multitek

MULTILED

M812-LD*

OPERATING MANUAL

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Revision 3
Date 2-9-2005
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1.1 General

The MultiLed M812-LD* is a compact 96 x 96 mm Din case 3 phase power meter, with the ability to measure Volts, Amps, Frequency, Active Power, Reactive Power, Apparent Power, Active Energy, Reactive Energy, Power Factor, Average Demand Amps, Active Power Apparent Power, Maximum Demand Amps, Active Power and Apparent Power

Power Systems :- Single Phase, Single Phase 3 wire, 3 Phase 3 wire unbalanced load & 3 Phase 4 wire unbalanced load.

The MultiLed is designed to be user friendly and simple to use. All operations are controlled by the two push buttons ⇧ & ⇩ on the front of the M812-LD*

All necessary programming is also carried out via the front two control buttons.

Each phase current and voltage is measured continuously and all other parameters are derived from these measurements in the software. Voltage and current measurements are true RMS.

1.2 Memory

All data including energy registers, current and voltage ratios and the calibration data is stored in a non volatile e^2prom memory. The e^2prom requires no battery or other circuitry to maintain the stored data.

1.3 Relay Output

The option of a relay is provide on M812 models. The relay output provides a pulse output corresponding to either Watt hour or VAr hour consumption. (see programming section 4.3.1).
The MultiLed automatically calculates the pulse rate and whether the units are W.h, kW.h or MW.h (VAr.h, kVAr.h or MVAr.h) from the nominal voltage and current inputs.
The relay is a normally open contact. Every time the MultiLed registers a Watt hour or VAr hour reading the relay closes.
Pulse widths can be programmed into the MultiLed, between 20 msec and 200 msec in steps of 20 msec. (see section 4.3.3).

1.4 Communications

The MultiLed has the option of providing RS485 or output of all measured parameters.
The RS485 enables reading and programming of the MultiLed via a host computer. The RS485 uses the Modbus protocol allowing multi-drop with up to 32 MultiLed's connected in parallel. The RS485 modbus protocol allows the MultiLed to be used with PC, PLC, RTU, Data loggers and Scada programs.
The RS232 allows the MultiLed to be connected to a standard serial communication port, for example on a host computer, data logger, PLC etc.

2.0 MultiLed Models

M812-LD* measures and displays phase and line volts, phase amps, frequency, active power, apparent power, reactive power, active energy, reactive energy, power factor, average demand for amps active power and apparent power, maximum demand for amps, active power and apparent power and option of neutral current.

Product codes	*Power System*
M812-LD1	*Single phase*
M812-LD1-3	*1 phase 3 wire unbalanced load*
M812-LD4	*3 phase 3 wire unbalanced load*
M812-LD9	*3 phase 4 wire unbalanced load*

3. DISPLAY SCREENS

3.1 . The sequence of the parameters displayed are dependant on the model and the wiring system that MultiLed is programmed for.

3.1.1 The following screens appear on M812-LD9 3 phase 4 wire unbalanced load :-



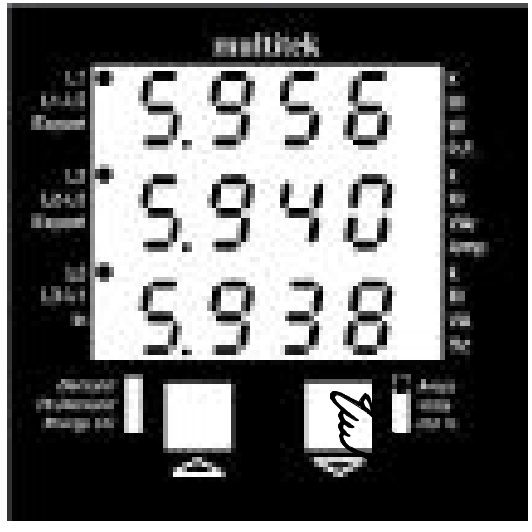
ACTION :
Switch on power

COMMENTS :
The MultiLed is programmed to 3 phase 4 wire unbalanced load. The first screen shows 3 phase line to neutral voltage.



ACTION :
Press ⇩

COMMENTS :
The second screen shows 3 phase line to line voltage L1/L2, L2/L3, L3/L1. If the ⇧ ***button is pressed the MultiLed goes back to the previous screen.***



ACTION :
Press ⇩

COMMENTS :
The third screen shows 3 phase current L1, L2, L3. If the ⇧ button is pressed the MultiLed goes back to the previous screen.



ACTION :
Press ⇩
COMMENTS :
The fourth screen shows total Watt, VAr and VA of the 3 phase system. Note for Watt & VAr if either parameter is Export the corresponding export annunciator LED is illuminated.



ACTION :
Press ⇩
COMMENTS :
The fifth screen is an option and shows the neutral current. The MultiLed calculates and displays the current flowing in the neutral lead.



ACTION :
Press
COMMENTS : If the option of neutral current is not ordered the fifth screen shows system Power Factor and Hz. Note minus sign and export annunciator indicate which quadrant the power and PF are in. See section 3.3.3.

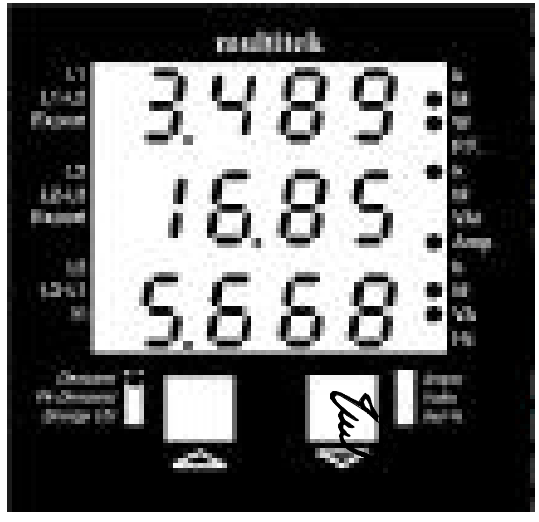


ACTION :
Press
COMMENTS :
The sixth screen displays Active Energy (W.h or kW.h or MW.h depending on CT and VT ratios) Note max 6 digits are used, in this example reading is 354999 kW.h



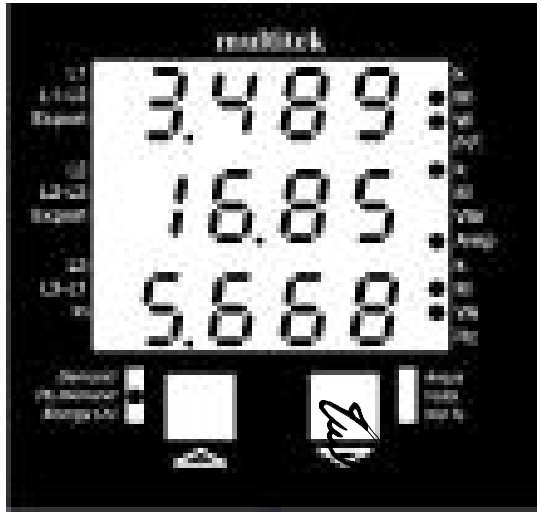
ACTION :
Press

COMMENTS :
The seventh screen displays Reactive Energy (VAr.h kVAr.h MVar.h depending on CT and VT ratios)



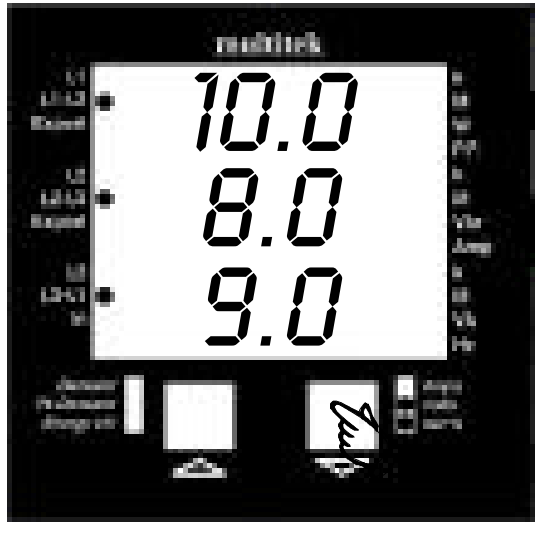
ACTION :
Press ⇩

COMMENTS :
The eighth screen shows the Average Demand for Watts, Amps and VA, of the system being measured.



ACTION :
Press ⇩

COMMENTS :
The ninth screen shows the Maximum Demand (Peak Demand) for Watts, Amps and VA, of the system being measured.



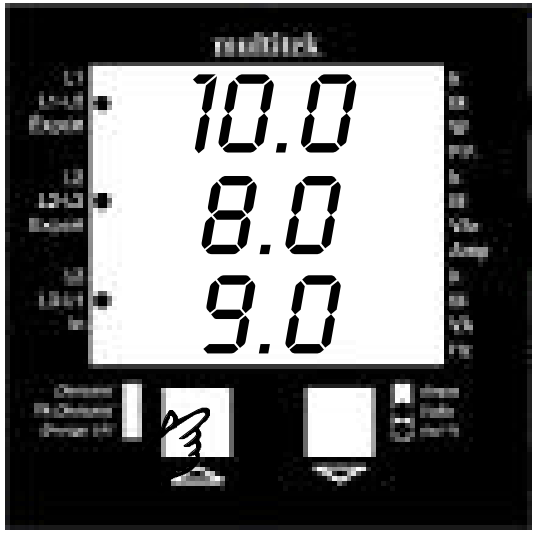
ACTION :
Press ⇩

COMMENTS : The tenth screen shows harmonic distortion of each phase voltage.



ACTION :
Press ⇩

COMMENTS : The eleventh screen shows harmonic distortion of each phase current.

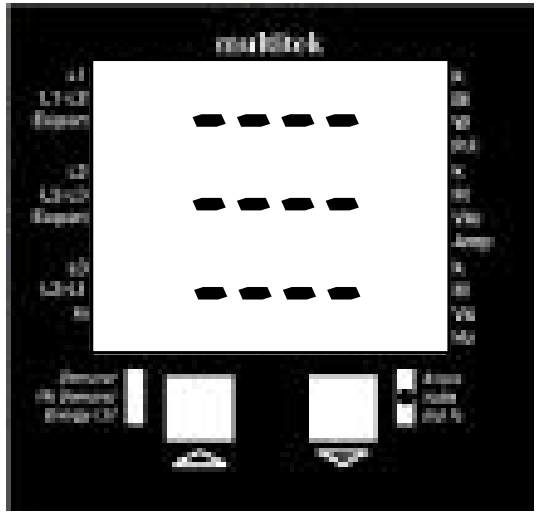


ACTION :
Press ⇧

COMMENTS :
Pressing ⇧ ***returns MultiLed to the previous screen.***

3.1.2 3 phase 3 wire unbalanced load screen sequence.
For 3 ph 3 w systems the screen sequence is identical to the 3 phase 4 wire unbalanced load, apart from the first screen where the voltage shown is the line to line voltage. The second screen is Amps
3.1.3 Single phase screen sequence.
Screen 1 V. Screen 2 A. Screen 3 W, VAr, VA. Screen 4 P.F. Hz Screen 5 W.h Screen 6 VAr.h Screen 7 Average Demand W, A, VA Screen 8 Maximum Demand W, A, VA, THD V, THD A.

