

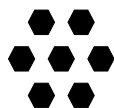
TELGUARD®

Cellular Alarm Transmission System Using SMS Digital Cellular Technology with Digital Voice Capability

MODEL TG-5



INSTALLATION AND OPERATING INSTRUCTIONS



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NOTICES

ABOUT THIS MANUAL

This manual assumes that you have basic security system installation skills such as measuring voltages, stripping wire, properly connecting wires together, connecting wires to terminals, and checking phone lines. It also assumes that you have a familiarity with the proper installation and programming tasks related to various Control/Communicator panels.

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FCC Notices

EXPOSURE TO RADIO FREQUENCY ENERGY

In 1991, the Institute of Electrical and Electronics Engineers (IEEE), and in 1992, the American National Standards Institute (ANSI), updated the 1982 ANSI Standard for safety levels with respect to human exposure to RF energy. Over 120 scientists, engineers and physicians from universities, government health agencies and industry, after reviewing the available body of research, developed this updated Standard. In March, 1993, the U.S. Federal Communications Commission (FCC) proposed the adoption of this updated Standard.

The design of your Telular **Telguard TG-5** complies with this updated Standard. Of course, if you want to limit RF exposure even further than the updated ANSI Standard, you may choose to install the unit in a manner that locates its antenna at an even greater distance from the general public than is recommended as a minimum by the standard.

To insure compliance with the standard, when selecting a mounting location for your **Telguard TG-5** do not mount it (or its associated antenna) in an area where the general public could reasonably be within 8 inches (20 centimeters) of the antenna.

EFFICIENT OPERATION

Do not operate your Telular product when holding the antenna. Be sure to mount the unit such that its antenna is a minimum of eight (8) inches (20 centimeters) is maintained from the general public.

For the best service quality, keep the antenna free from obstructions and point the antenna straight up.

ANTENNA CARE AND REPLACEMENT

Do not use the unit with a damaged antenna. If a damaged antenna comes into contact with the skin, a minor burn may result. Have your antenna replaced by a qualified technician immediately. Use only a manufacturer-approved antenna. Non-approved antennas, modifications, or attachments could impair service quality, damage the Telguard and violate FCC regulations.

FUTURE TESTING AND LIMITATIONS ON USE

Telguard® is part of an advanced design alarm-communication system. It does not offer guaranteed protection against burglary and fire. Any alarm communication system is subject to compromise or failure.

The Telguard® will not work without power. Devices powered by AC will not work if the AC power supply is off for any reason, however briefly, and at the same time, the backup battery is missing, dead or not properly installed.

The cellular radio network, needed to transmit alarm signals from a protected premises to a central monitoring station, may be inoperable or temporarily out of service. Cellular radio networks are also subject to compromise by sophisticated methods of attack.

This equipment, like any other electrical device is subject to component failure. Although this equipment is designed to be long lasting, the electrical components could fail at any time.

Due to these limitations, we recommend that if the automatic self-test feature is not enabled, other arrangements be made with the user to test the system at least once every three months. Moreover, arrangements should also be made for on site inspection/test by a licensed alarm installer at least once each year.

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1.0 GENERAL DESCRIPTION AND OPERATION

The Telguard® model TG-5 is a digital cellular radio alarm transmission device used to provide a primary transmission path (cellular) for control communicators (C/Cs). It uses the secondary transmission path (telco) when the cellular path is not available. When transmitting an alarm signal, Telguard obtains its data from the C/C by way of a telco interface. The device transmits a Link Request to the Telular operated Communication Center and when a link acknowledgement is received, the Telguard handshakes with the C/C and causes the C/C to transmit the alarm data. Telguard encodes the alarm data into SMS (Short Messaging System) protocol and transmits to the local digital cellular network provider. The signal is routed from the network provider to the decoding (message) center. The Communication Center performs like a central station receiver and issues the transmission acknowledgement when the last message in the transmission is received. After decoding and reformatting, the alarm signal is routed over telco to the appropriate alarm company central station for action.

