

TB/TS Thermistor Room Temperature Sensor



Description

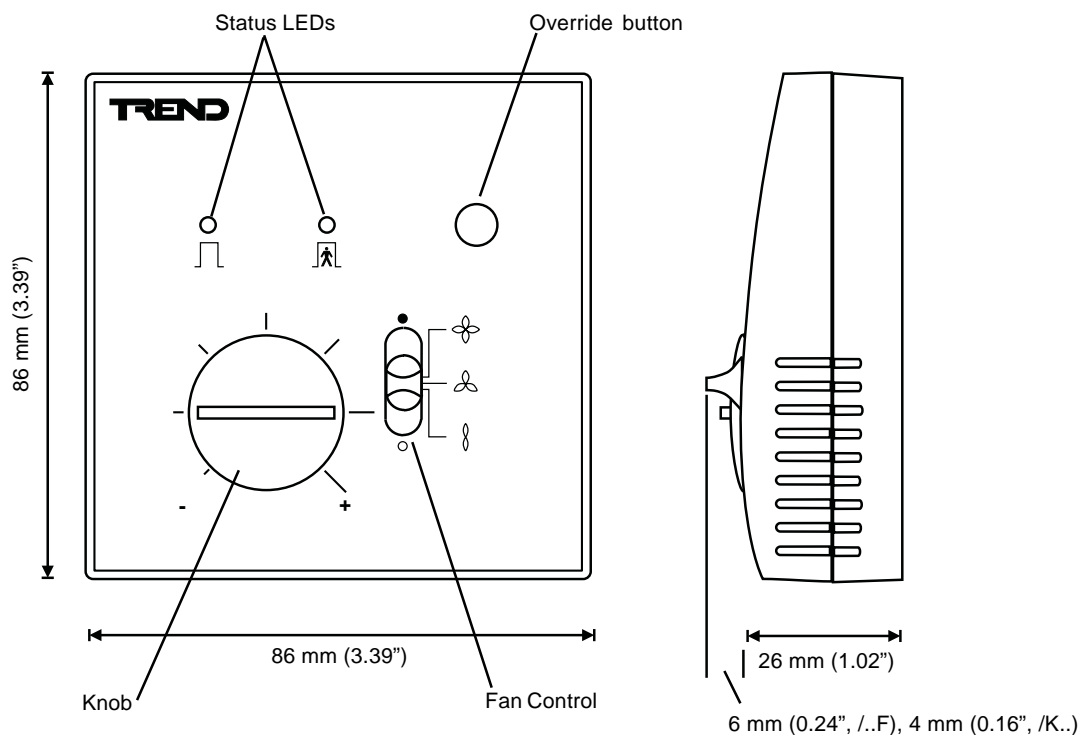
The TB/TS Thermistor Temperature Sensor is a wall-mounted thermistor room temperature sensor in a low-profile enclosure designed for good thermal response. It has several options including a low-profile adjustment knob (e.g. setpoint trim), a pushbutton (e.g. occupancy override), two LEDs (e.g. occupancy status indication), and a 5 way switch (e.g. fan control). These options are available in various combinations.

Features

- Surface fitting or fits on standard electrical back box
- Optional low profile adjustment knob (1 to 11 k Ω)
- Optional override button and status LEDs.
- Optional fan control switch (off, low, medium, high, automatic)

Physical

e.g. TB/TS/KOSF



FUNCTIONALITY

Housing

The TB/TS is suitable for mounting in a wall, and can either be mounted on a standard pattress or mounted on a flat surface.

TB/TS

The basic TB/TS sensor provides a standard Trend thermistor sensing element (10 kΩ at 25 °C, 77°F) for space temperature measurement. There are options for Knob input, Override button input, Status Indication output, and Fan Control input.

