

**Model 53U / 54U / 54UL /54UC Multi Power Monitor**

**PC CONFIGURATOR SOFTWARE**

**Model: 53UCFG Ver. 3.4**

# Users Manual

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# 1. INTRODUCTION

## 1.1 GENERAL DESCRIPTION

M-System 53UCFG is used to program parameters for model 53U, 54U, 54UL or 54UC Multi Power Monitor (referred hereunder as 'device'). The following major functions are available:

- Edit parameters
- Download parameters to the device, upload parameters from the device
- Save parameters as files, read parameters from files
- Compare parameters edited on the screen with the ones stored in the device

## 1.2 PC REQUIREMENTS

The following PC performance is required for adequate operation of the software program.

PC	IBM PC compatible
OS	Windows 98/Me/2000/XP/Vista (32 bits) The software may not function adequately in certain conditions.
CPU	Must meet the relevant Windows OS' requirements.
Memory	Must meet the relevant Windows OS' requirements.
Communication port	At least one COM port (COM1 through COM16) or LAN port is required.

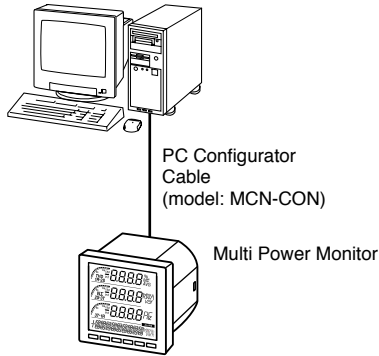
## CONNECTING THE DEVICE TO THE PC

The RS-232C/RS-485 Converter (model: R2K-1 or LK1) or the Communication Adaptor (model: 72EM-M4) is used to interface the device on the Modbus network to the PC.

In order to locally program the device, the non-isolated PC Configurator Cable (model: MCN-CON) is required to connect it to the PC. The RS-485 cable must be removed when the device is connected with the MCN-CON.

The 54U can be connected to the PC via the infrared port using the Infrared Communication Adaptor (model: COP-IRU).

### LOCAL CONNECTION

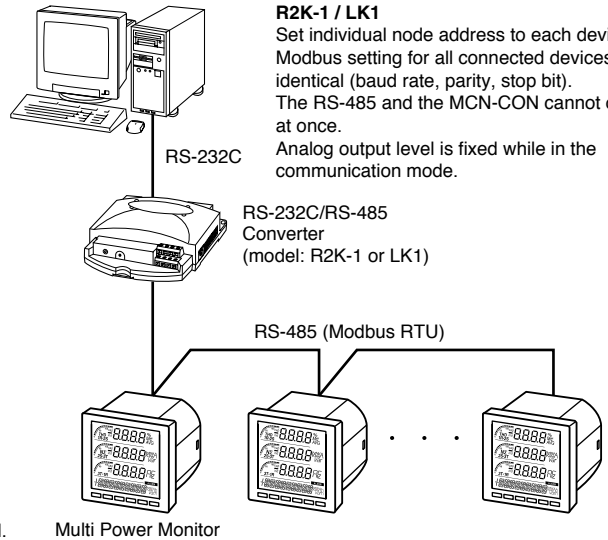


#### MCN-CON

Remove RS-485 cable (Modbus) from the device when it is to be connected to the MCN-CON. The RS-485 and the MCN-CON cannot operate at once.

With the analog output type, switch the device to the communication mode before connecting the MCN-CON. Analog output level is fixed while in the communication mode.

### NETWORK CONNECTION (RS-485)



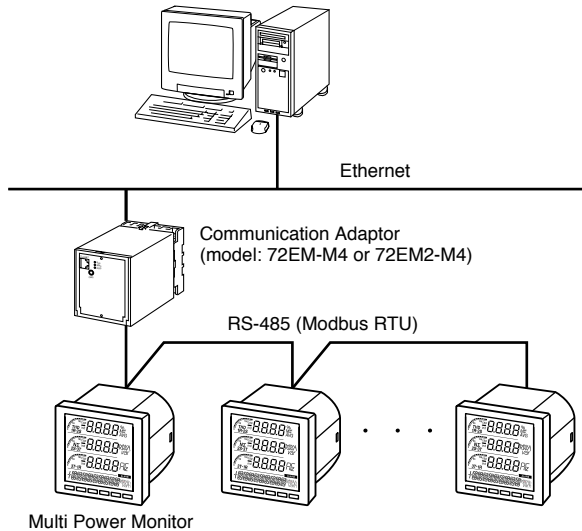
#### R2K-1 / LK1

Set individual node address to each device. Modbus setting for all connected devices must be identical (baud rate, parity, stop bit). The RS-485 and the MCN-CON cannot operate at once. Analog output level is fixed while in the communication mode.

RS-232C/RS-485 Converter (model: R2K-1 or LK1)

RS-485 (Modbus RTU)

### NETWORK CONNECTION (Ethernet)



#### 72EM-M4 or 72EM2-M4

Setting multiple master stations (PCs) is possible with Ethernet (Modbus TCP/IP) configuration, however, only one (1) PC is allowed to communicate to the device when programming it with the 53UCFG. Accessing the device from multiple stations may cause unexpected effects.

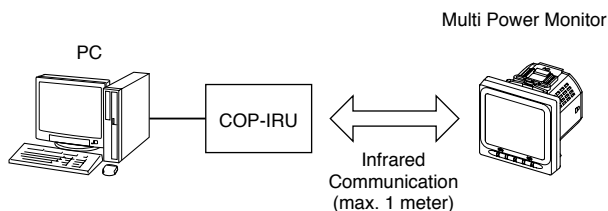
Set Modbus parameters for the devices as follows:

Node address: Individual number  
 Baud rate: 19200 bps or 38400 bps  
 identical to the 72EM-M4 setting  
 Parity: Odd  
 Stop bit: 1 bit

Set the 72EM-M4 or 72EM2-M4 as follows:

RS-485 baud rate: See above  
 Read timeout: 500  
 Write timeout: 2000

### LOCAL CONNECTION (infrared)



#### COP-IRU

Switch the 54U, 54UL or 54UC to the infrared communication mode before connecting the COP-IRU.

DO NOT set multiple devices to the infrared communication mode at once. Interference may cause unexpected results.

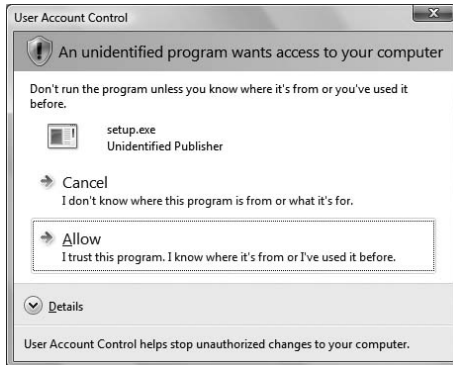
## 1.3 INSTALLING & DELETING THE PROGRAM

### INSTALL

The program is provided as compressed archive. Decompress the archive and execute 'setup.exe' to start up the 53UCFG installer program. Follow instructions on the Windows.

For Windows 2000/XP, log on as administrator to start installation.

For Windows Vista, log on as administrator but you still need to clarify your administrative right before proceeding. When User Account Control window appears, choose 'Allow.'



### DELETE

Open Control Panel > Add/Remove Programs. Select the 53UCFG from the program list and click Delete button.

## 2. BASIC OPERATIONS

### 2.1 STARTING THE 53UCFG

Open Program > M-System > Configurator > 53U, 54 Series to start up the 53UCFG on the Windows PC. The following window appears on the screen.



### 2.2 MODIFYING PARAMETERS

In order to modify parameters stored in the device, first (1) upload the device parameters, (2) modifying a part of or all of them on the screen, and then (3) download the new parameters to the device.

## 2.2.1 READING PARAMETERS FROM DEVICE (UPLOAD)

Clicking [Upload] opens the Connect dialog box.

In order to connect to the 53U with analog output type via the PC configuration cable, hold down [ IU ► ] button to switch the device to the communication mode before starting uploading. The analog output are held, separated from the actual input signals while in this mode.

In order to connect to the 54U or 54UL via the Infrared Communication Adaptor, hold down [ IU ► ] button to switch the device to the infrared communication mode before starting uploading.

### Modbus-RTU (RS-485 or local)

Connect dialog box for Modbus-RTU (RS-485 or local). The 'Device address' field contains '1'. Under 'PC Communication Port Setting', 'Modbus-RTU (RS-485/CONFIG)' is selected. The 'COM port' is 'Communications Port (COM1)', 'Baud rate' is '38400bps', 'Parity bit' is 'Odd', and 'Stop bit' is '1bit'. 'Station address' is '192.168.0.1' and 'Service port' is '502'.

Specify the relevant device address. Specify also the COM port and Modbus communication parameters depending upon the network configuration and the device's communication parameters.

Reference. 53U / 54U factory default setting.

Device address	1
Baud rate	38400
Parity bit	Odd
Stop bit	1 bit

### Modbus-TCP (Ethernet)

Connect dialog box for Modbus-TCP (Ethernet). The 'Device address' field contains '1'. Under 'PC Communication Port Setting', 'Modbus-TCP (TCP/IP)' is selected. The 'COM port' is 'Communications Port (COM1)', 'Baud rate' is '38400bps', 'Parity bit' is 'Odd', and 'Stop bit' is '1bit'. 'Station address' is '192.168.0.1' and 'Service port' is '502'.

Specify the IP address (Station address) and Service port (Standard Modbus TCP port number is '502').

### Infrared

Connect dialog box for Infrared. The 'Device address' field contains '1'. Under 'PC Communication Port Setting', 'Infrared' is selected. The 'COM port' is 'Communications Port (COM1)', 'Baud rate' is '38400bps', 'Parity bit' is 'Odd', and 'Stop bit' is '1bit'. 'Station address' is '192.168.0.1' and 'Service port' is '502'.

Specify the COM port.

Once all parameters confirmed, click [Connect] to start reading parameters stored in the connected device to show them on the screen.

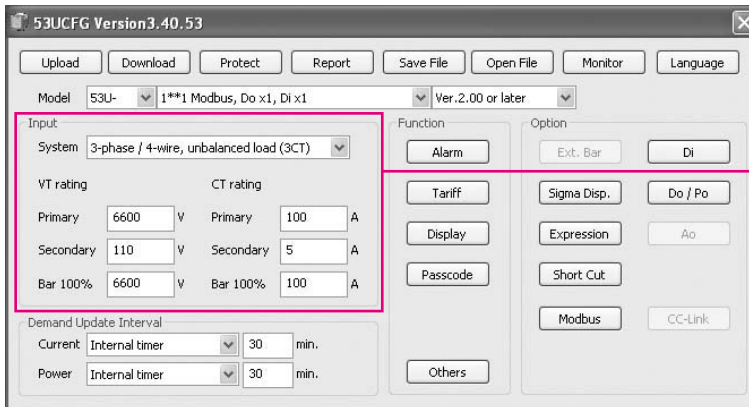
If an error message appears, confirm the hardware connection and network configuration and its parameters to retry.



