AKIM ELEKTRONIK LTD.

OEL-104 LIMNIGRAPH

USER MANUAL

Rev. 2.0

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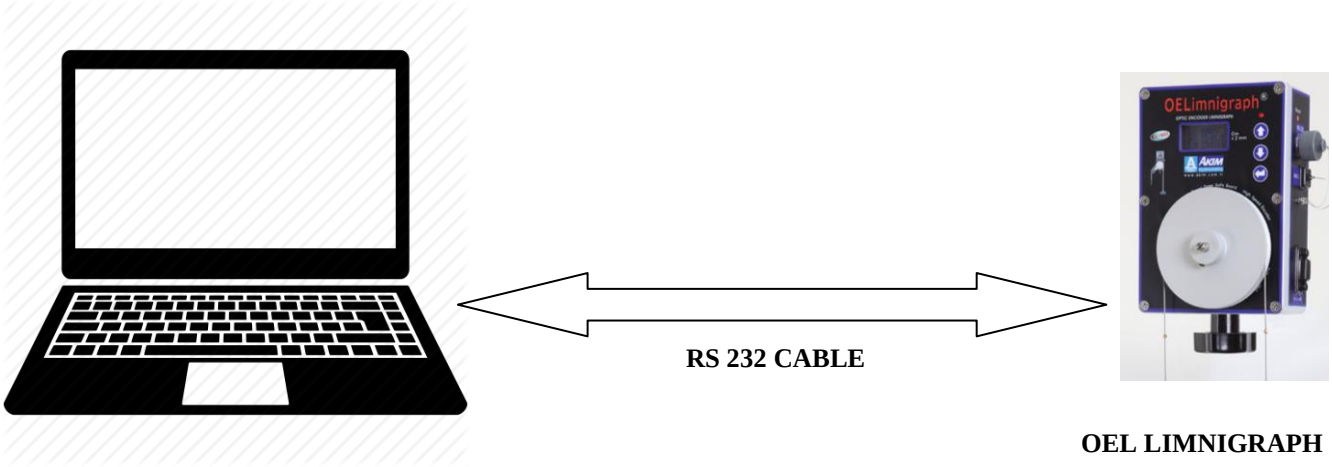
This document contains the operating instructions for the OELimnigraph.

INDEX

OPTICAL LIMNIGRAPH USER MANUAL

1. Preface

New generation limnigraph is designed to minimize data loss risk, store more and detailed data, use less energy and higher scanning speed, higher sensitivity, and fulfill optical limnigraph, read out unit, isolated serial port, line and GSM modem requirements.



2. System Operation

Data is stored on EPROM, and will not be lost even in the case of power supply failure. Address of last data to be saved and the date and time of the data saved is stored in RAM. There are two options for memory use, “Stop the log at the last address” and “Keep saving the data over 0. address when the last address is over (Ring or FIFO principle)”, and if the first option is chosen, the log stop date and time is stored by reaching the last address of the memory, a segment of EEPROM in micro-processor. On the second option, each “Ring” date and time upto five times is saved in this segment by “Ring” or “FIFO principle. 6th “Ring” date and time is saved over the first one. When data is transfered, date and time of the transfer is also saved under same principles to another segment upto five times. Maximum and minimum levels, rate and battery alarm dates and times are also saved in a 30 Byte segment upto 5 times. Other than the three segments working iwth Ring principle on the EEPROM in micro-processor, there are other segments where 27 ‘set-up’ parameters are saved, battery is installed and and ‘setup’ date/time is saved. RPRFLG Byte that helps receiving the log report is stored in RAM. However, if the battery power reduces down to a previously identified minimum level, logger stops all of the activities, and cancels high energy consuming functions and SCI if there is any at the moment, saves the last addresses to be stored for the 3 segments working under ‘Ring’ principle, last storage date/time to RPRFLG and EEPROM and the address to be saved on to another segment by using condensor energy. Date/time of battery outage is also saved on another segment. Therefore, all the reports and parameters of the equipment with new battery can be reached. Data saved in EEPROM can be found. If the battery power only reaches to alarm level over the dangerous level, warning will be sent to modem or laptop by SCI.
If the equipment is installed with battery for the first time, it is identified as “New Device”, if memory capacity, sensitivity and RTC time parameters are entered by triple keypad and “First Powered” after the battery is installed, it is identified as “PowerUp”, if the equipment is enetered with set up values, it is identified as “SetUp”, and if the equipment has logged data previously and a new battery is installed, it is called as “Signed”. If a ‘Signed’ equipment is ‘First Powered’, these new values in RAM are sent in 3 Bytes along with setup parameters when recalling saved parameters; if it is not ‘First Power’ed, values will not be sent.