3.3 If the input measuring voltage and current signals are lost but the auxiliary supply is still present the MultiLed indicates this by displaying the following.



COMMENTS :
This indicates that measuring signals are not present but MultiLed is still functioning correctly. Check input signal condition and connections etc.

3.4 If the auxiliary power is switched off the MultiLed stores the last screen, and when auxiliary power re-applied the last screen viewed will appear.

3.3 Export Watt and Var measurements

The MultiLed displays Export Watt and VAr readings by the corresponding Export annunciator led illuminating. If export annunciators are not illuminated Watt and VAr readings are importing.

3.4 Leading and Lagging Power Factor (Capacitive and Inductive loads).

3.4.1 Leading Power Factor.

A negative sign in front of the power factor reading indicates a Leading Power Factor. i.e. The current is leading, the load is capacitive. Example - .5000 P.F. indicates a Leading Power Factor of 0.5 (capacitive load).

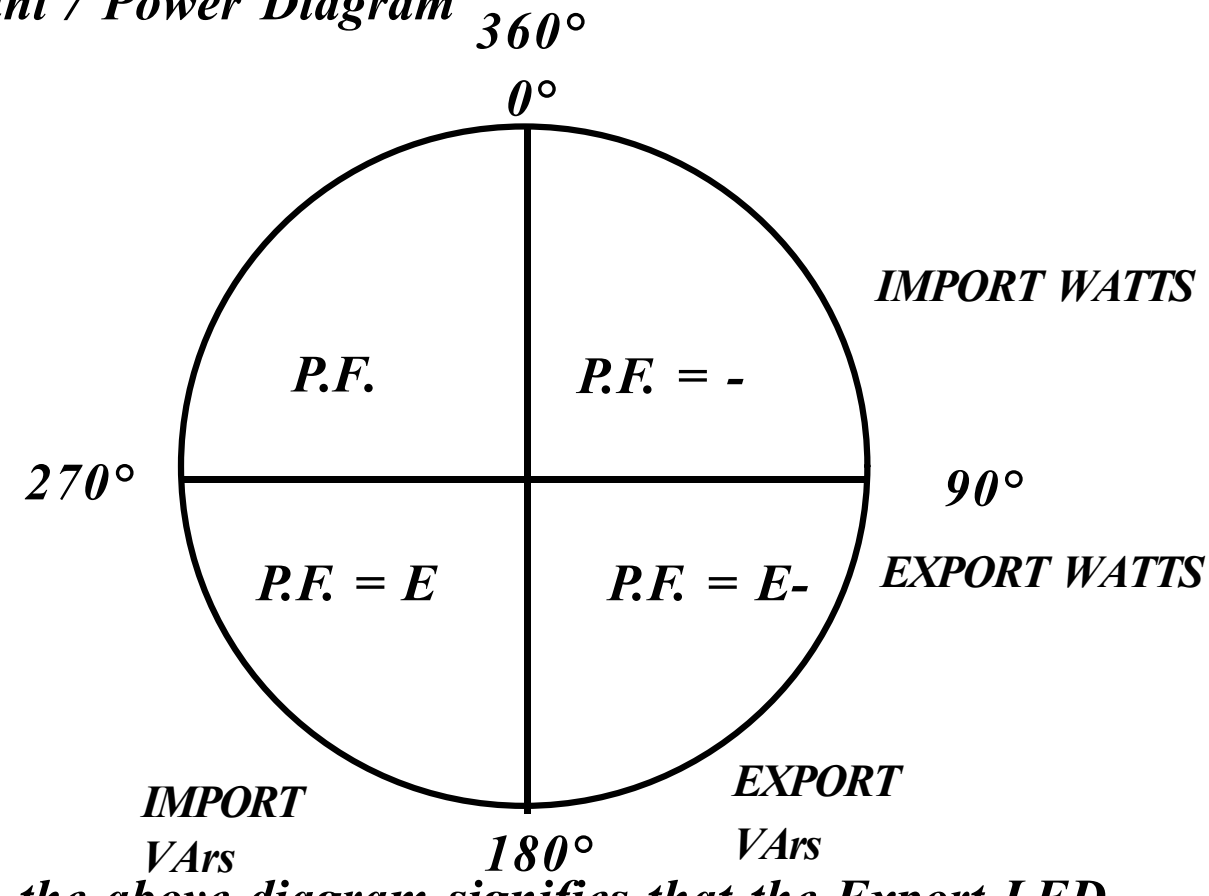
3.4.2 Lagging Power Factor.

No sign in front of the power factor reading indicates a Lagging Power Factor. i.e. The current is lagging, the load is inductive. Example 0.5000 P.F. Lagging Power Factor of 0.5 (inductive load).

3.4.3 Quadrant indication.

If the Export LED annunciator is illuminated this indicates power factor is in a negative quadrant. If Export LED annunciator is not illuminated this indicates the power factor is in a positive quadrant.

3.4.4 Quadrant / Power Diagram



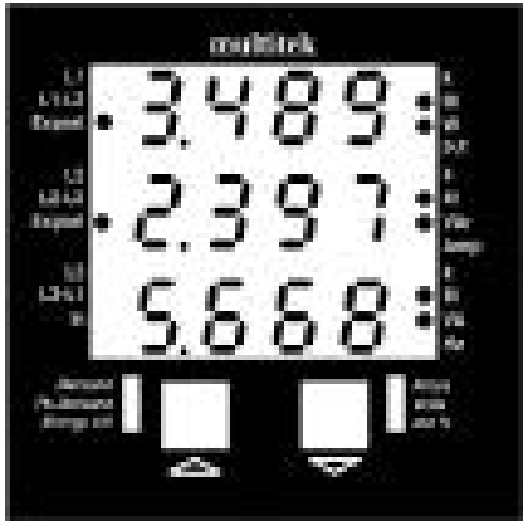
Note the E in the above diagram signifies that the Export LED annunciator is illuminated

3.4.5 Examples of Import and Export Power.



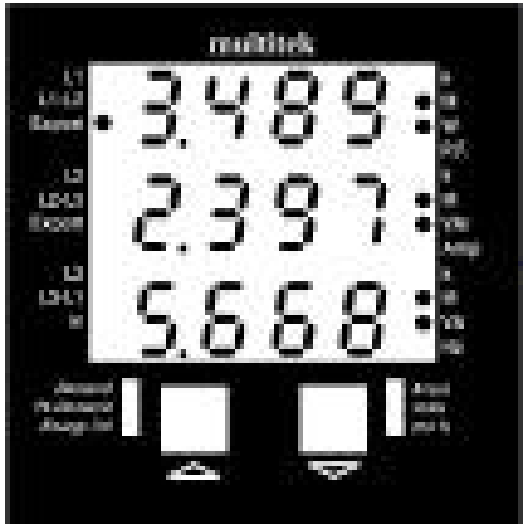
3.4.5.1 Power factor at 0.5 lead (60deg).

Line 1 = Importing kW
Line 2 = Exporting kVAr
Line 3 = VA measurement.



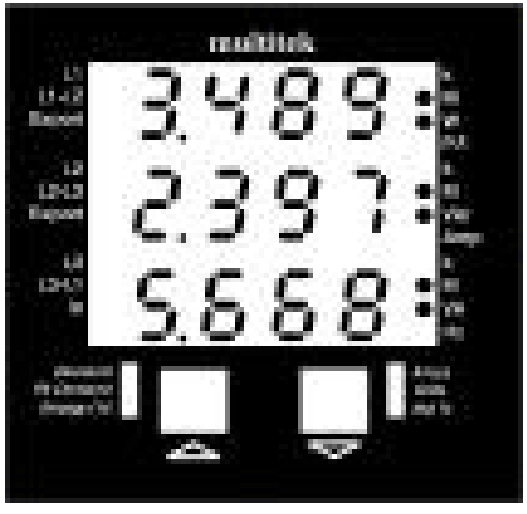
3.4.5.2 Power factor at 0.5 lead (120 deg) negative quadrant.

Line 1 = Exporting kW
Line 2 = Exporting kVAr
Line 3 = VA measurement



3.4.5.3 Power Factor at 0.5 lag (240 deg) negative quadrant.

Line 1 = Exporting kW
Line 2 = Importing KVAr
Line 3 = VA measurement



3.4.5.4 Power Factor at 0.5 lag (300 deg) positive quadrant.

Line 1 = Importing kW
Line 2 = Importing KVAr
Line 3 = VA measurement

3.4.6 Examples of Import and Export Lag and Lead Power Factors.

3.4.6.1 Power Factor at 0.5 lead (60 deg)



Line 1 = Leading Power Factor (capacitive load) in positive quadrant

Line 3 = Frequency measurment.

3.4.5.2 Power factor at 0.5 lead (120 deg) negative quadrant.



Line 1 = Leading Power Factor (capacitive load) in negative quadrant

Line 3 = Frequency measurment.

3.4.5.3 Power Factor at 0.5 lag (240 deg) negative quadrant.



Line 1 = Lagging Power Factor (inductive load) in negative quadrant

Line 3 = Frequency measurment.

3.4.5.4 Power Factor at 0.5 lag (300 deg) positive quadrant.



Line 1 = Lagging Power Factor (inductive load) in positive quadrant

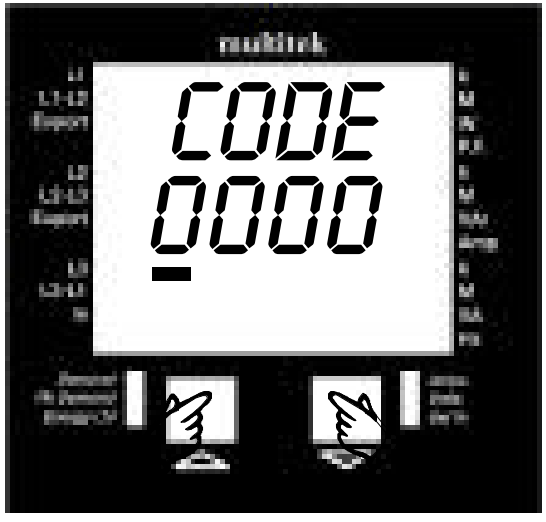
Line 3 = Frequency measurment.

4. PROGRAMMING

All units are fully programmed by the factory but there are many features that can be programmed by the User to suit individual applications and needs.
Programmed values and parameters are stored in non volatile memory and are therefore retained in power down situations.

4.1 To enter the programming mode the two front buttons ***&*** ***have to be pressed simultaneously and held for 5 seconds. The MultiLed now enters either the Security Code or the LED display brightness level control screen. If the security code has been programmed the MultiLed asks for the security code.***
NOTE 1
If this is the first time unit has been programmed and or no security code is set please proceed to page 21. Section 4.2.1.
NOTE 2
When in programming mode if the control buttons are not used for more than 3 minutes the MultiLed returns to the measuring mode and displays the first screen.
NOTE 3
If you do not wish to alter LED set up mode then Press ***again and the MultiLed display moves to the next programming mode :- SYS for setting input volts and amps see section 4.2.1***

4.1.2 Entering pre-programmed security code.



ACTION :
Press ⇩ & ⇧ simultaneously, and hold for 5 seconds.

