TOTAL ENGINEERING SERVICES TEAM, INC.

RTU / SCADA SYSTEMS

MODEM MONITOR

Document No. 1070-01

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MODEM MONITOR

BASIC DESCRIPTION

The Modem Monitor (C) is a proprietary device developed by TEST to serve as a multi-purpose remote timer and reset device. It is normally used in unattended locations where it is necessary to have an independent means of monitoring an RTU or any other electronic based system.

The modem monitor provides both local monitoring as well as remote reset capabilities. The unit provides three basic types of monitoring: **watchdog, timeout, and counter.** If any of the three types fails, then the device will provide a pulsed contact closure that can be used to perform a reset or other action.

MODEM MONITOR DESIGN

The device uses low level, low power electronics to provide the most reliable operation possible in a compact package. Each of the three monitoring modes, and the reset pulse, are "programmed" with jumper settings on the circuit card. No processors, software, or computer type devices are used. This minimizes the susceptibility of the unit to interference from electrical noise, power fluctuations, and other abnormal conditions under which it is intended to operate.

The basic design is intended to be easily attached to the 25 pin ribbon cable that normally connects a PC serial port to a standard phone modem. However, this is simply the standard configuration and is not the extent of the device's applications. Simple modifications allow the device to be used in other modes not using the RS-232 (+-12v) type communications of a modem. Other signal levels can also be accommodated, and there is a small breadboard area on the circuit card for custom modifications.

WATCHDOG TIMER

A "watchdog timer" is electronics slang for a device that watches another circuit for periodic operation. Normally, this is an output from the monitored device that changes state (off to on to off) within a specific period of time. Some devices, like high speed control devices, may use millisecond time ranges. A computer used in SCADA can normally use a time period of several minutes to

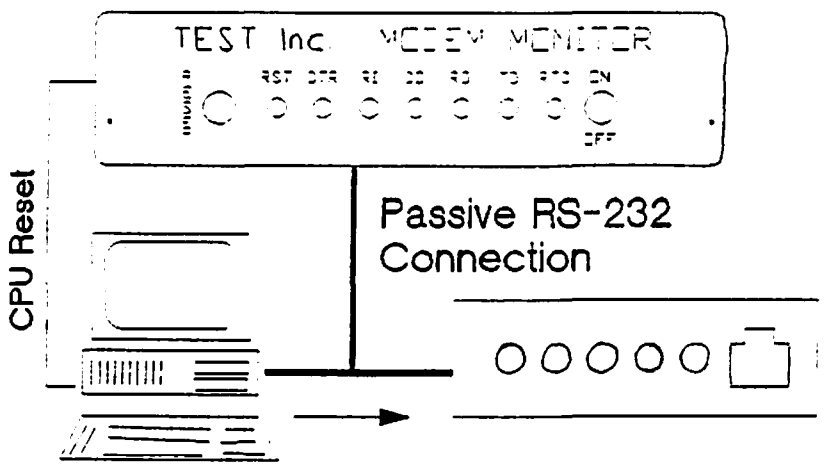
allow for normal, sporadic operation of the system without causing unnecessary resets.

The modem monitor watchdog timer is set by jumpers to watch the input signal for a constantly changing state. If the signal sits either off or on for to long, then the device will generate a reset pulse and start timing all over again. The standard input is from pin 4 of the DB-25 connector on the PC, which is generally the RTS line. This line is usually not needed by the modem itself, and the computer software can easily toggle this line to indicate all is well. If the line stops toggling, then the modem monitor will time out and reset the computer.

Inputs other than DB-25 pin 4 can be used by making the appropriate trace cuts and installing additional jumpers on the circuit card. Refer to the device schematic for more information.

NOTE: The modem device may be affected by the off-on operation of the RTS input. Although many devices do not require this signal for operation, the toggle action may cause improper operation. In many cases, simply removing the pin from the DB-25 connector at the modem will stop any associated problems. In other cases, the pin may have to be jumpered to + or 1 12 volts for proper operation. Refer to the modem or PRC manual for more information on the RTS requirements for that device.

MODEM MONITOR



Detects Computer Failure
Counts Modem Rings
Allows Remote Reset
Phone. Radio. LB-100 Versions

Design/Built by TEST

BREAK TIMEOUT

The modem monitor has a timeout section that responds to an input that remains active for too long. The selected input should be one that normally toggles, but should always return to a known state within a specific period of time.