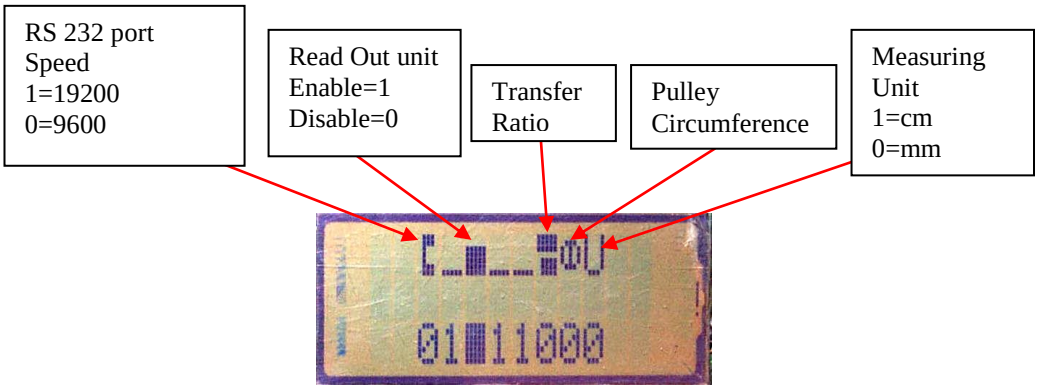
Protocol and message structure between Logger-PC is provided in Limnig2.Gen4 prepared on Visio. On the same document, technical details on alarm functions, data transfer and setup transfer is provided. While the equipment is

occupied with log activities, passive SCI (Serial Communication Interface) port is activated by the '0' charachter received, and send an identification message; 'A' (065d). PC (or modem) side sends a message of request… This is how all the communication is established except for the alarm warnings. Fort he alarm warnings, logger sends a '0' character followed by the warning message…
Logger sets up a ~10 s 'time out' timer for every character to be received from PC. Thus, communication can be done 'Byte to Byte' on any terminal program and keyboard. SCI has a 2 Bytes 'buffer', and established in a way that message structure does not oversize 2 bytes in row when receiving signs from the port. However, when PC side is sending 'setup', in order to avoid PC limitation on the timing of 30 parameters transfer, and to save continuous parameters, user will be warned both on the PC and logger side, and logging is stopped if the user insists on sending new parameters in order to start new log. If this process can not be completed due to a problem, logging is canceled, and equipment Works in a mode where only alarm and level recording functions are in operation by enabling a flag called UNSUCCES_SETUP in RPRFLG.
On the other hand, while the logger is sending signs, the longest and highest priority interrupt routine takes about 10 ms, thus there will be same length of delays between the bytes.
3 line LCD of the logger with 'Menu Drived' option, operates for 15 secs. if any of the keys is active. On each 'monitor display', display period can be extended by pressing left and right buttons, and the next 'monitor display' can be reached by pressing Enter. As for parameter access displays, right button is used for increase/change, left button is used for decrease/change, and the Enter button is used to activate the values. Various SCI 'prompts' are designed fort he status of the function or the errors if there are any. These will appear for 15 secs. and guide the user.

3. Setup on Limnigraph

After the optical limnigraph is resetted, pres any key and;

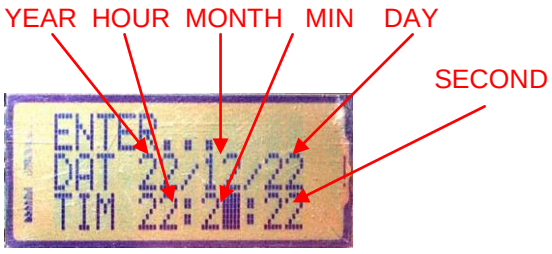
Following menu will be displayed. Baud identifies speed and level unit. Values can be changed by pressing Up and Down buttons. Pressing Enter button will jump the cursor to the next digit on the right side.



After measuring unit is entered, following menu will be displayed

Symbol " * " menu will be displayed. Numeric value in this menu is used for 4...20 mA output. This value is between 0 and 65. The value you enter here must be (if the display unit is connected) the value you should enter the display unit ("d" menu on the display unit).

Limnigraph level is divided in the amount of the value entered. This value is sent to read out unit, and therefore maximum and minimum levels are set for the 4...20 mA output. For example; If you want the level zero to be at 4 mA and maximum level 13 m. to be at 20 mA, you will need to enter this value as 5, so it will be 65535 mm / 5 = 13107.