### 2.2.2 MODIFYING PARAMETERS ON THE SCREEN

The initial window shows only basic parameters on the screen. Buttons such as [Alarm], [Energy] and [Advanced] are used to go into more detailed settings for respective categories.

In the example shown below, the device input has been changed to: 3-phase/4-wire, unbalanced load, VT ratio 6600/110V, CT ratio 100/5A.



Choose from the menu options or enter appropriate values.

Detailed description on each parameter and control button are given in the later pages of this manual.

### 2.2.3 WRITING PARAMETERS TO DEVICE (DOWNLOAD)

Clicking [Download] opens the Connect dialog box just as [Upload] button did. Specify the relevant device address. Specify also the COM port and Modbus communication parameters depending upon the network configuration and the device's communication parameters.

Click [Connect] to start downloading new parameters.

When the Modbus register writing protection is activated, a dialog box requesting Modbus passcode entry will appear on the screen.

Once downloading begins, a bargraph appears on the screen to indicate progress. When it disappears without any error messages, the new setting becomes valid.



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#### Caution !

Modbus parameters are not enabled by downloading. The device must be restarted (power supply turned off and on).

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## 2.3 PROTECTING PARAMETERS

This function is usable with Firmware Version 1.01 or later of the 53U, all available versions of the 54U, 54UL and 54UC.

In order to protect parameter changes by the front keys, Passcode (4-digit number) is used. It is also possible to lock local key operations to go to Setting mode.

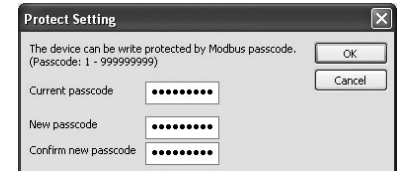
In order to protect parameter changes via Modbus (CONFIG port or RS-485), Modbus Register Writing Protection Passcode is used. The code consists of 9-digit number.

Clicking [Protection] opens the Connect dialog box just as [Upload] button did. Specify the relevant device address.

Specify also the COM port and Modbus communication parameters depending upon the network configuration and the device's communication parameters.

Click [Connect] to open Protect Setting dialog box.

Modbus passcode is selectable between 1 and 999 999 999. In order to change, enter the current passcode and new passcode (twice). If there is no passcode setting or if you do not want to activate the protection, leave relevant field blank. Click [OK].



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### Caution !

Once a passcode is set, no parameter changes via Modbus are available unless the correct passcode is entered. BE SURE NOT TO FORGET the passcode.

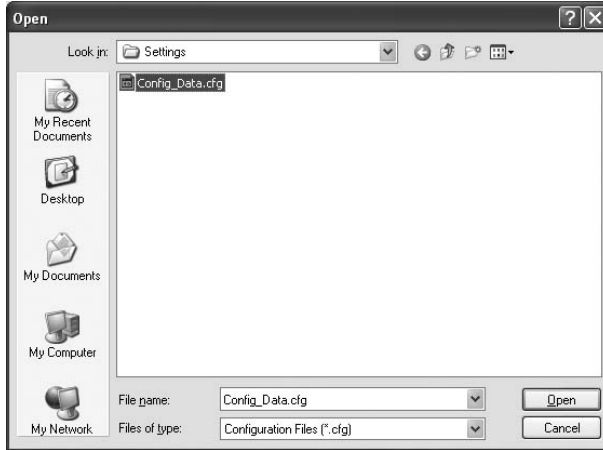
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## 2.4 SAVING FILES

Parameter set on the screen can be saved as a file on the hard disk. A file can be called up on the screen. You can store backup setting data by utilizing these functions in combination with [Upload] [Download] functions.

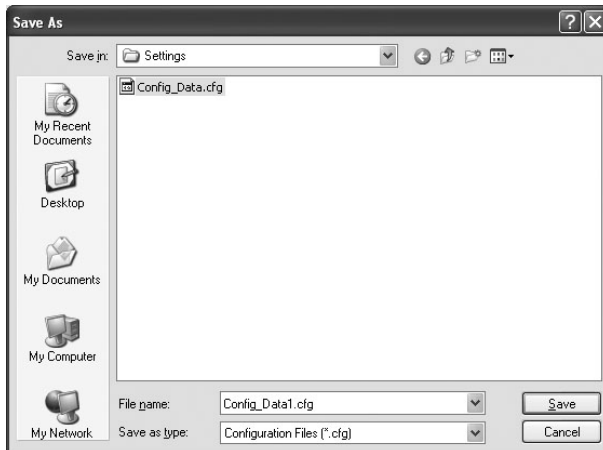
### 2.4.1 READING PARAMETERS SAVED AS FILE

Clicking [Open File] calls up the Windows-standard Open dialog box. Select a parameter file to show a stored parameter setting.



### 2.4.2 SAVING PARAMETERS IN A FILE

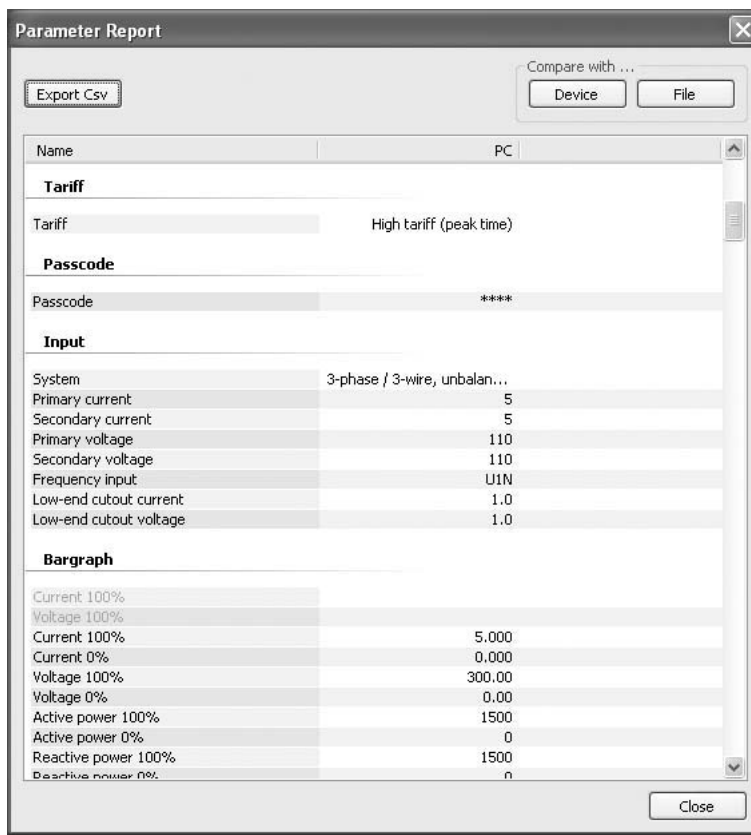
Clicking [Save File] calls up the Windows-standard Save As dialog box. Enter a desired file name to File Name field and click [Save] to store a parameter setting.



## 2.5 REPORT

### 2.5.1 DISPLAYING PARAMETERS

Clicking [Report] opens Parameter Report window showing all parameters presently edited on the screen.



### 2.5.2 COMPARING PARAMETERS

Parameters presently edited on the screen and those stored in the connected device or in a file can be compared side by side.

Click [Device] in order to upload the parameters in the device, or [File] to upload those in a file. Parameters are compared and listed on the screen side by side.

The rows showing differences between two sets of parameters are highlighted in red background. Cells for matching parameters are filled in white, or light gray. Gray characters shows parameters not supported by the other one.

The total number of non-matching cases is mentioned in the bottom of the window frame.

### 2.5.3 CSV FILE

The parameter list can be exported as a CSV text format file for use in another application software such as Microsoft Excel.

Click [Export Csv] button at the top left of the screen and go through standard Windows Save As procedure.

Input the file name and click [Save] button then the CSV file with the name is created. The CSV file format is in the following:

- Each row for one parameter
- Each row (parameter) consists of 3 or 4 separated data
- Data is arranged in order of 'Parameter group,' 'Parameter identification,' 'Parameter edited' and 'Parameter to compare.'

If you have not uploaded a parameter set for comparing, 'Parameter to compare' is not exported.

[Example]

```
"Display" , "Operation mode" , "All key operations are available"
```

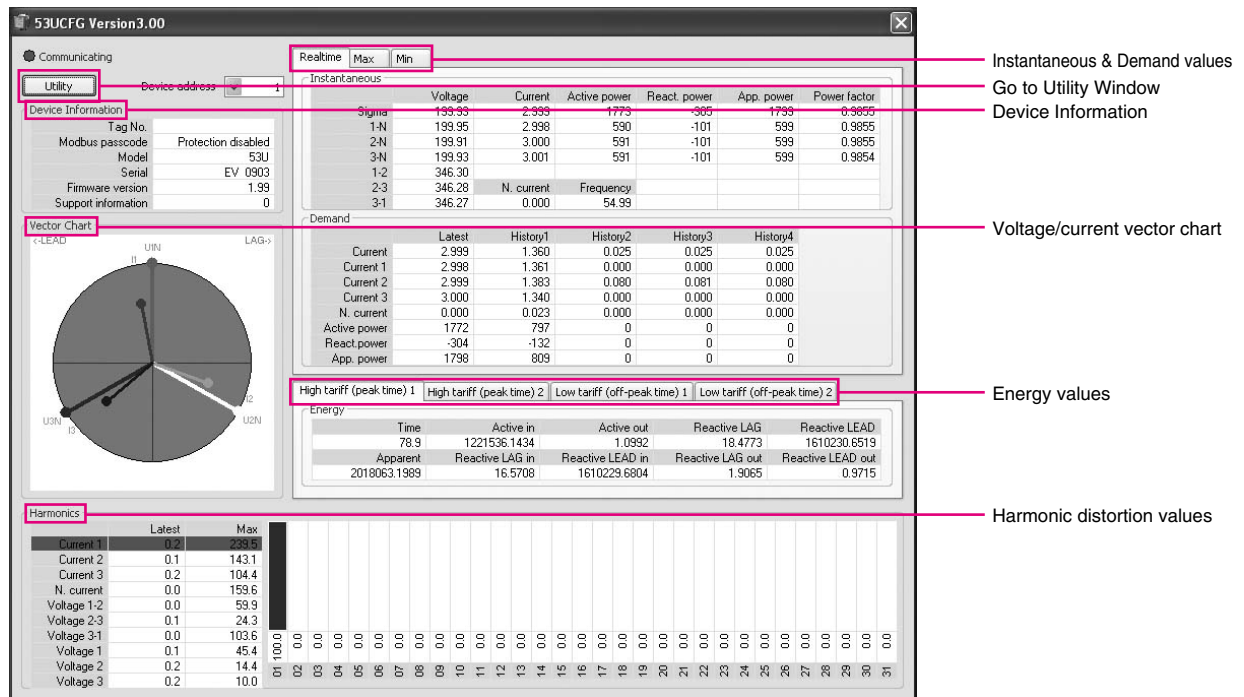
```
"Display" , "Data display view" , "0"
```

```
"Display" , "Energy display view" , "EP / Active energy, incoming"
```

## 2.6 MONITORING MEASURED VALUES

All the measured values of a particular device can be displayed on the PC screen.