There are three structural variants, the variant being used depends on the option set selected:

Two terminals: TB/TS

Half board with 3 terminals: TB/TS/K

Full board with 6 terminals: TB/TS/OS, /KO, /KOS, /KOF, /KOSF, /KE, /KEF

The adjacent schematic diagram illustrates the full complement of options. The TB/TS uses 2 unidentified terminals as polarity is unimportant, the TB/TS/K uses the half board with a 3 terminal

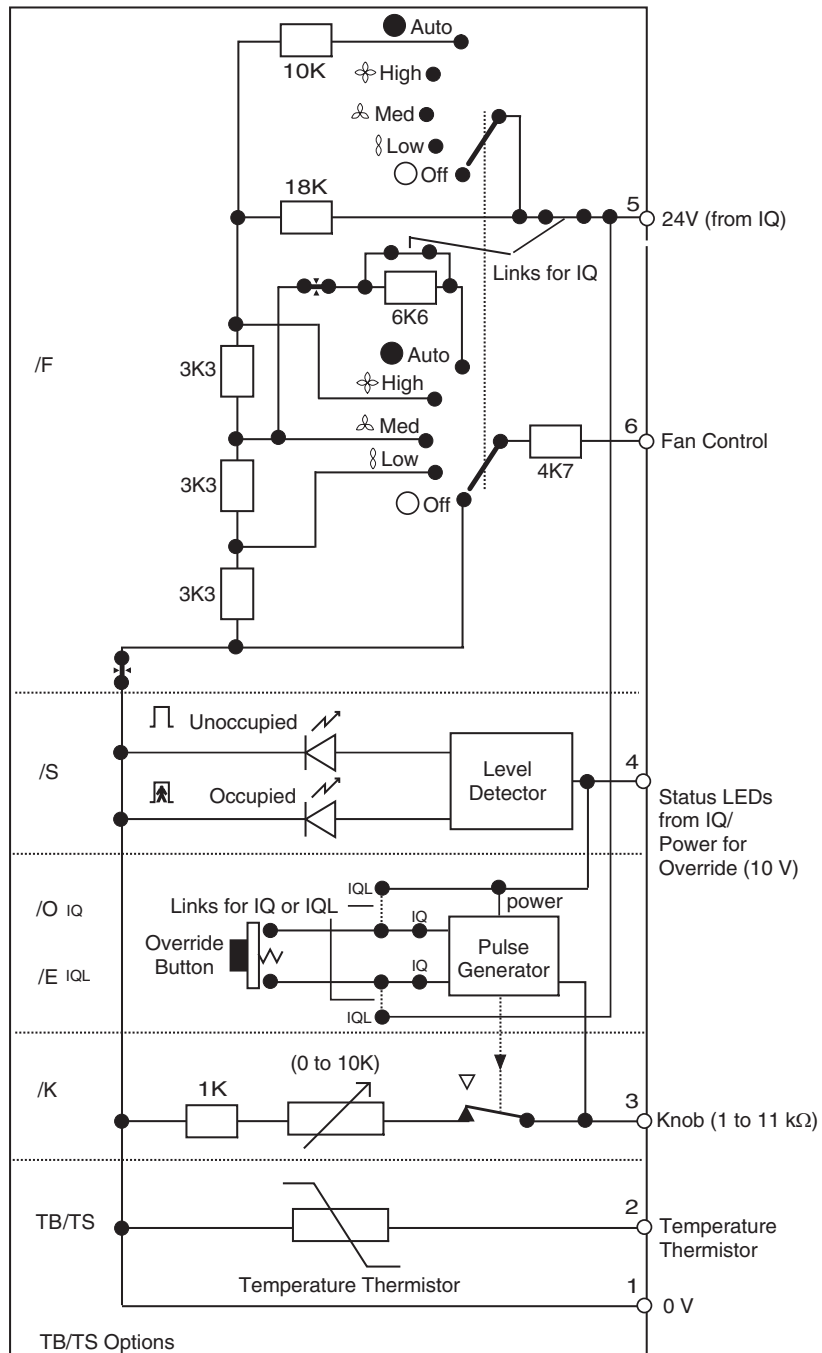
connector, and all the other options use the full board with a six terminal connector.

Factory set links are fitted to the full board which sets the board use for either IQ, or IQL use. The TB/TS/OS, /KO, /KOS, /KOF, /KOSF are linked for IQ use whereas TB/TS/KE, and /KEF are linked for IQL

Knob option, /K

The knob option, /K, gives a 1 to 11 kΩ potentiometer variable resistance. The minimum resistance of 1 kΩ eliminates the sensor module producing an 'Out of Limits' alarm as the controller thermistor input reads 0 V. (This is normally used to detect faulty thermistors).