In a typical alarm installation, Telguard is installed in the same area as the host alarm system. The incoming telco line is connected from any premises RJ-11 jack to Telguard and then from Telguard's RJ-45 jack to the host control/communicator's digital dialer in the normal fashion. Two programmable supervisory trip (STC) outputs are available for connection to the host control/communicator's trip zone input terminals in order to provide a Telguard trouble signal to the C/C. Additionally, automatic self-test and status-on-demand report signals are transmitted exclusively over the cellular network to the Communication Center. Telguard has its own internal power supply/battery charger. All telco line and cellular monitoring, switching and supervisory functions are built in--no extra modules are required.

Wireless voice calls may be made using POTS telephone equipment attached to the RJ-11 jack wired to the WVL terminal block in the TG-5. The Telguard processes incoming and outgoing voice calls. When service is available, the TG-5 generates a normal dial tone and when no-service or a non-registered cellular service is found, a separate no-service tone is generated. The TG-5 maintains an open audio path when in a call or call setup in order to receive progress tones and/or announcements provided by the cellular carrier or Telephone Company when connected. Typical indications from the network may include:

- Subscriber-not-available announcement
- Audible ring tone (ring tone heard by calling party)
- Subscriber-busy tone
- System-busy tone (also known as reorder tone and congestion tone)
- Special-Information-Tone (SIT)
- Call-Waiting tone
- Action-acknowledgement tone

The TG-5 voice interface sends information to an external Caller ID device to allow presentation of the calling party's telephone number if this service is available from the network. Both on-hook and off-hook caller ID are supported.

The Telguard model TG-5 comes with a special digital cellular transceiver (without handset), dipole antenna, interface with integrated control and power module, connecting cable, plug-in transformer and comes in a standard metal enclosure. It is UL Listed for residential burglary and residential fire.

The Listed equipment at the Telular operated Communication Center (TCC) plays a key role in the operation of every Telguard. All Telguard units are required to use the Communication Center because of the C/C alarm signal format encoding and decoding requirements used in packet-data transmissions over the digital cellular network. The Communication Center also manages the real-time databases for cellular activation and a complete history of every Telguard's operating conditions. These conditions include programming setup information, cellular alarm transmission information, supervisory trouble information, status-on-demand information, and automatic self-test information.

2.0 FEATURES

This section summarizes the key features of the Telguard. Actual installation instructions begin in Section 5.0.

2.1 OPERATING MODE

The Telguard is a digital cellular SMS transmission device that is installed at the protected premises to provide alarm transmission integrity for security systems and a separate digital cellular voice service. It is used to provide a primary transmission path (cellular) for control communicators (C/Cs). If the cellular path is not available the C/C will transmit the alarm message over the telco network. Voice calls can be made using POTS telephone equipment attached to RJ-11 jacks wired to the WVL terminal block.

2.2 C/C COMPATIBLE COMMUNICATION FORMATS

The Telguard reads the C/C's alarm messages and converts the C/C's Ademco Contact ID (DTMF) data format into SMS packet data protocol for transmission over the cellular radio network. In order for the C/C to be compatible with the Telguard, the C/C must be programmed to transmit alarm messages to the central station using Contact ID only.

2.3 COMPLETE SUPERVISION OF COMMUNICATION PATHS

The Telguard continuously supervises both the primary (cellular) and the secondary (telco) communication paths. If either path becomes inoperative, the Telguard generates a relay trip output that can be connected to a zone input of the host control communicator and/or used to activate remote sounding devices.

2.3.1 Line Fault Condition (LFC)

The Telguard monitors voltage on the incoming telco line. If an inoperative telco line is identified, a telco line fault condition (LFC) is declared.

LFC is programmable to trip the supervisory relay output (STC1) after a 30 or 60 second delay. When the STC1 trips, the STC LED indicates 3 flashes at a time and the C/C zone trip message is transmitted to the alarm company central station indicating system trouble. Upon telco restoral, the STC1 relay and STC LED are returned to normal and a STC restoral message is transmitted if the C/C is programmed to transmit restorals. Both STC relays have same functionality and are independently fully programmable. Update as you see fit.