Clicking [Monitor] opens the Connect dialog box (See Figure in Section 2.2.3). Specify the relevant device address, COM port and Modbus communication parameters and click [Connect].



Once the PC has started communicating with the connected device, display values are updated in approx. 0.5 second intervals.

### DEVICE INFORMATION

Tag No.	Tag number
Modbus passcode	Modbus register writing protection status Protection enabled : Modbus registers are write-protected. Protection disabled : Modbus registers are not protected. Not supported : This function is not supported.
Model	Model number
Serial	Serial number
Firmware version	Firmware version number
Support information	M-System's support information

### INSTANTANEOUS & DEMAND VALUES

[Real time], [Max] and [Min] tabs are selectable to switch the view between the instantaneous values, the maximum values and the minimum values respectively.

### ENERGY VALUES

[High tariff (peak) time] and [Low tariff (off-peak time)] tabs are selectable to switch the view.

### HARMONIC DISTORTION VALUES

The left-bottom table shows the total harmonic distortion (THD) for each measurand. Clicking on a row in this table switches the measurand displayed in the right-bottom table, where the detailed harmonic distortion values from 1st to 31st are shown.

## UTILITY

Use Utility window to reset count values. The window shows three reset operation buttons: [Energy], [Max/Min], [Demand], plus [Tag No.].



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Energy	Reset all the energy counts to zero.
Max/Min	Reset all the maximum and minimum values to the present values.
Demand	Reset all the demand values to zero.
Tag No.	Open Tag Number Setting dialog box. Max. 16 characters.

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## 2.7 SWITCHING LANGUAGE

Click [Language] to switch the display language between English and Japanese.

The program starts up in English mode as initial state when the OS is other than Japanese version. You can switch to Japanese only when the OS supports Japanese language.

### 3. PARAMETER LIST

Supported parameters depend upon model types. Supported ones are marked with 'X' in the following tables.

		53U-1xx1 (Ver. 1.02 or earlier)	53U-1xx1 (Ver. 2.00 or later)	53U-1xx2	53U-1xx3	53U-1xx4	53U-1xx5	53U-1xx6	53U-1xx7	53U-1xx8	53U-1xx9
Basic Parameters	System	X	X	X	X	X	X	X	X	X	X
	VT ratio primary / secondary	X	X	X	X	X	X	X	X	X	X
	VT bar 100%	X	X	X	X	X	X	X	X	X	X
	CT ratio primary / secondary	X	X	X	X	X	X	X	X	X	X
	CT bar 100%	X	X	X	X	X	X	X	X	X	X
	Demand update interval, current	X	X	X	X	X	X	X	X	X	X
Alarm	Demand update interval, power	X	X	X	X	X	X	X	X	X	X
	Power ON delay time	X	X	X	X	X	X	X	X	X	X
	Latching	X	X	X	X	X	X	X	X	X	X
	Current alarm I1...I3	X	X	X	X	X	X	X	X	X	X
	Neutral current alarm IN	X	X	X	X	X	X	X	X	X	X
	Delta voltage alarm U12...U31	X	X	X	X	X	X	X	X	X	X
	Phase voltage alarm U1N...U3N	X	X	X	X	X	X	X	X	X	X
	Active power alarm P	X	X	X	X	X	X	X	X	X	X
	Reactive power alarm Q	X	X	X	X	X	X	X	X	X	X
	Apparent power alarm S	X	X	X	X	X	X	X	X	X	X
	Power factor alarm PF	X	X	X	X	X	X	X	X	X	X
	Frequency alarm F	X	X	X	X	X	X	X	X	X	X
	Average current alarm I1...I3	X	X	X	X	X	X	X	X	X	X
	Average neutral current alarm IN AVG	X	X	X	X	X	X	X	X	X	X
	Average active power alarm P AVG	X	X	X	X	X	X	X	X	X	X
	Average reactive power alarm Q AVG	X	X	X	X	X	X	X	X	X	X
	Average apparent power alarm S AVG	X	X	X	X	X	X	X	X	X	X
	Current THD alarm THD1...THD13	X	X	X	X	X	X	X	X	X	X
	Neutral current THD alarm THDIN	X	X	X	X	X	X	X	X	X	X
	Delta voltage THD alarm THDU12...THDU31	X	X	X	X	X	X	X	X	X	X
	Phase voltage THD alarm THDU1N...THDU3N	X	X	X	X	X	X	X	X	X	X
	Phase angle between voltages alarm UT12...UT31		X	X	X	X	X	X	X	X	X
	Tariff	Tariff	X	X	X	X	X	X	X	X	X
	Display	Backlight operating mode	X	X	X	X	X	X	X	X	X
Backlight OFF timer		X	X	X	X	X	X	X	X	X	
Backlight brightness		X	X	X	X	X	X	X	X	X	
Backlight update rate			X	X	X	X	X	X	X	X	
Data display view		X	X	X	X	X	X	X	X	X	
Energy display view		X	X	X	X	X	X	X	X	X	
Key operation lock		X	X	X	X	X	X	X	X	X	
My default data display view		*1	X	X	X	X	X	X	X	X	
My default energy display view		X	X	X	X	X	X	X	X	X	
My default, use preset timer		X	X	X	X	X	X	X	X	X	
Other	Low-end cutout voltage	X	X	X	X	X	X	X	X	X	
	Low-end cutout current	X	X	X	X	X	X	X	X	X	
	Energy tariff function	X	X	X	X	X	X	X	X	X	
	Power factor PF sign	X	X	X	X	X	X	X	X	X	
	Reactive power Q sign	X	X	X	X	X	X	X	X	X	
	Phase reactive power Qn	X	X	X	X	X	X	X	X	X	
	Apparent power S	X	X	X	X	X	X	X	X	X	

\*1. -1 setting (cyclic) not selectable

		53U-1xx1 (Ver. 1.02 or earlier)	53U-1xx1 (Ver. 2.00 or later)	53U-1xx2	53U-1xx3	53U-1xx4	53U-1xx5	53U-1xx6	53U-1xx7	53U-1xx8	53U-1xx9
Extension Bar	Current bar										
	Voltage bar										
	Active power bar										
	Reactive power bar										
	Apparent power bar										
	Power factor bar										
	Frequency bar										
	Total harmonic distortion bar										
	Phase angle between voltages bar										
Σ View	Σ1, Line 1...3		*2	*2	*2	*2	*2	*2	*2	*2	*2
	Σ1, Line 4										
	Σ2, Line 1...3		*2	*2	*2	*2	*2	*2	*2	*2	*2
	Σ2, Line 4										
	Σ3, Line 1...3		*2	*2	*2	*2	*2	*2	*2	*2	*2
	Σ3, Line 4										
	Σ4, Line 1...3		*2	*2	*2	*2	*2	*2	*2	*2	*2
	Σ4, Line 4										
	Σ5, Line 1...4										
Σ6, Line 1...4											
Expression	Input line indication	X	X	X	X	X	X	X	X	X	X
	Phase direction indication	X	X	X	X	X	X	X	X	X	X
	Power format		X	X	X	X	X	X	X	X	X
Di	Di function	*3	X	X		X	X				
	Di contact type	X	X	X		X	X				
Do	Do 1 function, contact type, energy detail	X	X			X	X	X	X	X	X
	Do 2 function, contact type, energy detail							X	X	X	X
	Do 3 function, contact type, energy detail									X	X
	Do 4 function, contact type, energy detail										X
Ao	Ao 1 function, zero/span, linearization, I/O 0%/100%, table			X	X	X	X	X	X		
	Ao 2 function, zero/span, linearization, I/O 0%/100%, table			X	X	X	X	X	X		
	Ao 3 function, zero/span, linearization, I/O 0%/100%, table			X	X						
	Ao 4 function, zero/span, linearization, I/O 0%/100%, table			X	X						
Modbus	Device address	X	X	X	X	X	X	X	X	X	X
	Baud rate	X	X	X	X	X	X	X	X	X	X
	Parity bit	X	X	X	X	X	X	X	X	X	X
	Stop bit	X	X	X	X	X	X	X	X	X	X
	Long register	X	X	X	X	X	X	X	X	X	X
	Protocol operation timer	X	X	X	X	X	X	X	X	X	X
CC-Link	Node address										
	Transfer rate										
Shortcut	Clear alarm	X	X	X	X	X	X	X	X	X	X

\*2. Limit patterns are available.

\*3. Clear alarm and Tariff switching are not available.