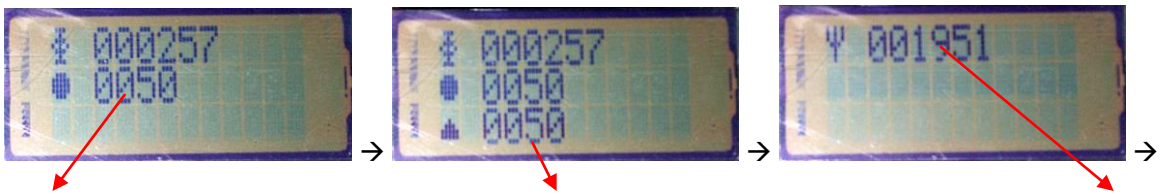


Current date and time menu is displayed. After adjusting date and time by Up and Down buttons, press Enter.

A display screen showing the battery is installed at the given date and 'System Setup' is completed.

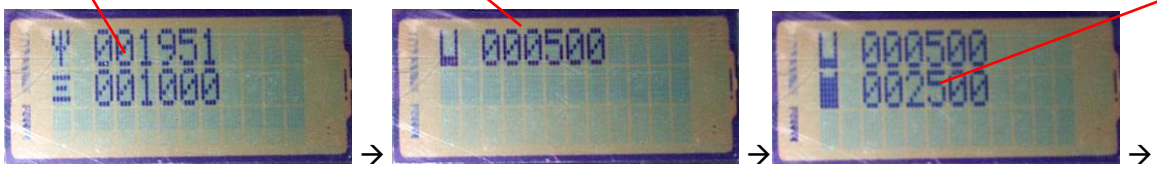
Before the last acceptance, if the set up is quitted at any menu, LCD display idles and shuts off in 10 seconds; press any key to turn the display on, screen will prompt for password and return to first menu item keeping the values saved after reset. If there are any data on the equipment that is not transferred, you will get the following message when you press any key after 'BATT.INSTALL' message:

You will need to transfer the data on Flash card or computer. Once the transfer is completed, press Enter key.

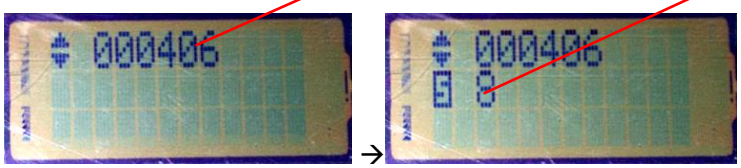


Zone, information is entered first, then the **Region**, information is entered, and finally **Station** information is entered.
Zone can be maximum 256, Region can be maximum 256 and for station 65535 values are entered. After these values are entered, system will ask you to enter eshel level information.

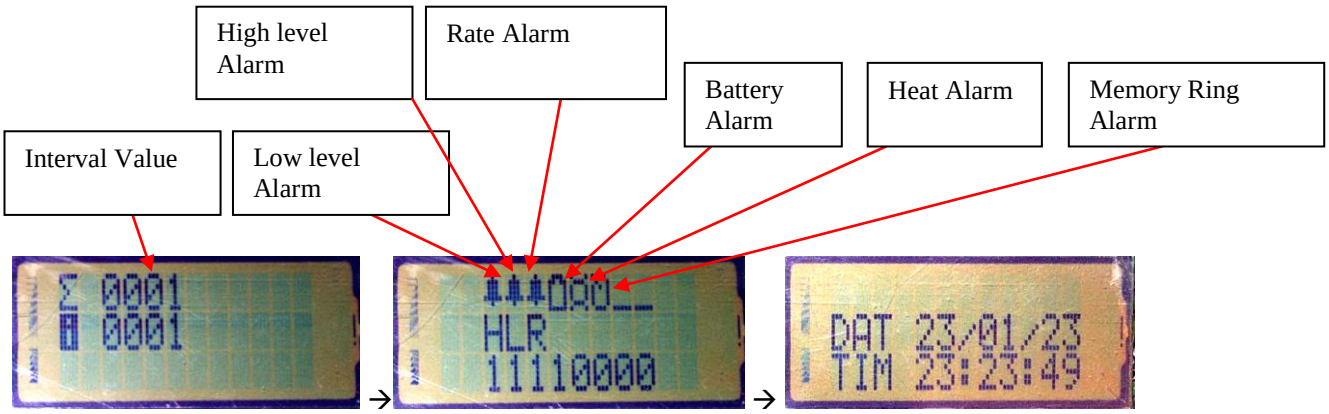
Scale level; water surface level is entered and the maximum value is 65535. Then the alarm level values will be displayed. Lowest water level value will be displayed. Once the lowest level value (Low alarm) is entered, Highest value will be entered (High Alarm)



After the high alarm is entered, rapid increase alarm level is entered. Rate symbol will be displayed; this value is a set value and must remain as 8.