COMMENTS :
MultiLed is now is now asking for the 4 digit security code.



ACTION :
Press ⇩

COMMENTS :
Press ⇩ until 1st digit of the security code figure is shown. If for example code is 2413 then press ⇩ until 2 is shown.



ACTION :
Press ⇧

COMMENTS :
Press ⇧ cursor moves to the 2nd digit.



ACTION :
Press ⇩

COMMENTS :
Press ⇩ ***until 2nd digit of the security code figure is shown, in this example when 4 is shown.***



ACTION :
Press ⇧

COMMENTS :
Press ⇧ ***cursor moves to the 3rd digit.***



ACTION :
Press ⇩

COMMENTS :
Press ⇩ ***until 3rd digit of the security code figure is shown, in this example when 1 is shown.***



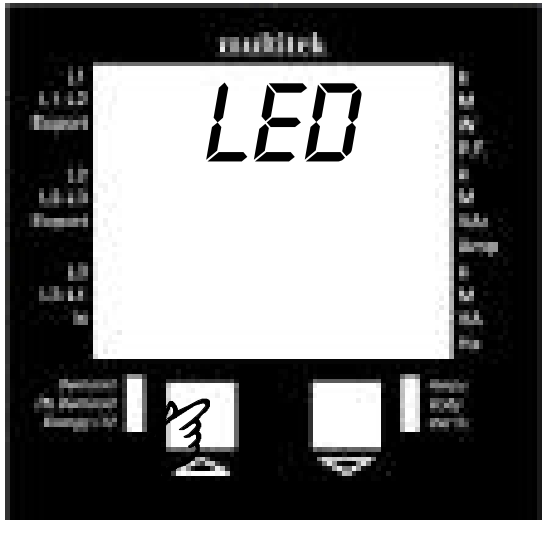
ACTION :
Press ⇧

COMMENTS :
Press ⇧ ***cursor moves to the 4th digit.***



ACTION :
Press ⇩

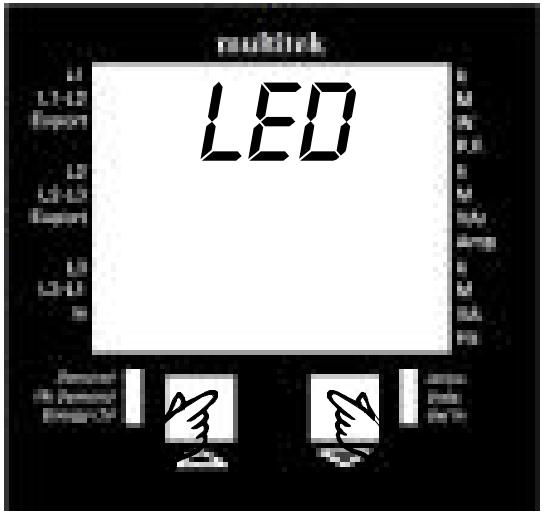
COMMENTS :
Press ⇩ ***until 4th digit of the security code figure is shown, in this example when 3 is shown.***



ACTION :
Press ⇧ ***level required is shown.***

COMMENTS :
Screen returns to LED brightness level now programmed.

4.2.1 Adjusting Display Brightness.



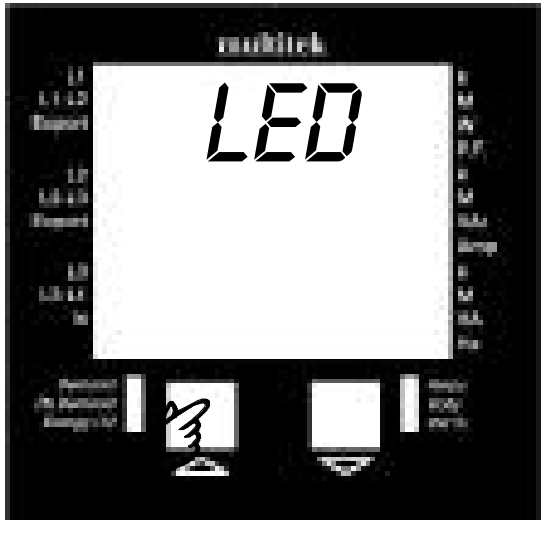
ACTION :
Press ↑ & ↓ simultaneously, and hold for 5 seconds

COMMENTS :
MultiLed is now in LED brightness adjustment mode



ACTION :
Press ↑

COMMENTS :
Screen shows brightness level 2. Pressing ↓ scrolls through 0,1,2,3,4 Note the factory sets brightness level at 2.



ACTION :
Press ↑ level required is shown.

COMMENTS :
Screen returns to LED brightness level now programmed.

4.2 Programming of nominal voltage, current inputs and ratios.

The SYS (system) mode allows the user to program the nominal voltage & current inputs and ratios. Please note the ratios can be changed as long as the secondary (the input to the MultiLed) stays as shown on the data label which is on the side of the product. For example if the MultiLed had been set by the factory to have a C.T. ratio 200/5A & the change required was for input C.T. ratio to be 500/5A this can be achieved by program changes. But if the change required was for a C.T. ratio 500/1A then the unit would have to be returned to the factory or distributor to have the internal C.T. changed from 5A to 1A. The same applies to the voltage if the MultiLed input voltage is 230 Volts L.N. then an external voltage transformer ratio can be programmed as long as the nominal input to the MultiLed remains at 230 Volts L.N.

4.2.1 Programming nominal voltage inputs.



ACTION :
Press ⇩

COMMENTS :
MultiLed is now in supply set up mode.



ACTION :
Press ⇧
COMMENTS :
Display shows nominal voltage programmed by the factory. In this example 230 volts L.N. The cursor flashes under the 1 st digit.

To change from 230 volts to for example 11kV :-



ACTION :
Press ⇩
COMMENTS :
Pressing ⇩ scrolls the digit with the cursor flashing below it from 0 to 9. When the digit required is displayed Press ⇧ to store. In this example 0 is required so Press ⇧ when zero is displayed.



ACTION :
Press ⇧

COMMENTS :
Cursor moves to the 2nd digit.



ACTION :
Press ↓

COMMENTS :
Press ↓ and scroll until 2nd digit shows 1.



ACTION :
Press ↑

COMMENTS :
Cursor moves to 3rd digit.



ACTION :
Press ↓

COMMENTS :
Press ↓ and scroll until 3rd digit shows 1.



ACTION :
Press ⇧

COMMENTS :
Cursor moves to the 4th digit. In this example the 4th is 0 so do not alter.



ACTION :
Press ⇧

COMMENTS :
SELE message appears, now unit can be set for V, kV or MV. (In this example, unit was set for 230V therefore annunciator remains unlit). Pressing ⇩ scrolls through V, kV, M i.e. k or M annunciator is lit.



ACTION :
Press ⇩

COMMENTS :
Press ⇧ if input required is V.



ACTION :
Press ⇩

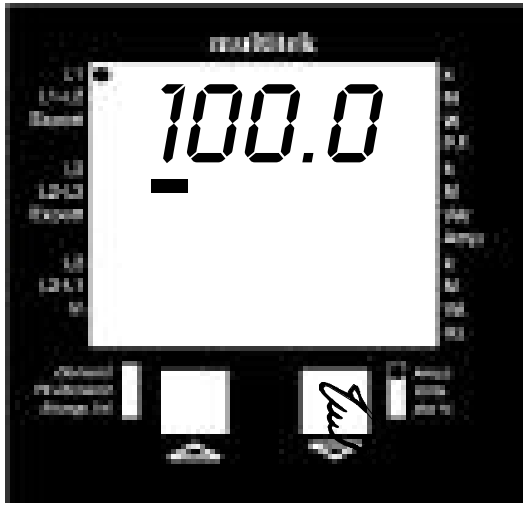
COMMENTS :
Press ⇧ if input required is kV. i.e. The k annunciator on right hand side is illuminated.



ACTION :
Press ⇩

COMMENTS :
Press ⇧ if input required is MV. The M annunciator is illuminated.

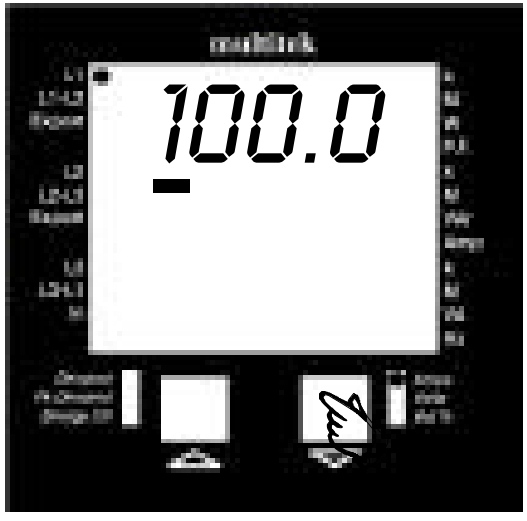
4.2.2 Programming current inputs. Once the voltage input has been set and ⇧ is pressed the screen goes to the current setting.



ACTION :
Press ⇧

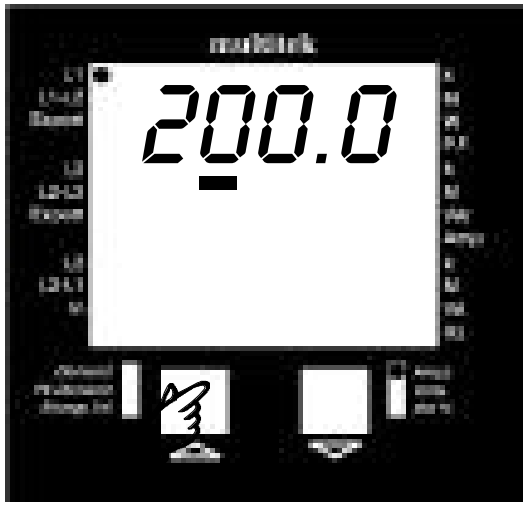
COMMENTS :
This shows the input set for 100 Amp input. The cursor flashes under the 1st digit.

To change to 250 amp input :-



ACTION :
Press ⇩

COMMENTS :
Continue pressing ⇩ until the 1st digit shows 2.



ACTION :
Press ⇧

COMMENTS :
The cursor moves to the 2nd digit.



ACTION :
Press ⇩

COMMENTS :
Continue pressing ⇩ ***until the 2nd digit shows 5.***



ACTION :
Press ⇧

COMMENTS :
The cursor will move to the 3rd digit. In this example the 3rd and 4th digits require 0 so press ⇧ ***twice to move the cursor along the 3rd and 4th digit without altering them.***

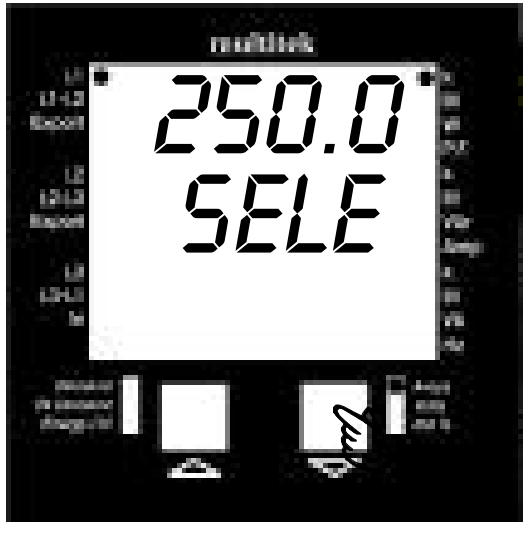


ACTION :
Press ⇧
COMMENTS :
SELE message appears, now unit can be set for A or kA, MA. (In this example unit was set for 250A therefore annuciator remains unlit). Pressing ⇩ ***scrolls through A, kA, MA i.e. k or M annuciator is lit.***



ACTION :
Press ⇩

COMMENTS :
Press ⇧ ***if input required is A.***



ACTION :
Press ⇩

COMMENTS :
Press ⇧ ***if input required is kA. The k annunciator is illuminated.***



ACTION :
Press ↓

COMMENTS :
Press ↑ ***if input required is MA. The M annunciator is illuminated.***



ACTION :
Press ↑

COMMENTS :
This indicates that the nominal voltage and current have been programmed.