	54U-1xx6/A	54U-1xx5/9	54U-1xx4	54U-1xx3/8 (Ver.2.00 or later)	54U-1xx2/7 (Ver.2.00 or later)	54U-1xx1 (Ver.2.00 or later)	54U-1xx3 (Ver. 1.03 or earlier)	54U-1xx2 (Ver. 1.03 or earlier)	54U-1xx1 (Ver. 1.03 or earlier)
Basic Parameters	System	*4	*4	*4	*4	*4	*4	*4	*4
	VT ratio primary / secondary	X	X	X	X	X	X	X	X
	VT bar 100%								
	CT ratio primary / secondary	X	X	X	X	X	X	X	X
	CT bar 100%								
	Demand update interval, current	X	X	X	X	X	X	X	X
Alarm	Demand update interval, power	X	X	X	X	X	X	X	X
	Power ON delay time	X	X	X	X	X	X	X	X
	Latching	X	X	X	X	X	X	X	X
	Current alarm I1...I3	X	X	X	X	X	X	X	X
	Neutral current alarm IN								
	Delta voltage alarm U12...U31	X	X	X	X	X	X	X	X
	Phase voltage alarm U1N...U3N	X	X	X	X	X	X	X	X
	Active power alarm P	X	X	X	X	X	X	X	X
	Reactive power alarm Q	X	X	X	X	X	X	X	X
	Apparent power alarm S	X	X	X	X	X	X	X	X
	Power factor alarm PF	X	X	X	X	X	X	X	X
	Frequency alarm F	X	X	X	X	X	X	X	X
	Average current alarm I1...I3	X	X	X	X	X	X	X	X
	Average neutral current alarm IN AVG								
	Average active power alarm P AVG	X	X	X	X	X	X	X	X
	Average reactive power alarm Q AVG	X	X	X	X	X	X	X	X
	Average apparent power alarm S AVG	X	X	X	X	X	X	X	X
	Current THD alarm THD1...THD13	X	X	X	X	X	X	X	X
	Neutral current THD alarm THDIN								
	Delta voltage THD alarm THDU12...THDU31	X	X	X	X	X	X	X	X
	Phase voltage THD alarm THDU1N...THDU3N	X	X	X	X	X	X	X	X
	Phase angle between voltages alarm UT12...UT31	X	X	X	X	X	X	X	X
Tariff	Tariff	X	X	X	X	X	X	X	X
Display	Backlight operating mode	X	X	X	X	X	X	X	X
	Backlight OFF timer	X	X	X	X	X	X	X	X
	Backlight brightness	X	X	X	X	X	X	X	X
	Backlight update rate				X	X	X	X	X
	Data display view	X	X	X	X	X	X	X	X
	Energy display view	X	X	X	X	X	X	X	X
	Key operation lock	X	X	X	X	X	X	X	X
	My default data display view	X	X	X	X	X	X	X	X
	My default energy display view	X	X	X	X	X	X	X	X
My default, use preset timer	X	X	X	X	X	X	X	X	
Other	Low-end cutout voltage	X	X	X	X	X	X	X	X
	Low-end cutout current	X	X	X	X	X	X	X	X
	Energy tariff function	X	X	X	X	X	X	X	X
	Power factor PF sign	X	X	X	X	X	X	X	X
	Reactive power Q sign	X	X	X	X	X	X	X	X
	Phase reactive power Qn	X	X	X	X	X	X	X	X
Apparent power S	X	X	X	X	X	X	X	X	

\*4. 3-phase / 4-wire not selectable

		54U-1xx1 (Ver. 1.03 or earlier)	54U-1xx2 (Ver. 1.03 or earlier)	54U-1xx3 (Ver. 1.03 or earlier)	54U-1xx1 (Ver. 2.00 or later)	54U-1xx2/7 (Ver. 2.00 or later)	54U-1xx3/8 (Ver. 2.00 or later)	54U-1xx4	54U-1xx5/9	54U-1xx6/A
Extension Bar	Current bar	X	X	X	X	X	X	X	X	X
	Voltage bar	X	X	X	X	X	X	X	X	X
	Active power bar	X	X	X	X	X	X	X	X	X
	Reactive power bar	X	X	X	X	X	X	X	X	X
	Apparent power bar	X	X	X	X	X	X	X	X	X
	Power factor bar	X	X	X	X	X	X	X	X	X
	Frequency bar	X	X	X	X	X	X	X	X	X
	Total harmonic distortion bar	X	X	X	X	X	X	X	X	X
	Phase angle between voltages bar	X	X	X	X	X	X	X	X	X
Σ View	Σ1, Line 1...3	X	X	X	X	X	X	X	X	X
	Σ1, Line 4	X	X	X	X	X	X	X	X	X
	Σ2, Line 1...3	X	X	X	X	X	X	X	X	X
	Σ2, Line 4	X	X	X	X	X	X	X	X	X
	Σ3, Line 1...3	X	X	X	X	X	X	X	X	X
	Σ3, Line 4	X	X	X	X	X	X	X	X	X
	Σ4, Line 1...3	X	X	X	X	X	X	X	X	X
	Σ4, Line 4	X	X	X	X	X	X	X	X	X
	Σ5, Line 1...4	X	X	X	X	X	X	X	X	X
Σ6, Line 1...4	X	X	X	X	X	X	X	X	X	
Expression	Input line indication									
	Phase direction indication									
	Power format				X	X	X	X	X	X
Di	Di function	*3	*3	*3	X	X	X			
	Di contact type	X	X	X	X	X	X			
Do	Do 1 function, contact type, energy detail	X	X	X	X	X	X	X	X	X
	Do 2 function, contact type, energy detail							X	X	X
	Do 3 function, contact type, energy detail									
	Do 4 function, contact type, energy detail									
Ao	Ao 1 function, zero/span, linearization, I/O 0%/100%, table		X	X		X	X		X	X
	Ao 2 function, zero/span, linearization, I/O 0%/100%, table		X	X		X	X		X	X
	Ao 3 function, zero/span, linearization, I/O 0%/100%, table		X	X		X	X		X	X
	Ao 4 function, zero/span, linearization, I/O 0%/100%, table		X	X		X	X		X	X
Modbus	Device address	X			X			X		
	Baud rate	X			X			X		
	Parity bit	X			X			X		
	Stop bit	X			X			X		
	Long register	X			X			X		
	Protocol operation timer	X			X			X		
CC-Link	Node address									
	Transfer rate									
Shortcut	Clear alarm				X	X	X	X	X	X

\*3. Clear alarm and Tariff switching are not available.

	54U-2xx2	54UC-2xx1	54UC-1xx2	54UC-1xx1		54UL-2xx2	54UL-2xx1	54UL-1xx2	54UL-1xx1		54U-2xx6/A	54U-2xx5/9	54U-2xx4	54U-2xx3/8	54U-2xx2/7	54U-2xx1
Basic Parameters	System	X	X	X	X	X	X	X	X	*4	X	X	X	X	X	X
	VT ratio primary / secondary	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	VT bar 100%															
	CT ratio primary / secondary	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	CT bar 100%															
	Demand update interval, current	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Demand update interval, power	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Alarm	Power ON delay time	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	Latching	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	Current alarm I1...I3	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	Neutral current alarm IN	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	Delta voltage alarm U12...U31	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	Phase voltage alarm U1N...U3N	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	Active power alarm P	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	Reactive power alarm Q	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	Apparent power alarm S	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	Power factor alarm PF	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	Frequency alarm F	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	Average current alarm I1...I3	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	Average neutral current alarm IN AVG	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	Average active power alarm P AVG	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	Average reactive power alarm Q AVG	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	Average apparent power alarm S AVG	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	Current THD alarm THD1...THD13	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	Neutral current THD alarm THDIN	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	Delta voltage THD alarm THDU12...THDU31	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	Phase voltage THD alarm THDU1N...THDU3N	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Phase angle between voltages alarm UT12...UT31	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
Tariff	Tariff	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Display	Backlight operating mode	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	Backlight OFF timer	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	Backlight brightness	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	Backlight update rate	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	Data display view	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	Energy display view	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	Key operation lock	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	My default data display view	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
My default energy display view	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
My default, use preset timer	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
Other	Low-end cutout voltage	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	Low-end cutout current	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
	Energy tariff function	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
	Power factor PF sign	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
	Reactive power Q sign	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
	Phase reactive power Qn	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
Apparent power S	X	X	X	X	X	X	X	X	X	X	X	X	X	X		

\*4. 3-phase / 4-wire not selectable

		54U-2xx1	54U-2xx2/7	54U-2xx3/8	54U-2xx4	54U-2xx5/9	54U-2xx6/A		54UL-1xx1	54UL-1xx2	54UL-2xx1	54UL-2xx2		54UC-1xx1	54UC-1xx2	54UC-2xx1	54UC-2xx2
Extension Bar	Current bar	X	X	X	X	X	X		X	X	X	X		X	X	X	X
	Voltage bar	X	X	X	X	X	X		X	X	X	X		X	X	X	X
	Active power bar	X	X	X	X	X	X		X	X	X	X		X	X	X	X
	Reactive power bar	X	X	X	X	X	X		X	X	X	X		X	X	X	X
	Apparent power bar	X	X	X	X	X	X		X	X	X	X		X	X	X	X
	Power factor bar	X	X	X	X	X	X		X	X	X	X		X	X	X	X
	Frequency bar	X	X	X	X	X	X		X	X	X	X		X	X	X	X
	Total harmonic distortion bar	X	X	X	X	X	X		X	X	X	X		X	X	X	X
	Phase angle between voltages bar	X	X	X	X	X	X		X	X	X	X		X	X	X	X
$\Sigma$ View	$\Sigma$ 1, Line 1...3	X	X	X	X	X	X		X	X	X	X		X	X	X	X
	$\Sigma$ 1, Line 4	X	X	X	X	X	X		X	X	X	X		X	X	X	X
	$\Sigma$ 2, Line 1...3	X	X	X	X	X	X		X	X	X	X		X	X	X	X
	$\Sigma$ 2, Line 4	X	X	X	X	X	X		X	X	X	X		X	X	X	X
	$\Sigma$ 3, Line 1...3	X	X	X	X	X	X		X	X	X	X		X	X	X	X
	$\Sigma$ 3, Line 4	X	X	X	X	X	X		X	X	X	X		X	X	X	X
	$\Sigma$ 4, Line 1...3	X	X	X	X	X	X		X	X	X	X		X	X	X	X
	$\Sigma$ 4, Line 4	X	X	X	X	X	X		X	X	X	X		X	X	X	X
	$\Sigma$ 5, Line 1...4	X	X	X	X	X	X		X	X	X	X		X	X	X	X
	$\Sigma$ 6, Line 1...4	X	X	X	X	X	X		X	X	X	X		X	X	X	X
Expression	Input line indication																
	Phase direction indication																
	Power format	X	X	X	X	X	X		X	X	X	X		X	X	X	X
Di	Di function	X	X	X					X		X			X		X	
	Di contact type	X	X	X					X		X			X		X	
Do	Do 1 function, contact type, energy detail	X	X	X	X	X	X		X	X	X	X		X	X	X	X
	Do 2 function, contact type, energy detail				X	X	X			X		X			X		X
	Do 3 function, contact type, energy detail																
	Do 4 function, contact type, energy detail																
Ao	Ao 1 function, zero/span, linearization, I/O 0%/100%, table		X	X		X	X										
	Ao 2 function, zero/span, linearization, I/O 0%/100%, table		X	X		X	X										
	Ao 3 function, zero/span, linearization, I/O 0%/100%, table		X	X		X	X										
	Ao 4 function, zero/span, linearization, I/O 0%/100%, table		X	X		X	X										
Modbus	Device address	X			X												
	Baud rate	X			X												
	Parity bit	X			X												
	Stop bit	X			X												
	Long register	X			X												
	Protocol operation timer	X			X												
CC-Link	Node address													X	X	X	X
	Transfer rate													X	X	X	X
Shortcut	Clear alarm	X	X	X	X	X	X		X	X	X	X		X	X	X	X

## 4. BASIC PARAMETERS

The initial window when you start up the 53UCFG contains basic parameters as described below.

### 4.1 MODEL

Choose an appropriate device type to be configured on the 53UCFG.

