INSTRUCTION MANUAL FOR ULTRASONIC/MICROWAVE SENSORS

1)**Install "PROBE_GatewayPC Software" on PC.**Remove previous installation. In Windows Control Panel go to the Programs and Features, select Probe_GatewayPC_Net and remove it. Select SETUP.EXE from installation media and follow instruction on the screen. PC user should have Administrator rights. Do not change the default installation folders.

2)On **MS Windows** PC click on **START button**, **ALL PROGRAMS**, and select **"Probe_GatewayPC_Net"** and click on **Probe_GatewayPC_Net** execution file (or use shortcut icon on the Desktop).

3)Click on **Stop Data Link** and on **Select_Com_Port** and choose from small window and save your serial communication port, next time you start Probe_GatewayPC you don't have to go through this stage.

4)**Select "Start Data Link"**, please wait about 25 seconds to get the communication, program goes through 9600 and 19200 Baud Rates to select one in use. You will see two bar graphs, displaying the last 8 echoes & tank level. When PC is connected to ultrasonic level device, the application header displays: Ultrasonic Sensor ID=2. For PC connected to the Radar the application header displays: Radar ID=2, range, pipe on/off status, pipe diameter and **Low Dielectric** status (for low dielectric materials it has to be ON, for more details go to 24). **Traffic icon** at the screen bottom indicates communication status to the level device.

5)**ShowCalibData** screen displays all calibration parameters. Click on the 4mA/20mA distance to display the distances in the metric units. All calibration parameters can be saved in any directory under any name in MS Excel format.

6)By selecting **"Diagnostic"** the screen displays all information on sensor "errors". Unhappy face icon at the screen bottom indicates sensor error.

7)**Temp. Sensor** shows temperature of environment (ultrasonic only)and it is only used to compensate temperature influence on the speed of sound.

8)**Echo Chart** displays information on automatic adjustment of power and gain of our level devices. Our devices monitor environmental conditions and adjust power and gain for optimal performance.

9)**Echo Profile** displays profiles of microwave and ultrasonic sensors. NOTE- when using this feature the sensor is not in the measurement mode. To return to the measurement mode exit the echo profile (select x in top right screen corner). Wait until you get the Data Link OK

(green light on the Probe Status LED). On the “echo profile” you will see a marker where the software picks up an echo and distance to a target. To change target for different measurement, exit profile screen, wait for updated data, and go to the echo profile again. The marker will pick up a new target. Freeze screen and select any point on the graph by clicking mouse to display the distance to selected target. 'Save to file' command saves the profile to PROBE_PROFILE file in C:\LEVEL\um_probe\ folder.

10)**Select AutoScan** (only for network) to collect data for all sensors connected in the network. Scanning time can be chosen from 5sec to 20sec. Other functions are disabled in Auto Scan mode.

11)**Download** allows downloading to ultrasonic and microwave sensors a new firmware (.hex file).

11a)Downloading using **Probe_GatewayPC**:
1) Copy .hex file to C:\ directory
2) Open Probe_Gateway PC and get communication with the level device
3) Click on Download button and select file .hex from the C drive directory, highlight that file and click on Start Download
4) Wait to the end of download.

If something happens during the download so the process was interrupted, turn off the radar(ultrasonic) and before you turn it on press and hold the push button. The light should be red. Close **Probe_GatewayPC** program and open **DownloadToPIC,** choose your com port and download the file from there (follow instruction written below).

11b)Downloading using **DownloadToPIC**:
1) Copy .hex file to C:\ directory
2) Turn the radar(ultrasonic) off.
3) Before you turn it on, push and hold the push-button during turning On.
4) The light on the unit will go to RED.
5) Open DownloadToPIC.Exe (it is one of the files in the communication package)
6) Specify your com port.
7) Select and highlight the .hex file and click on **Start Download**
8) Wait to the end of the downloading.
9) Close the program and go to Probe_GatewayPC.