TB/TS schematic diagram



FUNCTIONALITY (continued)

Override button option, /O (IQ), /E (IQL)

The override option allows the occupancy status of the area to be toggled or extended manually. For IQL controllers the status level detector and LED circuitry is not fitted to the TB/TS board, and the links isolate terminal 5, so that the override button provides a contact closure between terminals 4 and 5. For IQ controllers the button does not require any dedicated wiring as it operates by open circuiting the knob wiring for approximately seven seconds. However, this means that the knob output must always be wired even for the /OS option which does not have a knob. Similarly, the override option pulse generator is powered via terminal 4 (Status/Power), so it is also connected for /KO or /KOF options. For IQs, connect to 10 Vdc or 24 Vdc; if the sensor has status indication fitted but not used (/KOS, /OS, /KOSF used as /KO or /KOF), the input should be powered from 10 Vdc (e.g. from dummy analogue output for IQs). The override implementation can be achieved by the IQ control strategy shown. This differentiates between the operation of the push button and a circuit problem in the adjustment knob. The 'Out of Limits' alarm of the input sensor (S2) is used to detect the open circuit condition and this alarm should not be enabled or the alarm will be generated with each operation of the override button. The sequencing order of the sensor and the three logic modules is important as the strategy checks for the 'Out of limits' alarm bit of S2 (IQ2 bit 42,2) returning to zero one sequence step after it went into alarm. The output of the strategy is a pulse lasting one sequence cycle at node 21,2 which can be used within a larger strategy. A further logic module G4 can be used to latch this pulse and generate an occupation status. The gate module is used to avoid the open circuit knob value being passed through to subsequent modules by latching the previous value while the sensor is in alarm.

Status indication option, /S

An IQ control strategy is shown. The status indication is driven from pin 4. When the voltage output from the IQ is between 4.5 V and 5 V, the 'unoccupied', yellow LED is illuminated, and when it is above 5.5 V the 'occupied' green LED is illuminated. A function module F2 may be used to select the correct voltage as shown. The output of G4 from the override strategy may be used to select the appropriate status via the function module F2. Pressing the override button causes the selected LED to pulse for about 7.5 seconds. After this period the selected LED will return to steady illumination. This indicates that the button has been pressed and allows time for the IQ strategy to change the output to the status LEDs and select the other LED. Thus normally the operator will press the button, the current LED will flash and when the strategy has operated (after 5 seconds) the other status LED will be illuminated to confirm the occupancy status change.

Fan Control option, /F

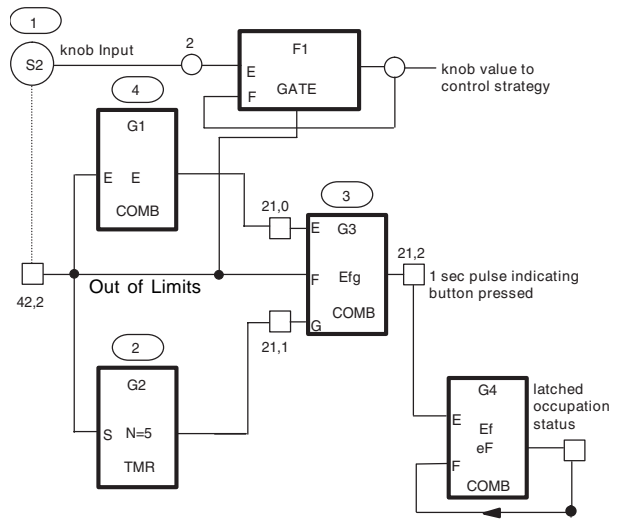
This switch provides either a stepped variable resistance, or a stepped variable voltage corresponding to five switch positions. The fan control produces a voltage signal for an IQ controller analogue voltage input between terminals 1 (0V) and 6 with terminal 5 connected to 24 V. If the board is linked for IQL then a set of different switched resistances is produced between terminals 1 and 6.

