



ONLINE TDS TRANSMITTER & CONTROLLER

Model : TDS 602 - 1

INSTRUCTION MANUAL



1. SPECIFICATION

Model	TDS 602 - 1
Display	4 + 4 Digit 0.5" & 0.39" 7 Seg RED LED Display
Cell Constant *	0.01 / 0.1 / 1(user selectable depends on range*)
Range(any one)	1 - 20ppm, 5 - 200ppm, 10 to 2000ppm, 1 to 20ppt, 5 to 200ppt
Resolution	0.01ppm to 0.1ppt (depends on range)
Temp. Compensation	Manual / Automatic (-20.0 to +150.0°C)
Temp. Sensor	RTD - PT 100 (3 wire)
Temp. Coefficient	0 to 3 % / °C(user adjustable)
Electrode Input	Conductivity cell on rear panel
Accuracy	1 % of range 1 digit
Set Point -	1 & 2 Two Set Point with 6 Relay Status Selectable
Relay Output	Relay - 1 for Setpoint - 1, Relay - 2 for Setpoint - 2 with 5A Rating
Relay Hysterisis	0 to 500 counts (user adjustable)(only for High & Low control modes)
Relay Cyclic delay	0 to 100 seconds (user adjustable)(only for High & Low control modes)
Alarm Output(optional)	inbuilt audible buzzer with front key reset
Optional Re. Tx. output	Galvanically Isolated 4 - 20 mA
Optional Comm. output	Isolated RS 485
Comm. Protocol	MODBUS RTU
Operating Environment	-10 to 50°C / 10 to 95 % RH Non Condensing
Power Supply	90 to 270V AC / DC 50Hz
Dimension	96 x 96 x 85 mm.
Cutout Dimension	92 x 92 mm
Weight	500 grams (Approx.)

Note: 1.* cell constant selection for selected ranges as follows

1) For 1 - 20ppm(Ultra pure & DM water) 0.01 cell constant selectable

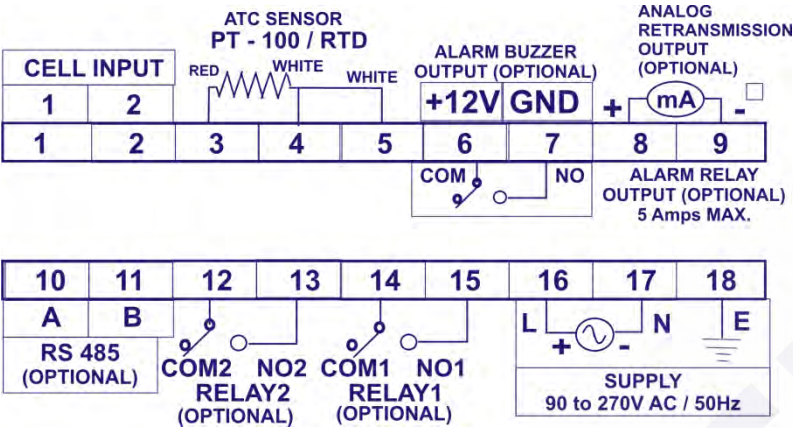
2) For 5 - 200ppm(Drinking water & other applications) 0.1 cell constant selectable

3) For 10 - 2000ppm, 1 - 20ppt & 5 - 200ppt(raw water, sewage & High range liquids) 1 cell constant only