NOTE: If either CT ratio or VT ratio is change the MultiLed automatically resets the energy and demand registers to zero.

4.3 Programming relay output. The RELAY programming mode allows the User to assign the relay pulsed output to either Watt hour or VAr hour. The MultiLed automatically calculates the pulse per hour from the nominal V & I input values and will also calculate whether they are W.h, kW.h or MW.h Additionally there is the facility to change the pulse rates in multiples of 10 and the pulse width between 20 msec and 200 msec in multiples of 20 msec.

4.3.1 Assigning relay to either Watt Hour or VAr Hour



ACTION :
Press ⇩ twice

COMMENTS :
MultiLed is now in relay programming mode.



ACTION :
Press ⇧

COMMENTS :
This shows 825.0 pulse per hour. Each pulse = 1 W.h. The SELECT message indicates relay output can be assigned to either W.h or VAr.h. Pressing ⇩ scrolls between W.h or VAr.h



ACTION :
Press ⇩

COMMENTS :
Press ⇧ if pulse output required is W.h (The MultiLed will automatically select whether to use W.h, kW.h or MW.h and illuminate the corresponding annunciator)



ACTION :
Press ⇩

COMMENTS :
Press ⇧ if pulse output required is VAr.h (The MultiLed will automatically select whether to use VAr.h kVAr.h or MVAr.h and annunciator will illuminate)

4.3.2 Selecting Relay Divisor

This allows the user to set the relay to pulse every 1, 10 or 100 counts. i.e. If the divisor is set to 1 every time MultiLed registers stores and displays 1 count relay pulses once. If set to 100, relay only pulse once after MultiLed has registered displayed and stored 100 counts. The MultiLed always displays the number of counts regardless of what the relay divisor is set to. i.e. If the kilowatt consumption was 500 kW per hour and relay divisor was set to 100 you would get 5 pulse an hour.



ACTION :

Press ⇩

COMMENTS :

Press ⇩ activates the decimal point. So with decimal point in this position divisor is set to 1 (825.0). So every count MultiLed registers and stores the relay pulses.



ACTION :

Press ⇩

COMMENTS :

Pressing ⇩ scrolls the decimal point. In this position divisor is set to 10 (82.50) so relay will pulse once after MultiLed has registered and stored 10 counts. Press ⇧ if this is relay rate required.



ACTION :

Press ⇩

COMMENTS :

With decimal point in this position divisor is set to 100 (8.250)so relay will pulse once, after MultiLed has registered and stored 100 counts. Press ⇧ if this is relay rate required.

4.3.3 Setting pulse width.



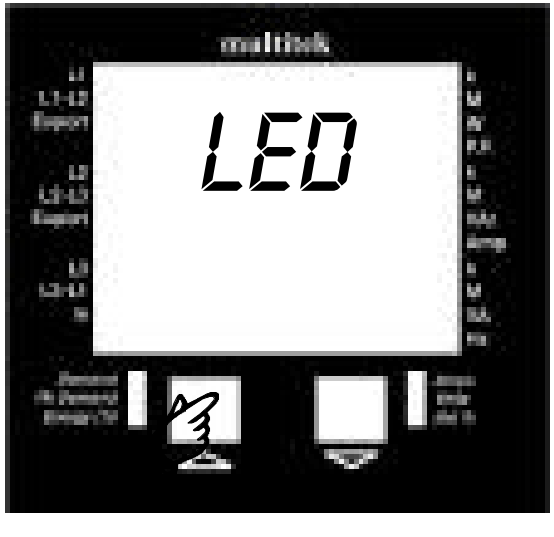
ACTION :
Press ⇧

COMMENTS :
The MultiLed is now in the pulse width LEN (LENGTH) setting mode. Pulse widths can be set between 20 msec and 200 msec. In this example the pulse width is set at 100 msec. Pressing ⇩ ***scrolls in steps of 20ms.***



ACTION :
Press ⇩

COMMENTS :
The pulse width has now been changed to 120 msec. Press ⇧ ***if this is the required value. If not press*** ⇩ ***to scroll until required value is displayed, then Press*** ⇧



ACTION :
Press ⇧

COMMENTS :
Indicates the relay has been assigned, the pulse rate set and the pulse width set.

4.4 RS485 data output port setting. (RS485 or RS232 are options if this option has not been purchased move to section 4.5)

4.4.1 Setting Baud Rates

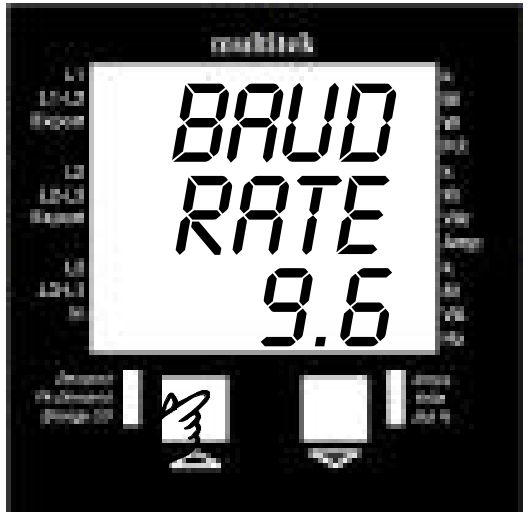


ACTION :

Press ⇩ three times

COMMENTS :

The MultiLed is now in the RS 485 port setting mode. If unit had been purchased with RS232 instead of RS485, the screen would show RS232



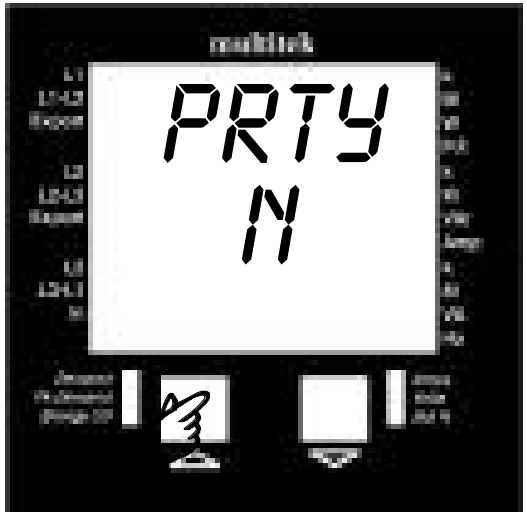
ACTION :

Press ⇧

COMMENTS :

The baud rate is displayed, in this case it is set at 9.6= 9600. Pressing ⇩ scrolls through the 4 baud rates available, 2400, 4800, 9600 and 19200. Once the baud rate required is shown on the ⇧ screen press

4.4.2 Setting Parity



ACTION :
Press ⇩

COMMENTS :
The MultiLed is now in the parity setting mode. The n= NO parity. Pressing ⇩ ***scrolls through the options n, E = even, O= odd. Press*** ⇧ ***if NO parity is required.***

4.4.3 Setting Stop Bits and Addresses. if the MultiLed communication port is RS232 proceed to 4.4.4. If MultiLed is fitted with RS485 proceed to 4.4.5.

4.4.4 Setting stop Bits (RS232 only)



ACTION :
Press ⇧

COMMENTS :
The MultiLed is now in the RS232 port setting mode. Pressing ⇩ ***scrolls through the option 1 = one stop, 2 = two stops. Press*** ⇧ ***if two stops are required.***

4.4.5 Setting the Node Address (RS485 only)

The number of node addresses available is 1 to 247. Each individual MultiLed that is to be connected to a common bus must have its own unique node address.



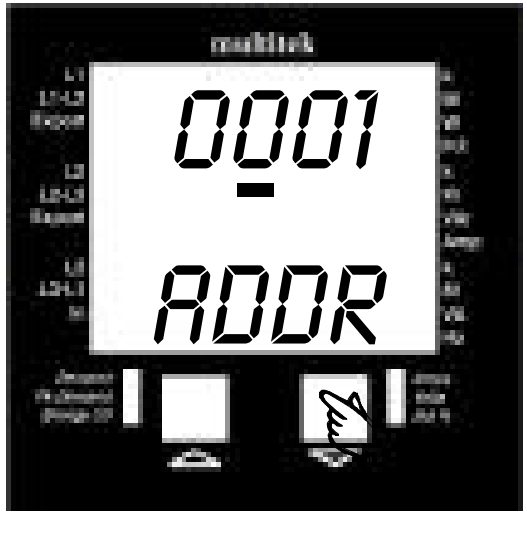
ACTION :

Press ⇧

COMMENTS :

The MultiLed is now in the node address setting mode. Node addresses between 1 and 247 can be set. In this example the MultiLed is set to node address 1.

i.e. 0001 = Node address 1.



ACTION :

Press ⇩

COMMENTS :

Pressing ⇩ ***scrolls the digit with the cursor flashing below it from 0 to 9. When the required number is displayed***

Press ⇧ ***to store.***

Example to set node address to 181 :-



ACTION :
Press ⇩

COMMENTS :
Press ⇩ ***until the 2nd digit shows 1.***



ACTION :
Press ⇧

COMMENTS :
The cursor now moves to the 3rd digit.



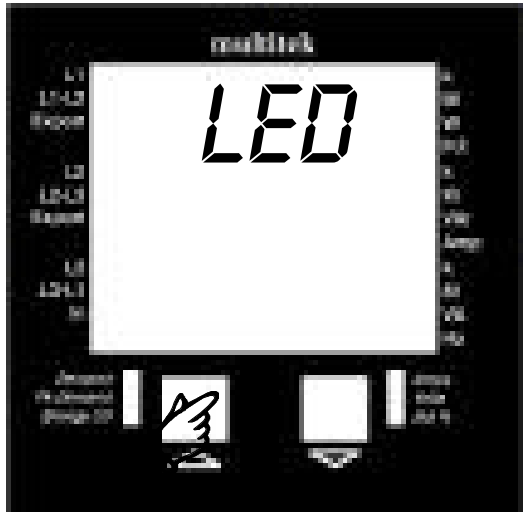
ACTION :
Press ⇩

COMMENTS :
Press ⇩ ***until the 3rd digit shows 8.***



ACTION :
Press ^

COMMENTS :
The cursor now moves to the 4th digit. As the 4th digit in this example is 1 as required press ^ The address 181 is now programmed.



ACTION :
Press ^

COMMENTS :
This indicates that the address is programmed.