2.3.3 No Service Condition (NSC)

Telguard declares a no service condition (NSC) when the measured "receive" cellular radio signal strength at the protected premises drops to -114 dBm or less.

NSC is programmable to trip the supervisory relay output (STC2) after a 30 or 60 second delay. When STC1 trips, the STC LED indicates 4 flashes at a time and the C/C zone trip message is transmitted to the central station indicating system trouble. Restoral of this condition occurs when a measurable signal strength greater than -114 dBm is maintained for the trip period of 30 or 60 seconds.

2.3.4 Radio Communications Failure Condition (RFC)

Radio communications failure condition (RFC) is declared when Telguard is unable to transmit over the cellular network even with acceptable signal strength. Two conditions can cause an RFC to occur, Link Request failure (RFC1) or Link Termination failure (RFC2).

2.3.4.1 RFC1 (Link Request Failure)

When there is an alarm signal to communicate, the Telguard attempts to transmit its message via radio. When the C/C goes off-hook, the Telguard transmits a Link Request to the TCC and waits for a Link Request ACK. If the Telguard does not receive an ACK for the transmission before the C/C hangs up, it will retransmit the Link Request again when the C/C goes off-hook for a redial attempt. If the Telguard does not receive an ACK after three attempts, then an RFC will be declared which trips the STC2 relay, causes the STC LED to flash

five times and switches the Telguard to Telco. Restoral of RFC occurs when the communication cycle is completed.

2.3.4.2 RFC2 (Link Termination Failure)

After the Telguard receives a Link Request ACK from the TCC, the Telguard communicates with the C/C to acquire the alarm message and transmits the message via radio. If the Telguard does not receive a link termination ACK (where the TCC acknowledges receiving the transmission) within 30 seconds, it will retry sending the entire transmission. Upon failing two attempts, the Telguard switches to Telco and allows the C/C to communicate directly with the Central Station. An RFC is declared causing the STC1 relay to trip and the STC LED to flash five times. Restoral of RFC occurs when the communication cycle is completed.

2.4 COMPLETE POWER SUPERVISION

Telguard monitors its backup battery as well as its AC power source and reports low or missing power conditions from either. Telguard's integrated control and power module incorporates a battery charger circuit that is programmable for various battery capacities.

2.4.1 Low/Missing Battery Condition (LBC)

The Telguard checks the backup battery voltage on initial power-up and every 5 minute thereafter. Additionally, a battery voltage test is performed by the Telguard every 24-hours while operating on AC power in order to measure the loaded battery voltage. Battery charging voltage turned off and the places a load on the battery. If the battery voltage is less than 11.6 volts, a LBC is declared whereby the STC LED blinks twice (½ sec ON, ½ sec OFF, ½ sec ON, ½ OFF every 5 seconds) and the STC2 relay trips. When the battery voltage increases to 12.1 volts, the STC LED and STC2 relay restore.

2.4.2 AC Failure Condition (ACFC)

AC failure condition (ACFC) occurs when AC power is lost or less than 102 VAC for 6 continuous hours (programmable). The AC Power LED goes out immediately, the STC LED blinks once and the STC trip output is activated after 6 hours. When AC power returns too normal (≥ 106 VAC for 60 seconds), the AC Power LED turns on immediately and the STC trip output restores after 60 seconds.

2.4.3 Catastrophic Failure (CF)

Catastrophic Failure (CF) is any condition that causes the Telguard to stop functioning at all levels. Most commonly because of AC power failure followed by a complete discharge of the backup battery. The STC1 and STC2 trip outputs are activated and visible indication is loss of all LED activity. Total loss of power to Telguard does not prevent transmission of alarm messages from the host C/C "through" the Telguard and out over an operative phone line in the normal fashion. This is a single line system. Alarm operation over Telco is not guaranteed.

