NCM-603 Hand Held Clamp-on Ultrasonic Transit Time Flowmeter

Quick Start - Operation Manual

Rev 10.01.08

This Quick Start is provided solely to help you get the flowmeter up and running as quickly as possible. For complete information on the flowmeter and its operation procedures, please refer to the User's Manual.

Step 1. Power On

Charge the battery fully before using the instrument.

Press the ON button. The meter will go through a self-checking process to make sure everything is alright. After a second, the screen similar to the figure on the right will appear. If it does not, please write down the error message and contact us.

Step 2. Configure the Measurement Settings

2.1. Enter transducer info (skip this if you have only one transducer pair) *Change the Scale Factor:* Press keys M45 (e.g., press MENU, 4 and 5 keys orderly.) Then, press the ENT key. Key in the new scale factor of the transducer

2.2. Enter pipe info

Pipe OD: press keys M11, and then ENT. The display should be similar to the figure on the right. Now enter the pipe outer diameter, and press the ENT key to confirm. ENT and enter the pipe wall-thickness value. Press ENT again to confirm.

```
M11
Outer Diameter
        4.500   in
=>_
```

Wall-Thickness: Press ⇩ to scroll down to the next menu M12. Press ENT and enter the pipe wall-thickness value. Press ENT to conform.

Pipe ID: Press ⇩ to scroll down to the next menu, M13. The correct ID value should be displayed on the screen.

Pipe Material: Press ⇩ to scroll down to M14. Press ENT and then use ⇩ to select the right item. If pipe material is not shown on the list (non-standard material), select any one of them. Press ENT to confirm.

```
M14
Pipe Material
=>0. Carbon Steel
1. Stainless Steel
```

Sound Speed in Pipe Wall: Press ⇩ to scroll down to M15. If you find your pipe material on the list in the previous step, the flowmeter should already know the sound speed. You can just skip this step and go to the next.

Otherwise, press ENT and enter the sound speed of your pipe material. You can find this information in the User's Manual. When you are done, press ENT to confirm.

Pipe lining: If your pipe has lining inside, enter the lining information on menu windows M16-M18.

2.3. Enter fluid info

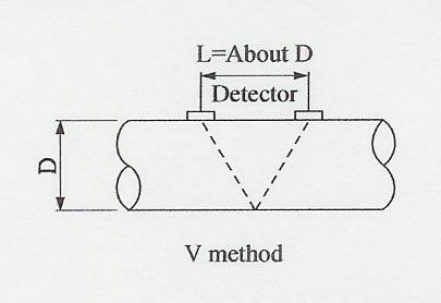
Fluid Type: Use the ⇩key to scroll down to M20, or, simply press keys M20. Then, press ENT and select the item that matches your fluid type. If you do not find a match (non-standard fluid), just select any one of them. Press the ENT key to confirm.

Sound Speed in Fluid: If you found your fluid type in the previous step, the flowmeter already has the sound speed info. Therefore, skip this step and go the next. Otherwise, press ⇩ to scroll down to M21. Press ENT and key in the sound speed of your fluid. You can find this information in the User's Manual. When you are done, press ENT to confirm.

2.4. Enter transducer installation info

Mounting Method: Use the ⇩key to scroll down to M24 or press M24. Then Press ENT and select the proper item and press ENT to confirm. For pipes < 1" try W-method. For pipes from 2" to 12" use the V method. For pipe sizes > 12 inches use the Z method.

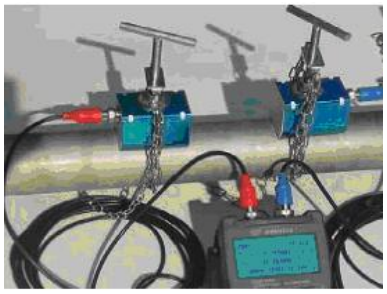
```
M24
Transducer Mounting
=>0.   V-Method
   1.0  Z-Method
```



Step 3. Install Transducers

Mounting Spacing: Use the ⇩key to scroll down to M25. The displayed value is the mounting spacing between the two transducers (see the figure on the right). Write down this number, as you will need it later when installing the transducers.