2. Online TDS sensor is Optional. It depends on application, working temperature, type of fitting and cable length

3. Due to continuous product improvements, Published specifications may change with out notice

2. CONNECTION DETAILS

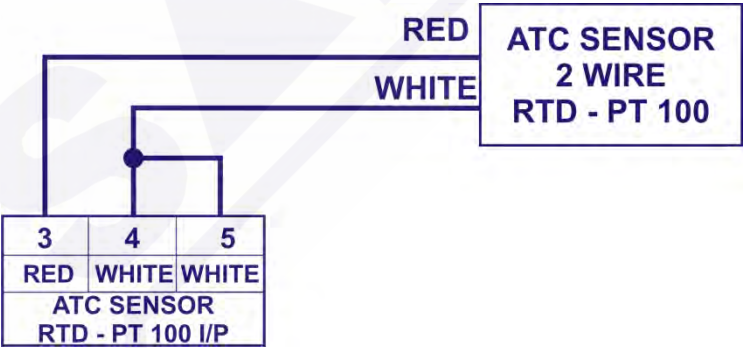


3. WIRING DETAILS

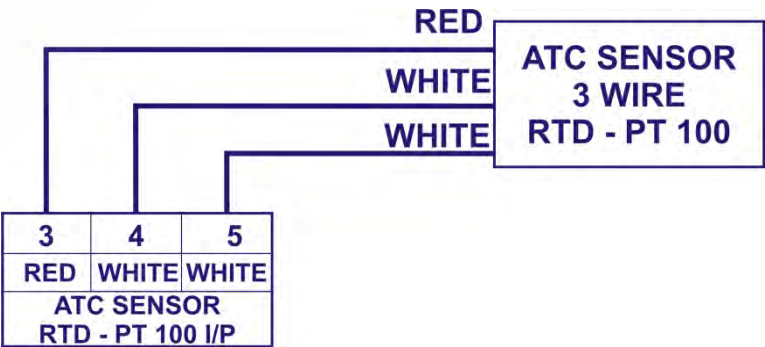
3.1. TDS ELECTRODE CONNECTION



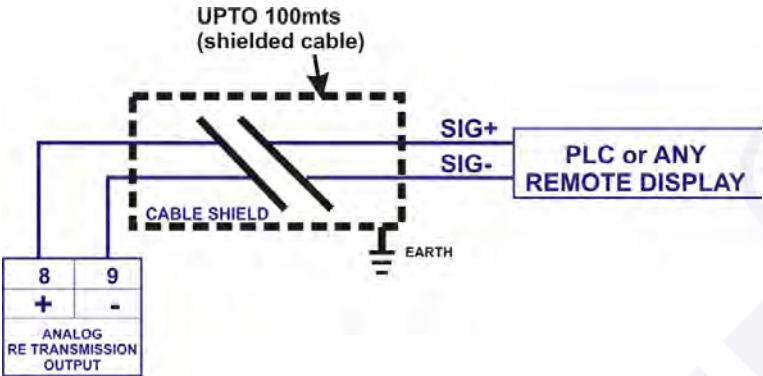
3.2. ATC SENSOR CONNECTION (2 WIRE RTD - PT 100 SENSOR)



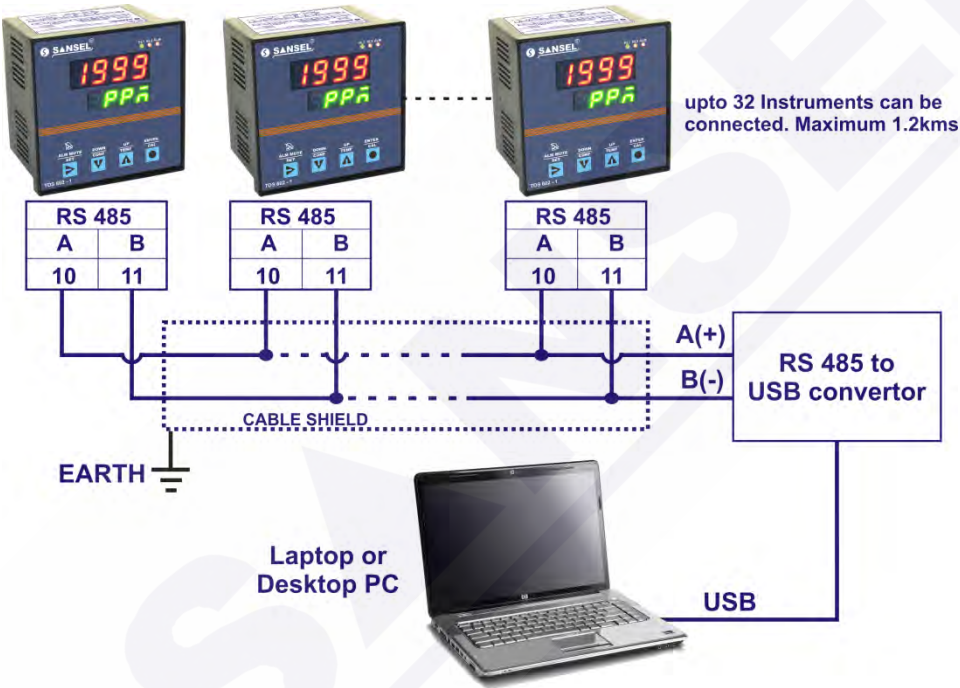
3.3. ATC SENSOR CONNECTION (3 WIRE RTD - PT 100 SENSOR)