2.5 TELGUARD AUTOMATIC SELF-TEST REPORT

The Telguard automatic self-test signal is originated by the Telguard on a daily, weekly, or monthly schedule. When the time for an automatic self-test occurs, the Telguard transmits a radio signal to the Communication Center and the Communication Center processes the signal on to the central station, just as normal alarm signals are processed. The central station receives the automatic self-test report in the same format that the C/C normally uses for communication over the telco line. The central station provides the Telguard self-test code along with the time and frequency of transmission when the Telguard is initially activated. However, an automatic self-test report can be initiated later, after the Telguard is installed, as well as modifying the time or frequency of reporting.

The Communication Center captures all current and historical data pertaining to the operation of the Telguard when it processes the automatic self-test signal on to the central station. This data contains current operational status (C.O.S.) of the Telguard such as "All OK", "AC fail condition", "low/missing battery condition", "line fault condition", or any combination of these as well as the current signal strength.

In addition, the data also contains historical data for supervisory events that occurred since the last self-test signal was transmitted. This data includes the number of occurrences of AC fail conditions, low battery conditions, line fault conditions, communications failure conditions and no cellular service conditions.

2.5.1 Telguard Remote Query Capability

Although Telguard has the capability for a daily, weekly, or monthly automatic self-test, a separate feature is provided for determining the current operational status of every Telguard. This feature is called Remote Query and is used to provide real-time operational status for Telguard on-demand. It is useful in resolving STC events that are reported by the C/C to the central station. Authorized personnel can initiate the Remote Query at any time by calling Customer Service. The Remote Query causes Telguard to upload current operational status data and historical data, just as the automatic self-test described above, except that the query signal is controlled by the one who initiates it. The query signal is held in the Telguard database at the Communication Center for review and is not forwarded on to the central station.

2.6 TELGUARD TERMINAL STRIP CONNECTIONS

The conveniently located terminal strip provides wiring connections for the Telguard supervisory trip outputs, battery leads for connecting to a 12 volt 4.0Ah, or 7.0AH rechargeable battery (battery leads are permanently connected directly to mother board), and AC power. The terminal strip can accommodate solid or stranded wire sizes from 14 gauge to 30 gauge.

2.6.1 Programmable Supervisory Trip Outputs (STC1 and STC2) Relays

The Telguard has two supervisory relay trip outputs (STC1 and STC2) and are energized in a powered up state when no system troubles exist. It enables a supervisory trouble code to be transmitted to the central station when connected to a C/C's 24-hour instant input zone. The STC relays are programmable, using a standard touch-tone telephone or buttset, to meet virtually any installation requirement.

The following supervisory features or combination of features are programmable to trip the STC relays in order to meet a variety of installation requirements:

- Always Off.
- Trips on *AC fail condition* (ACFC)
- Trips on *low or missing battery condition* (LBC).
- Trips on *line fault condition* (LFC).
- Trips on *no service condition* (NSC).
- Trips on *radio communication failure condition* (RFC).

The following system trouble features are embedded in the Telguard for tripping the STC relay and cannot be changed:

- Tripped when unit is not registered with the TCC
- Trips on *catastrophic failure* (CF) if all power is lost.
- Trips on *transmit-disable command* from the Communication Center. This radio command disables only the Telguard transmitter and would be used, for example, to shut down the Telguard due to a runaway dialer.

2.7 DIAGNOSTIC AND STATUS LEDs

Six LEDs are provided as a useful aid during installation and give installers an immediate visual indication of system status.