Selection

53U-	1**1	Modbus, Do x1, Di x1	Ver.1.02 or earlier Ver.2.00 or later
	1**2	Ao 4-20mA x4	
	1**3	Ao 1-5V x4	
	1**4	Ao 4-20mA x2, Do x1, Di x1	
	1**5	Ao 1-5V x2, Do x1, Di x1	
	1**6	Ao 4-20mA x2, Do x2	
	1**7	Do 1-5V x2, Do x2	
	1**8	Modbus, Do x3	
	1**9	Do x4	
54U-	1**1	Modbus, Do x1, Di x1	Ver.1.03 or earlier Ver.2.00 or later
	1**2/7	Ao 4-20mA x4, Di x1	Ver.1.03 or earlier Ver.2.00 or later
	1**3/8	Ao 1-5V x4, Do x1, Di x1	Ver.1.03 or earlier Ver.2.00 or later
	1**4	Modbus, Do x2	
	1**5/9	Ao 4-20mA x4, Do x2	
	1**6/A	Ao 1-5V x4, Do x2	
	2**1	3P4W, Modbus, Do x1, Di x1	
	2**2/7	3P4W, Ao 4-20mA x4, Do x1, Di x1	
	2**3/8	3P4W, Ao 1-5V x4, Do x1, Di x1	
	2**4	3P4W, Modbus, Do x2	
	2**5/9	3P4W, Ao 4-20mA x4, Do x2	
	2**6/A	3P4W, Ao 1-5V x4, Do x2	
54UL-	1**1	LonWorks, Do x1, Di x1	
	1**2	LonWorks, Do x2	
	2**1	3P4W, LonWorks, Do x1, Di x1	
	2**2	3P4W, LonWorks, Do x2	
54UC-	1**1	CC-Link, Do x1, Di x1	
	1**2	CC-Link, Do x2	
	2**1	CC-Link, Do x1, Di x1	
	2**2	CC-Link, Do x2	

Note. For models with 'External interface' code 2 or 7, select the same device type. Do the same for models with code 3 or 8, 5 or 9, and 6 or A.

## 4.2 INPUT

### SYSTEM

Choose an input wiring configuration from the following:

Selection / Range	
System	Single-phase / 2-wire (1CT) Single-phase / 3-wire (1CT) 3-phase / 3-wire, balanced load (1CT) 3-phase / 3-wire, unbalanced load (2CT) 3-phase / 4-wire, balanced load (1CT) *1 3-phase / 4-wire, unbalanced load (3CT) *1 3-phase / 3-wire, unbalanced load (3CT) *2

\*1. Selectable for the 53U, the 54U-2 and 54UL-2

\*2. Selectable for the 54U-2, 54UL-2 and 54UC-2

### VOLTAGE

Enter VT's primary and secondary and secondary ratings when an external voltage transformer (VT) is used. The maximum selectable ratio is 400kV/50V, but both CT and VT ratios must be considered to satisfy the maximum measurable power value of 2GVA.

'Bar 100%' value is applied as the full-scale bargraph range indicated on the left end of the LCD display and the full-scale vector chart range indicated on the monitor view. The 54U, 54UL and 54UC do not support this function. Use 'Bar Setting.'

Selection / Range	
Primary voltage	50V to 400000V
Secondary voltage	50V to 500V
Bar 100% voltage	50V to 400000V

### CURRENT

Enter CT's primary and secondary and secondary ratings when an external current transformer (CT) is used. The maximum selectable ratio is 20kA/1A, but both CT and VT ratios must be considered to satisfy the maximum measurable power value of 2GVA.

'Bar 100%' value is applied as the full-scale bargraph range indicated on the left end of the LCD display and the full-scale vector chart range indicated on the monitor view. The 54U, 54UL and 54UC do not support this function. Use 'Bar Setting.'

Selection / Range	
Primary current	1A to 20000A
Secondary current	1A to 5A
Bar 100% current	1A to 20000A

## 4.3 DEMAND UPDATE INTERVAL

### CURRENT & POWER

Choose how you want to update demand (average) values for the current and the power signals.

Selection / Range	
Internal timer	Demand values are calculated automatically by the internal timer (clock). Specify in minutes.
Discrete input	Demand values are calculated when a contact input is supplied to the device's discrete input terminals.

#### Caution !

With 'Discrete input' setting, demand values are automatically updated if there is no contact input for 100 minutes. Be sure to set also 'Update demand value' for 'Discrete input function' as explained in Section 3.3.

## 5. FUNCTION PARAMETERS

When you click various control buttons under 'Function' on the initial window of the 53UCFG, you can go to detailed setting.

### 5.1 ALARM

18 groups of measurands are available for alarm. Each alarm can have High and Low setpoints, enabled or disabled respectively.

#### ■ ALARM OUTPUT SETTING

ID	DEFINITION	LOW SETPOINT	HIGH SETPOINT	UNIT	DEVICE*1
I1-3	Current, Line 1 thr. Line 3	0.000	20 000.000	A	
IN	Neutral current	0.000	20 000.000	A	53U, 54U-2, 54UL-2, 54UC-2
U12-31	Delta voltage, Line 1 – 2, 2 – 3, 3 – 1	0.00	400 000.00	V	
U1N-3N	Phase voltage, Phase 1 thr. Phase 3	0.00	400 000.00	V	
P	Active power	-2 000 000 000	2 000 000 000	W	
Q	Reactive power	-2 000 000 000	2 000 000 000	var	
S	Apparent power	0	2 000 000 000	VA	
PF	Power factor	-1.0000	1.0000	cos $\phi$ *2	
F	Frequency	45.00	65.00	Hz	
I1-3 AVG	Average current, Line 1 thr. Line 3 (demand)	0.000	20 000.000	A	
IN AVG	Average neutral current (demand)	0.000	20 000.000	A	53U, 54U-2, 54UL-2, 54UC-2
P AVG	Average active power (demand)	-2 000 000 000	2 000 000 000	W	
Q AVG	Average reactive power (demand)	-2 000 000 000	2 000 000 000	var	
S AVG	Average apparent power (demand)	0	2 000 000 000	VA	
THDI1-3	THD, Current, Line 1 thr. Line 3	0.0	999.9	%	
THDIN	THD, Neutral current	0.0	999.9	%	53U, 54U-2, 54UL-2, 54UC-2
THDU12-31	THD, Delta voltage, Line 1 – 2, 2 – 3, 3 – 1	0.0	999.9	%	
THDU1N-3N	THD, Phase voltage, Phase 1 thr. Phase 3	0.0	999.9	%	
UT12-31	Phase angle between voltages, Phase 1 – 2, 2 – 3, 3 – 1	-180	180	°*4	54U, 54UL, 53U*3, 54UC

\*1. Function available for specific models.

\*2. Indicated PF on the 53U

\*3. Firmware Ver.2.00 or later

\*4. No unit indication on the module

## POWER ON DELAY TIME

Specify a time delay for the alarm to start functioning after the power is turned on. The time is counted up from the moment when the device starts measuring in approx. 2 seconds after all display segments are turned on at the startup.

Selection / Range

---

Power ON delay time	0 to 999 seconds
---------------------	------------------

---

## LATCHING

Check 'Latching' if you do not want to automatically reset an alarm once the measured value is out of the alarm range. In order to reset, (1) reset through network by Modbus command, (2) Remove the 'Check' mark of this setting, or (3) turn off the power supply to the device.

## HIGH SETPOINT / LOW SETPOINT

Refer to the above table for the selectable ranges for respective measurand. High alarm is triggered when the measured value goes above the High setpoint, while Low alarm is triggered when it goes below the Low setpoint.

## HYSTERESIS (DEADBAND)

Hysteresis is selectable for each alarm from 0.0 to 99.9%. Relationships between the set value in % and actual process value are indicated in the table below. 0% hysteresis equals to 0 in engineering unit unless otherwise mentioned.

### ■ HYSTERESIS

ID	DEFINITION	HYSTERESIS AT 100%	UNIT
I1-3	Current, Line 1 thr. Line 3	CT primary rating	A
IN	Neutral current	CT primary rating	A
U12-31	Delta voltage, Line 1 – 2, 2 – 3, 3 – 1	VT primary rating	V
U1N-3N	Phase voltage, Phase 1 thr. Phase 3	VT primary rating	V
P	Active power	CT primary rating x VT primary rating	W
Q	Reactive power	CT primary rating x VT primary rating	var
S	Apparent power	CT primary rating x VT primary rating	VA
PF	Power factor	1.0000	cos φ
F	Frequency	65.00 (45.00 at 0%)	Hz
I1-3 AVG	Average current, Line 1 thr. Line 3 (demand)	CT primary rating	A
IN AVG	Average neutral current (demand)	CT primary rating	A
P AVG	Average active power (demand)	CT primary rating x VT primary rating	W
Q AVG	Average reactive power (demand)	CT primary rating x VT primary rating	var
S AVG	Average apparent power (demand)	CT primary rating x VT primary rating	VA
THDI1-3	THD, Current, Line 1 thr. Line 3	100.0	%
THDIN	THD, Neutral current	100.0	%
THDU12-31	THD, Delta voltage, Line 1 – 2, 2 – 3, 3 – 1	100.0	%
THDU1N-3N	THD, Phase voltage, Phase 1 thr. Phase 3	100.0	%
UT12-31	Phase angle between voltages, Phase 1 – 2, 2 – 3, 3 – 1	360	°

## ON DELAY

Specify a time delay for the alarm to be triggered after the measured value is out of the normal range.

Selection / Range

---

ON delay time	0 to 999 seconds
---------------	------------------

---

## OUTPUT

Specify where you want to output each alarm.

Selection

---

Disable	No alarm output is provided.
---------	------------------------------

---

Display	ALARM indicator is activated but no discrete signal output is provided.
---------	---

---

Display + Do 1...Do 4	ALARM indicator is activated plus a discrete signal output is provided.
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---

### Caution !

With 'Display + Do x' setting, be sure to set also 'Alarm status' for 'Discrete output function' as explained in Section 3.4. Otherwise no contact output is actually provided.

---



## 5.2 TARIFF

Choose one of the two energy counters. This setting is valid only when 'Tariff function' under 'Advanced' setting (See Section 4.6) is set to 'Enable.' When that is set to 'Disable,' this setting is invalid, and then the High tariff (peak time) counter is always used.