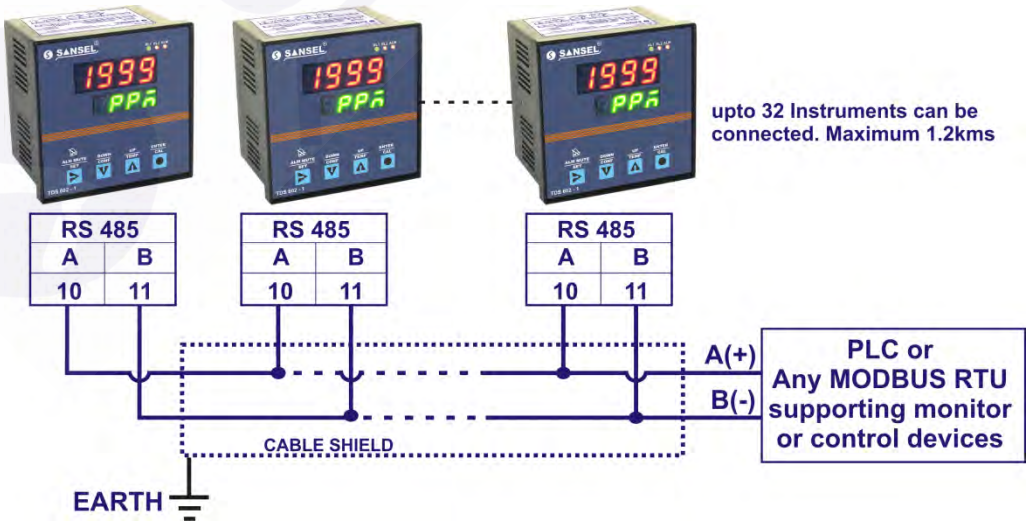
3.4. RE TRANSMISSION OUTPUT CONNECTION



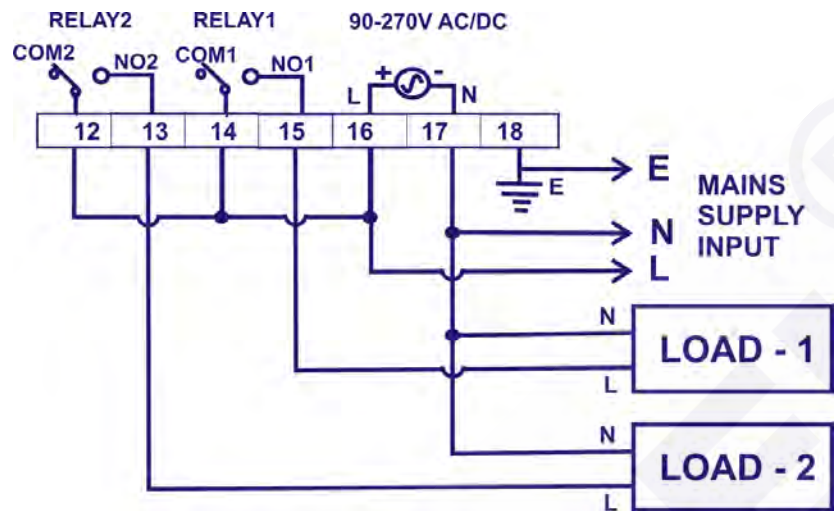
3.5. PC COMMUNICATION THROUGH RS 485



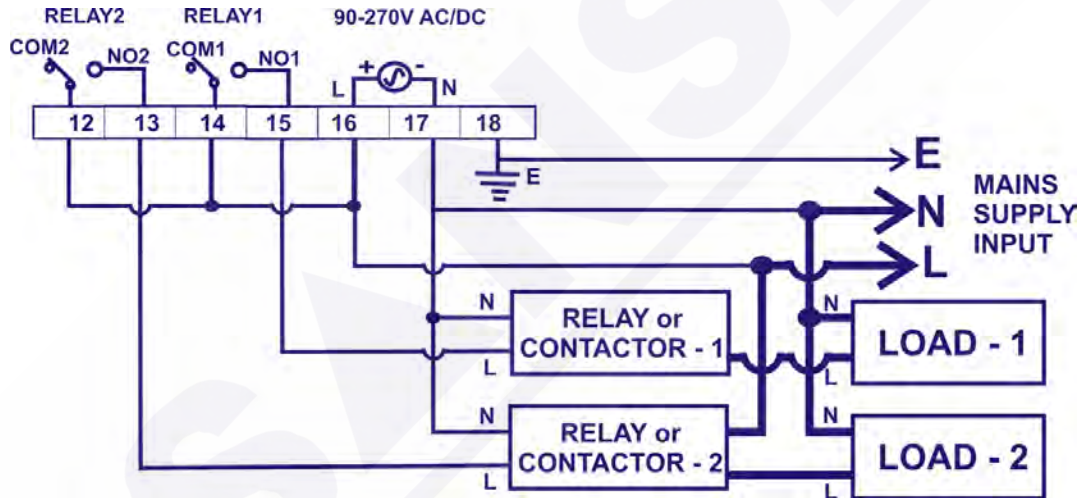
3.6. PLC or OTHER RS 485 MODBUS RTU supporting Device connection



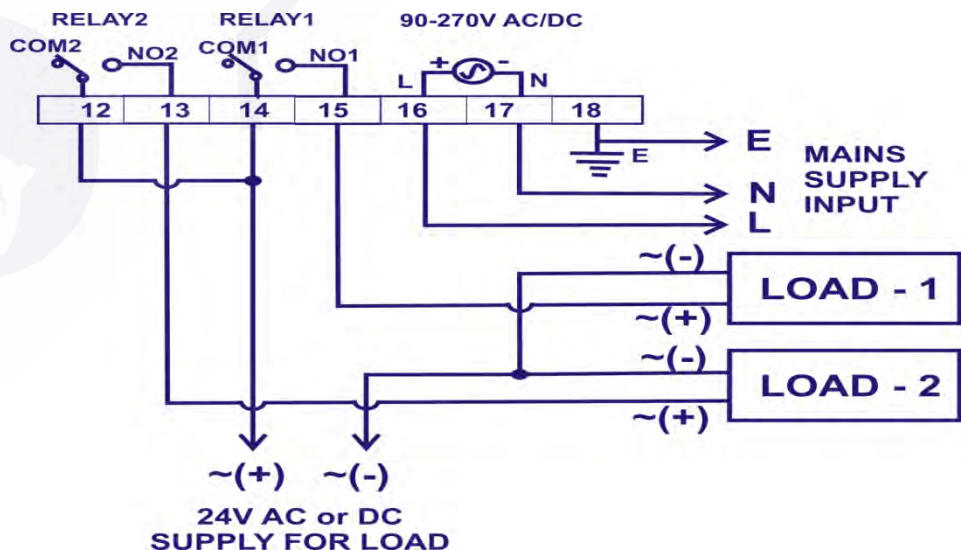
3.7. WIRING OF RELAY OUTPUT TO LOAD (SUPPLY 230V AC / BELOW 1kW LOAD)



