

RS485WDT MANUAL.tpd  
6-13-20  
UPDATED 5-1-21

REFERENCE MANUAL INFORMATION:  
FOR RS485WDT REV B&C UNITS

R E SMITH INC.  
10330 CHESTER ROAD  
CINCINNATI, OHIO 45215

513-874-4796 OFFICE  
513-638-0228 RON CELL  
www.rs485.com  
gres716@gmail.com

The RS485WDT is a replacement for the Industrologic UWDT485 with several enhancements, including a 9-35Vdc voltage input range, an "ACTIVE DATA" green LED indicator (with pulse "stretcher") for a bright/"vivid" indication when the RS485 reset/trigger/"keep-alive" data is being received. Also, user time-out jumper selection and, an RS485 common selection, of 100 ohms or hard common, as well as termination selection. Operating temperature range is -40C to 85C, with RH of 10 to 90%, non-condensing. Enclosure, Power Supply and, conformal coating is available. Improved accuracy for "keep-alive" timing.

The RS485WDT unit operates as an independant "defense mechanism" to guard against numerous system fault conditions in control applications, and is designed to monitor the system's communications integrity, by actively detecting on/off transitions (characters and/or pulses) on the RS485 "input-only" terminals, via a twisted wire pair. During normal operation, the units internal timer is continually reset by the RS485 line activity, and a Form-C "dry contact" Relay remains energized for the time-out value set by jumper selection (5 fixed values & one custom setting of up to 7+ minutes. When the RS485 input does NOT receive input information (data is lost) the watchdogs internal timer times-out and DE-energizes the Form-C Relay to indicate a fault condition. If power to the unit is lost, the Relay will Naturally De-energize also.

Loss of control can be caused by numerous problems such as: control system faults (CPU latch-up), wiring & cabling failure, tampering, software problems, communications problems (open line, shorts, loading and or distance issues), or power failure. The Relay contacts can be used to activate an Alarm, shut down the system, or provide a system reset signal. Once the power and RS485 input information is restored the timer will reset and normal operation can continue.

FEATURES:

- 1) Discrete RS485 detection circuitry, SA555P timer, buffered relay driver, and 6 LED indicators
- 2) RS485 receiver/trigger input with "vivid" green brightness LED with pulse "stretcher" for single character timer reset at data rates up to 921.6Kbps+
- 3) RS485 termination jumper and resistor, RS485 common jumper selection of 100 ohm 1/2 watt resistor (per RS485 application note) or "hard" common
- 4) Jumper selection of 5 time out values (+/- 20%): 100S = 97Sec., 75S = 79Sec., 50S = 53Sec., 25S = 27Sec., T5S = 5Sec., and TOV (sixth jumper) for a custom setting from 1-440Seconds (7Min+) via R23
- 5) Fail safe operation when using K1 relay NO and COM terminals, for loss of power, detection of RS485 data loss, open/shorted RS485 input conditions, etc.

- 6) Screw terminal (& 2.1mm center positive circular connector) power, and screw terminal relay contacts, and RS485 trigger input signals
- 7) Form-C relay connections for NC COM NO @ lamp and 30Vdc operation
- 8) 6 LED indicators for: trigger input (bright green), power (yellow), 2 red relay K1 off/error, and 2 green relay K1 on/timer active
- 9) On-board switching power supply for 9-35Vdc operation (current 50mA typ. (1/2W), with relay on, current decreases as voltage increases
- 10) 2.1mm barrel connector with center positive for easy connection to wall-wort supplies (input power is diode protected for both barrel and terminal connections) and a transient protection diode is also included
- 11) Optional enclosure and power supply are available from R E Smith, Inc.: 513-874-4796 to order, 513-638-0228C for technical assistance.
- 12) Operating temperature range -40C to 85C, RH 10-90% non-condensing conformal coating is available
- 13) Board has 4 mounting standoffs that will accommodate #6 hardware
- 14) RS485 trigger connections for -,+,COM/100 ohms, may be necessary to reverse +/- signals depending on equipment connected to, use 24AWG twisted pair wire (one pair only) for best results, 4000ft @ 100Kbps
- 15) See schematic for additional information or contact Ron, the design engineer, at gres716@gmail.com/513-638-0228 for help or documentation