The voltage and resistance levels corresponding to the five switch positions are shown in the adjacent table:

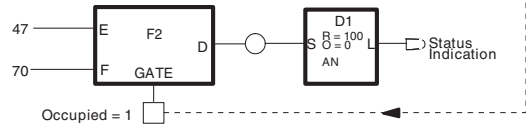
Switch Position	TB/TS/ version Function:	IQ, /KOF /KOSF		IQL, /KEF
		Voltage		Resistance
		Nominal	Recommended	
Legend	Terminals:	1 (0V) to 6, 5 (24V)		1 to 6
○	Fan Off	0V		4K7 ohms
⋮	Fan low speed	2.8V	>2 V	8K0 ohms
⊗	Fan medium speed	5.6V	>4.5 V	11K3 ohms
⊕	Fan high speed	8.5V	>7 V	14K6 ohms
●	Automatic	9.7V	>9 V	17K9 ohms

Note that the IQ recommended limits may need to be changed to suit mains supply voltage and auxiliary supply loading, or a 24 Vdc regulated supply can be used.

IQ Override Strategy



IQ Status Indication Strategy



Note that pulse time and timer settings are for IQs with 1 s cycle time.

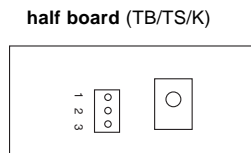
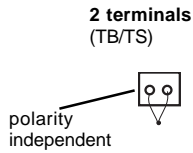
Note that the nodes only apply to pre-IQ3 strategies

INSTALLATION

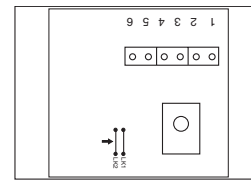
Choose location
Mount sensor (via two screws - minimum)
Connect terminals
Assemble sensor unit
Setup Strategy
Test

For full installation details see TB/TS Installation Instructions TG200604, TB/TS/K Installation Instructions TG200607, TB/TS/KO, /OS, /KOS, /KOF, /KOSF Installation Instructions TG200606, TB/TS/KE, /KEF Installation Instructions TG200605

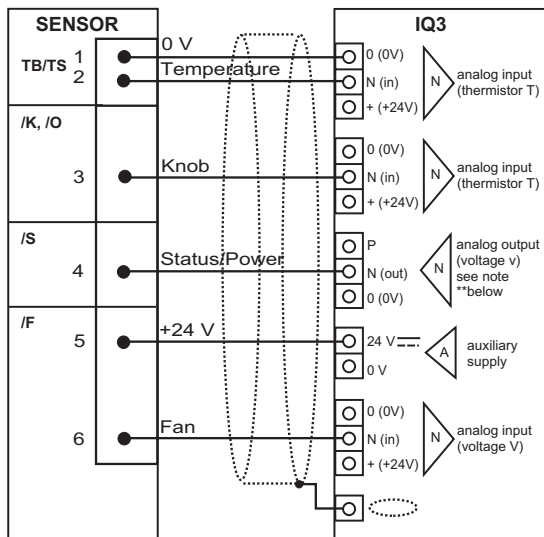
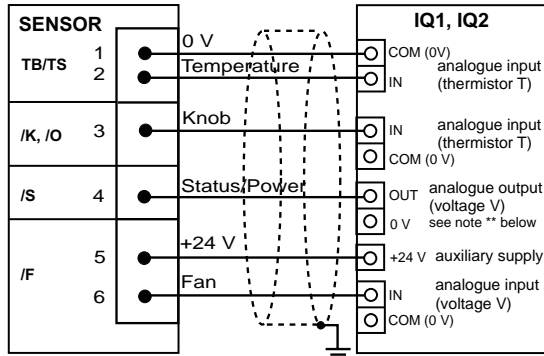
CONNECTIONS



full board (TB/TS/..., /KO, /OS, /KOS, /KOF, /KOSF, /KE, /KEF)



IQ



OPTION	CONNECT TERMINALS
TB/TS	1, 2
TB/TS/K	1, 2, 3
TB/TS/KO***	1, 2, 3, 4**
TB/TS/OS***	1, 2, 3*, 4
TB/TS/KOS***	1, 2, 3, 4
TB/TS/KOF***	1, 2, 3, 4**, 5, 6
TB/TS/KOSF***	1, 2, 3, 4, 5, 6

Asterisked notes relating to IQ table:

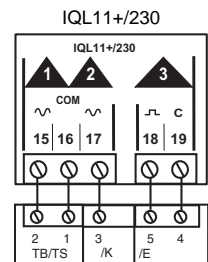
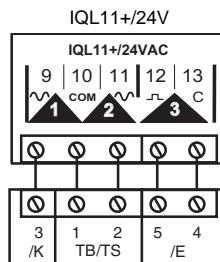
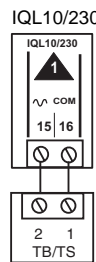
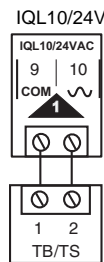
*Note that the override function operates via the knob connection so that for the /OS option, the Knob connection must be made.

