	57	10	10	10	100	D7	100	10	10	100
1C	1	10	100	1	5C	10	10	100	1	DC	100	10	100	1
1D	1	10	100	10	5D	10	10	100	10	DD	100	10	100	10
1F	1	10	100	100	5F	10	10	100	100	DF	100	10	100	100
30	1	100	1	1	70	10	100	1	1	F0	100	100	1	1
31	1	100	1	10	71	10	100	1	10	F1	100	100	1	10
33	1	100	1	100	73	10	100	1	100	F3	100	100	1	100
34	1	100	10	1	74	10	100	10	1	F4	100	100	10	1
35	1	100	10	10	75	10	100	10	10	F5	100	100	10	10
37	1	100	10	100	77	10	100	10	100	F7	100	100	10	100
3C	1	100	100	1	7C	10	100	100	1	FC	100	100	100	1
3D	1	100	100	10	7D	10	100	100	10	FD	100	100	100	10
3F	1	100	100	100	7F	10	100	100	100	FF	100	100	100	100

B.3 Example of Data File in EM61MK2 Format

The EM61MK2 data file records are written in binary format, therefore the file may have different shape when displayed or printed, depending on particular video or printer settings.

```
EM61MK2 V220GPS000
H lg          0.100
O  354.56N    0.00
O  134.94N    0.00
O   58.97N    0.00
O   20.39N    0.00
L100
B           0.00
AW          1.000
Z10172000 20:02:34
O  354.56N    0.00
O  134.94N    0.00
O   58.97N    0.00
O   20.39N    0.00
FÿY••géJO20024276
FÿZ3•ò(JO20024336
FÿZ:´†óMO20024347
FÿX À>üNO20024358
@$GPGGA,000230.00,433
#6.59281,N,07936.6513
#3,W,2,7,1,139.93,M,-
#35,M,6,118*52
!           20024369
FÿYoëöBPO20024374
FÿZ$jàRO20024385
FÿYI-•üSO20024396
FÿYvæÀNO20024407
FÿZgÅ$QO20024418
FÿZ<b'öQO20024429
FÿY}j·MO20024440
FÿZC%CNO20024451
FÿZT@-ëQO20024462
@$GPGGA,000231.00,433
#6.59281,N,07936.6513
#5,W,2,7,1,140.29,M,-
#35,M,5,118*59
!           20024473
FÿY0Ó$LO20024473
FÿYÔfÛ-FO20024484
FÿZdð}èIO20024495
FÿZíuæDO20024506
FÿY...È^ûHO20024517
@$GPGGA,000232.00,433
#6.59280,N,07936.6513
#4,W,2,7,1,140.27,M,-
#35,M,6,118*57
!           20024572
FÿYk-      FO20024578
FÿXü,â+HO20024589
FÿY=™DEO20024600
FÿZÒ²>GO20024611
FÿYßŸ^÷JO20024622
FÿZÉ£FO20024633
FÿZøó>
HO20024644
```