#### MONITORING THE RS485 SIGNALS:

To use the RS485WDT to monitor the RS485 data activity, the keep-alive signal should be connected to the RS485 terminal block: -,+, with common being optional. It should be noted that various manufacturers of RS485 equipment label their signals in various ways. A and B are often used and + and - with opposite polarities are common. If a differential signal such as RS485, is reversed, the data will be inverted. If proper operation is NOT achieved, try reversing the wires on our unit and try again. Our + terminal is higher in voltage than the - terminal when there is no data present (this is the idle state). A bias network is built in.

Termination can be selected by using the TERM jumper near K1. The "E" position enables the termination and should be used if the RS485WDT is located at the end of an RS485 line. If the RS485WDT is located in a position other than the end of the line, then the TERM jumper should be in the "D" position to disable the termination resistor.

The application note for RS485 has a recommendation to connect the common of nodes, on a network through a 100 ohm, 1/2 watt resistor at each node. This provides a semi-stiff common between the units and helps keep the units within the common mode range of the RS485 chips, without causing excessive current to flow due to different common potentials on a network. Select either 100 or GND on the jumper just below the green LED for ACTIVE DATA. Default setting is 100.

When power is applied to the RS485WDT unit the K1 red LED indicators (2) will be on, and both K1 green LED indicators, as well as the K1 relay will be off. When the device or RS485 line that is being monitored begins sending trigger signals, the "ACTIVE DATA" green LED will flash, turning on the K1 relay, the green K1 LEDs and, turning off the red K1 LEDs. From this point on, the "keep-alive" trigger signals must continue to occur at intervals more frequent than the time out value selected for the 555 timer IC, or the time will expire/ time out, turning off the K1 relay, the green LEDs, and turning on the red LEDs. Power failure can be identified by all LED indicators being off. The yellow LED will remain on when power is applied to the unit.

A single "keep-alive" character @921.6Kbps should be sufficient to discharge timing capacitor C4 and, extend the time before the next "keep-alive" signal needs to be sent. The resistor values that have been selected, for the timing function(s), have been adjusted to allow

the low leakage 1N4448 (D4) diode and the "pulse stretcher" to operate properly. At 961.2Kbps the data bit time is only 1.1uSec., and the "pulse stretcher" extends this time to approximately 47mSec. and, allows for a "vivid" green flash on the "ACTIVE DATE" LED, while allowing about 7-8 time constants to discharge the timing capacitor C4 to approximately 0.65V to 1.0V. If you have any false indications on the K1 relay output, try to increase the timing resistor to a higher value, or send a few additional characters as a "keep-alive" signal. Data rates from 110Bps to over 921.6Kbps should allow the unit to operate properly. Higher data rates are possible. Call Ron, 513-638-0228C if there are questions.

#### USING THE K1 RELAY FOR FAIL SAFE OPERATION:

Most applications should use the normally open (NO) and common (COM) contacts on the K1 relay to provide not only signal monitoring; but, to also provide a fail-safe indication for power to the RS485WDT. If either the signal being monitored or power is lost, the K1 relay will be off and, the normally open (NO) and common (COM) contacts will be OPEN and disrupt the current flow, indicating an error. The contacts on several units can be cascaded to allow the monitoring of several data lines in a large system and, can then be connected to one alarm device. The LED indicators on each RS485WDT unit can then be used to determine the signal/power loss status on a specific unit.

Also, if you need to monitor a 4-wire RS422 signal in both directions, then 2 RS485WDT would be needed, to fully monitor all data activity. Next cascade the relay normally open (NO) and common (COM) contacts. If data flow is disrupted in either direction (or both) the monitoring current will be disrupted, indication a Fault/Error.