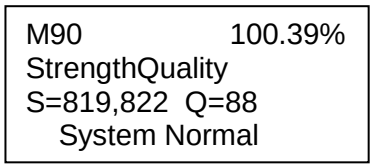
```
M25
Transducer Spacing
      3.80  in
=>_
```



Step 4. Fine Tuning

On the main unit, press M90 to enter into menu M90. There are three important numbers displayed on this window (refer to the figure below): Transit-time ratio R, signal strength S and signal quality Q. Their values shall fall into the right ranges in order t o justify the reading:

R: 97% ~ 103%
S: 600 ~ 990 Q: 60 ~ 99.

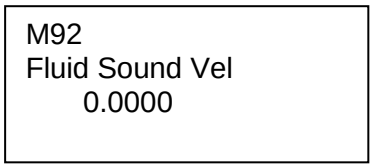


If these values are not in the above ranges, you need to verify the parameters you have entered in Step 2. If you believe your entries are correct and the three numbers are still off their ranges, you may need to check your installation. Here are some tips:

- Moving transducers closer to or away from each other will increase or decrease the transit-time ratio R.
- For small pipes (smaller than 1 ½"), wrap some acoustic damping materials around the pipe, but leave an open window for transducers to make direct contact with pipe surface. Examples of damping material are GraceIce Water Shield materials, silicone rubber, epoxy, etc. Warning: be aware of their temperature limitations and other safety instructions.
- For copper pipes which ODs are less than 1", you may need a special transducer adapter. Make sure the transducer mounting area on the pipe is coating-free and smooth. Also, do not use excessive couplant on either transducer face or pipe surface.

Please refer to section 2.9.4 of the User's Manual for more details.

The sound speed information in menu M92 might also be useful for debugging. The displayed value should be close to the one you have entered in step 2.3. If you have entered fluid type in step 2.3 instead, and you do not know the fluid sound speed, you can find this information in the Appendix of the User's Manual.



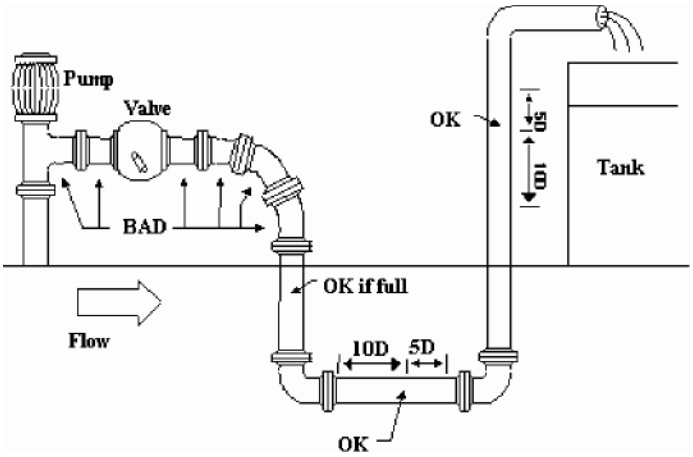
If all the three parameters are good, your installation is done. You are ready to look at your measurement results on menu window M00.

Appendix

Transducer Installation Guide

A.1. Find the mounting site

(A) Pipe must be full of liquids at the measurement site.
(B) No heavy corrosion of deposition inside of the pipe.
(C) Must be a safe location.
(D) The straight run of the pipe must not be shorter than 15D as a general guideline, where D is the pipe diameter. Insufficient straight pipe length will degrade the accuracy of the results.
(E) The transducer mounting site should be 10D straight run upstream and 5D straight run downstream (see the following drawing.)
(F) If there are flow disturbing parts such as pumps, valves, etc. on the upstream, the straight pipe length should be increased. The disturbance strength of those flow conducting parts will be (low to high):
Single Bend -> Pipe Reduction / Enlargement -> Outflow Tee -> Same Plane Multiple Bends -> Inflow Tee -> Out of Plane Multiple Bends -> Valve -> Pump

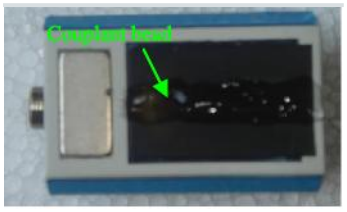


A.2. Prepare the Pipe Surface

Clean the pipe surface where the transducers will be mounted. Remove rust and paint. Sand the surface if not smooth. Use wet cloth to wipe off the powder after sanding. Dry up the surface. A dry, clean surface will ensure a good acoustic bond between transducer and pipe.