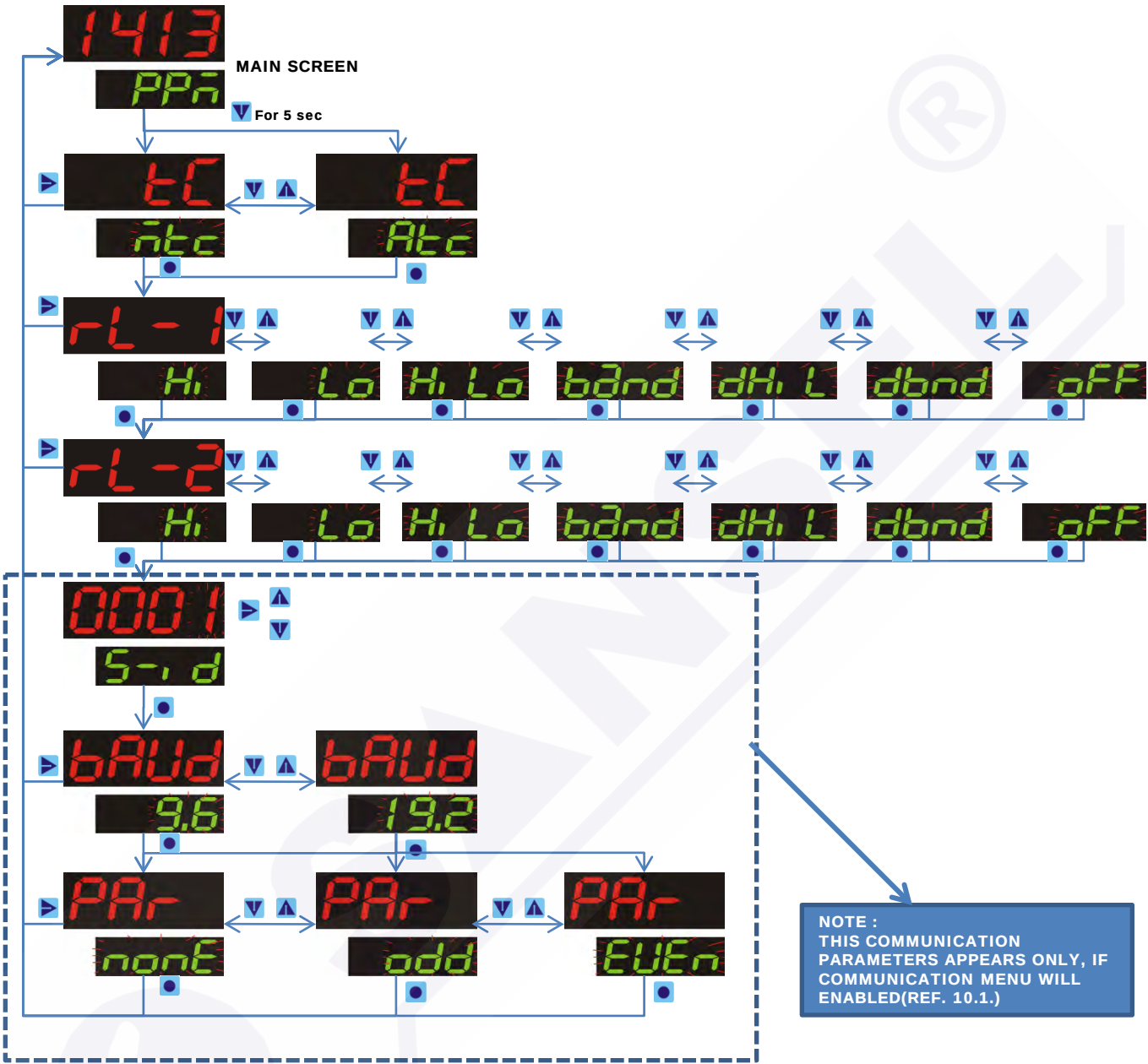
3.8. WIRING OF RELAY OUTPUT TO LOAD (SUPPLY 230V AC / ABOVE 1kW LOAD)



3.9. WIRING OF RELAY OUTPUT TO LOAD (SUPPLY 24V AC / DC)



4. PROGRAMMING AND CONFIGURATION



SYMBOL	NAME	DESCRIPTION
	TEMP. COMPENSATION	Used to change the Temperature Compensation from the choice of "Manual Temp. Compensation(MTC)" & "Auto Temp. Compensation(ATC)"
	RELAY - 1 CONTROL MODE	Used to change the Relay - 1 control mode from the choice of "High", "Low", "High & Low", "Band", "Differential High & low", "Differential band", "OFF"
	RELAY - 2 CONTROL MODE	Used to change the Relay - 2 control mode from the choice of "High", "Low", "High & Low", "Band", "Differential High & low", "Differential band", "OFF"
	HIGH	OUTPUT gives, if PV goes below the HIGH SETVALUE
	LOW	OUTPUT gives, if PV goes above the LOW SETVALUE
	HIGH & LOW	OUTPUT gives, if PV goes above the HIGH SETVALUE & below the LOW SETVALUE
	BAND	OUTPUT gives, if PV goes above the LOW SETVALUE & below the HIGH SETVALUE
	DIFFERENTIAL HIGH & LOW	if PV goes above the HIGH SETVALUE the OUTPUT will ON till the PV goes below the LOW SETVALUE, then OUTPUT will OFF till the HIGH SETVALUE reach.
	DIFFERENTIAL BAND	if PV goes above the LOW SETVALUE the OUTPUT will ON till the PV goes below the HIGH SETVALUE, then OUTPUT will OFF till the LOW SETVALUE reach.
	OFF	OUTPUT OFF
	SLAVE ID	Digital Communication Slave Address(ID)(1 to 32), On a network of Instruments the Address is used to specify or identify a particular instrument.
	BAUD RATE(kbps)	Digital Communication Baud Rate(9.6 & 19.2 kbps)
	PARITY	Digital Communication Parity (NONE, ODD, EVEN)

5. TEMPERATURE COMPENSATION (-20 to 150°C)

There are typically two ways to compensate for errors in TDS reading due to temperature of liquid as follows.