4.5 Resetting of energy registers. The ENERGY programming mode allows the User to reset both the Watt hour register (W.h, kW.h, MW.h) and the VAr hour register (VAr.h, kVAr.h, MVAr.h) to zero.



ACTION :
Press ⇩ 4 times.

COMMENTS :
The MultiLed is now in the energy register reset mode.



ACTION :
Press ⇧

COMMENTS :
The screen now display's the option to either reset energy register (Y) yes or do not reset energy registers (N) no. Press ⇧ (Y) to reset W.h &VAr.h registers or Press ⇩ (N) if resetting of registers is not reqd.

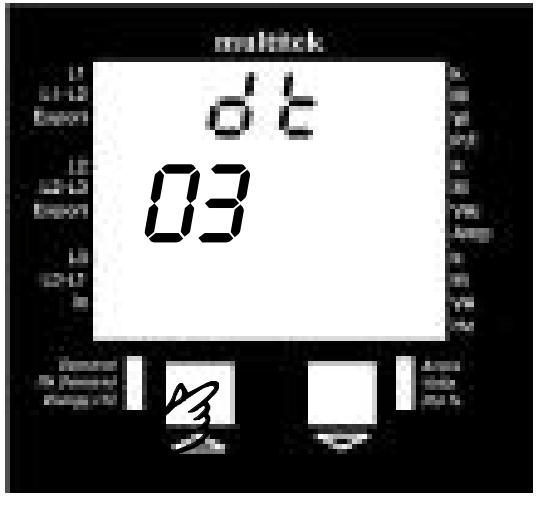
4.6 The MultiLed measures Average Demand and Max Demand of Amps, Watts and VA. Demand times between 3 & 30 mins can be programmed when in dt (demand time) programming mode. The MultiLed samples the instantaneous values for 1 min. then takes the average of these samples & updates the reading. This sampling updating ever min. continues until the time period selected is reached. e.g. If time period is 15 min. then after 15 min. the ave. of 15 min. demand is displayed. When the 16th min. is reached the

MultiLed takes the average of mins. 2 to 16 and displays the result.



ACTION :
Press ⇩ 5 times

COMMENTS :
The MultiLed is now in the demand time period setting mode.



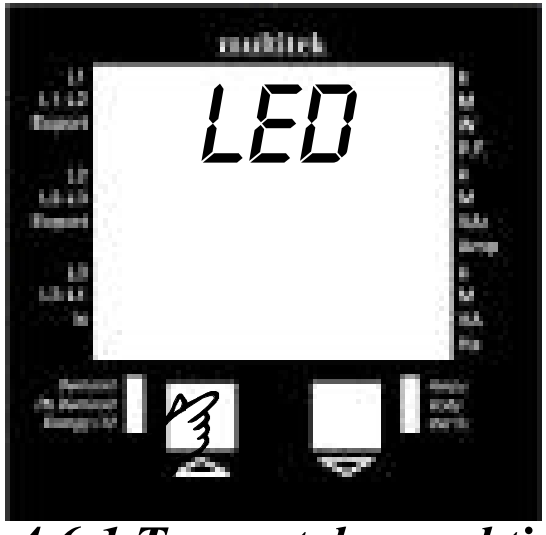
ACTION :
Press ⇧

COMMENTS :
The MultiLed is now in the time period setting mode. The time period shown in this example is 3 minutes. If this is period required press ⇧



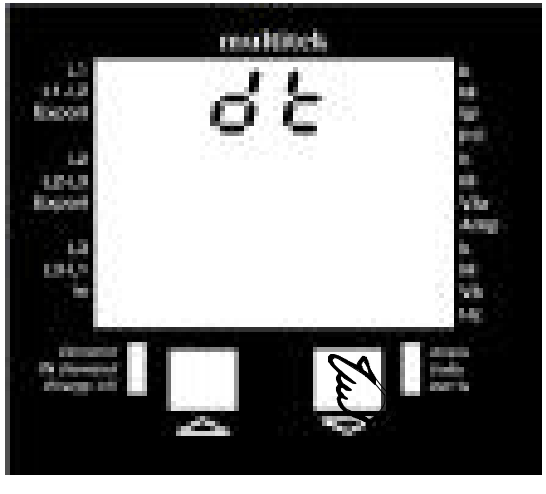
ACTION :
Press ⇩

COMMENTS :
Pressing the ⇩ increments the time period by 1 min, up to the maximum of 30 minutes (min. period 3 minutes). So in this example time period shown is 15 minutes. If this is period required press ⇧



ACTION :
Press ⇧
COMMENTS :Indicates that demand time period has been set. Note when a time period has been set the MultiLed automatically resets the time to zero. The new time period starts once MultiLed is returned to the measuring mode.

4.6.1 To reset demand time period to zero.



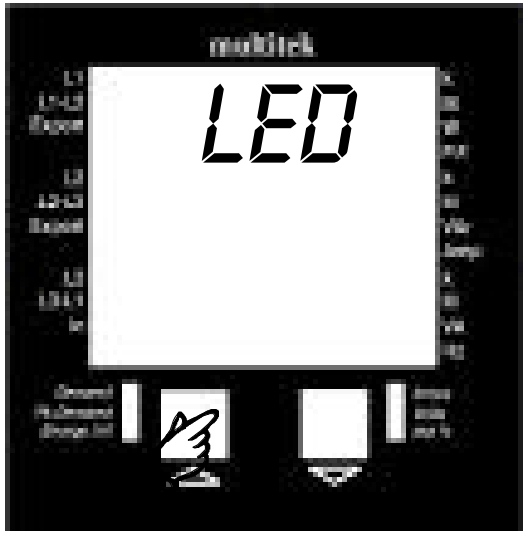
ACTION :
Press ⇩ 5 times

COMMENTS :
The MultiLed is now in the demand time period setting mode.



ACTION :
Press ⇧ twice

COMMENTS :
The screen now display's the option to either reset demand time period to zero (Y) yes or do not reset time period (N) no.

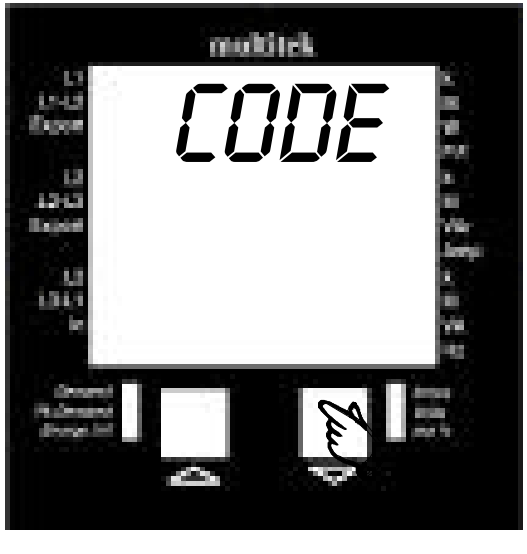


ACTION :
Press ⇧

COMMENTS :
Indicates that demand time period has been reset to zero. Demand period will start when MultiLed is returned to measuring mode.

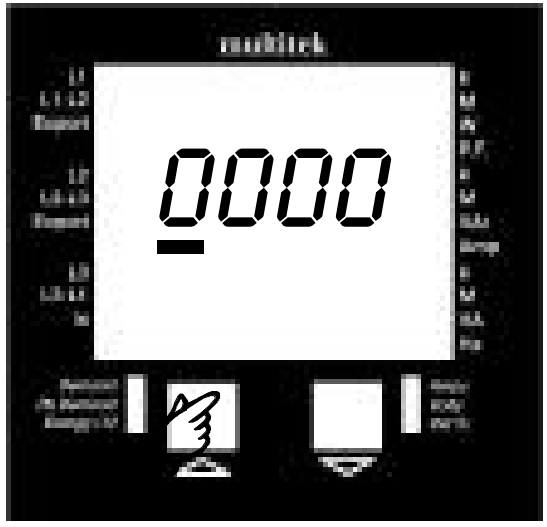
NOTE. The Maximum Demand values are the maximum values the MultiLed has measured from the time meter is switched on. These maximum demand values are displayed until either auxiliary is switch off, demand is reset to zero or demand time is altered.

4.7 Programming Security Code. Once the 4 digit code is set only authorised user can enter the programming section..



ACTION :
Press ⇩ ***6 times***

COMMENTS :
The MultiDigit is now in the security code setting mode.



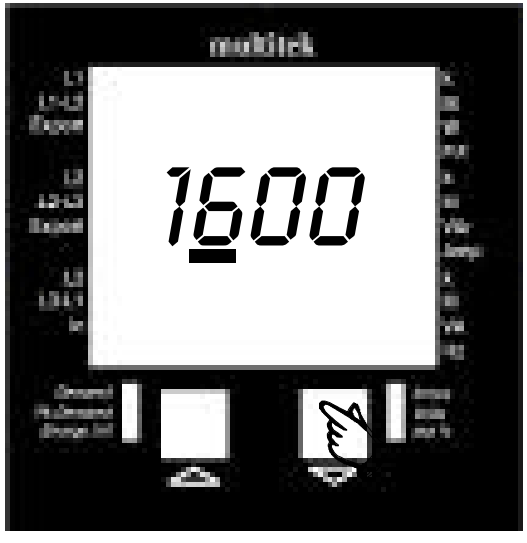
ACTION :
Press ↑
COMMENTS :
Four zero are displayed and the cusor is flashing under the first digit. Using ↓ scroll through 0-9 until first digit of code required is shown. Example to program 1605.



ACTION :
Press ↓
COMMENTS :
Press ↓ until desired figure is shown in this example 1.

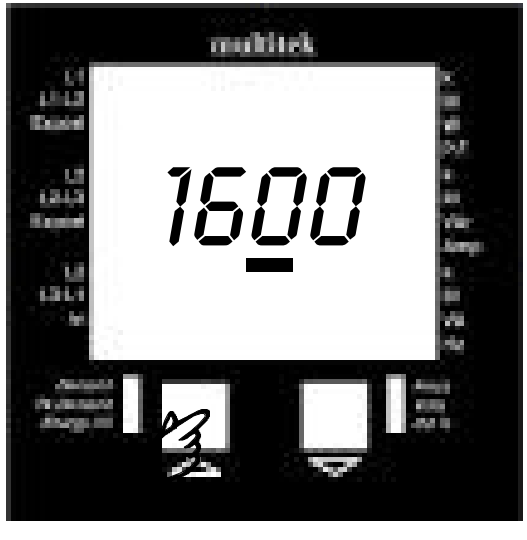


ACTION :
Press ↑
COMMENTS :
Press ↑ cursor moves to the 2nd digit.