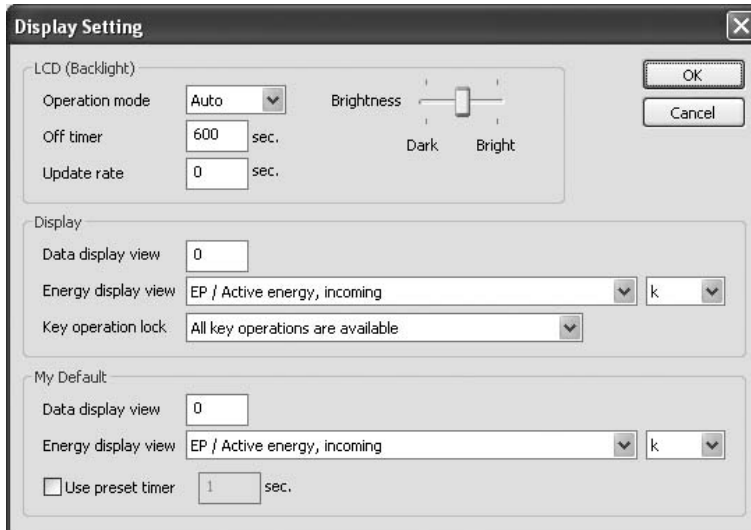
### Selection

---

Tariff	High tariff (peak time)
	Low tariff (off-peak time)

---

## 5.3 DISPLAY



### 5.3.1 LCD BACKLIGHT

#### OPERATION MODE

Specify when you want to maintain the backlight continuously on or not.

##### Selection

Auto	Backlight turns on when keys are touched, when an alarm is triggered, or in a system error status. After the device is operated, it automatically turns off after 'Off timer' time has been elapsed.
On	Continuously on.
Off	Continuously off except when an alarm is triggered or in a system error status.

#### OFF TIMER

Specify the time duration to maintain the backlight turned on after the device is operated.

##### Selection / Range

Off timer	1 to 999 seconds
-----------	------------------

#### UPDATE RATE

Specify the time rate in which measurands are updated on the display. With '0,' the display is updated in the maximum possible rate.

This setting is irrelevant for the display's flashing in case of alarms.

##### Selection / Range

Update rate	0 to 60 seconds
-------------	-----------------

#### BRIGHTNESS

Three levels of brightness can be selected using the sliding bar on the screen.

##### Selection

Left	Dark
Center	Normal
Right	Bright

### 5.3.2 DISPLAY

#### DATA DISPLAY VIEW

Specify which measuring variable you want to show on the 1st to 3rd line data displays. Enter the view number described in the flowchart in the 53U instruction manual (EM-6485-B).

#### ENERGY DISPLAY VIEW

Specify which energy variable you want to show on the 4th line energy display.

Selection	
Energy display view	EP / Active energy, incoming EQ / Reactive energy, lag ES / Apparent energy EP- / Active energy, outgoing EQ- / Reactive energy, lead EQ+LAG / Reactive energy, lag, incoming EQ+ LEAD / Reactive energy, lead, incoming EQ-LAG / Reactive energy, lag, outgoing EQ-LEAD / Reactive energy, lead, outgoing EQ+P / Reactive energy, incoming *1 EQ-P / Reactive energy, outgoing *1 EPA / Active energy, (incoming – outgoing) *1 EQA / Reactive energy, (incoming + outgoing) *1 TIMER / Energy count time
	L-EP / Active energy, incoming, off-peak (low tariff) L-EQ / Reactive energy, lag, off-peak (low tariff) L-ES / Apparent energy, off-peak (low tariff) L-EP- / Active energy, outgoing, off-peak (low tariff) L-EQ- / Reactive energy, lead, off-peak (low tariff) L-EQ+LAG / Reactive energy, lag, incoming, off-peak (low tariff) L-EQ+LEAD / Reactive energy, lead, incoming, off-peak (low tariff) L-EQ-LAG / Reactive energy, lag, outgoing, off-peak (low tariff) L-EQ-LEAD / Reactive energy, lead, outgoing, off-peak (low tariff) L-EQ+P / Reactive energy, incoming (low tariff) *1 L-EQ-P / Reactive energy, outgoing (low tariff) *1 L-EPA / Active energy, (incoming – outgoing) (low tariff) *1 L-EQA / Reactive energy, (incoming + outgoing) (low tariff) *1 L-TIMER / Energy count time, off-peak (low tariff)

\*1. Available for the 53U and 54U Firmware Ver.2.00 or later, and all versions of the 54UL and 54UC

Choose 'k' if you want to add 'k' to the engineering unit indication. When the energy count time is specified, the unit is fixed at 'h.'

#### KEY OPERATION LOCK

You can prohibit the device from unwanted operating and/or unauthorized programming changes.

Selection	
All key operations are available.	
All key operations are locked.	All keys locked except the operation to go to the infrared communication mode with the 54U, 54UL and 54UC.
Lock the key operation to go to Setting mode only	Key function to enter the programming mode (keep pressing E PRG key) is disabled. All other key operations to switch display views are available.

### 5.3.3 MY DEFAULT

You can choose a specific view to which the display always returns after a specified time while keys are untouched, or with single button control (hold down  $\Sigma$  button).

The  $\Sigma$  display automatically switches every 10 seconds from  $\Sigma 1$  through  $\Sigma 4$  (53U) or through  $\Sigma 6$  (54U) when this is set to '-1.' (Available for the 53U Firmware Ver.2.00 or later, all versions of the 54U, 54UL and 54UC)

#### DATA DISPLAY VIEW & ENERGY DISPLAY VIEW

Specify the display view No. and the energy display type you want to return to.

#### USE PRESET TIMER

When you choose this selection, you can specify the time to return to My Default view if key are untouched.

Selection / Range

---

Use preset timer                      1 to 999 seconds

---

### 5.4 PASSCODE

4-digit passcode is needed to enter the programming mode when you use the front keys. Type in 4-digit number once and twice for confirmation and click OK.



Selection / Range

---

Passcode                                      0000 to 9999

---

## 5.5 OTHER SETTINGS

### 5.5.1 INPUT

#### LOW-END CUTOUT (VOLTAGE & CURRENT)

Specify voltage/current low-end cutout values in %. Actual cutout voltage/current are calculated from the CT/VT's primary rating by the following equations:

Low-end cutout current = Setting in % x CT's primary rating

Low-end cutout voltage = Setting in % x VT's primary rating

When the input signal goes below the calculated values, '0' is supplied as the input, discarding the actual input signal. For the voltage, the setting is applied to Phase voltage (line-to-neutral) except for 3-phase/3-wire system, to Delta voltage (line-to-line).

#### FREQUENCY INPUT

Specify either voltage or current to monitor AC frequency.

Selection	
I1	I1 current
U1N	U1 voltage

### 5.5.2 ENERGY

#### ENABLE / DISABLE TARIFF FUNCTION

Specify to enable or disable the tariff switching function. When enabled, two energy counters are switchable at any specific timing.

Selection	
Tariff function	Disable
	Enable

### 5.5.3 CALCULATION METHOD

#### POWER FACTOR PF SIGN

Selection	
Standard (IEC)	Positive in incoming active power, Negative in outgoing active power.
IEEE	Positive in LAG (inductive), Negative in LEAD (capacitive)

#### REACTIVE POWER Q SIGN

Selection	
Standard (IEC)	Positive from [PF = 1.0] to 180° in LAG direction; Negative for the other direction.
Inverted when outgoing (Special)	Identical to IEC method in incoming power; Positive-negative inverted in outgoing power.

#### PHASE REACTIVE POWER Qn

Selection	
Standard (Vector S-P)	$Q_n = \sqrt{S_n^2 - P_n^2}$
Reactive power method (Sigma UI)	$Q_n = \frac{1}{N_{smp}} \sum_{i=1}^{N_{smp}} (U_{n_i} - U_{u_i}) I_{i+(N_{smp}/4)}$

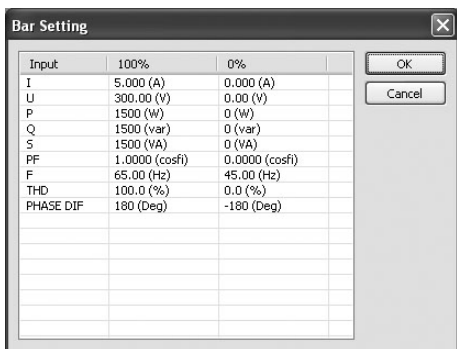
#### APPARENT POWER S

Selection	
Standard (Vector P+Q)	$S = \sqrt{P^2 + Q^2}$
Sum (S1+S2+S3)	$S = S1 + S2 + S3$

## 6. OPTION PARAMETERS

When you click various control buttons under 'Option' on the initial window of the 53UCFG, you can go to detailed setting.

### 6.1 EXTENSION BAR



This option is available for the 54U, 54UL and 54UC.

The measurand on the first line of the display is also on the bargraph. The following nine (9) parameters are selectable.

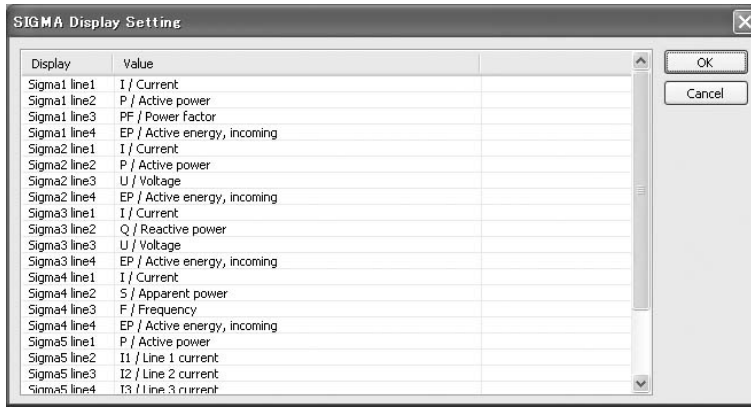
#### ■ EXTENSION BAR SETTING

ID	DEFINITION	100% RANGE VALUE		0% RANGE VALUE		UNIT
		MINIMUM	MAXIMUM	MINIMUM	MAXIMUM	
I	Current	0.000	20 000.000	0.000	20 000.000	A
U	Voltage	0.00	400 000.00	0.00	400 000.00	V
P	Active power	0	2 000 000 000	-2 000 000 000	2 000 000 000	W
Q	Reactive power	0	2 000 000 000	-2 000 000 000	2 000 000 000	var
S	Apparent power	0	2 000 000 000	0	2 000 000 000	VA
PF	Power factor	0.0000	1.0000	-1.0000	1.0000	cos $\phi$ *1
F	Frequency	45.00	65.00	45.00	65.00	Hz
THD	Total harmonic distortion	0.0	999.9	0.0	999.9	%
PHASE DIF	Phase angle between voltages	0	180	-180	180	$\phi$ *2

\*1. Indicated PF on the 53U

\*2. No unit indication on the module

## 6.2 Σ DISPLAY



This option is available for the 53U Firmware Ver.2.00 or later, and all versions of the 54U, 54UL and 54UC.