1. AUTOMATIC TEMPERATURE COMPENSATION (ATC)
2. MANUAL TEMPERATURE COMPENSATION (MTC)
3. TEMPERATURE CO EFFICIENT (0 to 3.00 % / °C)

5.1. AUTOMATIC TEMPERATURE COMPENSATION (ATC)

ATC uses a RTD – PT100 sensor to measure the temperature of the solution and transmits it back to the TDS 602 - 1 where the pH readings are corrected for the temperature.

To use this ATC mode user need to configure the Temperature compensation mode as “ATC” and connect an RTD – PT100 temperature sensor to TDS 602 - 1 back terminal as instructed in wiring diagram(Ref. 3.2.) and install the sensor in parallel to TDS Electrode in liquid to measure TDS.

To view the Temperature reading of ATC sensor just press TEMP key once the display shows the liquid temperature as follows.



5.2. MANUAL TEMPERATURE COMPENSATION (MTC)

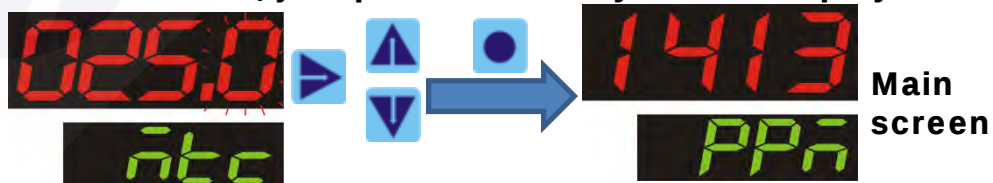
MTC requires the user to key in the solution temperature in to the TDS 602 - 1, so that the reading can be correct for the inputted temperature. However, if the temperature of the solution changes it needs to be manually updated in the TDS 602 - 1.

To use this MTC mode user need to configure the Temperature compensation mode as “MTC”.

To view the MTC value, just press TEMP key once the display shows the value as follows.



To Edit the MTC value, just press TEMP key till the display shows



5.3. TEMPERATURE CO EFFICIENT(0 To 3.00 % / °C)

STEP 1 : Switch OFF the TDS 602 - 1 & Switch ON by pressing DOWN key the display shows



STEP 2 : To modify the value in “TEMP CO EFFICIENT”, using UP & DOWN keys to scroll the blinking digit(between 0 – 9) & move using SET key and set the desire “TEMP CO EFFICIENT”. Then press ENTER key to save & exit to Main screen as above.

6. ATC ERROR OFFSET(± 15°C)

For better accuracy, Calibration of the ATC value in TDS 602 – 1 is recommended.

In addition, the ATC value in TDS 602 – 1 must be recalibrated whenever:

- The ATC sensor is replaced.
- After testing long term in high temperature.
- Where high accuracy is required.
- At least once a month.

Before start calibrating the ATC, take the standard RTD Temperature source or Mercury thermometer and start calibration as following simple steps.

NOTE : For Best results, calibrate with certified RTD Temperature Source or mercury thermometer.

6.1. TEMPERATURE SOURCE SIMULATION METHOD

STEP 1 : Switch OFF the TDS 602 - 1 , Connect the Temperature Source to the respected ATC terminal of TDS 602 - 1 as per wiring diagram given above (Ref. 3).

STEP 2 : Switch ON the TDS 602 - 1 , simulate the minimum temperature (0°C) & view the ATC value for that by press TEMP key once.

STEP 3 : If error occurs in ATC reading, just Switch OFF the TDS 602 – 1 & Switch ON by pressing TEMP key the display shows



ATC ERROR OFFSET VALUE = STANDARD VALUE – MEASURED VALUE

STEP 4 : Calculate the OFFSET value using above simple formula & enter the value in “TEMP OFFSET”, using UP & DOWN keys to scroll the blinking digit(between 0 – 9) & move using SET key and set the desire “ATC ERROR OFFSET”. Then press ENTER key to save & exit to Main screen as above.

6.2. COMPARISON METHOD

STEP 1 : Connect the ATC sensor to the respected ATC terminal of TDS 602 - 1 as per wiring diagram given above (Ref. 3).

STEP 2 : Take some water in a beaker & Dip the ATC sensor and Master mercury thermometer & wait for stable temperature reading in both.

STEP 3 : If error occurs in ATC reading, just Switch OFF the TDS 602 - 1 & Switch ON by pressing TEMP key the display shows



ATC ERROR OFFSET VALUE = STANDARD VALUE – MEASURED VALUE

STEP 4 : Calculate the OFFSET value using above simple formula & enter the value in “TEMP OFFSET”, using UP & DOWN keys to scroll the blinking digit(between 0 – 9) & move using SET key and set the desire “ATC ERROR OFFSET”. Then press ENTER key to save & exit to Main screen as above.

7. CALIBRATION PROCEDURE FOR TDS 602 – 1

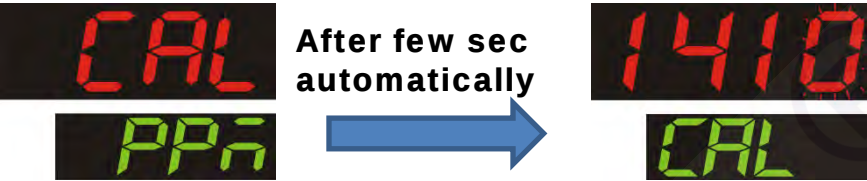
For better accuracy, Calibration of the TDS 602 - 1 is recommended. In addition, the TDS 602 - 1 must be recalibrated whenever:

- The TDS Electrode is replaced.
- After testing long term in high temperature.
- Where high accuracy is required.
- At least once a month.