12)**SensorStatusMonitoring** function displays status of selected sensor. Push **Update_all** command button to display status of all sensors in network. Traffic icon green/red light indicates communication status. All other function are disabled in this mode.

13)In **File Select**
a) **DataLogging in Excel format** (default is ON) in FILE menu to collect history data for current and temperature in MS Excel format. Directory for data collection: C:\LEVEL\um_probe\GATEWAYPC\DATA\yyyy mm

dd\sensorID\ Data is collected for each sensor ID. The current is collected in 1 hour data files and temperature is collected in 24 hours data files. Use the chart wizard in MS Excel to create the graph and view current and temperature data. The current data is collected every 0.5 second and temperature is collected every 1 minute.

b) **"Profile Logging"**to store profile every 1 minute, so wait at least 1 min to get first profile. Execute Profile Viewer.exe to view stored history profiles. Profiles are stored in MS Excel format in C:\LEVEL\um_probe\GATEWAYPC\LOG\year_month_day\sensorID\ directory.

c) **"Send Mail"** options to send the probe profile by Email. Obtain the SMTP Mail server address, SMTP Mail Port number and SMTP Mail SSL Encryption option from
the Internet Provider. Send Mail example:

smtp mail server address:	smtp.mail.yahoo.com
smtp mail port:	25
SSL Encryption:	NO
USER ID/Account:	user internet account
USER password:	user internet password
sender address:	user@yahoo.com
send to:	target@yahoo.com

14)**Set-up your PC for Ethernet** connection with ultrasonic and microwave level devices using RS232 or RS485 Ethernet adaptors. All adaptors provided by Manufacturer have a set-up to communicate with Probe_GatewayPC communication program. To set-up a PC with Windows to communicate through the Ethernet one needs as follows:
a) Open Control Panel,
b) Click on Network Connection,
c) Click on Local Area Connection, with mouse right button go to Properties,
d) Click on Internet Protocol TCP/IP,
e) Use the following IP Address: 169.254.240.118
f) Subnet mask: 255.255.0.0
g) Safe the set-up.
f) Start Probe_GatewayPC, click on **Start Data Link**, click on **Tools**, click on **Select Data Protocol**, click on TCP/IP.

15)To do **4mA and 20mA Programmable Calibration** (use a target at a distance longer than minimum distance), go to Tools and click on 4mA/20mA Distance Calib., go through the first message (4mA/20mA distance calib.?) by clicking OK, put the calibration values and click OK, wait for the confirmation. In case of the Mini ultrasonic both calibration points control high or low level alarm relay (20mA is high level alarm, 4mA is low level alarm). Click on Metric System in case of calibration in m. and cm.. Zero distance (reference point for ultrasonic is at the ultrasonic transducer face, for radar it is at the beginning of the mounting thread from antenna side.

16)**Fix point Calibration** (the same as using the sensor calibration **Push Button**) it is in the top left corner of the screen. 20mA Calib.

is for 20mA calibration, 4mA Calib. is for 4mA calibration. In this calibration a target has to be used at two locations to simulate full or empty tank fix point calibration (programmable calibration is recommended for longer distances, go to point 15). Zero distance (reference point for ultrasonic is at the ultrasonic transducer face, for radar it is at the beginning of the mounting thread from antenna side). For radar use metal flat target, for ultrasonic use any flat target.

17)In case of Probe_GatewayPC5.0 and higher **MINI ultrasonic level** device application is started by selecting "MINI_PROBE" from **"APPLICATIONS"** menu item. To get to Tools click on mini_probe_tools. In Tools Relay ON Set point is used to change relay ON and OFF states difference (hysteresis) using a percent of span between 4mA and 20mA (default is 5%, for example choosing 100% gives On at 20mA and OFF at 4mA). The high or low level alarm (Select Alarm)is set by 20mA or 4mA calibration, this can be done using communication (click on Select Alarm) or push button (press it and hold it until the light goes off, continuous green light means 20mA is alarm set point, blinking green light means 4mA is alarm set point.