After the Enter button is pressed, MWBI is displayed. After MWBI value is adjusted, press Enter. Interval value will be displayed. The values to be entered in these two sections identifies the recording intervals of the limnigraph. If you enter 2 for MWBI value and 30 for interval value, multiplication of these two values identifies the data recording intervals of the limnigraph. Based on this sample, limnigraph records twice in 60 minutes and provides with the average of these 2 recordings.



After limnigraph recording interval values are entered, next stage will the alarm set up. Alarms can be set by using Up and Down buttons. In order to enable the alarm, enter the number 1, pressing Enter buton will save the setting and move to the next alarm indicator on the right. Increase and decrease rate alarms can be adjusted to the needs, however it is reccomended that battery and memory ring alarmsa re enabled. Battery alarm will warn the user when the battery life is low. Ring alarm means that the capacity of memory is full, and the system will start deleting the earliest saved items and record the new data over. Limnigraph will start working after these alarms are set.

…Logger will start processing.

Messages displayed when connection with modem or PC is established

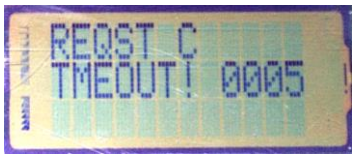
"T" (084d) character is sent after "0" from the 'Logger' in order to receive setup parameters and information on RAM or System EEPROM to PC side. After the transfer is completed, system awaits for confirmation message from the PC. If this process is completed successfully;

For '**Setup**' -> 

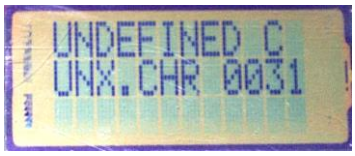
, For '**Signed**' -> 

For '**PowerUp**' -> "**REPORT P TRNSF.OK!**" For '**NewDevice**' -> "**REPORT N TRNSF.OK!**" messages are displayed.

İf no character is sent for the required process after “0”



message is displayed, if an unknown character is sent,



message is ‘displayed’.

If ‘Confirmations Message’ is not sent within the time limit (‘time out’ period),

“**CONF C**
TMEOUT! 0005” message will be displayed.

4. SetUp on PC side

If the user opens up a card belongs to the logger, SW on PC side enforces to receive the current setup parameters and all reports on the equipment before sending the setup to the recorder. After the user updates all the information on the recorder, program checks for new data saved after the last data transfer, and if there is, it will ask the user to transfer the data on EEPROM. (Same as data transfer requirement warning by the recorder when entering set up values on limnigraph side) After data transfer, system will keep warning the user depending on the status of the recorder, either the new set up would terminate the ongoing log or the data would not be re-accessible if the battery is renewed. If the user stil prefers to sen the setup, he will need to enter both system and log passwords correct. Otherwise, set up will not be allowed. Request is given by (083d) and (04d). After the confirmation message is received from limnigraph, “**1923**” in other terms, (07d) and (0130d) is entered for “**Setup via Serial Port Access Code**” requested by limnigraph over the communication protocol identified in Technical Guide. After the “confirmation message” for password verification is received from limnigraph, setup parameters are sent. This password can be changed for different work groups (Both SW, and chip basis). Date/Time is received from PC RTC, and asks user if the date/time settings needs to be changed. As specified on technical guide, the equipment does not force you to save at 24:00 Also it does not require an MWBI x Interval value to divide 1440 to an integer number. However, it will answer such request same as previous genertaion models. As a result, program will accept a MWBI x Interval value that divides 1440 to an integer number, and makes the adjustment by adding user requested delay time to SURE parameter in the size of 2 bytes, and by delaying sending process of the PC. As stated on the technical guide, parameters are sent maximum 2 bytes in row in order not to disturb the current log process. Therefore, it is constituted of “Data Message”, heading “D” foloowed by a single Byte. As the user is aware of the fact that the log will be disturbed, after the program sends the correct password, 30 parameters are sent to equipment continuously within the “time out” period. As the parameters are being sent, current logging is stopped, and UNSUCCES_SETUP flag=1 is accomplished to indicate a potential failure on the report. Following a successfull parameter transfer, equipment sends “confirmation’ (065d ve 04d) characters and starts the log process.

is displayed on limnigraph LCD unit for 15 secs.

Data Transfer

Data transfer from a logging limnigraph after set up is done by reading all the addresses from the first address of start block to the address of saving location, and transfering to serial port. It will not refuse the request even if the start block is bigger or smaller than saving location or if the memory is Ring'ed. However, if the start block is same as saving (actual) block, only that block is sent to saving address.