Before start calibrating the TDS 602 - 1, take the freshly prepared (or) purchased standard solution(range depends on application used) each with 100ml quantity in a beaker and start calibration as following simple steps.

NOTE : For Best results, calibrate with certified accurate standard Solutions.

STEP 1 : Rinse the Electrode with Distilled Water. Immerse the Electrode into the Standard solution and wait for stabilization of Reading, Press CAL Key till the Display Shows



STEP 2 : Then use UP & DOWN keys to roll over the blinking digit(0 – 9) and move by SET key to adjust the Standard value and Press CAL key to Confirm the Calibration value. The display shows



NOTE :
AT CALIBRATION MODE, THE DISPLAY SHOWS “CERR” (CALIBRATION ERROR) AS FOLLOWS



The following table may be useful to find and correcting, if above “CALIBRATION ERROR” will appear.

CAUSES	REMEDY
1. Wrong calibration method	1. Retry with proper settings & procedure given above
2. The solution is more deviation (not within $\pm 50\%$) from the standard value.	2. Check the standard solution value
3. Expired standard solution used	3. Calibrate with newly purchased standard solution
4. TDS Electrode damage	4. Replace new TDS Electrode & calibrate with TDS 602 - 1
5. TDS Electrode fails	5. Replace new TDS Electrode & calibrate with TDS 602 - 1

Note : If still the “CALIBRATION ERROR” exists please follow the “FAULT FINDING GUIDE”(Ref. 11)

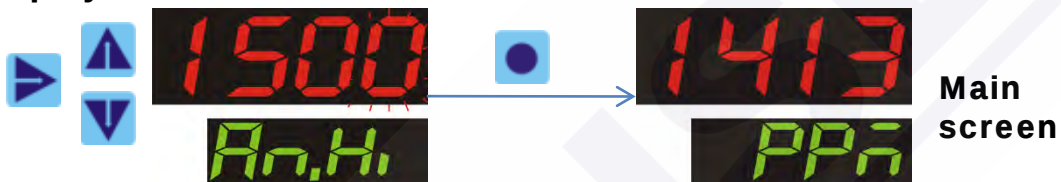
8. ANALOG RE TRANSMISSION OUTPUT SETTING

NOTE : It will work only, if the “ANALOG RE TRANSMISSION OUTPUT” will enable on Hardware on factory.

STEP 1 : To View and Modify the Analog Re Transmission Output LOW & HIGH Limits, Switch OFF the TDS 602 – 1 and ON by Pressing SET key the display shows



STEP 2 : To Modify the “Analog Output LOW” Limits(0 to 9999counts), use UP & DOWN keys to roll over (0 – 9), move blinking digit by SET key and save and Enter to “Analog Output HIGH” Limits by pressing ENTER key the display shows



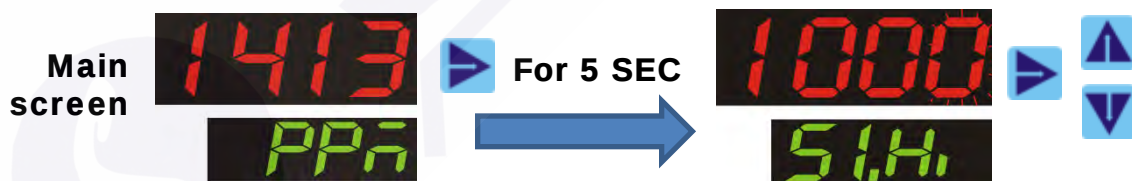
STEP 3 : To Modify the “Analog Output HIGH” Limits(0 to 9999counts), use UP & DOWN keys to roll over (0 – 9), move blinking digit by SET key and save and Exit to main screen by pressing ENTER key as above.

9. ALARM or RELAY SETTINGS

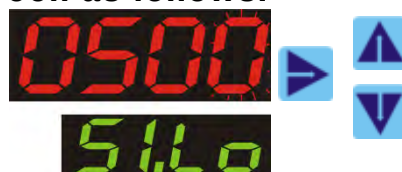
9.1. SETVALUE

This Alarm setvalues used to alert the local operator by glowing audible buzzer attached inbuilt(optional) in TDS 602 – 1 & also used to control any process using relay contact(5A rated). To view & Configure the “ALARM or RELAY SETVALUES” follow the steps below.

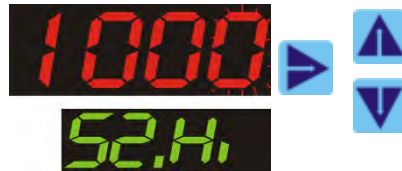
STEP 1 : In Main Screen, Press SET Key till the Display Shows



STEP 2 : In “OUT1 HIGH SET” screen, use UP & DOWN keys to scroll the blinking digit(between 0 – 9) & move by SET key and set the desire “OUT1 HIGH SET”. Then press ENTER key to save & enter into to “OUT1 LOW SET” screen as follows.



STEP 3 : In “OUT1 LOW SET” screen, use UP & DOWN keys to scroll the blinking digit(between 0 – 9) & move by SET key and set the desire “OUT1 LOW SET”. Then press ENTER key to save & enter into to “OUT2 HIGH SET” screen as follows.



STEP 4 : In “OUT2 HIGH SET” screen, use UP & DOWN keys to scroll the blinking digit(between 0 – 9) & move using SET key and set the desire “OUT2 HIGH SET”. Then press ENTER key to save & enter into to “OUT2 LOW SET” screen as follows.