B.4 Example of Converted Output Format

If Output in Set Output Port was enabled and Format was set to Converted the data will be send through serial port to external device in the following format.

```
082216G.R61
L1010
AS
Z08222002 16:43:15.750
E      14.00   164.60   90.09   40.10   123.70 16:43:18.010
E      13.00   166.18   88.16   40.48   124.96 16:43:18.560
$GPGGA,214218.00,4336.59343,N,07936.65086,W,2,7,1,139.61,M,-35,M,4,118*50 16:43:18.770
E      12.00   161.02   91.85   41.33   120.28 16:43:19.100
E      11.00   165.47   92.22   37.72   123.65 16:43:19.600
$GPGGA,214219.00,4336.59342,N,07936.65088,W,2,7,1,139.50,M,-35,M,5,118*5D 16:43:19.760
E      10.00   168.53   90.49   41.03   127.45 16:43:20.150
E      9.00    168.09   89.97   42.26   126.31 16:43:20.700
$GPGGA,214220.00,4336.59340,N,07936.65086,W,2,7,1,139.48,M,-35,M,4,118*53 16:43:20.810
E      8.00    161.19   83.53   45.38   120.79 16:43:21.250
E      7.00    167.16   87.46   44.43   125.57 16:43:21.800
$GPGGA,214221.00,4336.59344,N,07936.65087,W,2,7,1,139.71,M,-35,M,5,118*5C 16:43:21.850
E      6.00    163.30   91.15   42.72   121.75 16:43:22.350
$GPGGA,214222.00,4336.59342,N,07936.65087,W,2,7,1,139.55,M,-35,M,6,118*5C 16:43:22.780
Ccars      16:43:28.940
S      0.00 16:43:40.910
E      0.00   159.82   87.55   41.14   120.02 16:43:42.670
$GPGGA,214242.00,4336.59338,N,07936.65084,W,2,7,1,139.31,M,-35,M,4,118*54 16:43:42.780
E     -1.00   164.09   85.39   42.08   123.52 16:43:43.220
E     -2.00   168.11   89.50   38.59   125.47 16:43:43.770
$GPGGA,214243.00,4336.59333,N,07936.65081,W,2,7,1,139.40,M,-35,M,5,118*5C 16:43:43.820
E     -3.00   163.27   91.27   39.43   121.26 16:43:44.320
$GPGGA,214244.00,4336.59338,N,07936.65082,W,2,7,1,139.39,M,-35,M,4,118*5C 16:43:44.810
E     -4.00   173.31   85.18   39.15   129.80 16:43:44.970
E     -5.00   167.73   86.50   40.46   125.44 16:43:45.470
$GPGGA,214245.00,4336.59337,N,07936.65082,W,2,7,1,139.39,M,-35,M,5,118*53 16:43:45.800
E     -6.00   160.22   89.60   41.87   119.69 16:43:46.020
E     -7.00   156.22   86.11   41.21   116.17 16:43:46.570
$GPGGA,214246.00,4336.59340,N,07936.65081,W,2,7,1,139.39,M,-35,M,5,118*50 16:43:46.790
E     -8.00   166.34   82.56   42.52   124.57 16:43:47.120
E     -9.00   162.43   91.53   41.76   122.31 16:43:47.670
L1011
AN
Z08222002 16:43:52.830
E     -13.00   164.46   86.29   42.02   123.07 16:43:54.970
E     -12.00   166.59   90.96   38.07   124.89 16:43:55.470
$GPGGA,214255.00,4336.59338,N,07936.65086,W,2,7,1,139.40,M,-35,M,5,118*57 16:43:55.790
E     -11.00   162.35   84.26   36.85   121.94 16:43:56.010
E     -10.00   164.98   84.38   39.85   122.63 16:43:56.510
$GPGGA,214256.00,4336.59336,N,07936.65084,W,2,7,1,139.56,M,-35,M,4,118*5E 16:43:56.780
E     -9.00   158.19   83.68   42.57   118.85 16:43:57.060
E     -8.00   160.18   89.11   41.25   120.10 16:43:57.610
$GPGGA,214257.00,4336.59339,N,07936.65086,W,2,7,1,139.69,M,-35,M,5,118*5F 16:43:57.770
E     -7.00   162.64   88.78   37.40   122.74 16:43:58.160
E     -6.00   166.85   89.09   39.56   124.83 16:43:58.710
$GPGGA,214258.00,4336.59338,N,07936.65082,W,2,7,1,139.59,M,-35,M,6,118*55 16:43:58.760
E      3.00   167.44   84.42   40.87   124.98 16:44:03.980
E      4.00   165.91   82.21   37.78   124.29 16:44:04.530
$GPGGA,214304.00,4336.59336,N,07936.65084,W,2,6,1,139.48,M,-35,M,6,118*54 16:44:04.800
E      5.00   167.22   86.83   38.72   125.98 16:44:05.080
E      6.00   164.38   90.12   39.10   122.34 16:44:05.630
$GPGGA,214305.00,4336.59336,N,07936.65083,W,2,6,1,139.45,M,-35,M,5,118*5C 16:44:05.790
E      7.00   166.56   86.78   39.47   125.01 16:44:06.180
E      8.00   163.56   84.19   40.42   124.17 16:44:06.720
$GPGGA,214306.00,4336.59336,N,07936.65088,W,2,6,1,139.49,M,-35,M,5,118*58 16:44:06.780
E      9.00   168.66   87.61   42.58   128.10 16:44:07.220
C END FILE 16:44:10.300
```

Appendix C

C.1 Performing Hard Reset in Allegro and Pro4000

To perform hard reset in Allegro or Pro4000 hold down the ON/OFF key for 8 to 10 seconds. Release the key when the reboot process begins.