#### SETTING KEEP-ALIVE TIMER VALUES:

Six jumpers locations (2X6, 0.025" pins) are provided for setting the "keep-alive" timer value. The jumpers are located at the bottom of the circuit board near timing capacitor C4. Jumpers are labeled as 100S, 75S, 50S, 25S, T5S, and TOV. Only one jumper should be installed for the six locations that are available. The first four jumpers: 100S, 75S, 50S, and 25S are the jumpers used for normal operation. T5S is used to test the timer for a 5Sec. time out, and TOV is a custom setting that will allow for a "time out value" from 1Sec. to about 440Seconds (7Min+) if R23 is installed. If a custom TOV value is required we can install an appropriate resistor in location R23 for special situations; however, please keep in mind that the timing value could be +/- 20%. Call Ron, 513-638-0228C if there are questions or if you need assistance.

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Optional items available: Enclosure-M @ \$10.00ea., 12VDC-SPS "wall-wort" power supply @ \$8.50ea., and conformal coating @ \$30.00/unit. A schematic and additional technical information is available. The RS485WDT Rev. C unit is generally available from stock @ \$69.00ea.

We hope this manual will provide the necessary information to help facilitate the successful operation of this product. Any feedback or suggestions concerning this unit would be appreciated,

# MODEL RS485WDT REV C

THE RS485WDT IS A REPLACEMENT FOR THE INDUSTRIAL UWDT485 WITH SEVERAL ENHANCEMENTS, INCLUDING A 9-35VDC VOLTAGE INPUT RANGE, AN "ACTIVE DATA" GREEN LED INDICATOR (WITH PULSE "STRETCHER") FOR A BRIGHT/"VIVID" INDICATION WHEN THE RS485 RESET/TRIGGER/"KEEP-ALIVE" DATA IS BEING RECEIVED. ALSO, DIGITAL/JUMPER TOV (TIME OUT VALUE) SELECTION, ANY DATA RATE OR COM SPECIFICATION UP TO 9216KBPS+, AND IMPROVED TIMING, FORM-C RELAY FACILITATES DETECTION OF DATA OR POWER LOSS, AS WELL AS SHORTED DATA LINES (FAIL-SAFE BIAS).

AN ALARM "LOOP" CAN BE FORMED BY USING THE RELAY NO AND COMMON TERMINALS. CASCADE MULTIPLE UNITS TO ALLOW THE MONITORING OF SEVERAL DATA LINES IN LARGE SYSTEMS AND, THEN CONNECT ONE ALARM DEVICE. LED INDICATORS ON EACH RS485WDT UNIT CAN THEN BE USED TO DETERMINE THE SIGNAL/POWER LOSS STATUS ON A SPECIFIC UNIT. RS422 (<4-WIRE) SIGNALS CAN BE MONITORED IN BOTH DIRECTIONS BY USING A PAIR OF RS485WDT UNITS. LOSS OF THE MONITORING CURRENT WILL INDICATE A FAULT/ERROR CONDITION.

- SET ONE JUMPER ONLY FOR DELAY TIME
- USER TOV 1-440S, SET BY R23, SEE RS485WDT DRAWING OR MANUAL
- 1-JUMPER = TIME

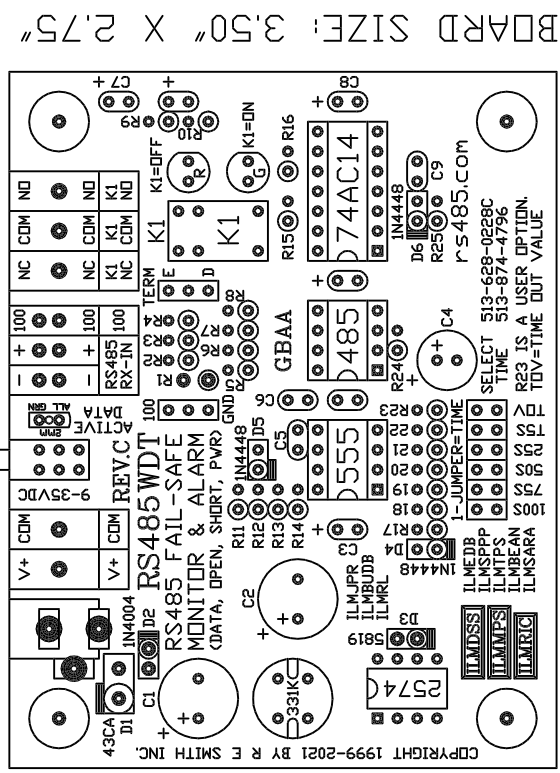
- ENABLE RS485 150 OHM TERMINATION
- DISABLE RS485 150 OHM TERMINATION
- 100 OHM 1/2W TO COMMON
- RS485 "HARD" COMMON
- GND