18)**Modbus RTU** protocol, in Tools of Probe_GatewayPC click on Select Data Link Protocol and select Modbus RTU, wait for confirmation. For MODBUS RTU use the Holding Register addresses as follows:

- 79 Ultrasonic Probe echo timer
- 108 Microwave Probe echo timer
- 100 4 mA calibration timer
- 96 20 mA calibration timer
- 309 current in mA for Radar and Ultrasonic, top of oil for oil-water interface detector (*100 factor)
- 322 distance in inches for Ultrasonic (*100 factor)
- 324 distance in inches for Radar, top of oil for oil-water interface detector (*100 factor)
- 328 current in mA oil-water interface for oil-water interface detector (*100 factor)
- 329 current in mA for Mini ultrasonic (*100 factor)
- 330 distance in inches oil-water interface for oil-water interface detector (*100 factor)
- 342 distance in inches for Mini ultrasonic (*100 factor)

In many **PLCs** decimal 1 is added to the above registers' addresses and decimal 40 in front, for example **40325** is register **324**

19)In Tools **Read Sensor ID**, reads sensor's ID for single device communication.

20)In Tools **Add New Sensor** (for network configuration), choose new ID and click OK, for network use 4 and higher number, don't use number 3, ID is 2 for a single sensor (manufacture default).

21)In Tools **Remove Sensor ID,** choose sensor ID to be removed and click OK.

22)Program new sensor ID, first click on **SelectSensor_ID** (click on new ID number to get blue background !) and then click on **Fix Sensor ID** (in Tools), in Fix Sensor ID window put old ID to remove Old ID,click OK.

23)For low dielectric materials such as oils and other non-conductive materials turn on in Tools **Low Dielectric Materials**, this parameter is for microwave only.

24)**Select PIPE ON in Tools for microwave** propagation in metal pipes, after that click on Select Pipe Diameter in Tools to choose proper diameter of metal pipe.

25)**Window out** for ultrasonic and microwave sensors, in case of unwanted reflections this procedure can be used. Make sure that the sensor is in fast response mode (Damping OFF).
Before using the Window Out procedure programmable calibration on full and empty tank is recommended. To use the procedure follow this:
a. go to Echo Profile and click on Clear WindowOut,
b. click on Freeze/Update/Window Out,
c. using mouse click on a point before (left to) unwanted echo and then on **WindowOutMin**,
d. using mouse click on a point after (right to) the unwanted echo and then on **WindowOutMax**,
e. close the Echo Profile and wait in the Main program for a message WindowOut calibration done,
f. to activate the Window Out procedure go to Tools and click on Window Out and wait for the conformation. For the first time users of this procedure a contact with technical support group is recommended.

26)**20mA Blanking** used for ultrasonic and microwave level devices. Using 20mA or 4mA programmable full tank calibration select distance to sensors that covers any unwanted echoes which are closer than full tank calibration. Allow for the microwave about 5inch margins (all echoes that are at shorter distance than full tank calibration – 5inch will be ignored). To activate this go to Tools and click on 20mA Blanking and wait for the conformation. In case of microwave click also on Low Dielectric Material and it has to be ON. Don't use this feature with push button calibration!!! **Do not use for Radar when Power coef. is 40**.

27)**Set Loss of Echo Time,** this feature is for ultrasonic and microwave level devices. To program loss of echo time go to Tools and click on Set Loss of Echo Time, after that specify the loss of echo time between 1 and (3)4 minutes and wait for the conformation. 0 min disables Loss of Echo (No Loss of Echo) in ultrasonic and microwave level devices. .

28)**Select 22mA or 2mA loss of echo** is available in Tools for both ultrasonic and microwave devices, the default value is 22mA.