C.2 Panning the Display in Allegro and Pro4000

If the display in Allegro or Pro4000 is shifted at the beginning of the program you can do following:

You can move the display window by pressing the GOLD key plus the desired arrow key in Allegro, while in Pro4000 the display window can be moved by pressing the GREEN key plus the desired arrow key.

C.3 Operating DOS in Allegro

To start DOS (if the Allegro operates under control of Windows CE), tap the **Start** button on the Windows CE Desktop and select **Programs | Boot to DOS**. In DOS you can operate the Allegro by using standard DOS commands from the DOS prompt or through FileScout, a DOS File Management Utility.

C.4 Short Overview of Programs FileScout/ProShell and Lynx

Two programs, FileScout and Lynx, are supplied with the Allegro system and can be used to transfer files between the Allegro and a desktop Windows based computer. Programs ProShell (similar to FileScout) and Lynx are supplied with the Pro4000 system.

To run FileScout in Allegro, type **FS** at the DOS prompt and then press <ENTER>. To run ProShell in Pro4000, type **PS** at the DOS prompt and press <ENTER>. Use the function keys and arrow keys to make selections in both, FileScout and ProShell.

The program ProLink which is used to transfer files between Allegro or Pro4000 is factory installed in the Allegro/Pro4000 ROM (drive A:). When FileScout or ProShell is run ProLink is automatically initiated.

Lynx runs on computers equipped with Windows 95 or higher. To install Lynx from Allegro disk insert CD disk follow the instructions given by the install programs. To install Lynx from Pro4000 disks, insert the Pro4000 Setup disk (Utility disk #1) into drive A: on your computer and run the Setup program. The Lynx icon will appear on your desktop after installation is complete. When Lynx is started two Windows Explorer type screens will be displayed. The top screen, labeled Local, displays the contents of the PC. The bottom screen, labeled Remote, displays the contents of the Allegro or Pro4000 assuming a connection is established. Several file management functions can be performed using Lynx, including File Transfer, renaming folders, creating new folders or sub-folders, and deleting files.

C.5 File Transfer Using Lynx

Establishing Communication

To transfer data to and from a base computer, attach the cable (null modem serial communication cable) between the Allegro (or Pro4000) and the computer COM ports. Run FileScout on the Allegro (type command **FS** to run FileScout) or ProShell on the Pro4000 (type command **PS** to run ProShell) and Lynx on the PC computer.

Correct communication ports must be selected on both computers. To set up the serial port on the PC, from Lynx select the **Transfer/Select COM Port** menu option. To set up the communication port on the Allegro/Pro4000, press <F5>(Xfer) from main screen of FileScout or ProShell, and then press <F1> to toggle between ports COM1 and COM2.

Juniper Systems recommends that the Allegro (or Pro4000) is in auto baud rate detection mode (the default setting). In this mode, the Allegro (or Pro4000) tries to establish communication at 115K baud, and in case communication fails at this rate, it automatically steps down to the next slowest rate until communication is established.

To start communication click on the **Connect** button (the green circulating arrows in the centre tool bar) or select the Transfer/Connect to Remote menu option from Lynx. When connection is established the contents of the Allegro (or Pro4000) Field Computer will be displayed in the Lynx bottom Remote view screen.

Transferring Files to the Allegro from the PC

Select the folder in the Remote view screen. Transferred files will be saved in this folder.

In the Local view screen select files to be transferred to the Allegro (or Pro4000).

Click the Down arrow button or select Transfer/Send to Remote from the main menu. File transfer starts immediately. In cases where the selected file exists in the logger the program will prompt for permission to overwrite.