JUMPER INSTALLED  
(FACTORY SETTING)  
I=INSTALL, R=REMOVE

LINK: [rs485.com/prs485wdt.html/](http://rs485.com/prs485wdt.html/)



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SHEET 1	OF 1	RS485WDTQD	



## QUICK DATA & INFORMATION

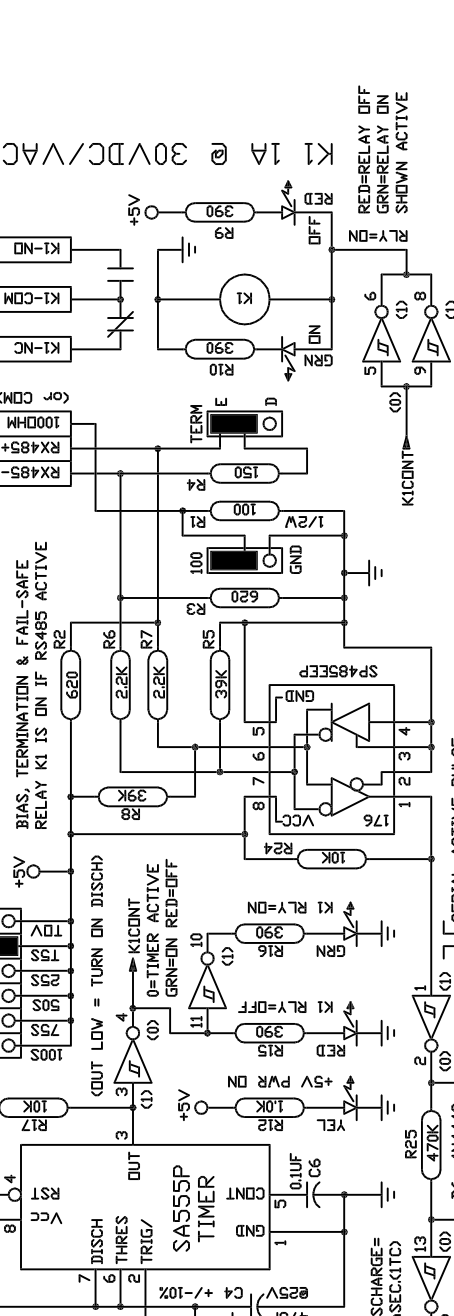
FAIL-SAFE BIAS VIVID ACTIVE DATA INDICATOR	DATA RATE UP TO 921.6Kbps+ DETECT 1uS DATA
TEMP/HUMIDITY -40C TO 85C 10-90%RH NON-CD	VOLTAGE & PWR Vin = 9-35VDC 0.5 WATTS TYP.
NO/COM RELAY FOR FAIL-SAFE OPERATION MODE	TIME-OUT SELECT 100S, 75S, 50S, 25S, 5.1S, USER
FAIL SAFE OPERATION FOR LOSS OF DATA, POWER, SHORTED DATA LINES, 6 LED INDICATORS FOR UNIT STATUS	
TALK TO RON THE DESIGN ENGINEER 513-638-0228 CELL, NO TEXTING PLEASE, EXCEPT FOR PHONE NUMBER EMAIL ADDRESS AND YOUR NAME.	

# RS485 WATCH DOG TIMER

**IMPORTANT NOTE:**  
ON PWR UP RELAY K1=OFF. CALCULATED TIME IS "ACCURATE" WHEN A TRIGGER PULSE IS RECEIVED. WHEN K1=ON A "KEEP ALIVE" PULSE CAN REDUCE THIS DELAY BY UP TO 20%. IN ADDITION TO THE COMPONENT TOLERANCES OF 20% (0.0V vs 0.65V+).

USE ND/COM CONTACTS FOR 'FAIL-SAFE' OPERATION.