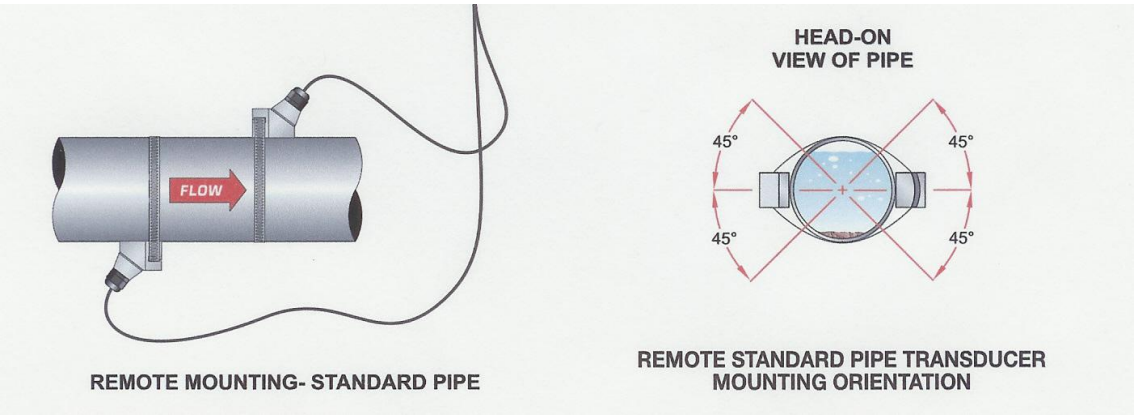
A.3. Prepare the Transducer

Clean the transducer surface. Keep the surface dry. Put couplant on transducer surface as shown in the right figure. Do not put couplant more than necessary, especially for small pipe.



A.4. Install the Transducers

Notice: For horizontal pipe line, it is recommended to install the transducers on the side instead of on the top or bottom of the pipe. This is to avoid air bubbles on the top and sediments on the bottom of the pipe.



A.4.3. M1 type transducer:

First, mark the transducer installation location on the pipe surface according to the mounting spacing given in menu M25. You may need to make a paper template to help you accurately locate the transducer position, especially if you plan to use Z-method for the installation.

Then, connect the mounting fixture around the pipe. Leave the chain loose so you can slip the transducer underneath.

Apply a small amount of couplant in the prepared area of the pipe where transducers will be in contact.

Slip the transducer under the clamp fixture. Tighten the screw. Do the same thing for the other transducer. Use the above figure as a reference.

If the pipe material is metal, you do not need the clamp fixture. The transducers will automatically attach to the pipe by magnetic force. Finally, connect the Transducer cables to the main unit.

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NCM-603 MENUE WINDOW DETAILS