Transferring Files from the Allegro to the PC

Select the folder in the Local view screen. Transferred files will be saved in this folder.

In the Remote view screen select files to be transferred to the PC.

Click the Up arrow button or select Transfer/Receive from Remote from the main menu. File transfer starts immediately. If selected files exist in the selected folder in the PC the program will prompt for permission to overwrite.

When the transferring session is finished click the Disconnect button before disconnecting the serial cable. Otherwise, the Esc key must be pressed on the logger to return the Allegro (or Pro4000) to normal function. Please refer to Allegro or Pro4000 Field Computer User's Manual (Section 5) for more detailed description of FileScout/ProShell and Lynx functions.

Appendix D

Installation of a serial port extension card may be necessary only in case an external simultaneous output is used. In this case three serial ports may be needed, one for EM61-MK2, one for GPS receiver, and one for external output.

D.1 Installation of the Quatech QSP-100 Card in Allegro (or Pro4000)

Installation of the Quatech QSP-100 PCMCIA 4 channel card is described in detail in Quatech User's Manual "QSP-100 Four Channel Asynchronous RS-232 PCMCIA Adapter". The card can be installed in DOS environment using two configuration software programs; a Client Driver, QSP100CL.SYS, and a card Enabler, QSP100EN.EXE. The differences between these two programs are discussed in section 2 of the Quatech User's Manual, however the Client Driver is the preferred method of installation and configuration.

The Allegro (and Pro4000) system is configured with necessary Card and Socket Services software. Default configuration of CONFIG.SYS is given in Pro4000 User's Manual (page 6-6). Installation of the QSP-100 Client Driver requires modification of a startup file CONFIG.SYS. The CONFIG.SYS startup file containing default configuration settings is stored in the ROM (drive A:) and the C: drive. The file on the C: drive is used by the Pro4000 during boot up. Therefore CONFIG.SYS on drive C: has to be modified using a text editor or more conveniently, option F2 in the program ProShell (ProShell is activated by typing **ps** at the DOS command prompt).

The following procedure can be used to install the QSP-100 Client Driver in Pro4000:

Copy the file QSP100CL.SYS from the QSP-100 diskette onto the Pro4000 system drive C: (i.e. to directory C:\UTIL) using the Juniper Systems communication software Lynx (see Appendix C).

Using text editor (option F2 in FileScout or ProShell), open the CONFIG.SYS located in the root directory of the drive C:.

Locate lines in the file where the Card and Socket Services software is installed. After the lines installing this software (likely at the end of the file), add the following line to the CONFIG.SYS file:

DEVICEHIGH=C:\UTIL\QSP100CL.SYS

or

DEVICE=C:\UTIL\QSP100CL.SYS

(assuming that the file QSP100CL.SYS is located in directory C:\UTIL.). Two programs, ProShell (includes ProLink) and Lynx, are supplied with the Pro4000 system and can be used to transfer files between the Pro4000 and a desktop Windows based computer.(assuming that the file QSP100CL.SYS is located in directory C:\UTIL.). Several command line options can be specified at this line. These options are discussed in section 2.1.2 of the Quatech User's Manual, however installation of the Client Driver on several Pro4000 computers revealed that these options can be omitted and a base address and interrupt level are assigned Card and Socket Services.

Insert the QSP-100 card into one of the system's PCMCIA slots. The QSP-100 Client Driver supports "Hot Swapping" which means that it is not necessary to have the card

installed when booting the system. However, by inserting the card before booting Pro4000, the Client Driver will provide the card configuration and this information (base address and interrupt level - IRQ) is necessary to set up properly communication parameters (option "Advance COM Setup" in the ML61MK2 Main Menu).

Reboot the system (power ON or press keys Ctrl+Alt+Del) and note the message displayed when the QSP-100 Client Driver is loaded. The message has following form (screen panning may be necessary to view the entire message):

QSP-100 Client Driver, Version 1.00
Copyright 1996 Quatech, Inc. All rights reserved.

Socket 0 Configuration:
I/O Base Address 1 = 0380H
Interrupt = IRQ 5

Note the I/O Base Address and Interrupt since these parameters will be necessary to assign QSP-100 serial ports in ML61MK2 software.