STEP 5 : In “OUT2 LOW SET” screen, use UP & DOWN keys to scroll the blinking digit(between 0 – 9) & move using SET key and set the desire “ALARM2 HIGH SET”. Then press ENTER key to save & exit to Main screen as follows.



NOTE :

1. IN ABOVE “ALARM or RELAY SETVALUES” RESPECTED SETVALUES ONLY APPEAR AS PER SELECTED “ALARM MODES”(REF. 4).
2. DURING SETTING THE ABOVE “ALARM or RELAY SETVALUES”, IF THE “SERR”(SETVALUE ERROR) WILL APPEAR AS FOLLOWS.



The above “SETVALUE ERROR” will appear, during setting any setvalue “LOW” value lesser than “HIGH” value of same OUTPUT.

9.2. HYSTERISIS & CYCLIC DELAY

This Alarm CYCLIC DELAY used to glowing audible buzzer or RELAY in TDS 602 – 1 & also used to control any process using relay contact(5A rated). To view & Configure the “ALARM or RELAY CYCLIC DELAY” follow the steps below.

STEP 1 : In Main Screen, Press SET & DOWN Key simultaneously till the Display Shows



STEP 2 : To Modify the “OUTPUT – 1 HYSTERESIS” (0 to 5.00pH), use UP & DOWN keys to roll over (0 – 9), move blinking digit by SET key and save by Enter to “OUTPUT – 1 CYCLIC DELAY” by pressing ENTER key the display shows



STEP 3 : To Modify the “OUTPUT – 1 CYCLIC DELAY” (0 to 100sec), use UP & DOWN keys to roll over (0 – 9), move blinking digit by SET key and save by Enter to “OUTPUT – 2 HYSTERESIS” by pressing ENTER key the display shows as above. To Modify the “OUTPUT – 2 HYSTERESIS” (0 to 5.00pH), use UP & DOWN keys to roll over (0 – 9), move blinking digit by SET key and save by Enter to “OUTPUT – 2 CYCLIC DELAY” by pressing ENTER key the display shows



STEP 4 : To Modify the “OUTPUT – 2 CYCLIC DELAY” (0 to 100sec), use UP & DOWN keys to roll over (0 – 9), move blinking digit by SET key and save and Exit to main screen by pressing ENTER key the display shows as above.

10. DIGITAL COMMUNICATION

NOTE : It will work only, if the “DIGITAL COMMUNICATION OUTPUT” will enable on Hardware on factory.

10.1. COMMUNICATION SETTING PARAMETER (ENABLE / DISABLE)

This “COMMUNICATION SETTINGS PARAMETER” is used to hide the communication parameter settings like SLAVE ID, BAUD RATE & PARITY from Configuration menu for unauthorized person operation protection.

STEP 1 : To modify the “COMMUNICATION SETTINGS PARAMETER”, Switch OFF the pH 600 – 1 & ON by pressing UP & DOWN Key simultaneously till the Display Shows



STEP 2 : Use UP & DOWN keys to scroll between ENABLE & DISABLE the communication settings and select the desire mode and press ENTER key to save the mode return back to main screen.

10.2. PARAMETER MODBUS ADDRESSES

This is a complete list of parameters MODBUS Addresses available in the TDS 602 – 1.

Parameter Name	Address	Function	Actual read(A)	Factor*	DESCRIPTION
TDS value	40001	Read	0 to 2000	See Table**	Actual TDS value reading
OUTPUT - 1 Control mode	40002	Read/Write	0 to 6	=A/1	0 - High,1 - Low,2 - High Low, 3 - Band,4 - Diff. High Low, 5 - Diff. Band,6 - Off
Set value high1	40003	Read/Write	0 to 2000	See Table**	-
Set value low1	40004	Read/Write	0 to 2000	See Table**	-
Temperature value	40005	Read/Write	0 to 2000	See Table**	-
Slave ID	40006	Read	1 to 32	=A/1	Communication Address
Baud rate	40007	Read	0 or 1	=A/1	0 - 9600, 1 - 19200
Parity	40008	Read	0 to 2	=A/1	0 - None, 1 - Odd, 2 - Even
OUTPUT - 1 status	40009	Read	0 or 1	=A/1	0 - Relay1 ON,1 - Relay1 OFF
Alarm Status	40010	Read	0 or 1	=A/1	0 - Alarm OFF,1 - Alarm ON
Alarm Condition	40011	Read	0 or 1	=A/1	0 - OFF Condition, 1 - ON Condition
Unit	40012	Read/Write	0 or 1	=A/1	0 - ppm, 1 - ppt
Resolution	40013	Read/Write	0 to 2	=A/1	0 - 1, 1 - 0.1, 2 - 0.01
OUTPUT - 2 Control mode	40014	Read/Write	0 to 6	=A/1	0 - High,1 - Low,2 - High Low, 3 - Band,4 - Diff. High Low, 5 - Diff. Band,6 - Off
Set value high2	40015	Read/Write	0 to 2000	See Table**	0 - MTC,1 - ATC
Set value low2	40016	Read/Write	0 to 2000	See Table**	-
Temp. comp. mode	40017	Read/Write	0 or 1	=A/1	-
Temp. offset value	40018	Read/Write	-150 to 150	=A/10	-
Analog low limit	40019	Read/Write	0 to 2000	See Table**	for 4-20mA Retransmission
Analog high limit	40020	Read/Write	0 to 2000	See Table**	for 4-20mA Retransmission
Temp. Coefficient	40021	Read/Write	0 to 300	=A/100	0 to 3.00 % / °C
Hysteresis relay1	40023	Read/Write	0 to 500	See Table**	Applicable only for High and Low Relay Modes
Cyclic delay relay1	40024	Read/Write	0 to 100	See Table**	-
Hysteresis relay2	40025	Read/Write	0 to 500	See Table**	Applicable only for High and Low Relay Modes
Cyclic delay relay2	40026	Read/Write	0 to 100	See Table**	-
OUTPUT - 2 status	40027	Read	0 or 1	=A/1	0 - Relay2 ON,1 - Relay2 OFF
ATC sensor status	40028	Read	0 or 1	=A/1	0 - RTD Sensor Connected, 1 - RTD open