**Note that the override function takes its power from the Status/Power connection so the Status/Power connection (terminal 4) must also be made for /KO and /KOF versions. For these /KO and /KOF versions, connect the Status/Power. For IQs, connect to 10 Vdc or 24 Vdc, but if status indication is fitted but not used (/OS, /KOS, /KOSF used as /KO or /KOF), 10 Vdc must be used e.g. from dummy analogue output.

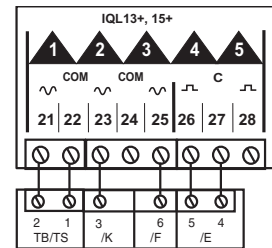
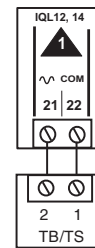
***Note that /KO, /OS, /KOS, /KOF, /KOSF cannot be used by IQ211 (although they can be used by IQ212)

IQL

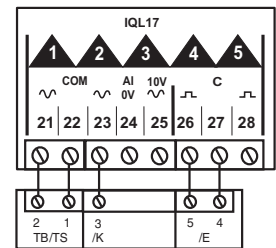
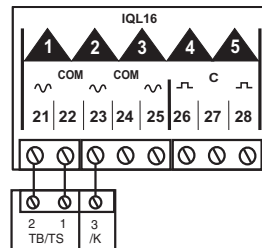
IQL	OPTIONS
IQL10, 12, 14	TB/TS
IQL11, 17	TB/TS, TB/TS/K, TB/TS/KE
IQL13	TB/TS, TB/TS/K, TB/TS/KE, TB/TS/KEF
IQL15	TB/TS, TB/TS/K, TB/TS/KE, TB/TS/KEF
IQL16	TB/TS, TB/TS/K



/24 and /230




/24 and /230



DISPOSAL

COSHH (Control of Substances Hazardous to Health - UK Government Regulations 2002) ASSESSMENT FOR DISPOSAL OF TB/TS.

RECYCLING.  All plastic and metal parts are recyclable. The printed circuit board may be sent to any PCB recovery contractor to recover some of the components for any metals such as gold and silver.



WEEE Directive :

At the end of their useful life the packaging and product should be disposed of by a suitable recycling centre.

Do not dispose of with normal household waste.
Do not burn.

PRODUCT CODES

TB/TS/[OPTIONS] :thermistor temperature sensor with options as shown in table. Consists of 2 parts (front panel, and backplate) for either flush mounting or mounting on a standard pattress.

Valid variants:

UK order code	US order code	
TB/TS	882000540	
TB/TS/K	882000560	
TB/TS/KO	882000580	
TB/TS/OS	882000590	
TB/TS/KOS	882000600	
TB/TS/KOF	882000610	
TB/TS/KOSF	882000620	
TB/TS/KE	882000630	
TB/TS/KEF		
TB/TS/BOX20	882000550	:Box of 20 sensors
TB/TS/K/BOX20	882000570	:Box of 20 sensors
WSA/10/USA	882001560	:Pack of 10 wall sensor adaptor plates to facilitate mounting TB/TS on US or Danish electrical back boxes. Each plate complete with 2 plastic covers, 2 back box screws, and two 3.5 mm TB/TS screws.

[OPTION]	Description
blank	Thermistor Temperature sensor only
K	1 to 11 kohm adjustment knob (e.g. setpoint trim)
O	Pushbutton (e.g. occupancy override); open circuits knob wiring
E	Pushbutton (e.g. occupancy override); volt free contact closure
S	Status LEDs - two LEDs (e.g. indicating occupied/unoccupied)
F	Fan speed select input to give off, low speed, medium speed, high speed, or automatic, either by stepped voltage or switched resistance values

SPECIFICATIONS

Electrical

- Connection :1 part screw terminals for 0.5 to 2.5 mm² cross section area (14 to 20 AWG) cable. 2 terminals for TB/TS, 3 for TB/TS/K, and 6 for all other options.
- Thermistor :10 kΩ @ 25 °C (77 °F)
- Temperature range :0 to +40 °C (recommended).
- Temperature Accuracy :of sensor, ±0.44 °C, ±0.79 °F(0 to +40 °C, 32 to 104 °F)
- Potentiometer :1 kΩ to 11 kΩ ±20 %.
- Override /O :7s duration pulse (open circuits knob input).
- /E :volt free contact closure
- Status LEDs :Occupied green LED 5.5 V to 10 V, Unoccupied yellow LED 4.5 V to 5.0 V.
- Fan Control for IQ :5 level switched voltage (0 V to 9.7 V).
- for IQL :5 level switched resistance 4.7 kΩ to 17.9 kΩ (TB/TS/KEF only).