The base I/O address of the QSP-100 is in hexadecimal notation and resides on an even 32-byte (20H) boundary. This address is assign to the first serial port of the card (a first left cable, see Figure B.1). The following ports require 8 bytes of I/O space for each port.

The Allegro (or Pro4000) serial ports have parameters:

COM1 - base I/O address 3F8, IRQ 4
COM2 - base I/O address 2F8, IRQ 3

Names for additional serial ports have only identification meaning in DOS environment, and they are fully described by I/O address and interrupt level.

Assuming that in the EM61MK2A program the serial ports associated with QSP-100 card will be named COM3, COM4, COM5, and COM6, and the assigned I/O Base Address is 380H and IRQ is 5, the following settings must be specified in "Advance COM Setup" menu:

COM3 - address: 380
Irq: 5
COM4 - address: 388
Irq: 5
COM5 - address: 390
Irq: 5
COM6 - address: 398
Irq: 5

In case I/O Base Address will be 300H, addresses for ports will be as follows:

COM3 - 300
COM4 - 308
COM5 - 310
COM6 - 318

If I/O Base Address is 120H, then the corresponding numbers will be 120H, 128H, 130H, and 138H.

D.2 Installation of the Quatech SSP-100 Card in Allegro (or Pro4000)

Installation of the Quatech QSP-100 PCMCIA 1 channel card is described in detail in Quatech User's Manual "SSP-100 RS-232 Serial Port Type II PCMCIA Card". The card can be installed in DOS environment using two configuration software programs; a Client Driver, SSP100CL.COM, and a card Enabler, SSP100EN.EXE. The differences between these two programs are discussed in section 2 of the Quatech User's Manual, however the Client Driver is the preferred method of installation and configuration.

The Allegro (and Pro4000) system is configured with necessary Card and Socket Services software. Default configuration of AUTOEXEC.BAT is given in Pro4000 User's Manual (page 6-6). Installation of the SSP-100 Client Driver requires modification of a startup file AUTOEXEC.BAT. The AUTOEXEC.BAT startup file containing default configuration settings is stored in the ROM (drive A:) and the C: drive. The file on the C: drive is used by the Pro4000 during boot up. Therefore AUTOEXEC.BAT on drive C: has to be modified using a text editor or more conveniently, option F2 in the program ProShell (ProShell is activated by typing **ps** at the DOS command prompt).

The following procedure can be used to install the SSP-100 Client Driver in Allegro (Pro4000):

Copy the file SSP100CL.COM from the SSP-100 diskette onto the Allegro system drive C: (i.e. to directory C:\UTIL) using the Juniper Systems communication software Lynx (see Appendix C).

Using text editor (option F2 in File Scout or ProShell), open the AUTOEXEC.BAT located in the root directory of drive C:.

Add the following line to the AUTOEXEC.BAT file:

C:\UTIL\SSP100CL.COM

(assuming that the file SSP100CL.COM is located in directory C:\UTIL.). Several command line options can be specified on this line. These options are discussed in section 2.1.1 and 2.2 of the Quatech User's Manual, however installation of the Client Driver on several Pro4000 computers revealed that these options can be omitted and the card serial port will be assigned to the next available port, i.e. COM3, assuming that COM1 and COM2 are already occupied. If a second SSP-100 is installed, then it will be configured at COM4.

Reboot the system (power ON or press keys Ctrl+Alt+Del) and note that the confirmation message is displayed when the SSP-100 Client Driver is loaded. The SSP-100 Client Driver supports "Hot Swapping" which means that it is not necessary to have the card installed when booting the system.

Standard COM port resources are:

COM1:	I/O Base Address = 3F8, IRQ Level = 4
COM2:	I/O Base Address = 2F8, IRQ Level = 3
COM3:	I/O Base Address = 3E8, IRQ Level = 4
COM4:	I/O Base Address = 2E8, IRQ Level = 3

The I/O Base Address and Interrupt will be necessary to assign SSP-100 serial ports in EM61MK2A software (Advanced COM Setup).