Note : *Read Final value of any above parameter, after applying the “Actual read” to “Factor” given.

** Read Final value of some selected parameters above, as per table below.

TDS value Resolution	Factor**
1	=A/1
0.1	=A/10
0.01	=A/100

10.3. MODBUS MASTER QUERY AND RESPONSE FEEDBACKS FROM TDS 602 - 1

TDS 602 – 1 supports the RTU Mode in MODBUS communications. This device acts like a slave device in the MODBUS network. The slave address with which the unit is Configurable(Ref. 4) between 1 to 32(decimal). TDS 602 – 1 supports functions 03 of the MODBUS protocol.

10.3.1.COMMUNICATION PARAMETERS:

Baud Rate : 9600(Configurable Ref. 4)
Flow Control : NONE
No of data bits : 8
Parity : NONE(Configurable Ref. 4)
No of Stop Bits : 1(Configurable Ref. 4)

10.3.2. SUPPORTED FUNCTIONS AND SCOPE:

Function 03 – Read Holding registers

10.3.3. QUERY FROM MASTER DEVICE

Field Name	Example (Hex)
Slave Address	01
Function	03
Start Address Hi (Refer 10.3.5)	00
Start Address Lo (Refer 10.3.5)	00
No of Registers to read Hi	00
No of Registers to read Lo	01
Error Check	CRC

The above example is a typical example of supported format for function # 03.

10.3.4. RESPONSE FROM TDS 602 – 1

Field Name	Example (Hex)
Slave Address	01
Function	03
Byte Count	02
Data Hi	xx
Data Lo	xx
Error Check	CRC

10.3.5. MODBUS QUERY LIST IN HEX DECIMAL(hex)

Parameter Name	Function	Start Address Hi	Start Address Lo	No. of Registers to read Hi	No. of Registers to read Lo
TDS value	03	00	00	00	01
OUTPUT - 1 Control mode	03	00	01	00	01
Set value high1	03	00	02	00	01
Set value low1	03	00	03	00	01
Temperature value	03	00	04	00	01
Slave ID	03	00	05	00	01
Baud rate	03	00	06	00	01
Parity	03	00	07	00	01
OUTPUT - 1 status	03	00	08	00	01
Alarm Status	03	00	09	00	01
Alarm Condition	03	00	0A	00	01
Unit	03	00	0B	00	01
Resolution	03	00	0C	00	01
OUTPUT - 2 Control mode	03	00	0D	00	01
Set value high2	03	00	0E	00	01
Set value low2	03	00	0F	00	01
Temp. comp. mode	03	00	10	00	01
Temp. offset value	03	00	11	00	01
Analog low limit	03	00	12	00	01
Analog high limit	03	00	13	00	01
Temp. Coefficient	03	00	14	00	01
Hysteresis relay1	03	00	15	00	01
Cyclic delay relay1	03	00	16	00	01
Hysteresis relay2	03	00	17	00	01
Cyclic delay relay2	03	00	18	00	01
OUTPUT - 2 status	03	00	19	00	01
ATC sensor status	03	00	1A	00	01

10.3.6. MORE ON UNSUPPORTED FUNCTIONS:

Unsupported functions will not return a response from TDS 602 - 1 . However continuing development will ensure that more Functions will be added to this model in future releases. For specific Functional requirements please contact SANSEL INSTRUMENTS AND CONTROLS.

11. FAULT FINDING GUIDE

The following table may be useful in correcting malfunctions and avoiding simple pitfalls.

CAUSE	REMEDY
Display not glow	Check A.C supply (If it is ok, TDS 602 – 1 need to service at factory.)
Reading fluctuating	Poor earthing (1. If poor, Connect on efficient earth 2. If it is ok, TDS 602 – 1 need to service at factory.)
Relay or Alarm Output not coming	1. Check the “RELAY CONTROL MODE”(Ref. 4) & “RELAY or ALARM SETTINGS”(Ref. 9) 2. Check the represented wiring is correctly connected(Ref. 3) (If it is ok, TDS 602 – 1 need to service at factory.)
Analog Retransmission Output not coming	1. Check the “ANALOG RETRANSMISSION OUTPUT SETTINGS”(Ref. 8) 2. Check the represented wiring is correctly connected(Ref. 3) (If it is ok, TDS 602 – 1 need to service at factory.)
Communication Output not coming	1. Check the “DIGITAL COMUNICATION OUTPUT SETTINGS”(Ref. 4) 2. Check the represented wiring is correctly connected(Ref. 3) (If it is ok, TDS 602 – 1 need to service at factory.)

12. CONTACT US

SANSEL INSTRUMENTS AND CONTROLS
 No.1/46, GANGA NAGAR, MMDA COLONY, MADURAVOYAL,
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 02/17 18 of 18 Version 1.0