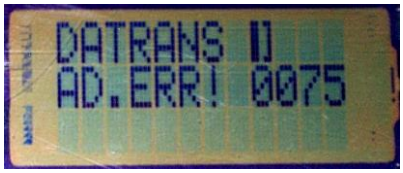
Each block transfered is notified to the user.

Request is sent by PC as "068d" and "Transfer Start Block d".

Based on starting block, which part of the memory that data transfer scanned and sent is explained on technical guide. PC side sends "confirmation message" that limnigraph is awaiting for at the end, and transfer is completed.

message is displayed for 15 secs.

If the provided starting block is more than memory capacity,



user is warned by this message. If data transfer is requested from an equipment with no set up or no log ("**NewDevice**" or " **PowerUp**"),

"**DATRANS D**
NOSIGN! 0075" warning is displayed. If the "confirmation message" is not sent within 'time out' period,

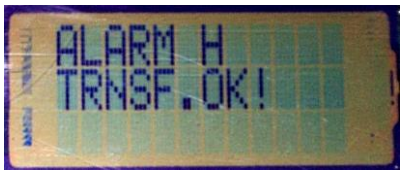
"**DATRANS D**
TMEOUT 0052" message is displayed and the communication is cancelled. If the PC side can not get the sent block "correct", sends the "confirmation message" as "078d" and "04d". In that case, limnigraph repeats the same block one more time.

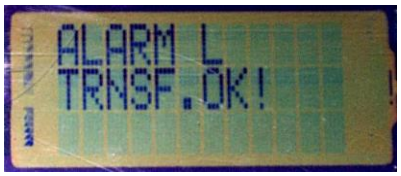
If the data transfer is requested from a limnigrapgh with "setup", UNSUCCES_SETUP or LOG_STOP (If end of Memory is chosen instead of Ring) or battery is changed and "signed" but was not given "setup", as explained on technical guide, transfer is sent from the first address of the starting block to the 00 address without leaving a single address.

If there are new logs during data transfer, address matches are done dynamic, and these will be added on the last block.

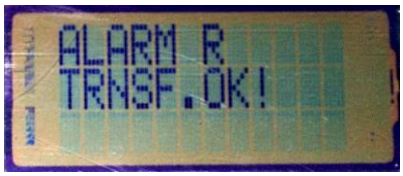
5. Alarms

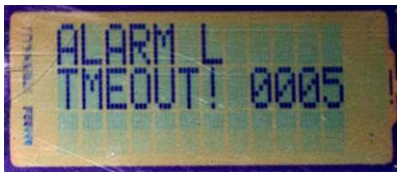
High level, low level, rate and battery alarms can be activated by Bits at LOGFLG1. No measuring or matching is done for disabled alarms. After measuring and matching process is completed for enabled alarms, if the threshold level is overcome, "alarm message" routine will be started over serial port. This message will be sent every 15 seconds until the confirmation message is sent from PC or modem. After a "Confirmation message" is received, message will not be repeated.





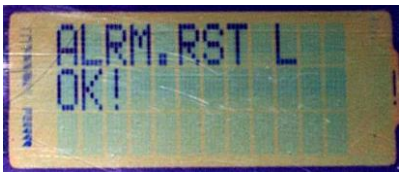
Messages displayed on LCD after “confirmation message” is received from PC or modem for “**High Level Alarm**” and “**Low Level Alarm**”.





After “confirmation message” is sent from PC or modem for “**Rate Alarm**”, on LCD is shown above. If the “Confirmation message” is not send to PC or modem for SCI within “**time out**” period, above left message is displayed.

Flag for this alarm in RPRFLG is enabled by setting to “1”. On the other hand, system records Date/Time information to the current Alarm Segment address in EEPROM in 6 bytes size. After the related unit takes necessarry actions on limnigraph side and brings the level to “acceptable zone” between the alarm values, it sends an “alarm reset message” to limnigraph to reset this alarm. After limnigraph replies with a “confirmation message”, the flag is set back to “0”.



Messages displayed on LCD after **“High Level Alarm Reset**” and “**Low Level Alarm Reset**” sent by PC or modem.

Message displayed on LCD after “**Rate Alarm Reset**” sent by PC or modem.