### 53U

#### ■ 53U : Σ VIEW MEASURANDS & SELECTABLE POSITIONS (lines, X = selectable)

ID	PARAMETER	UNIT	LINE 1	LINE 2	LINE 3
NULL	Undefined	----	X	X	X
I	Current	A	X		
U	Voltage	V			X
P	Active power	W		X	
Q	Reactive power	var		X	
S	Apparent power	VA		X	
PF	Power factor	PF			X
F	Frequency	Hz			X

Four (4) Σ views are available. The following options are selectable for Line 1 through Line 3 of each view.

### 54U, 54UL and 54UC

Six (6) Σ views are available. The following options are freely selectable for Line 1 through Line 3 of each view.

Energy and Count Time is selectable for only Line 4.



■ 54U, 54UL and 54UC :  $\Sigma$  VIEW MEASURANDS

ID	PARAMETER
NULL	Undefined
I	Current
U	Voltage
P	Active power
Q	Reactive power
S	Apparent power
PF	Power factor
F	Frequency
I1	Current, Line 1
I2	Current, Line 2
I3	Current, Line 3
IN	Current, Neutral *1
U12	Delta voltage, 1 – 2
U23	Delta voltage, 2 – 3
U31	Delta voltage, 3 – 1
U1N	Phase voltage, Phase 1
U2N	Phase voltage, Phase 2
U3N	Phase voltage, Phase 3
P1	Active power, Phase 1
P2	Active power, Phase 2
P3	Active power, Phase 3
Q1	Reactive power, Phase 1
Q2	Reactive power, Phase 2
Q3	Reactive power, Phase 3
S1	Apparent power, Phase 1
S2	Apparent power, Phase 2
S3	Apparent power, Phase 3
PF1	Power factor, Phase 1
PF2	Power factor, Phase 2
PF3	Power factor, Phase 3
THDI1	Current total harmonic distortion, Line 1
THDI2	Current total harmonic distortion, Line 2
THDI3	Current total harmonic distortion, Line 3
THDIN	Total harmonic distortion, Neutral *1
THDU12	Delta voltage total harmonic distortion, 1 – 2
THDU23	Delta voltage total harmonic distortion, 2 – 3
THDU31	Delta voltage total harmonic distortion, 3 – 1
THDU1N	Phase voltage total harmonic distortion, Phase 1
THDU2N	Phase voltage total harmonic distortion, Phase 2
THDU3N	Phase voltage total harmonic distortion, Phase 3
UT12	Phase angle between Phase 1 – 2 voltages
UT23	Phase angle between Phase 2 – 3 voltages
UT31	Phase angle between Phase 3 – 1 voltages
EP	Active energy, high tariff, incoming
EQ	Reactive energy, high tariff, LAG
ES	Apparent energy, high tariff
EP–	Active energy, high tariff, outgoing
EQ–	Reactive energy, high tariff, LEAD
EQ+LAG	Reactive energy, high tariff, incoming, LAG
EQ+LEAD	Reactive energy, high tariff, incoming, LEAD
EQ–LAG	Reactive energy, high tariff, outgoing, LAG
EQ–LEAD	Reactive energy, high tariff, outgoing, LEAD
TIMER	Energy count time, high tariff
L-EP	Active energy, low tariff, incoming
L-EQ	Reactive energy, low tariff, LAG
L-ES	Apparent energy, low tariff
L-EP–	Active energy, low tariff, outgoing
L-EQ–	Reactive energy, low tariff, LEAD
L-EQ+LAG	Reactive energy, low tariff, incoming, LAG
L-EQ+LEAD	Reactive energy, low tariff, incoming, LEAD
L-EQ–LAG	Reactive energy, low tariff, outgoing, LAG
L-EQ–LEAD	Reactive energy, low tariff, outgoing, LEAD
L-TIMER	Energy count time, low tariff

ID	PARAMETER
EQ+P	Reactive energy, high tariff, incoming *2
EQ-P	Reactive energy, high tariff, ongoing *2
EPA	Active energy, high tariff, (incoming – outgoing) *2
EQA	Reactive energy, high tariff, (incoming + outgoing) *2
L-EQ+P	Reactive energy, low tariff, incoming *2
L-EQ-P	Reactive energy, low tariff, outgoing *2
L-EPA	Active energy, low tariff, (incoming – outgoing) *2
L-EQA	Reactive energy, low tariff, (incoming + outgoing) *2

\*1. Available for the 54U-2, 54UL-2 and 54UC-2

\*2. Available for the 54U Firmware Ver.2.00 or later, and all versions of the 54UL and 54UC

### 6.3 DISPLAY



#### INPUT LINE INDICATION

Selection

1 - 2 - 3	<i>1R-2S</i> <i>1R-2S</i>
	<i>2S-3T</i> <i>2S-3T</i>
	<i>3T-1R</i> <i>3T-1R</i>
R - S - T	<i>1R-2S</i> <b><i>1R-2S</i></b>
	<i>2S-3T</i> <b><i>2S-3T</i></b>
	<i>3T-1R</i> <b><i>3T-1R</i></b>

#### PHASE DIRECTION INDICATION

Selection

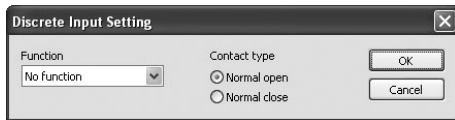
inductive / capacitive	<i>cap</i> <i>cap</i>
	<i>ind</i> <i>ind</i>
	<i>LEAG</i> <i>LEAG</i>
LAG / LEAD	<i>cap</i> <i>cap</i>
	<i>ind</i> <i>ind</i>
	<b><i>LEAG</i></b> <b><i>LEAD</i></b>

#### POWER FORMAT

Selection

Use k if power <= 9999	0.0000k ... 9.999k
No use k if power <= 9999	0 ... 9999 (10.00k at 10 000)

## 6.4 DISCRETE INPUT



### FUNCTION

Specify which function you want to assign for the device's discrete input terminals.

Selection

---

No function                      Undefined

---

Update demand value

---

Reset energy count

---

Reset alarm

---

Switch tariff

### CONTACT TYPE

Selection

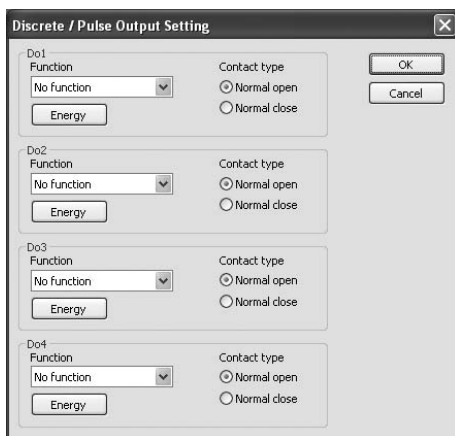
---

Normal open

---

Normal closed

## 6.5 DISCRETE OUTPUT



### FUNCTION

Specify which function you want to assign for the device's discrete output terminals Do 1 ... Do 4. You cannot assign those which are not provided as hardware.

Selection

---

No function                      Undefined

---

Energy count

---

Alarm status

### CONTACT TYPE

Selection

---

Normal open

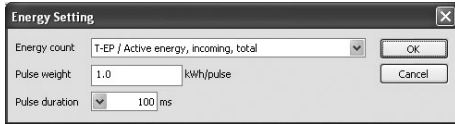
---

Normal closed

### ENERGY DETAIL

Clicking [Energy] button opens detailed energy setting window. (See Section 6.6)

## 6.6 ENERGY



Define energy count parameters for pulse output. In order to have an energy count output, be sure to set 'Discrete output function' to 'Energy count' as explained in Section 6.5.

### ENERGY COUNT

Specify which energy parameter you want to supply to the pulse count output. Choose from the tables below and in the following page.

#### PULSE WEIGHT

Specify how much energy value corresponds to one pulse.

Selection / Range	
Pulse weight	0.1 to 10000.0 k (Wh/varh/VAh)

#### PULSE DURATION

Specify the output pulse width appropriate for a receiving instrument.

Selection / Range	
Pulse duration	100 to 2000 milliseconds (in 100 msec. increments)

#### ■ 53U Firmware Ver.1.02 or earlier & 54U Firmware Ver.1.03 or earlier : ENERGY COUNT

ID	PARAMETER
EP	Active energy, incoming
EQ	Reactive energy, LAG
ES	Apparent energy
EP-	Active energy, outgoing
EQ-	Reactive energy, LEAD
EQ+LAG	Reactive energy, incoming, LAG
EQ+LEAD	Reactive energy, incoming, LEAD
EQ-LAG	Reactive energy, outgoing, LAG
EQ-LEAD	Reactive energy, outgoing, LEAD

■ 53U Firmware Ver.2.00 or later, 54U Firmware Ver.2.00 or later, and all versions of 54UL and 54UC : ENERGY COUNT

ID	PARAMETER
T-EP	Active energy, incoming
T-EQ	Reactive energy, LAG
T-ES	Apparent energy
T-EP-	Active energy, outgoing
T-EQ-	Reactive energy, LEAD
T-EQ+LAG T-EQ+LEAD	Reactive energy, incoming, LAG Reactive energy, incoming, LEAD
T-EQ-LAG T-EQ-LEAD	Reactive energy, outgoing, LAG Reactive energy, outgoing, LEAD
T-EQ+P T-EQ-P	Reactive energy, incoming Reactive energy, outgoing
T-EPA	Active energy, (incoming – outgoing)
T-EQA	Reactive energy, (incoming + outgoing)
EP	Active energy, high tariff, incoming
EQ	Reactive energy, high tariff, LAG
ES	Apparent energy, high tariff
EP-	Active energy, high tariff, outgoing
EQ-	Reactive energy, high tariff, LEAD
EQ+LAG EQ+LEAD	Reactive energy, high tariff, incoming, LAG Reactive energy, high tariff, incoming, LEAD
EQ-LAG EQ-LEAD	Reactive energy, high tariff, outgoing, LAG Reactive energy, high tariff, outgoing, LEAD
EQ+P EQ-P	Reactive energy, high tariff, incoming Reactive energy, high tariff, outgoing
EPA	Active energy, high tariff, (incoming – outgoing)
EQA	Reactive energy, high tariff, (incoming + outgoing)
L-EP	Active energy, low tariff, incomin
L-EQ	Reactive energy, low tariff, LAG
L-ES	Apparent energy, low tariff
L-EP-	Active energy, low tariff, outgoing
L-EQ-	Reactive energy, low tariff, LEAD
L-EQ+LAG L-EQ+LEAD	Reactive energy, low tariff, incoming, LAG Reactive energy, low tariff, incoming, LEAD
L-EQ-LAG L-EQ-LEAD	Reactive energy, low tariff, outgoing, LAG Reactive energy, low tariff, outgoing, LEAD
L-EQ+P L-EQ-P	Reactive energy, low tariff, incoming Reactive energy, low tariff, outgoing
L-EPA	Active energy, low tariff, (incoming – outgoing)
L-EQA	Reactive energy, low tariff, (incoming + outgoing)

## 6.7 ANALOG OUTPUT

Specify which function you want to assign for the device's analog output terminals Ao 1 ... Ao 4. You cannot assign those which are not provided as hardware.