29)**Damping** is used for the ultrasonic and microwave level devices. In case of waves or turbulences on liquids increase the damping time, do it gradually until results are stable. Longer damping time is also required for solids. Damping slows down the sensor response, do not use it for small tanks with fast rate of liquid change. Sensor's response is the fastest with Damping OFF (in Tools).

30)**Solid Material/Liquid Materials** is used for the ultrasonic sensor. This feature is very useful for tanks with very high water condensation, dust and noise. It stimulates the ultrasonic transducers with very high energy pulses to provide extra cleaning to the transducers faces and high transmit pulse for dust penetration. To activate it go to Tools and click on Solid Material/Liquid Materials. In case of dusty applications choose Burst Power high (equal to 100), for liquid applications in narrow and tall tanks choose Burst Power low (about 3).

31)**Vaporized Liquid High Power** is used to turn on hardware option to generate high-power pulses in liquid applications with steam. It is used to provide extra cleaning to the transducers faces and compensate for high attenuation of the ultrasonic wave. To activate this go to Tools and click on both Solid Material/Liquid Materials and Vaporized Liquid High Power.

32)**Select Burst Power** this is activated by Solid Material/Liquid Materials and it is used to change the transmit pulse width (in microseconds). Use 100 for solid materials.

33)**Filter Size** is used to change the filter width for ultrasonic probe. The filter width defines the range of allowed noise. The echo timer is ignored if it is out of defined filter range. The default filter width is 40inch, choose about 10% of tank's height. In case of solid materials and short tanks use 1 to 3 Filter Size.

34)Selection in Tools of **6" or 8" Antenna Extension** is used in case of radar with the antenna extensions to pass metal standpipes.

35)In Tools **Disable/Enable Calib.** can enable or disable **Push Button** on radar and ultrasonic (except Mini).

36)In Tools **Oil Dielectric Constant** is used in oil-water interface mode which needs a special software that is available, for more details go to 42. Click on Oil Dielectric Constant and select value of it to get the right reading.

37)In Tools when using a special software for **Oil-Water Interface**, click on **Oil App Tuning** and choose at least 20 for a proper operation. This parameter controls the time between reading the oil top and the oil-water interface, for more details go to 42.

38) In Tools when ultrasonic sensor is **installed in the middle of the dome shape tank which creates multiply reflections**, please turn On in Tools **Solid Material/Liquid Materials and Vaporized Liquid High Power, chose also Filter With.**

39)In Tools **Power coef**. is used to increase power of the radar which can help in case of **multiply reflections** and unwanted echoes from oil-water and oil-tank bottom interfaces, this feature is recommended with Low Dielectric Material ON and 20mA Blanking is OFF. **The Power coef. equal to 40 turns on the logic to handle roof reflection problem and oil-water separation false echo.**

40)In Tools **Distance to Target** is used for solid materials during start-up when radar doesn't receive any echoes. Click on this parameter and put a distance from the radar mounting thread to surface of solid material. Radar will display that distance until valid echoes will be received, Probe Software Rev. 14 or 17 is required (find it in **ShowCaliData**).

41)In Tools **Select Data Link Speed** selects two Baud Rates 9600 or 19.2K for communication with level sensors. After speed selection click on Stop Data Link, and close the communication program and re-start it again.

42)In **Applications** there are the following options: **Oil Application, Mini Probe** (described in point 17), **BASE_TANK_Farm and CUSTOM_TANK_Farm.**

a) **Oil Application,** select it when Oil-water interface is downloaded to the radar and please follow the instruction:
1) In Tools do 4mA and 20mA calibration.
2) Click on Applications and choose **Oil Application.**
3) You get displayed on the screen: Oil Thickness, first value is the timer, second is the thickness in Inches, plus you get Oil Dielectric Constant display.
4) Click on Tools and choose **Oil Dielectric Constant**, enter value for dielectric constant of oil (clean oil is about 2, crude one about 3 or 4)
5) Click on Send to Probe, wait for the conformation and Exit this feature.
6) Click Stop Data Link and close completely GatewayPC.
7) Open again the GatewayPC and repeat point 2.
8) In Tools click on **Oil App Tuning**, choose about 20sec.
9) You will get on the screen two current values, one from the oil top and another one from oil-water interface, the hardware current from the radar will display the same two values. The current output will alternate between top of oil and oil-water interface every 20sec (this time is set up by OIL App Tuning).