LED Function Table – Normal Operating Mode (J5 = OUT)

LED Symbol	Color	Duty Cycle	Indication
Registration LED 5	Green	Solid On	Unit is registered with the message center and enabled
		Off	Unit not registered with message center (and disabled)
		Flashing	Unit is registered but disabled
STC - LED 4	RED	OFF	ALL OK
		1 Flash*	System Trouble Condition – Low/Missing AC Power
		2 Flashes*	System Trouble Condition – Low/Missing Battery Condition
		3 Flashes*	System Trouble Condition – LFC
		4 Flashes*	System Trouble Condition – NSC
		5 Flashes*	System Trouble Condition – RFC
		6 Flashes*	System Trouble Condition – DTF
HOOK STATUS – LED 3	Yellow	Off	C/C on hook
		Fast Flash	C/C off-hook to transmit signals over cellular.
Acknowledgement – LED 2	Red	Solid ON	Telguard waiting for acknowledgement from Communication Center
		OFF	Not processing alarm signals
LED 1	Green	OFF	TG-5 initialized
		On	TG-5 initializing

2.7.1 LED Signal Strength Indication

The Telguard provides the installer with an easy to use LED radio signal strength indicator (RSSI) for positioning the unit or remote antenna to obtain the strongest RF signal possible. A signal strength reading can be obtained at any time there is power applied to the Telguard without affecting the operation of the unit. When the “**RSSI**” jumper J10 is “IN”, the Telguard displays the current received signal strength within 5 seconds. The signal strength is read from Left to right using the four sequential LEDs located on the top right side of the printed circuit board with the **Radio TX LED = 1** and the **AC POWER LED = 4**.

RSSI Value	LED's Lighted	RF dBm
NO SVC	LED 1* = on, LED 2-4 = off	≤ -114 dBm
0	LED 1 = on, LED 2-4 = off	≤ -111 dBm
1	LED 1 = on, LED 2 = slow flash LED 3-4 = off	≥ -110 dBm
2	LED 1-2 = on, LED 3-4 = off	≥ -100 dBm
3	LED 1-2 = on, LED 3 = slow flash LED 4 = off	≥ -90 dBm (Minimum signal strength required)
4	LED 1-3 = on, LED 4 = off	≥ -80 dBm
5	LED 1-3 = on, LED 4 = slow flash	≥ -70 dBm
6	LED 1-4 = on	≥ -60 dBm

3.0 GETTING READY

Before attempting to connect Telguard to the host C/C, please note the following:

1. Be sure you have all the proper parts before you go to the job site. The following items are shipped with each Telguard unit:
 - ✓ Basic Telguard unit in a metal enclosure.
 - ✓ UL Listed plug-in transformer.
 - ✓ Antenna.
 - ✓ 3-foot modular plug-to-plug cord for connecting Telguard to RJ11X jack.
 - ✓ Telguard Installation and Operating Instructions Manual
 - ✓ Telguard TG-5 Home Owner Manual
 - ✓ Backup Battery must be provided by installer.
2. You must also have certain installation test tools.
 - A standard telephone or lineman's buttset is required at the job site for use in programming the unit.

4.0 INSTALLATION SUMMARY

There are five steps in installing Telguard properly. **IF YOU DO NOT PROCEED IN THE ORDER AND MANNER PRESCRIBED, YOU MAY NOT COMPLETE THE INSTALLATION IN THE TIME ALLOCATED.** These five steps are summarized below and then explained in detail in the remainder of this manual.

4.1 CONFIRM QUALITY OF SERVICE FOR VOICE CALLS

First, you will be confirming that Telguard's SIM Card is correctly installed into the unit and cellular service is activated. **This is the most important step in the installation, since the programming parameters contain all the necessary information for successful communications.** Also, you will confirm that Telguard has adequate cellular signal strength and Quality of Service for voice.

4.2 TRANSMIT C/C ALARMS OVER THE TELCO CONNECTION

Once you have confirmed that the unit is active and the voice quality is good, you will be ready to verify that the C/C is programmed properly. This step is important to verify that the C/C is programmed with valid account code and central station information before transmitting signals through the cellular network.

4.3 TRANSMIT C/C ALARMS OVER THE CELLULAR RADIO NETWORK

Next, you will be connecting the C/C's digital dialer output to Telguard and verifying that alarm signals can be reliably sent through Telguard over cellular to the central station digital receiver. The incoming Telco line is not connected to Telguard during this step.