Thus, if the level goes beyond the alarm level again, same alarm warns the related unit again. If the unit does not take action on limnigraph side and sends the “alarm reset message”, and the alarm level is exceeded after measuring and comparing process, alarm warning is re-sent to the office. That means the necessarry actions are not taken, and requires an urgent action. Details on “Alarm message” and “alarm reset message” protocol are explained on Technical Guide. The process for Rate Alarm is a little different. Even if the office receiving “Alarm message” does not take necessarry action, alarm is not re-sent after the “alarm reset message”. Because the logic is the “level derivative by time”. If the level change rate exceeds the “Rate Alarm” value and goes back to “acceptable values”, a new “alarm message” for “Rate Alarm” will not be sent. As for “Batery Alarm”, the only thing to do after the “alarm message” is received is to g oto limnigraph immediately and change the battery. This alarm can not be resetted.

However, the alarm is not repeated as in the other alarms once the PC or modem recieves the “alarm message”. The related flag in RPRFLG is set as “1“ and can not be changed. User shall uninstall the battery and wait 15-20 seconds before installing the new one.

In the mean time, “Data Safe Guard” function is activated, and as explained in Technical Guide, limnigraph saves all necessarry RAM registers to be used in reaching all data about the last status of the log into LASTWRI_SEG segment in system EEPROM. Even if the data is not transfered before changing battery, all the data on data

transfers, when the battery was changed, time and address of last record, and which addresses RPRFLG and Ring type System EEPROM segments reached information can be obtained on the report. If the battery is not changed, and battery goes below the previously identified voltage, “Data Safe Guard” function is activated. After that point of time, logger can be at any status wşth a dead battery. However, all the data can be reached aftter the battery is changed.

Battery measuring is done by a voltage reference chip in 20 ppm sensitivity, and shown on LCD with a 6 step icon in the units which the linear equivalents provided on the table in Technical Guide. These values are stored in MBATSTA register in the RAM, and is also sent over the serial port when communication is established.

6. Monitoring SetUp Parameters by Using Keypad.

After Setup parameters are entered, the logging starts as the following message is displayed on LCD

And it can be at any status at any time such as “Awaiting Before the Starts”, depending on preferred memory use, “Ringed” or “Log Stop in End of Memory”. Limnigraph can be montiored on the buttons without any additional instrument. During this process, non of the other functions will be interrupted, nor any of the data will be lost.
By pressing any key,

will be displayed. Level and Date/Time can be monitored dynamically.

Screens can be displayed by pressing any of the right or left buttons to set “LCD ON Time” to 15 seconds. Pressing “Enter” key will move the cursor to the next screen.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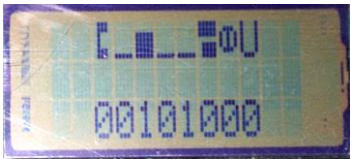
-> 
->

… **Memory Capacity**, **Resolution**, **SYSFLG** of which the Bits were explained previously.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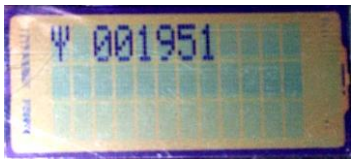
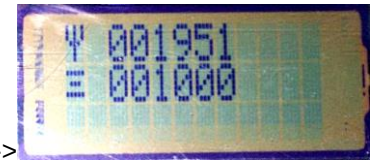
->

…**Awaiting Time**, **Region** and **Zone** screens…


-> 
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…**Station Number** (2 Bytes, 65535 ea), **Scale** and **Low Alarm Level**,

->


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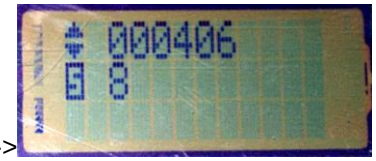

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…**High Alarm Level**, **Rate Alarm Value** and **Scan Rate**,

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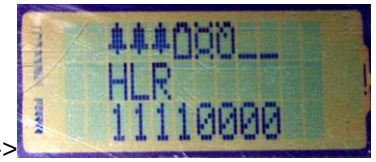

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…**MWBI, Interval** and **LOGFLG1**. LOGFLG1bits from left: High Level Alarm, Low Level Alarm, Rate Alarm, Batter Alarm, request Bits for Heat Measurement (1=Active, 0=Passive) and Bit for Memory Use Selection (1=Ring, 0=Stop Log at the End of Memory). Last two bits are reserved to answer future demands, and does not effect any of the functions.