Menu No.	Function
M00	Display three positive negative net totalizers, signal strength, signal quality and working status
M01	Display POS totalizer, flow rate, velocity, signal strength, signal quality and working status
M02	Display NEG totalizer, flow rate, velocity, signal strength, signal quality and working status
M03	Display NET totalizer, flow rate, velocity, signal strength, signal quality and working status
M04	Display date and time, flow rate, signal strength, signal quality and working status
M05	Display date and time, velocity, signal strength, signal quality and working status
M06	Display the wave shape of the receiving signal
M07	Display the battery terminal voltage and its estimated lasting time
M08	Display the all the detailed working status, signal strength, signal quality
M09	Display today's total flow, velocity, signal strength, signal quality and working status
M10	Window for entering the outer perimeter of the pipe
M11	Window for entering the outer diameter of the pipe 0 to 6000mm is the allowed ranged of the value .
M12	Window for entering the pipe wall thickness
M13	Window for entering the inner diameter of the pipe
M14	Window for selecting pipe material. Standard pipe materials (that the user need not know the speed) include:(0) carbon steel (1) stainless steel (2) cast iron (3) ductile iron (4) copper (5) PVC (6) aluminum (7) asbestos (8) fiberglass
M15	Window for entering the pipe material speed only for non-standard pipe materials
M16	Window for selecing the liner material, select none for pipes without any liner Standard liner materials that the user need not know the speed include: (1) Tar Epoxy (2) Rubber (3) Mortar (4) Polypropylene (5) Polystryol (6) Polystyrene (7) Polyester (8) Polyethylene (9) Ebonite (10) Teflon
M17	Window for entering the liner material speed only for non-standard liner materials
M18	Window for entering the liner thickness, if there is a liner
M19	Window for entering the ABS thickness of the inside wall of the pipe.
M20	Window for selecting fluid type for standard liquids that the user need not know the liquid speed include: (0) Water (1) Sea Water (2) Kerosene (3) Gasoline (4) Fuel Oil (5) Crude Oil (6) Propane at -45C (7) Butane at 0C (8) Other Liquids (9) Diesel Oil (10) Caster Oil (11) Peanut Oil (12) # 90 Gasoline (13) # 93 Gasoline (14) Alcohol (15) Hot water at 125C
M21	Window for entering the fluid sonic velocity only for non-standard liquids
M22	Window for entering the viscosity of the non-standard liquids

M23	Window for selecting the proper transducers. There are 14 different types of transducers for selection. If the user-type-transducers are used, 4 user type wedge parameters, which will be prompted by the software, should be entered following. If the π type transducers are used, 3 π, type transducers and pipe parameters should be entered following.
M24	Window for selecting the transducer mounting methods. Four methods can be selected: (0) V-method (1) Z-method (2) N-method (3) W-method
M25	Display the transducer mounting spacing
M26	Entry to store the parameter configuration into the internal NVRAM
M27	Entry to load one set of saved parameters
M28	Select YES or NO for the instrument to determine whether or not to hold (or to keep) the last correct value when poor signal condition occurs. Yes is the default setup.
M29	Enter a value ranging from 000 to 999. 0 is the default value.
M30	Window for selecting unit system. Default value is "Metric". The change from English to Metric of vice versa will not affect the unit for totalizers.
M31	Window for selecting flow rate that will be used by the instrument afterward Flow rate can be in: 0. Cubic Meter short for (m3) 1. Liter (1) 2. USZ gallon (gal) 3. Imperial Gallon (igl) 4. Million USA gallon (mgl) 5. Cubic feet (cf) 6. USA liquid barrel (bal) 7. Imperial liquid barrel (ib) 8. Oil barrel (0b) The flow unit in terms of time can be per day, per hour, per minute or per second. So there are 36 different flow rate units in total for selection.
M32	Window for selecting the totalizers"' working unit
M33	Select totalizer multiplier. The multiplier ranges from 0.001 to 10000.
M34	Turn on or turn off the NET totalizer
M35	Turn on or turn off the POS totalizer
M36	Turn on or turn off the NEG totalizer
M37	(1) Totalizer Reset (2) Restore the instrument to the default parameters as the manufacturer did by pressing the dot key followed by the backspace key. Tale care or make note on the parameters before doing the restoration
M38	Press-a-key-to-run or to stop totalizer for easier calibration
M39	Operational interface language selection in Chinese and English. This selection makes it possible that more that 2 billion of people on the world can read the menu.
M40	Flow rate damper for a stable valve. The input range is 0 to 999 seconds. 0 means there is no damping. Default value is 10 seconds.
M41	Lower flow rate cut-off to avoid invalid accumulation.
M42	Zero point setup under the condition when there is no liquid running inside the pipe
M43	Clear the zero point by the user, and restore the zero point set by the manufacturer.