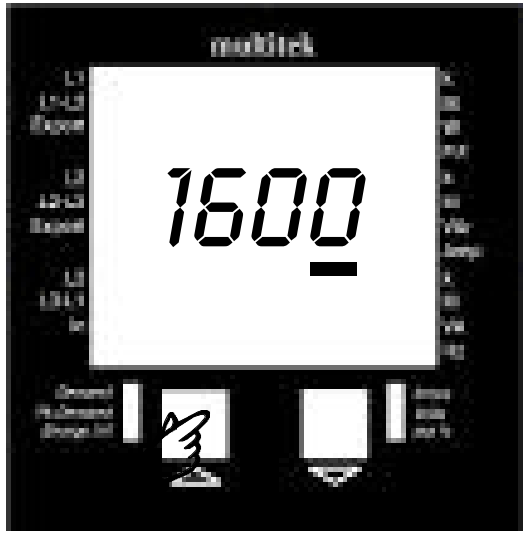
ACTION :
Press ⇩

COMMENTS :
Press ⇩ ***until desired figure is shown, in this example 6.***



ACTION :
Press ⇧

COMMENTS :
Press ⇧ ***cursor moves to the 3nd digit. In the example the third digit required is 0 so press*** ⇧ ***again.***

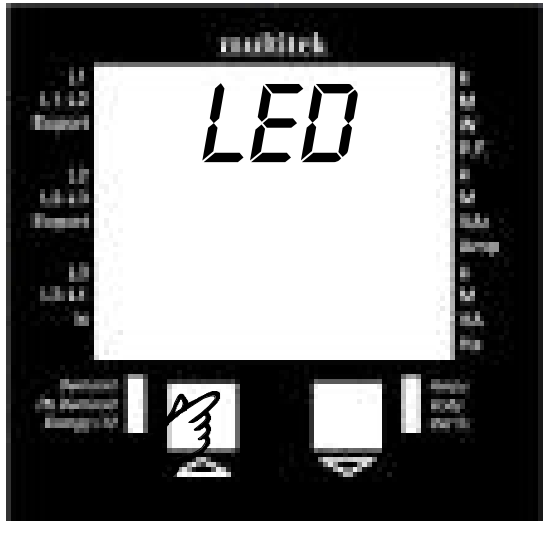


ACTION :
Press ⇧

COMMENTS :
Press ⇧ ***cursor moves to the 4th digit.***



ACTION :
Press ⇩
COMMENTS :
Press ⇩ until desired figure is shown in this example 1.



ACTION :
Press ⇧
COMMENTS :
Indicates that security code is programmed.

4.8 To terminate programming for M812-LD units. Once the programming has been completed there are two options available either to cancel (CNCL) all data entered whilst in the programming mode or to end (END) programming and return to measuring function.

4.8.1 To cancel data entered.



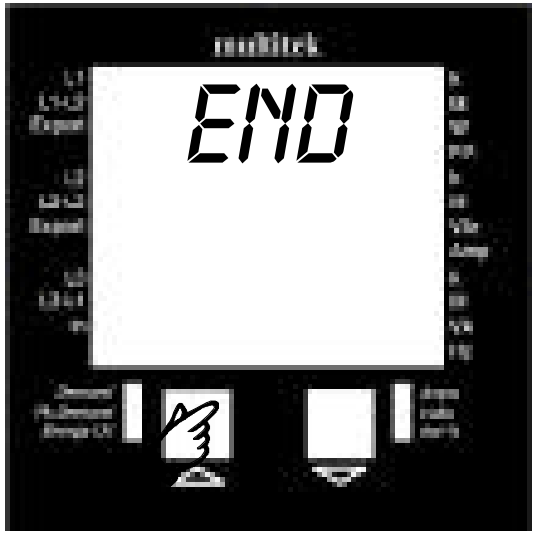
ACTION :
Press 7 times
COMMENTS :
The MultiLed is now in the CANCEL mode. Press ⇧ to cancel all data entered during programming and return to measuring function. Press ⇩ to go to END function.



ACTION :
Press ⇧

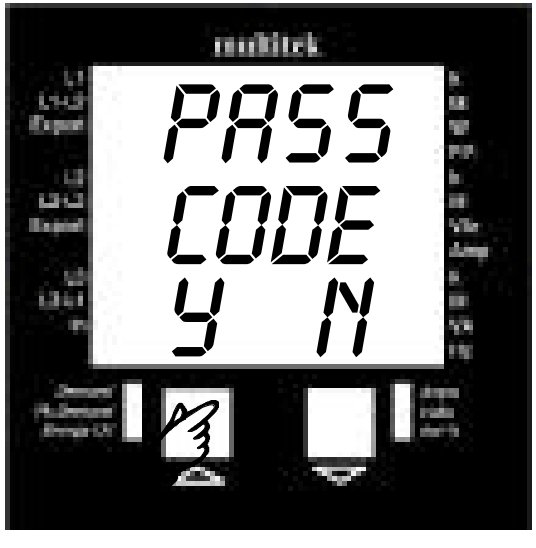
COMMENTS :
All the information entered whilst in the programming mode has been cancelled and the MultiLed has returned to the measuring mode.

4.8.2 To end programming.



ACTION :
Press ⇩ 8 times

COMMENTS :
Press ⇧ to end programming, but before programming is ended you will be asked if you wish to retain the security code.



ACTION :
Press

COMMENTS :
The screen now display's the option to either retain security code (Y) yes or cancel security code (N) no. Press ⇧ (Y) to retain security code or Press ⇩ (N) if security code no longer required.



ACTION :
Press ⇧ or ⇩

COMMENTS :
All data that has been entered during programming is stored and MultiLed has now returned to measuring mode.

5.0 RS485 COMMUNICATION

The RS 485 allows remote reading and programming of the MultiLed via a host computer. The communication protocol used is a subset of Modicons Modbus, enabling the use of standard host computer, PLC and scada programs. Up to 32 MultiLeds can be connected in parallel to a single communication bus

5.1 MultiLed Modbus Protocol

5.1.1 Physical Connections

The interface to the Modbus network is via RS485 connection. This takes the form of a twisted pair cable, preferably screened, onto which up to 32 devices may be connected, one of which will be the host PC or controller node. The devices on the network are connected in parallel + to +, - to - and shield to shield (screen to screen). The shield should be connected to earth at one point of the network only. Other manufacturers of devices intended for use on the Modbus network may have different + and - designations : some have Hi, Lo or A ,B. In any case reversing the + and - connections may have the desired results if the device fails to communicate with the master node.

The maximum length of the twisted pair cable specified by the RS standard is 1.2km. Any length over 200m should be terminated at each end with a resistor equal to the cable's characteristic impedance in series with a 0.1µF capacitor.

A typical network cable is Beldon 8761.

5.1.2 Communication Format

Baud rate : 2400, 4800, 9600, 19200

Low level character format :
With Odd or Even parity = 1 start bit, 8 data bits, 1 parity bit, 1 stop bit
With NO parity = 1 start bit , 8 data bits, 2 stops bits.

5.1.3 Modbus Format

Data format :
RTU
32 bit, floating point format to IEEE-754 standard, exponent bias 127, most significant byte transmitted first. There is no word reversal.
Address range: 1-247
Error Check :
Cyclic Redundancy Check (CRC), Polynomial exclusive OR value A001h Low byte sent first.

5.3.4 Modbus Protocol

Only the RTU (Remote Terminal Unit) form of the Modbus protocol will be supported and all references in this sheet refer to RTU format. Typically, the master or controller requests data from its slaves by polling them one at a time and waiting for a pre-defined amount of time for a response. If a node doesn't respond within this time period the master will try accessing it a further two times before indicating to the Scada system that the node has gone off-line or there is a fault with it. If all is well the node will respond with the data requested.
A typical communication 'packet' will be in the form :
[Node Address] [Function] [Byte count, Data etc.] [Error check].
Because Modbus is a word (2 byte) orientated protocol, floating point (4 byte) register numbers are counted in multiples of two.

viz register 1 = start address 0
register 2 = start address 2
register 3 = start address 4
register 4 = start address 6
Formula = (register required -1) x2

This also applies to the number of registers requested. If 2 registers are requested the number of WORDS in the packet's [Number of registers] slot should equal 4. (See examples in the following sections.

CRC Calculations
To calculate the Cyclic Redundancy Check value.
Load a word register with 0xFFFF (CRCREG)
Repeat the following for each character in the Modbus packet
{
XOR the low byte of the word register with the next (or first) character in the buffer
Repeat the following for the whole character
{
Get the state of the lsb of CRCREG Low byte
Shift the CRCREG right by one bit shifting in a zero in the msb
If the bit shifted out is a logical 1, XOR CRCREG with 0xA001
}
}
CRCREG contains the CRC of the buffer

5.3.6 Timing

RTU frame timing :

The message start with an interval of at least 3.5 character times. Following the last transmitted character, a similar interval of a least 3.5 character times marks the end message.

The entire message frame must be transmitted as a continuous stream.

5.3.7 Response time.

Modbus response time from reception of the last character to the transmission of the 1st character in its reply is less than 200 msec.

5.3.8 Codes Supported

Function 3 (03 hex) Read holding registers. (4X)

Function 4 (04 hex) Read input registers. (3X)

Function 16 (10 hex) Preset Multiple register. (4X)

Function 17 (11 hex) Report slave ID

BROADCAST is not supported and this command does not cause the slave to respond to the master.

An EXCEPTION error will be generated if the node cannot fulfil the task set by the Master or the Slave receives invalid data in its data slot.

Exception code table

Code	Name
01	Illegal Function
02	Illegal Data Address
03	Illegal Data Value

5.3.9 Modbus Codes Reference

Function 4 (04 hex) - read input registers. (3X)

These registers contain the measured and calculated values of the instrument. Register addresses in the instrument start at 0 but in keeping with Modicon Modbus codes, are designated addresses starting at 30001.

Packet from master format :

[Node Addr][04][reg start addr(2 bytes)][No. of reg (2 bytes)] [CRC(2 bytes)]

Response from slave format:

[Node Addr][04](Byte count][Data (byte count bytes)][CRC(2 bytes)]

The table below lists the parameter with the Modbus equivalent address and its address within the MultiLed. Any data requested that isn't applicable to the Type & System column, will return the value -ve infinity (FFFFFFFFh)

3X REGS

Registers name	*Modbus Addr, (dec)*	*Reg, Start Addr. (hex)*	*MultiLed Type & System Type*
Volts L2-L1	*30001*	*0000*	*M812-LD9& LD4*
Volts L3-L2	*30002*	*0002*	*M812-LD9&LD4*
Volts L1-L3	*30003*	*0004*	*M812-LD9&LD4*
*System Volts L1**	*30004*	*0006*	*All types*
*System Volts L2**	*30005*	*0008*	*M812-LD9&LD4*
*System Volts L3**	*30006*	*000A*	*M812-LD9&LD4*
System Amps L1	*30007*	*000C*	*All types*
System Amps L2	*30008*	*000E*	*M812-LD9&LD4*
System Amps L3	*30009*	*0010*	*M812-LD9&LD4*

System W	*30010*	*0012*	*All types*
System VA	*30011*	*0014*	*All types*
System VAr	*30012*	*0016*	*All types*
System P.F.	*30013*	*0018*	*All types*
System W.h	*30014*	*001A*	*All types*
System VAr.h	*30015*	*001C*	*All types*
System Frequency	*30016*	*001E*	*All types*
Watts L1	*30017*	*0020*	*M812-LD9*
Watts L2	*30018*	*0022*	*M812-LD9*
Watts L3	*30019*	*0024*	*M812-LD9*
VAr L1	*30020*	*0026*	*M812-LD9*
VAr L2	*30021*	*0028*	*M812-LD9*
VAr L3	*30022*	*002A*	*M812-LD9*
Sys. W Demand	*30023*	*002C*	*All types*
Sys VA Demand	*30024*	*002E*	*All types*
Sys A Demand	*30025*	*0030*	*All types*
Neutral Current	*30026*	*0032*	*M812-LD9*
Max W Demand	*30027*	*0034*	*All types*
Max VA Demand	*30028*	*0036*	*All types*
Max A Demand	*30029*	*0038*	*All types*
THD V1	*30030*	*003A*	*All types*
THD V2	*30031*	*003C*	*All types*
THD V3	*30032*	*003E*	*All types*
THD I1	*30033*	*0040*	*All types*
THD I2	*30034*	*0042*	*All types*
THD I3	*30035*	*0044*	*All types*