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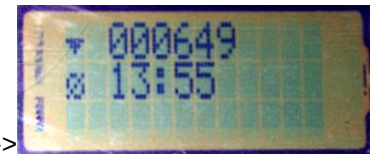

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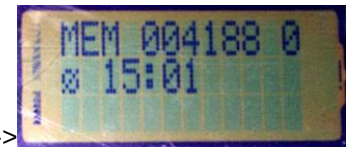
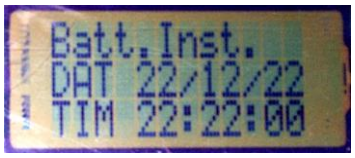


->

… **Momentary Maximum** and time of occurence, **Momentary Minimum** and time of occurence, and **The Last Approached Address of Memory** (0. Because it is recorded on Address as well, and "Record→ Increases Address principle is followed, this value also shows the record value). On the second line of the same screen, date and time of this record is indicated. Date is provided on the first screen. Memory saving date is updated at 24:00, and stored in YE_WRI,MO_WRI,DA_WRI and WE_WRI registers in RAM. Hour and minute information is stored in HO_WRI and MI_WRI When the voltage goes down the alarm level, these registers are saved on LASWRI_SEG segment on System EPROM by using the energy on condensor.



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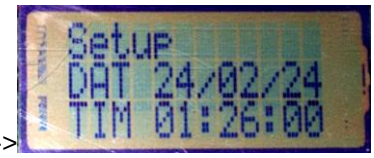

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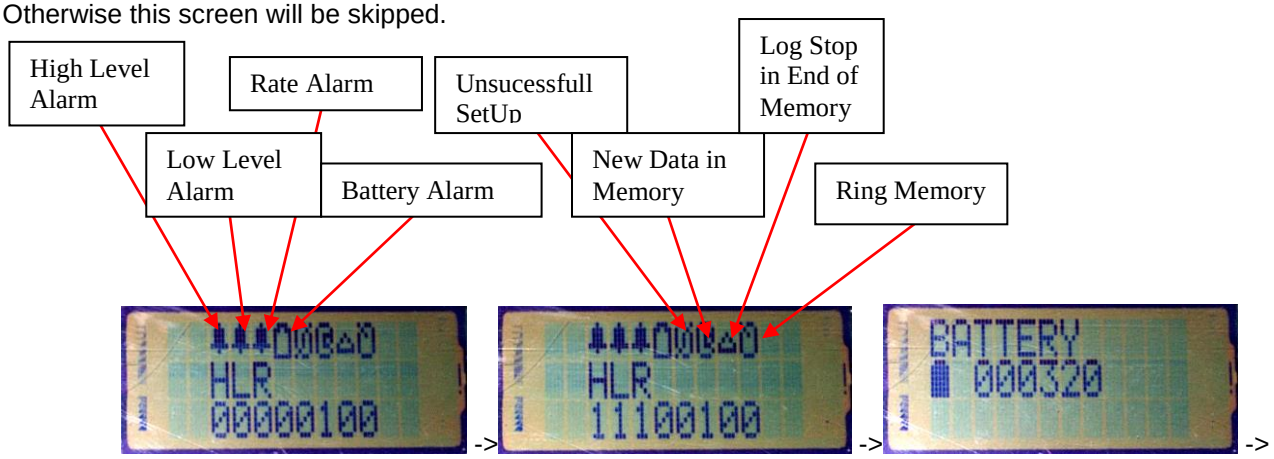
… **Battery Installation Time** (If the user installing battery has applied "First Power" process, this date indicates the actual battery installation date. If the user does not "first power", If the user does not apply "First Power" process, Date/Time parameters provided in the setup parameters and sent over serial port shall be displayed). **SetUp Time** and **Data Transfer Time** – if data is transefered at least once after setup (this screen will not be displayed if there aren't any data transfer accomplished after setup). The following screen will be the time for Ring- if it is enabled and Ring'ed at least once. This screen will be displayed as;

"Mem. Ring
DAT 02/07/25

TIM 15:05:30". (Note: Because both times are saved in Ring format in System EEPROM, the time of last event is displayed.)

Otherwise this screen will be skipped.