In the standard modem monitor configuration, the timeout input is the Receive Data (RD) line, DB-25 pin 3, from the modem to the computer. This line normally carries data from the modem to the PC, but spends some of its time in an idle state. During normal transmissions, the line will move high and low to transmit a character, but will always return to the idle state between characters. This is the basis of asynchronous communications that is used by the modem.

A special condition, called a BREAK, is when the data line remains active for more than one character time. The BREAK signal is the condition for which the modem monitor is watching. A true BREAK is when the line remains active for just slightly more than one character time. This time is dependent on the modem's baud rate and the length of a single character. Many systems use 1200 baud, with a total of 10 bits per character. Thus, one character time is 10/1200 = 1/120th of a second. Setting the timeout to this value will allow for the quickest response.

However, it is not uncommon for unintentional breaks to appear on a noisy communications line. Therefore, it is desirable to set the break timeout to a fairly long time (several seconds) and use an unusually long break signal to initiate the reset.

COUNTER MONITOR

The modem monitor has counter circuit that can be reset and counts transitions on an input signal. One input is used to increment the counter, while another input is used to reset the counter. If the programmed count is exceeded before the counter reset line is activated, the unit will generate a reset pulse and as well as clear the counter.

Typical phone modem installations use the Ring Indicator (RI), DB-25 pin 22, as the default counter input. The modem should answer the phone and provide a connection within a known number of rings. Setting the counter to a number higher than the maximum allowable rings allows for repeated calls to the unit, which keep incrementing the counter, to generate a reset pulse.

The normal counter reset input is the DCD (data carrier detect) line, which indicates that the two modem systems have made an audio connection. In order for this to occur, the monitored modem must go off-hook, generate an answer carrier tone, and then hear the response tone from the calling modem. If all this happens, then the modem is operating properly and the counter is reset. If a DCD is never generated then something is wrong and a reset is required. The reset may result from a problem with the modem, computer, or communications. If the communications are poor, it is possible for the monitored modem to go off-hook but not be able to transmit an answer carrier tone or hear the response tone.

The counter input is buffered to provide a 1/2 second non-resetting pulse for each transition of the input. This allows ring signal inputs that toggle rapidly to count as a single ring. This section can be bypassed for installations requiring special configurations.

MODEM SETUP CONSIDERATIONS

When using a phone modem with the modem monitor, it must be properly configured in order to activate the monitor in the correct manner. Many HAYES compatible modems provide several choices for the DCD line. This is because some software programs and some computer systems have problems with DCD lines that come and go. Therefore, there are jumper and/or programming options in the modem that can be used to force DCD true, false, or to have it follow the actual carrier signal. The modem monitor requires that the DCD line follow the actual carrier signal so it can properly detect connections and disconnects.

Another consideration is the PIN 4, RTS line that is normally used as the watchdog input to the monitor. In normal operation, the computer will toggle this line once every second or so. Some modems, while not using this input, get confused with the toggle. The solution is to remove pin 4 from the DB-25 connector right at the modem. If the modem requires that pin 4 be truly active all the time, then either a jumper can be installed from another always-active pin (like pin 20) or the monitor can be configured to monitor another signal.

Some small battery powered modems monitor certain input signals to determine when the modem should be powered up. Refer to the documentation on the modem to verify that these signals are not in conflict with those of the modem monitor.

PACKET RADIO CONTROLLER MODIFICATIONS

A Packet Radio Controller (PRC) is a device used to connect two computers over a radio. While similar to a normal phone modem, the device has different audio interface circuits to provide microphone and speaker connections rather than the standard telephone RJ11 quick disconnect. The PRC also has a self contained computer that takes care of the many details of packet transmission, error detection, and routing.

PRC communications are half duplex, meaning that only one unit can transmit at a time. This is much like two people talking over a radio. There is no constant transmission, but rather a series of back and forth transmissions. The modem monitor must be modified slightly to use different inputs than a standard phone modem.