USER TOV(TIME OUT VALUE) CAN BE INSTALLED FOR R23. THIS SHOULD BE A 1/4V 5% RESISTOR IN THE RANGE OF 10K TO 10M. TO CALCULATE THE TIME DELAY USE:  $T = R \times 47\mu F \times 1.1$ . THE ACCURACY OF THE TIME DELAY IS APPROX. +/- 20%. IF A 1% RESISTOR IS USED THE ACCURACY CAN BE IMPROVED. UNITS ARE SHIPPED WITH THE JUMPER INSTALLED FOR 5.1S. USE ONE JUMPER TO SET TIMER VALUE.



IF K1=OFF, C4+=0.0V(55S) WILL DISCHARGE C4+ TO ABOUT 0.65V TO 1.0V AND EXTEND K1=ON BY 85% OF CALCULATED TIME VALUE.

ACTIVE DATA (RESET PULSE) 48ms  
"VIVID" FLASH @ 921.6Kbps  
AND LOWER DATA RATES

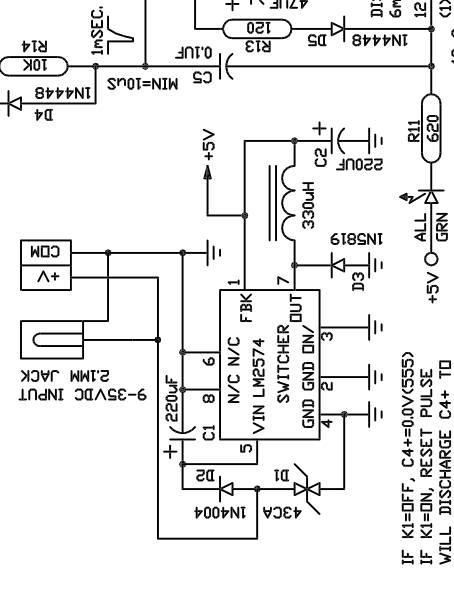
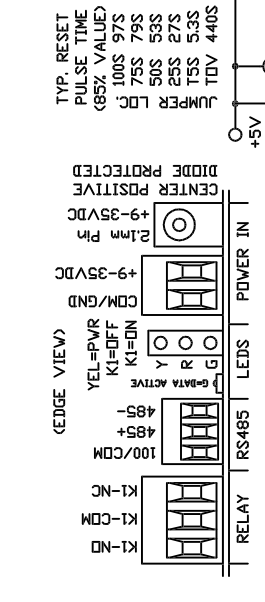
DISCHARGE= 6mSEC.(1TC)

CALL R0N @ 513-638-0228 FOR TECHNICAL SUPPORT!

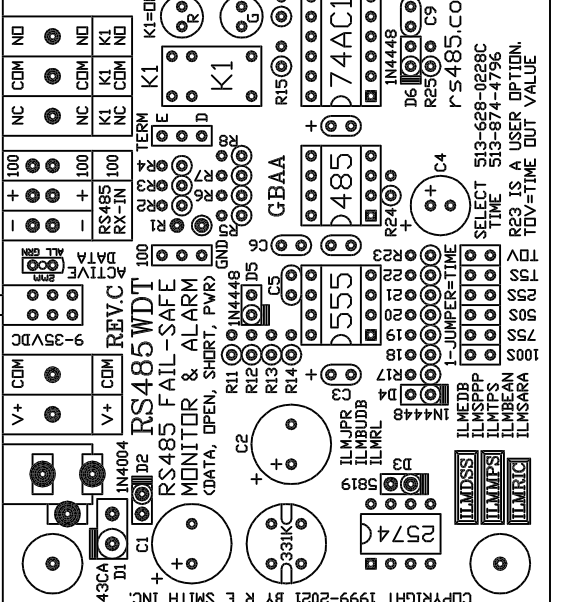
**MODEL RS485WDT**

**REV C**

**RESmith**  
WWW.RS485.COM  
10330 CHESTER ROAD, CINCINNATI, OHIO 45216  
513-874-4796



LINK: [rs485.com/prs485wdt.html/](http://rs485.com/prs485wdt.html/)  
BOARD SIZE: 3.50" X 2.75"



DUPLICATE TO THE DESIGN OF THE 55S TIMER, IT IS NOT POSSIBLE TO ACCESS/CONTROL THE INTERNAL RESET CIRCUITRY, THAT IS CAPABLE OF DISCHARGING THE TIMING CAPACITOR (C4, 47uF) TO 0.0V. IF OUTPUT RETURNS TO ZERO, DISCHARGE OCCURS & THE TRIGGER INPUT IS ACTIVE AGAIN.