4.4 CONNECT SUPERVISORY TRIP OUTPUTS

Telguard's supervisory trip outputs are connected to the C/C and then tested.

4.5 COMPLETE THE INSTALLATION

Your last step will be to check the jumper setting of J10 (LED mode, out = normal), attach earth ground, and permanently mount the unit.

* * * *

With this overview of the installation in mind, you should now proceed with the actual installation, following the steps described in the remainder of this manual. Experienced installers following these steps can usually install Telguard in new installations with good signal strength in a maximum of 30 minutes and in retrofit/existing installations in a maximum of one hour.

5.0 INSTALLATION STEPS

This five-step installation approach (5.1 through 5.5) provides the alarm installer with the easiest and fastest method of properly installing Telguard. Please follow the instructions carefully and if you should need assistance or have any questions, call for

TECHNICAL SUPPORT: 1-800- 229-2326

5.1 STEP 1: CONFIRM QUALITY OF SERVICE FOR VOICE CALLS

Confirm that Telguard's SIM card is properly installed into the unit, cellular service is activated, and Telguard has adequate cellular signal-strength and Quality of Service. **This is the most important step in the installation, since the programming parameters contain all the necessary information for successful communications and good signal-strength and Quality of Service insures performance reliability.**

5.1.1 Locate Unit

Pick a spot next to the C/C where you think the Telguard will be mounted and place the unit down temporarily in that spot. **Do not mount it permanently now**, since it may need to be moved to receive a better cellular radio signal or a remote high-gain antenna may be necessary.

5.1.2 Connect Backup Battery and AC Power Transformer

To apply power to Telguard, attach battery leads to battery terminals noting polarity.

Connect the Telguard AC power transformer to AC terminals using stranded copper insulated wire following wire gauge and length recommendations below:

<u>Recommended Wire Size</u>	<u>Length Not to Exceed</u>
18 ga	20 ft
16 ga	40 ft
14 ga	60 ft

5.1.3 Connect Antenna and Temporarily Place Unit

The Telguard is supplied with an antenna that is connected directly to the unit. If a stronger radio signal is required, the unit with antenna connected must be moved to a better signal location. The characteristics of the Telguard antenna can be altered depending upon the wall material and materials contained within the wall chosen for mounting. These effects may not be clearly identified by RSSI monitoring alone. The wall materials may have a more profound affect on the antennas transmit band performance.

When selecting a mounting location, do not mount this unit in an area where the general public could reasonably be within 20cm (8 inches) of the antenna.

Note 1: Optimum RF performance can usually be found at the highest point within a building with the fewest number of walls between the Telguard's antenna and the outside of the premises.

Note 2: To avoid interference with other electronic devices operating in the area, avoid mounting the Telguard's antenna near other electronic devices.

Note 3: The Telguard TG-5 unit is designed for indoor installations ONLY.

These considerations should be coupled with the best RSSI indication obtainable (see section 2.7.1). Care should be taken to insure that a large metal object such as a refrigerator or a metal cabinet is not located on the opposite side of the wall.

If moving the Telguard to a different location is not practical, then you may need a longer cable on the remote antenna in order to receive adequate radio signal strength. Pick a high, visually secure spot, using the guidelines below.

5.1.3.1 Tips for Improved Radio Signal Reception

- The higher the antenna the better. So, start in the drop ceiling above the unit and proceed up from there, to the roof if necessary.
- Remember, the antenna should be as inconspicuous as possible for greatest visual security.
- Try to keep the antenna away from sources of RF interference, including pumps, compressors, ovens, etc., or where metal objects can shield it or otherwise block the cellular radio RF signal.
- Place the antenna perpendicular to the ground, either right side up or upside down. Do not mount the antenna horizontally.