** In 3 wire mode system V1, V2, V3 will have the same value as volts L2-L1, L3-L2, L1-L3.*

Example
To obtain all 3 line powers in a 4 wire system on Node 23h
Packet from master :
Start at Power L1 (0020), request 3 regs (0006 words)
[23][04][0020][0006][CRC(2bytes)]

Response from slave format :
[23][04][OC][12 bytes of data(3 regs x 4 bytes)][CRC(2 bytes)]

<u>Function 3 (03 hex)</u> - Reading registers (4X)
These registers contain the system setting and controls. Register addresses in the instrument start at 0, but in keeping
with Modicon Modbus codes, are designated addresses starting at 40001

<u>Read</u>
Packet from master format :
[Node addr][03][Register start addr.(2 bytes)][No of reg(2 bytes)][CRC (2 bytes)]
Response form Slave format :
[Node addr][03][Byte count][Data(byte count bytes)][CRC(2 bytes)]

Function 16 (10 hex)* - *Preset Multiple registers (4X)
These registers contain the system settings and controls. Register addresses in the MultiLed at 0, but in keeping with Modicon Modbus codes, are designated addresses starting 40001.

Write
Packet from master :
[Node addr][10][Register start address(2 bytes)][No of registers(2 bytes)][Byte count][Data (byte count bytes)][CRC (2 bytes)]

Response from slave format :
[Node addr][10][Register start addr.(2 bytes)][No of registers(2 bytes)][CRC (2 bytes)]
The table lists the parameter, its Modbus equivalent address and its address within the MultiLed. Any Illegal operation will return an Error code.

4X REGS

Reg Name	*Modbus Addr. (dec)*	*Reg Start Addr. (hex)*	*Read (code 3)*	*Write (code 16)*
Sys. V	*40001*	*0000*	*Get the system voltage*	*Set the system voltage*
Sys. I	*40002*	*0002*	*Get the system current*	*Set the system current*
Sys. Type	*40003*	*0004*	*Get the sys. type 1= Single phase 2= 3 ph 3 wire 3= 3 ph 4 wire*	*Set the sys. type 1 = Single phase 2 = 3ph 3 wire 3 = 3 ph 4 wire*
Sys. Power	*40004*	*0006*	*Get the sys power*	*Illegal operation*
Demand time	*40005*	*0008*	*Get the demand time (3-30min.)*	*Set the demand time (3-30min.)*
Demand period	*40006*	*000A*	*Get the No. of sub -intervals left to integrate in the 1st demd. period*	*Illegal operation*
Relay divisor	*40007*	*000C*	*Get relay divisor 1, 10 or 100*	*Set relay divisor 1, 10 or 100*
Relay pulse width	*40008*	*000E*	*Get the No. of 20mS in the relay pulse width 0 to 10= off to 200mS*	*Set the No. of 20 mS in the relay pulse width 0 to 10 = off to200mS*

Reset energy counters	*40009 0010*	*Illegal operation*	*Initialise energy counters Write 0 to this register*
Reset demand counters	*40010 0012*	*Illegal operation*	*Initialise energy counters Write 0 to this register*

Example. To obtain System Volts & System Amps on Node 23h
Packet from master format :
Start at system voltage (0000), request 2 regs (0004 words)
[23][03][0000][0004][CRC(2 bytes)]

Response from slave format ;
[23][03][08][8 bytes of data(2 regs x 4 bytes)] [CRC (2 bytes)]
To set both System Volts and System Amps on Node 23h
Packet from the master format :
Start at system voltage (0000), set 2 regs (0004 words)
[23][10][0000][0004][08][8 bytes of data (2 regs x 4 bytes)]
[CRC (2 bytes)]
Response from slave format :
[23][10][0000][0004][CRC(2 bytes)]
<u>Function 17 (11hex)</u> - Report Slave ID
This function returns 10 floating point values.
To obtain ID on Node 23h
Packet from master format :
[23][11][CRC(2 bytes)]

Response from slave format :
[23][11][28][40 bytes of data (10 regs x 4 bytes)][CRC(2 bytes)]
The table on the next page lists the various names, their register position in the data portion of the return packet and their usage.

Report Slave ID

Register Name	*Packet Position (register No.)*	
Slave ID	*0000*	*Always 800 (dec)*
Internal use only	*0001*	
Parity Errors	*0002*	*0-255 counter. Resets to zero on count 256*
CRC Errors	*0003*	*0-255 counter. Resets to zero on count 256*
I.D. software Rev.	*0004*	
Spare	*0005*	*Future use*
Spare	*0006*	*Future use*
Spare	*0007*	*Future use*
Spare	*0008*	*Future use*

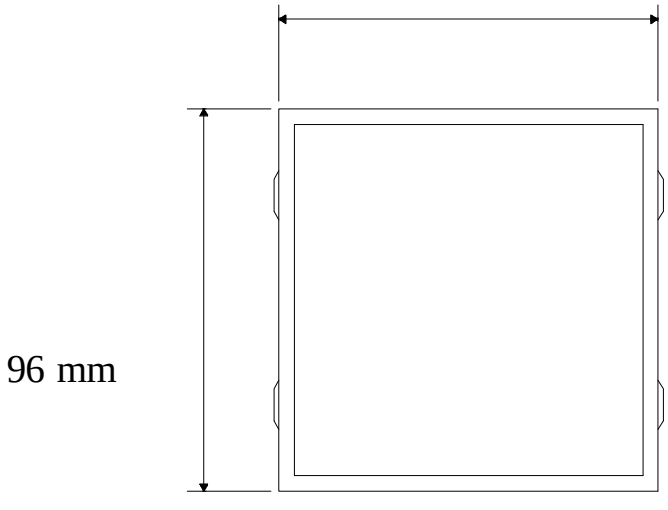
6. INSTALLATION

6.1 Case

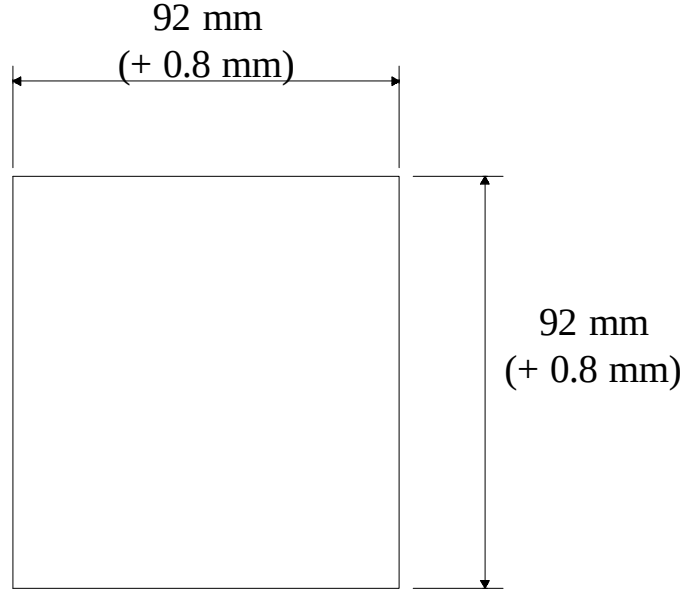
The MultiLed M812-LD* is designed for panel mounting and uses a standard 96 x 96 DIN case.

CASE DIMENSIONS

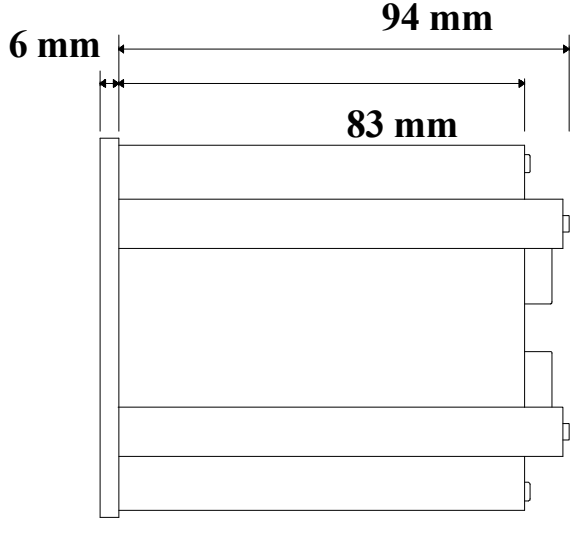
FRONT



PANEL CUTOUT



SIDE



6.2 Auxiliary Supply

The auxiliary supply can be connected in parallel with the measuring input voltage, but this restricts the measuring range of the input voltage to ± 15% of nominal.

6.3 Protective Fuses

It is good practice for the user to provide fuse protection to all input circuits and the auxiliary supply.

6.4 Current Transformers (C.T.s)

Internally the MultiLed has C.T.s fitted which are either 5A or 1A. The current circuit is designed for connection to the secondary of external C.T. These transformers should conform to at least Class 1 as per BS7626 (IEC 185) or equivalent. The secondary of these external transformers must have the same nominal current input as that specified on the data label on the MultiLed. e.g. If the MultiLed has a current ratio specified as 500/5A, then the CT could be changed to 800/5A (or any ratio with secondary 5A) and used once the current ratio has been programmed into the MultiLed. But if the ratio change was 800/1A the MultiLed would have to be returned to the factory to have the internal current transformer changed to 1A.

Warning. The secondary of a current transformer must never be allowed to be in an open circuit condition when the primary is energized. In the open circuit condition high voltage may be present. Each current transformer secondary should be short-circuited when not connected to the meter.