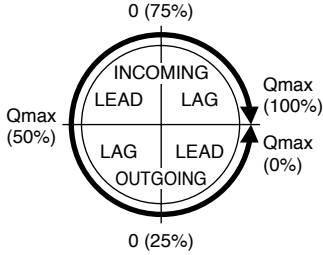
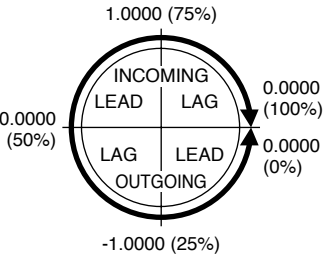
You can conduct fine adjustments, set scaling and linearization table for each assigned output.

### INPUT

Choose measurand from the table below.

#### ■ PARAMETERS TO BE ASSIGNED TO ANALOG OUTPUTS

ID	DEFINITION	RANGE (0 to 100%)
NO ASSIGN	Not assigned *2	
I	Current	0 to CT primary rating
U	Voltage	0 to VT primary rating
P	Active power	$\pm$ (VT primary rating $\times$ CT primary rating $\times$ n) *1
Q	Reactive power	$\pm$ (VT primary rating $\times$ CT primary rating $\times$ n) *1
S	Apparent power	0 to (VT primary rating $\times$ CT primary rating $\times$ n) *1
PF	Power factor	-1.0000 to + 1.0000
F	Frequency	45.00 to 65.00
I1	Current, Line 1	0 to CT primary rating
I2	Current, Line 2	0 to CT primary rating
I3	Current, Line 3	0 to CT primary rating
IN *3	Neutral current	0 to CT primary rating
U12	Delta voltage, Line 1 – 2	0 to VT primary rating
U23	Delta voltage, Line 2 – 3	0 to VT primary rating
U31	Delta voltage, Line 3 – 1	0 to VT primary rating
U1N	Phase voltage, Phase 1	0 to VT primary rating
U2N	Phase voltage, Phase 2	0 to VT primary rating
U3N	Phase voltage, Phase 3	0 to VT primary rating
P1	Active power, Phase 1	$\pm$ (VT primary rating $\times$ CT primary rating $\times$ n) *1
P2	Active power, Phase 2	$\pm$ (VT primary rating $\times$ CT primary rating $\times$ n) *1
P3	Active power, Phase 3	$\pm$ (VT primary rating $\times$ CT primary rating $\times$ n) *1
Q1	Reactive power, Phase 1	$\pm$ (VT primary rating $\times$ CT primary rating $\times$ n) *1
Q2	Reactive power, Phase 2	$\pm$ (VT primary rating $\times$ CT primary rating $\times$ n) *1
Q3	Reactive power, Phase 3	$\pm$ (VT primary rating $\times$ CT primary rating $\times$ n) *1
S1	Apparent power, Phase 1	0 to (VT primary rating $\times$ CT primary rating $\times$ n) *1
S2	Apparent power, Phase 2	0 to (VT primary rating $\times$ CT primary rating $\times$ n) *1
S3	Apparent power, Phase 3	0 to (VT primary rating $\times$ CT primary rating $\times$ n) *1
PF1	Power factor, Phase 1	-1.0000 to + 1.0000
PF2	Power factor, Phase 2	-1.0000 to + 1.0000
PF3	Power factor, Phase 3	-1.0000 to + 1.0000

ID	DEFINITION	RANGE (0 to 100%)
THDI1	THD, Current, Line 1	0.0 to 100.0
THDI2	THD, Current, Line 2	0.0 to 100.0
THDI3	THD, Current, Line 3	0.0 to 100.0
THDIN *3	THD, Neutral current	0.0 to 100.0
THDU12	THD, Delta voltage, Line 1 – 2	0.0 to 100.0
THDU23	THD, Delta voltage, Line 2 – 3	0.0 to 100.0
THDU31	THD, Delta voltage, Line 3 – 1	0.0 to 100.0
THDU1N	THD, Phase voltage, Phase 1	0.0 to 100.0
THDU2N	THD, Phase voltage, Phase 2	0.0 to 100.0
THDU3N	THD, Phase voltage, Phase 3	0.0 to 100.0
T-Q	Reactive power for bidirectional current	$Q_{max} = (CT \text{ primary rating}) \times (VT \text{ primary rating}) \times n$ *1 
T-PF	Power factor for bidirectional current	

\*1. Single-phase/2-wire:  $n = 1$ , Single-phase/3-wire:  $n = 2$ , Three-phase/3-wire:  $n = 3 / \sqrt{3}$ , Three-phase/4-wire:  $n = 3$

\*2. When an output is re-assigned to 'Not Assigned' during measuring, the output value is held until the power supply is turned off.

\*3. Available for the 53U Firmware Ver.2.00 or later, and all versions of the 54U-2, 54UL-2 and 54UC-2

## ADJUST ZERO / ADJUST SPAN

Analog output can be finely calibrated using Adjust Zero and Adjust Span by the following equation:

$$\text{Analog Output} = (\text{Output Value} - \text{Analog 0\%}) \times \text{Adjust Fine} + \text{Analog 0\%} + [\text{Adjust Zero} \times (\text{Analog 100\%} - \text{Analog 0\%})]$$

Where

Analog 0% = 4mA or 1V

Analog 100% = 20mA or 5V

Adjust Zero, Adjust Span 100.00% = 1.0000

Zero is adjustable within  $\pm 5\%$ , while Span is adjustable from 95.00 to 105.00%.

## LINEARIZER

Specify whether the output is proportional to the input or to be linearized. When 'Table' is selected, the segment data is specified with Table X[0] ... Table X[9] and Table Y[0] ... Table Y[9].

Selection / Range	
Linear	Proportional to the input
Table	Linearized output

## INPUT 0% / OUTPUT 0% / INPUT 100% / OUTPUT 100%

When 'Linear' is selected with 'Linearizer,' the output range is scaled using these parameters.

$$\text{Output} = \frac{\text{Input} - \text{Input 0\%}}{\text{Input 100\%} - \text{Input 0\%}} \times (\text{Output 100\%} - \text{Output 0\%}) + \text{Output 0\%}$$

[Note] Input value in engineering unit is first converted into percentage of the full-scale range before provided to the above equation.

Input 0% and Input 100% are selectable from -15.00 to 140.00%.

Output 0% and Output 100% is selectable from 1.60 to 22.40mA (4 to 20 mA range), or from 0.400 to 5.600V (1 to 5V range).

## TABLE X[0] ... TABLE X[9] / TABLE Y[0] ... TABLE Y[9]

When 'Table' is selected with 'Linearizer,' the segment data table must be set.

Table consists of ten (10) pairs of X (input) and Y (output) values. When the input is equal to X[n], Y[n] is provided as output.

When the input is between X[n-1] and X[n], the output is provided by the following equation.

$$\text{Output} = \frac{\text{Input} - \text{Table X}[n-1]}{\text{Table X}[n] - \text{Table X}[n-1]} \times (\text{Table Y}[n] - \text{Table Y}[n-1]) + \text{Table Y}[n-1]$$

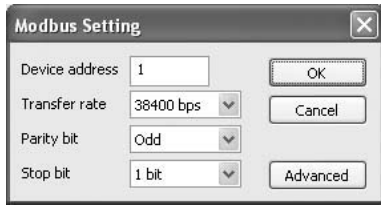
[Note] Input value in engineering unit is first converted into percentage of the full-scale range before provided to the above equation.

Segment data must be arranged in ascending order, i.e. X[n] must be greater than X[n-1]. For example, if you have set X[7] smaller than X[6], Table X[7] and later values are not used. Linearization is complete with data from X[0] to X[6].

When the input value is lower than X[0], the output equals Y[0]. When the input is higher than X[max], the output equals Y[max].



## 6.8 MODBUS



Modbus communication parameters are applied only when the device is restarted (power is turned off and on). Only 'downloading' modified parameters does not affect the device operation.

### DEVICE ADDRESS

Selection / Range

---

Device address	1 to 247
----------------	----------

---

### TRANSFER RATE

Selection / Range

---

Transfer rate	1200 bps
	2400 bps
	4800 bps
	9600 bps
	19200 bps
	38400 bps

---

### PARITY BIT

Selection / Range

---

Parity bit	None
	Odd
	Even

---

### STOP BIT

Selection / Range

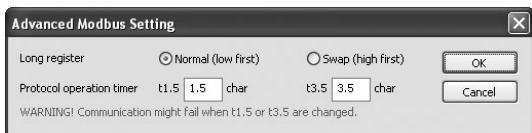
---

Stop bit	1 bit
	2 bit

---

Click [Advanced] button to go to 'Advanced Modbus Setting' (See 6.9).

## 6.9 ADVANCED MODBUS SETTING



### LONG REGISTER (32-bit words assignments)

Specify the order of lower digits and higher digits in sending a 32-bit word data.

Selection

Normal (low first)	Lower digit word assigned to the lower address
Swap (high first)	Higher digit word assigned to the lower address

### PROTOCOL OPERATION TIMER

Specify the character length for t1.5 and t3.5 timers. Modbus defines t1.5 timer as 1.5 character, and t3.5 timer as 3.5 character. These settings should not be changed in normal circumstances. Change these settings only upon M-System customer support's suggestion.

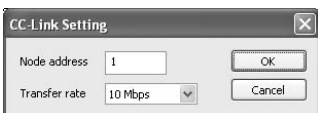
Selection / Range

t1.5	0.1 to 6.0 characters
t3.5	0.1 to 6.0 characters

#### Caution !

Modbus communication parameters are applied only when the device is restarted (power is turned off and on). Only 'downloading' modified parameters does not affect the device operation.

## 6.10 CC-Link



CC-Link communication parameters are applied only when the device is restarted (power is turned off and on). Only 'downloading' modified parameters does not affect the device operation.

### NODE ADDRESS

Selection / Range

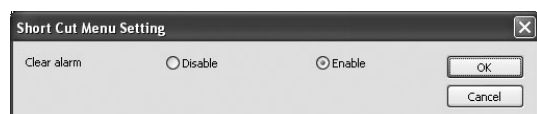
Node address	1 to 64
--------------	---------

### TRANSFER RATE

Selection / Range

Transfer rate	156 kbps
	625 kbps
	2.5 Mbps
	5 Mbps
	10 Mbps

## 6.11 SHORT CUT



Specify either you want to use the shortcut command to reset alarms.



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Specifications are subject to change without notice.

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