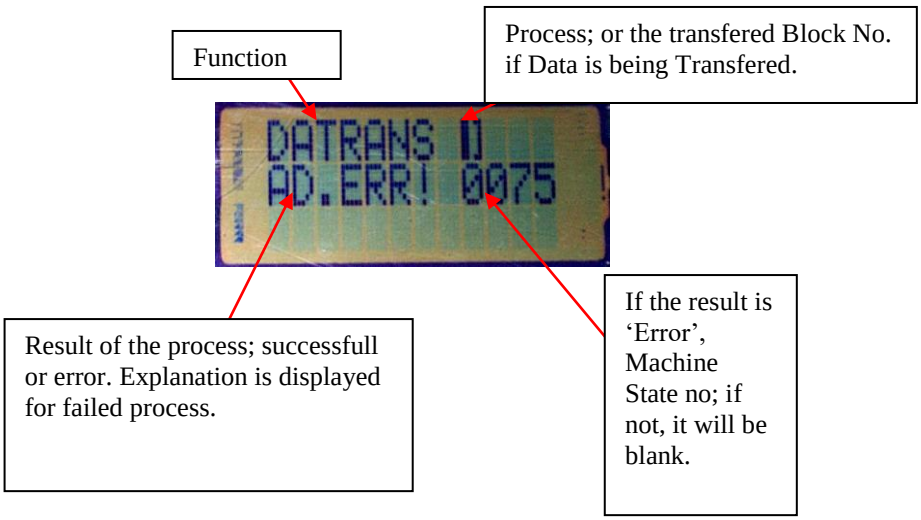


RPRFLG (RPRFLG Bits, the flags that enable the Alarms, from left to right, High Level Alarm, Low Level Alarm, Rate Alarm and Battery Alarms (1 = Enabled, 0 = Inactive), UNSUCCES_SETUP, DATA_IN_MEM (It is “cleared” after Data Transfer; However it will be “set” again by data storage. Log Stop in End of Memory and Memory Ring flags.) Another example of RPRFLG and **Battery** Icon and level screens,

…If keep pressing ”Enter” key, the screen will go back to the first screen.

7. SCI Functions and Message Format

Serial communication functions of Limnigraph that enables to communicate both with modem and PC are supported with LCD messages to proivde diagnostic and monitoring. In all SCI routins, information and character receiving period that limnigraph awaits in “receive” status is 15 seconds of time out periods. For other SCI functions other than the Data Transfer function, LCD message is displayed after the routin is completed in positive or negative result. As for Data Transfer routin, block in transfer is displayed on screen. Thus, user is informed on which block of the 256kByte data is being transfered, and how long it will take to complete the transfer.



8. Technical Specifications

- Optionally; operable with Optical Encoder or Pressure Sensor
- Optional memory capacity for Minimum power use is up to 256kByte (512kByte),
- Optional frame diameter,
- Optional Transfer Rate
- Optional Sensitivity (For Optical Encoder için); 64 definable sector/tour or 128 definable sector/tour,
- 10 year maintenance free logging with a single C Size battery,
- All data and parameters are saved in EEPROMs,
- “Data and Report Safe Guard” features on the battery-go-out,
- Menu Driven Software,
- RTC,
- Reliable battery monitoring,
- Setup from keypad or serial port,
- Inspection through LCD for all parameters and information,
- High optical encoder scan rate,
- Compatibility with operation by line, GSM or RF Modems,
- SMS Message for level, rate or battery alarms,
- Optional Read-Out Unit; 4-20mA, 0-10V, 0-5V outputs,
- Optional full Insulated RS232 Driver,
- Optional temperature measuring,
- I2C port for extention (optional) units

Mechanical Accessory

Pulley Circumference: 128mm or 256mm (optional),
Pulley Torque : ~0,03 cm.kg,
Float: Polyester,
Transmission: Punched Steel Stripe

Logger

Range: (32727mm fs (@0,5mm resolution; Optional), 65535mm fs (@1mm resolution)…131070Cm (@2Cm resolution),
Resolution: 0,5mm (Optional), 1mm, 2mm, 4mm, 5mm, 10mm, 20mm are derivated from pulley circumference, transfer ratio, encoder resolution and unit divider combinations,
Display: Low power consumption, 3 x 12 COG, LCD unit, 15sec auto shutt-off
KeyPad: 3 key for operation and internal reset button,
Memory : Data Memory: Low Power EEPROM, Parameter and Reports Memory: EEPROM,
Memory Capacity: Data Memory 32kByte, 64kByte, 128kByte and up to 256kByte; approx. 128000 data record (512kByte optional),
Operating Temperature Range: -40 °C…+60 °C,
Humidity: up to 95% relative,
RTC: Auto calender until the year 2099 (automatic year leap),
Ports: RS232 for Serial Comm., I2C Bus for optional extention units,
Power: Single 3,6V, 2700mAh C size battery,
Current Consumption: 4uA @ device no setup, 42uA @device setup with high scann speed (125msec;up to 512m/sec level tracking spped), alarms, sytem monitoring and full functions, plus ~250uA if LCD active, plus ~500uA if SCI active (including the optical encoder consumption),

Encoder

Principle: Light Pulse Scann Opticaly; absolute and incremental reading together a logger,
Resolution: 6,7 or 8 (Optional) Bits Gray; 64 defined sector/tour and 128 defined sector/tour,
Input/Output: CMOS 8 bit parallel data and control signals,
Operating Temperature Range: -40 °C…+75 °C,
Humiditiy: up to 95% relative,
Power: 3,6V dc,
Current Consumption: ~10uA @scan rate 1 shaft sample/125msec, in absolute darkness.