6.5 Voltage Transformers (V.T.s)

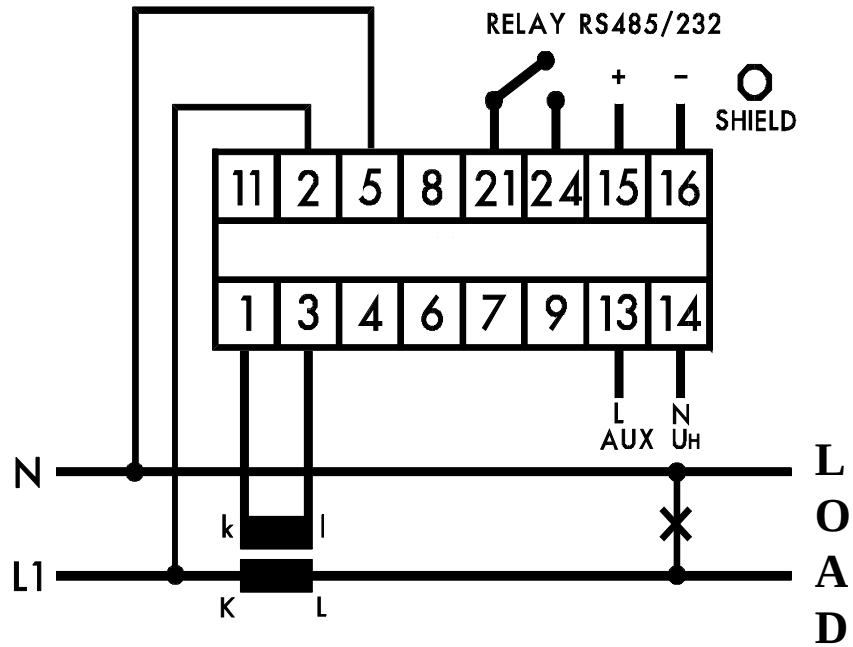
Connection of voltages higher than the rated voltage, that is specified on the MultiLed data label, is possible using external V.Ts. These transformers must be at least Class1 accuracy. The secondary of these transformers must have the same nominal voltage as that specified on the data label on the MultiLed. e.g. If the MultiLed has voltage specified as 110 Volts Line to Line, then a Transformer with Ratio of 6600/110 volt can be used, once this ratio has been programmed into the MultiLed. But if the ratio was 6600/400V the unit would have to be returned to the factory or distributor to have internal component changes to cater for the 400V input.

7. CONNECTION DIAGRAMS

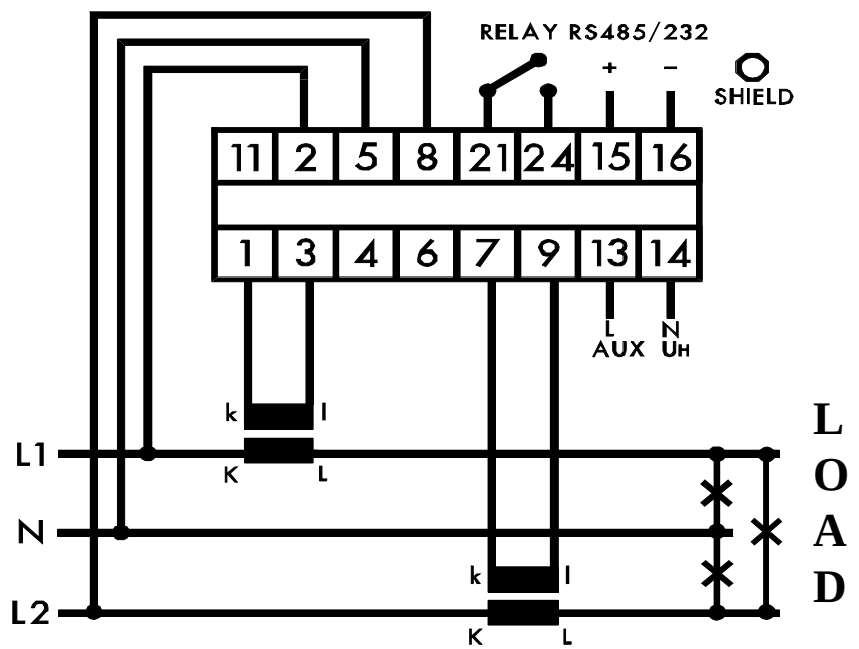
7.1 All connections must be made as shown ensuring, all starts and finishes of current and voltage transformers are connected as shown.

Wiring Reference Note : k = x1 (white) l = x2 (black) K=H1, L=H2

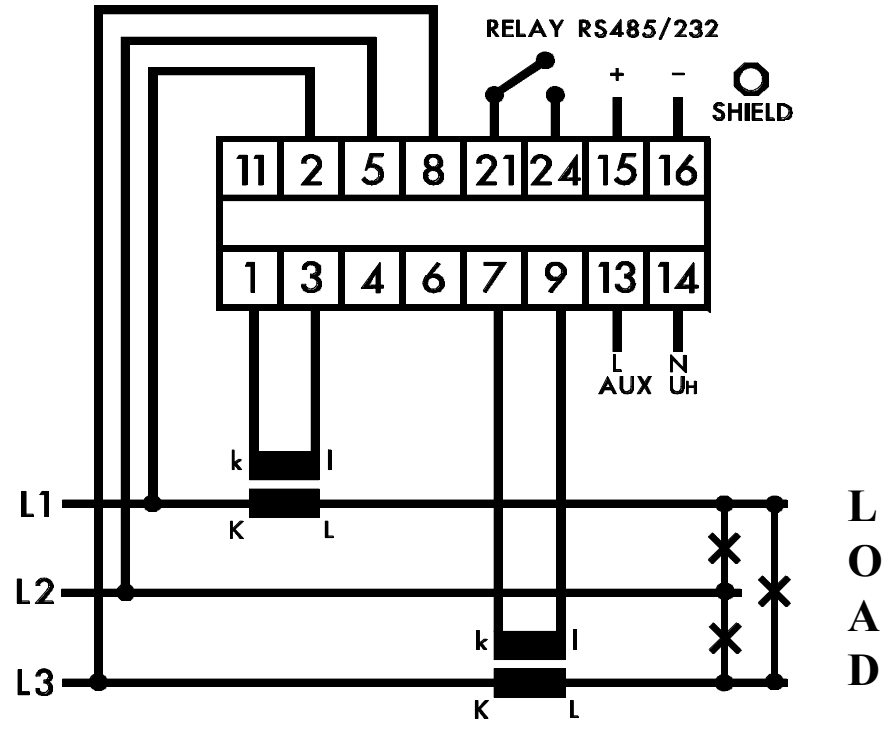
SINGLE PHASE



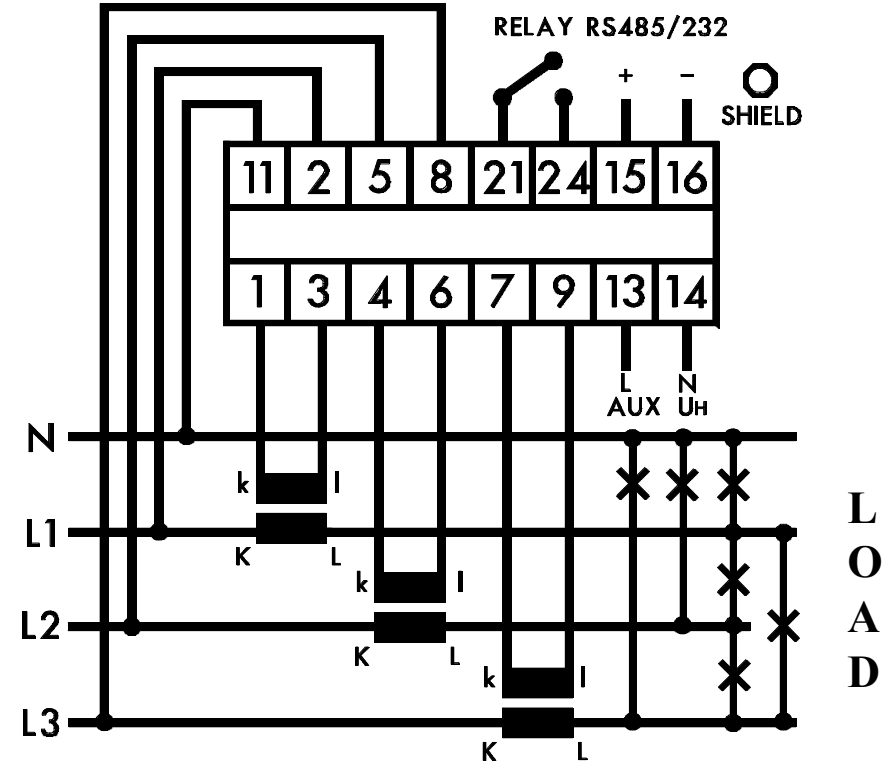
SINGLE PHASE
3 WIRE



3 PHASE 3 WIRE UNBALANCED LOAD



3 PHASE 4 WIRE UNBALANCED LOAD



*MULTILED M812-LD**

PARAMETERS DISPLAYED

Phase and Line Volts
Phase Amps
Frequency
Active Power
Apparent Power
Reactive Power
Power Factor
Active Energy
Reactive Energy
Amp Demand
Active Power Demand
Apparent Power Demand
Max. Demand Active Power
Max. Demand Current
Max. Demand Apparent Power
THD Phase Volts
THD Phase Current

SYSTEMS

Single phase
Single phase 3 Wire
3 phase 3 wire unbalanced
3 phase 4 wire unbalanced

AUXILIARY

AC voltage 115 or 230 volts (± 15%)
45 to 65 Hz burden < 7VA

OPTIONS

Pulsed Output	*W.h or VAr.h*
RS485	*Modbus protocol*
RS232	*ASCII*
DC Auxiliary	*12V, 24V, 48V, 110V*
Neutral Current	*M812-LD9 only*

INPUT

Rated Un	*57.8 to 600V specify nominal voltage.*
Range	*20-120% Un*
Burden	*0.5VA per phase*
Overload	*1.5 x Un continuous 4 x Un for 1 second*
Rated In	*1 or 5 amp*
Range	*10-120% In*
Burden	*0.5VA per phase*
Overload	*4 x In continuous. 50x In for 1sec*
Frequency	*45/65Hz*

INSULATION

Test Voltage :

3 kV RMS 50 Hz for 1 min between case, input, auxiliary. 1kV between case, input, auxiliary, relay output & RS485 output.

Impulse Test :

EMC 5kV transient comply with IEC 801 / EN 55020 HF Surge withstand: IEC 801 / EN55020 ANSI C37.90A

Interference:

EHF 2.5 kV 1MHz complying with IEC 255-4

Protection ClassII : complying with IEC348 / BS4753 /DIN 57411 / VDE

ENVIRONMENTAL

Working Temp.	*0 to +60 °C*
Function Temp.	*- 5 to +60 °C*
Storage Temp.	*-10 to +65 °C*
Temperature Coeff.	*0.01% per °C*
R.H.	*0-95% non condensing*
Warm up time	*1 min.*
Shock	*10G in 3 planes*

APPLIED STANDARDS

General	*IEC 688 BSEN60688, BS4889, IEC 359*
EMC	*Emissions BSEN50081/2*
	Immunity BSEN50082/2
Safety	*IEC 1010, BSEN601010*

UL, C-UL, CSA

ENCLOSURE

Std. DIN case 96 x 96 x 98mm
Panel mount Via 4 retaining brackets
Cutout 92 + 0.8mm x 92 + 0.8mm
Material Black Polycarbonate
complying with UL 94 VO
Terminals Screws for 2 x 0.5-5mm
Weight 0.8kg / 1.75lb

OUTPUT RELAY

W.h or VAr.h SPNO. Rated 50V
Pulsed output. 150mA 5W ac/dc
Pulse rate Automatically set
Pulse duration Programmable in steps
of 20 msec from 20 msec
to 200 msec

ACCURACY

Volt & Amp 0.5% of reading ± 2 digit
Frequency 0.1Hz ± 1 digit
Active Power 1% of reading ± 2 digit
Reactive Power 1% of reading ± 2 digit
Apparent Power 1% of reading ± 2 digit
Power Factor 2% of range
Energy IEC 1036 Class 1
THD ± 1% of range