Input channels and sensor scaling

Knob
The input channel should be linked for thermistor, T.

The sensor type module must be set up with the correct scaling. The recommended method of setting the sensor type scaling is to use SET. For all IQ2 series controllers with firmware version 2.1 or greater, or IQ3 series controllers, the SET Unique Sensor Reference given below should be used

Knob TB 3 deg trim (guaranteed ±3 trim)
alternatively: **Knob T 3 deg trim** (±3 ±20% linear trim)

Alternatively set sensor type scaling mode 5, characterise, and enter scaling manually using table below (this produces a guaranteed trim of -3 to +3). Note that for IQ3 the scaling mode and exponent (E) do not need to be set up.

Y	Input type	3 (thermistor volts)
E	Exponent	1
U	Upper	3.2
L	Lower	-3.2
P	Points	4
x	lx	Ox
1	.95	-3.1
2	1.05	-3
3	8.95	+3
4	13.05	+3.1

For all other IQ controllers see the Sensor Scaling Reference Card, TB100521A.

Thermistor
The input channel should be linked for thermistor, T.

The sensor type module must be set up with the correct scaling. The recommended method of setting the sensor type scaling is to use SET. For all IQ2 series controllers with firmware version 2.1 or greater, or IQ3 series controllers, the SET Unique Sensor Reference given below should be used

Thermistor TBTS (°C)
Thermistor TBTS F (°F)

Alternatively set sensor type scaling mode 5, characterise, and enter scaling manually using table below. Note that for IQ3 the scaling mode and exponent (E) do not need to be set up.

System Accuracy
(including controller)
:±0.9 °C, ±1.62 °F
(0 °C to +40 °C,
32 °F to 104 °F)

Units		°C	°F
Y	Input type	1 (thermistor volts)	
E	Exponent	3	
U	Upper	50	122
L	Lower	-5	23
P	Points	6	
x	lx	Ox (°C)	Ox (°F)
1	2.641	50	122
2	3.47	40	104
3	4.46	30	86
4	6.663	10	50
5	7.668	0	32
6	8.102	-5	23

For all other IQ controllers see the Sensor Scaling Reference Card, TB100521A.

Fan Control
The input channel should be linked for voltage, V.

The sensor type module must be set up with the correct scaling. The recommended method of setting the sensor type scaling is to use SET. For all IQ2 series controllers with firmware version 2.1 or greater, or IQ3 series controllers, the SET Unique Sensor Reference given below should be used.

Fan Control V

Alternatively set sensor type scaling mode 5, characterise, and enter scaling manually using table below (this produces the input in the range 0 to 9.7). Note that for IQ3 the scaling mode and exponent (E) do not need to be set up.

Y	Input type	0 (volts)
E	Exponent	2
U	Upper	10
L	Lower	0
P	Points	2
x	lx	Ox
1	0	0
2	10	10

For all other IQ controllers see the Sensor Scaling Reference Card, TB100521A.

Mechanical

- Flush fitting :86 mm (3.39") x 86 mm (3.39") x 26 mm (1.02") depth. Add 6 mm (0.24") to depth for /..F, add 4 mm (0.16") for /K..
- Enclosure Material :Flame retardant (V0) ABS.
- Environmental :-10 °C (14 °F) to +50 °C (122 °F)
0 to 90 %RH non-condensing.

Manufactured for and on behalf of the Environmental and Combustion Controls Division of Honeywell Technologies Sàrl, Ecublens, Route du Bois 37,Switzerland by its Authorized Representative, Trend Control Systems Limited.

Trend Control Systems Limited reserves the right to revise this publication from time to time and make changes to the content hereof without obligation to notify any person of such revisions or changes.

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