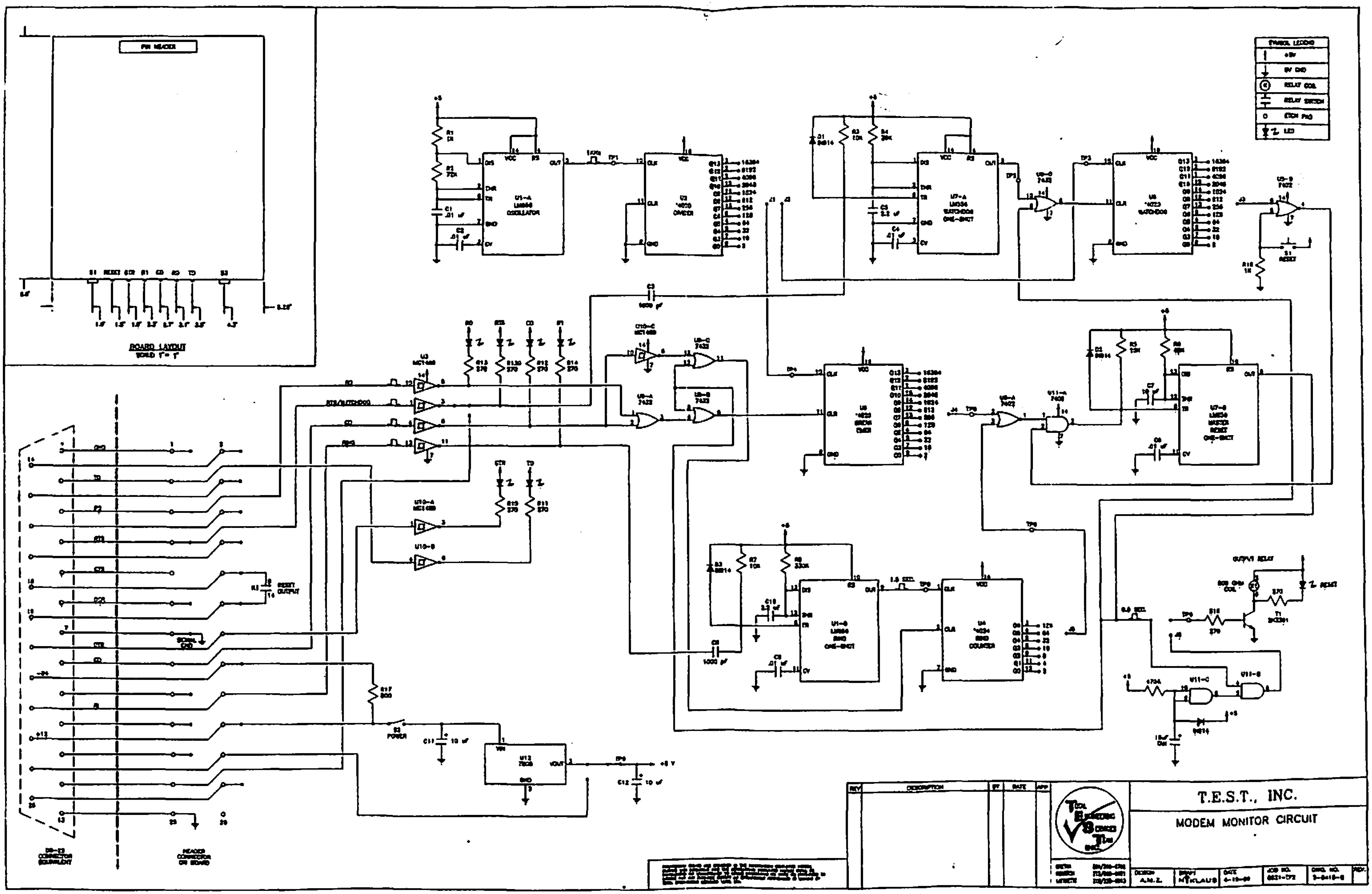
In PRC installations, there is no ring signal because there is no phone to ring. So, the counter can be connected to the DCD line (DB-25 pin 8) from the PRC which indicates a logical connection to another PRC. Each time a PRC connects to another PRC, it raises the DCD line and keeps it there as long as the logical connection is maintained. The actual carrier is only present during radio keying.

The PRC cannot generate a break signal, so another approach must be used to provide a timeout type reset. In this case, the overall communications connect time is used as the timeout. A value of several minutes is normally used here to time the DCD signal that indicates a logical connection to another PRC.

STANDARD CONFIGURATION SUMMARY

The most common uses of the modem monitor are in telephone modem and packet radio controller applications. The standard configurations for each are as follows:

MONITOR	-- PHONE MODEM --		-------- P R C --------	
FUNCTION	DB-25 PIN	PERIOD	DB-25 PIN	PERIOD
Watchdog	4 - RTS	4 mins	4 - RTS	4 mins
Timeout	3 - RD	4 secs	8 - DCD	5 mins
Counter Input	22- RI	8 rings	8 - DCD	4 dcds
Counter Reset	8 - DCD	-	3 - RD	-


T.E.S.T., INC.
MODEM MONITOR CIRCUIT
BOARD LAYOUT
SYMBOL LEGEND
OUTPUT RELAY
POWER
RESET