5.1.4 Measure Received Signal Strength (RSSI) for Best Antenna Placement

Measure the received signal strength by putting jumper J10 "IN". This switches the LEDs to signal strength mode. Now, slowly move the unit or remote antenna to achieve maximum signal strength. Pick the place where the most LEDs (up to four) are lighted.

LED Function Table – View RSSI Mode

RSSI Value	LED's Lighted	RF dBm
NO SVC	LED 1* = on, 2-4 = off	≤ -116 dBm
0	LED 1 = on, 2-4 = off	≤ -111 dBm
1	LED 1 = on, 2 = slow flash LED 3-4 = off	≥ -110 dBm
2	LED 1-2 = on, LED 3-4 = off	≥ -100 dBm
3	LED 1-2 = ON, 3 = SLOW FLASH LED 4 = off	≥ -90 dBm (Minimum signal strength required)
4	LED 1-3 = on, LED 4 = off	≥ -80 dBm
5	LED 1-3 = on , 4 = slow flash	≥ -70 dBm
6	LED 1-4 = on	≥ -60 dBm
*Note: LED 1 = Radio TX; LED 2 = Mode; LED 3 = STC; LED 4 = AC Power.		

NOTE: If you can not obtain a signal strength reading of TWO LEDS ON SOLID AND THE THIRD LED ON SLOW FLASH, you will probably need to move the unit and/or remote antenna higher, or switch to a special antenna, as described below.

5.1.4.1 Antenna Options

Antenna problems are unlikely unless the premises are located in a fringe network coverage area, in a building below ground level, or in a metal structure. However, here are your options:

Magnetic Mount 3-dB gain Antenna with 12ft. Cable: The 3dB magnetic mount antenna comes with 12 feet of cable (Telular model no: MMA-3).

Magnetic Mount 3-dB gain Antenna with 35ft. or 50ft. Cable: The 3dB magnetic mount antenna comes with 35 or 50 feet of cable (Telular P/N: MMA-35 or MMA-50).

5.1.5 Place a call on the WVL

Connect a telephone to the RJ-11 jack that is wired to the main circuit board of the Telguard marked **JP5**.

You should be able to place a call over the WVL. Dial a number the same as you would over a standard telephone line, there is no need for special dialing. Pay particular attention to the clarity of the call, you are listening for clear (no echoing or static) communications. If there is noise on the line the antenna will require a different position. Sometimes a very small change will yield good results.

NOTE: THERE ARE MANY DIFFERENT PARAMETERS THAT CAN BE MODIFIED FOR THE WVL. PLEASE SEE END-USER MANUAL FOR PROGRAMMING OPTIONS.

5.2 STEP 2: TRANSMIT C/C ALARMS OVER THE TELCO CONNECTION

Be sure the C/C will transmit a simple alarm signal over the telco line through the RJ-11 to the central station when the Telguard is disabled. In checking this, do not apply power to the Telguard. Make sure house phones are not in use.

5.2.1 Connect C/C to Telguard Jack 2

Plug the modular jack of the C/C-to-Telguard cable (supplied) from C/C to J5 on the Telguard.

5.2.2 Connect Telguard to RJ-11 Jack

Plug the modular jack of the Telguard cable from J6 to the RJ-11 jack in the premise.

5.2.3 Verify Alarm Signal Transmissions over Telco

Trip several alarms on the C/C and verify that the central station received them by calling the central station operator. Use a lineman's buttset in **MONITOR MODE** and connected to Telguard's "T" and "R" test pins to "listen" to communications between the C/C and Telguard.

5.3 STEP 3: PROGRAM THE TELGUARD FOR ALARM TRANSMISSION AND TRANSMIT C/C ALARMS OVER THE CELLULAR RADIO NETWORK

Confirm that the Telguard enables the host C/C to transmit alarm signals over the cellular radio network. In checking this, disconnect the incoming telco line to the Telguard.