b) **BASE_TANK_Farm**, select it when a tank graphical display is required, choose your tank shape (rectangular tank with cone bottom is Tank 8), click on Build Custom Tank, fill out Tank Data, Tank ID is the one selected in ProbeGatewayPC_Net. Empty Tank Calibration (4mA is commonly used) has to be equal to TANK HEIGHT. After that click on Save, this will be saved and it will be listed on **CUSTOM_TANK_Farm** by Tank's Name and ID and displayed as bar graphs. Next to each bar graph, level in %, material name, tank's free space and distance from sensor to material surface are also displayed. A tank will be fully displayed by clicking on tank list. Clicking once on a tank in tank list with Auto Scan off updates a tank's measurement. In CUSTOM_TANK_Farm the Delete Tank button is used to delete the tank from the user data base.

43)**Factory Settings** option consists of a list of programmable parameters that are used by Manufacturer only. Please contact Technical Support for further information. These parameters are only used to fix defective sensor.

44)**High and Low Alarms** set-up. HIGH ALARM is used for high level of materials, LOW ALARM is used for low level of materials. When these alarms are activated, blinking screen and audio sound of a PC will be ON. To program On and OFF points of these alarms please click on HIGH ALARM and LOW ALARM, put in distances in inches or meters from sensors (for radar is mounting thread, for ultrasonic is transducer face) to a material level. When material level riches these points the alarms will be ON or OFF.
HIGH ALARM is activated for distances equal or shorter than ON point.
HIGH ALARM is deactivated for distances equal or longer than OFF point.
LOW ALARM is activated for distances equal or longer than ON point.
LOW ALARM is deactivated for distances equal or shorter than OFF point.
To enable alarm click on **Enable Alarm**, to disable alarm click on **Disable Alarm**.
To silence audio sound click on **Silence ON**, to turn on audio sound click on **Silence OFF**.
When material level is above the alarm ON point, clicking on Disable Alarm or Silence ON will not change the red colour of the bar graph (alarm state) in Custom_Tank_Farm into the blue colour (non-alarm state). Only material level below alarm OFF point will change the red colour of the bar graph into blue colour.

45. **To make new Tank Display software in ModbusRTU for 3&4 wire ultrasonic and radar (file name: Probe_GatewayPC_TANKS.EXE) working please follow this. This Tank Display offers very reliable error-less communication. It displays bar graphs with Tanks' names, Level, Volume and Mass, and physical tanks' as well.**

To use this program please follow this.

a. Follow point 42b, create all your tanks, select them from BASE_TANK_Farm.

b.Open the main program **ProbeGatewayPC_NET** , click on **Start Data Link** , go to **Select Sensor ID** and highlight the lowest ID, for example 4 (in network don't use lower number than 4).

c. Go to **Tools**, click on **Select Data Protocol** and choose **Modbus RTU**, to the question appearing on your screen **Select ModbusRTU Protocol** answer **YES**, wait until you get a message **Select Modbus RTU calibration done**, click **OK**, from **Start Data Link** it changes to **Stop Data Link.**

d. In **Select Sensor ID** highlight the next sensor, click on **Start Data Link** and repeat the above. Please continue this until the last sensor, so all the sensors will be in **Modbus RTU** protocol. If you want to change sensors' setup please use the main program again and after you done change all the sensors to **ModbusRTU** protocol again.

e. Now you are ready to use **Probe_GatewayPC_TANKS.EXE**