**SPECIFICATIONS, FEATURES & DESIGN NOTES:**

- 1) 9-35VDC INPUT V RANGE, -40 TO 85C OPERATION, 10% TO 90% RH, NON CONDENSING, FAIL-SAFE MODE, LOW PWR, INDUSTRIAL LOGIC UWDT485 REPLACEMENT.
- 2) RS485 RESET @ ANY DATA RATE, WITH ACTIVE DATA "PULSE ENHANCED" GRN LED INDICATOR, DETECTION OF DATA LOSS, OPEN/SHORTED RS485 INPUT, PWR LOSS.
- 3) +/-20% ACCURACY WITH 5 JUMPER SELECTABLE TIMES OF 100S,75S,50S,25S,15S, AS WELL AS A USER TOV VALUE FOR A TIME DELAY SETTING OF 1-440 SEC.
- 4) RS485 BIAS, TERMINATION JUMPER & 100 OHMS TO COMMON/GROUND SHUNT JUMPER SELECTION.
- 5) FORM-C 1-AMP, 30-VOLT(AC/DC) RELAY CONTACTS, WITH GREEN LED(S) FOR K1=ON, OR RED LED(S) FOR K1=OFF(FAULT/ERROR) & YELLOW PWR LED.
- 6) CALL FOR ADDITIONAL INFORMATION, MANUAL SOON.
- 7) OPTIONAL ENCLOSURE & POWER SUPPLY AVAILABLE.

CALL R0N @ 513-638-0228 FOR TECHNICAL SUPPORT!

RS485WDT ONLY \$69.00ea.  
WITH ENCLOSURE \$79.00ea.  
12V POWER SUPPLY \$8.50ea.  
CONFORMAL COATING \$35.00  
NO SOCKETS OR JUMPERS  
CALL FOR OPTIONS

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SHEET 1 OF 1  
RS485WDT

DRAWN BY RES  
DATE 10-14-19  
REV 2-22-21  
SCALE NONE  
CHKD. BY RES

SUBJECT MODEL RS485WDT  
FOR WATCH DOG TIMER

REV. NO. RS485WDT  
JWG-NO. RS485WDT  
C

MEDIUM LABEL REV C

2.1MM +VIN POWER 9-35V	V+ CDM	9-35VDC	LED	ALM GRN ACT GRN	RS485 RX-IN	100	NC CDM NO	NO	R=K1-ALARM G=TIMER-OK
V+ CDM	Y=PWR R=ALM G=OK	9-35VDC	LED	ALM GRN ACT GRN	RS485 RX-IN	100	NC CDM NO	NO	R=K1-ALARM G=TIMER-OK
V+ CDM	Y=PWR R=ALM G=OK	9-35VDC	LED	ALM GRN ACT GRN	RS485 RX-IN	100	K1 K1 K1 NC CDM NO	NO	USE NO&COM FOR FAIL SAFE MODE

**MODEL RS485WDT**  
**WATCH DOG TIMER/ALARM**

SIGNAL MONITORING & PWR FAIL DETECTION  
FOR ANY RS485 DATA RATE

**RESmith** INC.  
**WWW.RS485.COM**  
10330 CHESTER ROAD, CINCINNATI, OHIO 45215  
**513-874-4796**

MODEL RS458WDT-C

DRAWN BY RES		SUBJECT MODEL RS485WDT	
DATE 2-22-21		FOR WATCH DOG TIMER	
REV		SCALE NONE	
SHEET 1 OF 1		CHKD. BY RES	
RS485WDT-L		DWG. NO. RS485WDT-L	
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R. E. SMITH INCORPORATED CINCINNATI, OH 45215		REV. C	