M44	Set up a manual; flow bias. Generally this valve should be 0.
M45	Scale factor for the instrument. The default value in "1". Keep this value as "1", when no user calibration has been made.
M46	Network environmental Identification Number. Any interger can be entered except 13(0DH), carriage return), 10 (0 AH, line feeding), 42 (2,AH), 38, 65535. Every set of the instrument in a network environment should have a unique IDN. Please refer to the chapter for communication.
M47	System locker to avoid modification of parameters
M48	Not used
M49	Communication Tester
M50	"Option" selection for the built-in logger. It also functions as the switch of logger
M51	Time setup for the data logger
M52	(1) Data logging direction control. If ' To RS-232 ' is selected, all the data produced by the data logger will be transmitted out through the RS-232 interface. (2) If ' To buffer ' is selected, the data will be stored into the built-in logger memory. (3) Buffer transferring and buffer clearing
M53	Logger buffer viewer. It functions as a file editor. Use Dot, backspace UP and DN keys to browse the buffer. If the logger is ON, the viewer will automatically refresh once new data are stored
M54	Not used
M55	Not used
M56	Not used
M57	Not used
M58	Not used
M59	Not used
M60	99-year calendar. Press ENT for modification. Use the dot key to skip the digits that need no adjusting.
M61	Display Version information and Electronic Serial Number (ESN) that are unique for each TDS-100 series flow meter. The users can employ the ESN for instrumentation management.
M62	RS-232 setup. Baud rate can be 75 to 115200 bps
M63	Not used
M64	Not used
M65	Not used
M66	Not used
M67	Input the frequency range for the frequency output. The biggest range is 0HZ-9999Hz. Default value is 1-1001 Hz
M68	Enter a flow rate valve that corresponds to lower frequency
M69	Enter a flow rate valve that corresponds to higher frequency

M70	LCD display backlight control. The entered valve indicates how many seconds the backlight will be on with every key pressing.
M71	LCD contrast control. The LCD will become darker when a small value is entered.
M72	Working timer. It can be cleared by pressing ENT key, and the select YES.
M73	Enter Lower Flow Rate value that will trigger the # 1 Alarm. There are two virtual alarms in the system. By "virtual" we mean that the user must redirect the output of the alarms by seting up the output hardware in M78 and M77.
M74	Enter the higher flow rate value that will trigger the # 1 Alarm
M75	Enter the lower flow rate value that will trigger the # 2 Alarm
M76	Enter the higher flow rate value that will trigger the # 2 Alarm
M77	Buzzer setup. If a proper input source is selected, the buzzer will beep when the trigger event occurs.
M78	OCT (Open Collect Transistor Output) setup By selecting a proper input source, the OCT hardware will close when the trigger event occurs
M79	Not used
M80	Work as a keypad and display for another bandhold set by RS-232 connected with the handset.
M81	Not used
M82	Date totalizer
M83	Not used
M84	Not used
M85	Not used
M86	Not used
M87	Not used
M88	Not used
M89	Not used
M90	Display signal strength, signal quality, time ratio on the upper right corner.
M91	Displays the Time Ratio between the Measured Total Transit Time and the Calculated time. It the pipe parameters are entered correctly and the transducers are properly installed, the ration valve should be in the range of 100± 3%. Otherwise the entered parameters and the transducer installation should be checked.
M92	Displays the estimated fluid sound velocity. If this value has an obvious difference with the actual fluid sound speed, pipe parameters entered and the transducer installation should be checked again.
M93	Displays total transit time and delta time (transit time difference)
M94	Displays the Reynolds number and the pipe factor used by the flow rate program

M95	Not used
M96	Not used
M97	Command to record the pipe parameters entered by the user either to the built-in data logger or to RS-232C serial interface.
M98	Command to record the pipe parameters entered by the user either to the built-in data logger or to RS-232C serial interface.
M99	Command to copy the current display either to the built-in data logger or to RS-232C serial interface.
M+0	Browse the 64 recorded instrument power-on and power-off data and time with the flow rate at the time of power on and off
M+1	Displays the total working time of the instrument
M+2	Displays the last power-off date and time
M+3	Displays the last power-off flow rate
M+4	Displays the times of instrument powered on (the instrument has been powered on)
M+5	A scientific calculator for the convenience of field working. All the values are in single accuracy. The drawback is that the user can't operate it by direct key-pressing
M+6	Not used
M+7	Not used
M+8	Not used
M+9	Not used
M+10	Entry to Firmware adjusting windows only for the manufacturer.