The Telguard model TG-5 is self-activating with the Telular Communication Center. During the processing of the first alarm signal over the cellular network the Telguard will transmit all of the programming parameters from the Telguard along with the information (central station number and account code) from the alarm panel. Once this information is received, the Telular Communication Center will transmit a message back to the Telguard indicating that the unit is registered. When this message is received the LED'S on the unit will begin operating in normal mode. The STC LED will begin flashing 3 three times to indicate a Telephone Line Fault condition and the Mode led will come on solid.

5.3.1 Setup & Programming the Operating Parameters in the Telguard

When the Telguard is received from the factory and is powered up for the first time, it is immediately ready for registration after a 10 second delay, provided the default settings are what you want. The STC LED turns on steady, the Mode LED will be off and the STC 1 and STC 2 relays will be tripped. If changes are required to the default settings, the Telguard can be programmed using a line-mans buttset connected to the T & R pins or a POTS phone connected to JP 5 (where the WVL is normally connected).

Put the line-mans buttset in talk mode or pick up the POTS phone, connect power to the Telguard, when ready for programming you will enter *#*0*12344321#, this will put the Telguard into a Master Access programming mode.

5.3.1.1 Command Key Sequences for Pots Programming

Key Sequence	Description
# * 0 * 1 2 3 4 4 3 2 1 #	Enters the programming Mode
On hook	Exits programming and stores changes

The syntax for programming a specific memory location is as follows:

* **Memory location (3digits)** *, **value**,

For example, to change the Telguard factory default for STC 1 Trip Output reporting from all system troubles to only to include LBC, the installer would power down the Telguard, connect a buttset to the JP 5 connector, reconnect power,

Next press # * 0 * 1 2 3 4 4 3 2 1 #

Then press # * 850 * 2 #

And hang up this will change STC 1 trip output to report only LFC

5.3.3 Complete the Telguard Programming Data Sheet

Fill out the following **Telguard Programming Data Sheet**. The completed data sheet enables you to properly install and test the Telguard as well as provide a valuable aid to future troubleshooting if it becomes necessary. Detach and retain this data sheet in your customer account file for future reference. The Telguard default setup is pre-programmed at the factory. Default setup values are listed and highlighted in "**bold**" type.

Customer Name:			Telguard Serial No:	
Installation Location:			Date Installed:	Installed By:
MEM LOC.	FIELD	DEFAULT VALUE	NEW PROGRAM VALUE	SETTING
832	C/C Reporting Format	8		8 = Contact ID
850	STC 1 Trip Output Reporting	4		Enter the SUM TOTAL of the events that you wish to trip the STC relay by ADDING the corresponding values: (ex: 01+02+08+16=27) Note that a LFC will not trip the STC relay. Program 31 (27+04) for all supervised features to trip the STC relay. 00 = STC Trip Input Not Used 01 = AC Failure 04 = LFC 16 = RFC 02 = Low Battery 08 = NSC 31 = All
851	STC 2 Trip Output Reporting	27		SAME AS ABOVE LOCATION 851
852	STC Trip Delay for LFC and NSC	2		1=30 Seconds 2=60 Seconds
861	CFC Number of Events	0		0 = disabled 2 = 4 attempts 1 = 2 attempts 3 = 8 attempts
862	CFC between Events	1		1 = 30 seconds 2 = 60 seconds
863	RFC Number of Attempts	3		0=Disabled 3 = 3 Attempts 6 = 6 Attempts 1=1 Attempts 4 = 4 Attempts 7 = 7 Attempts 2=2 Attempts 5 = 5 Attempts 8 = 8 Attempts
867	Standby Battery Size (standard lead-acid battery)	4		0 = No Battery 3 = 4 ah 1 = 0.8 ah 4 = 7 ah 2 = 1.2 ah 5 = 14 ah
899	Factory Default Unit			

5.3.4 *Disconnect Telguard from RJ-11 Jack*

Disconnect the Plug from J6 of the Telguard that goes to the RJ-11 Jack at the premise Telguard.

5.3.5 *Verify Alarm Signal Transmissions over Cellular*

Trip several alarms on the C/C and verify that the central station received them by calling the central station operator. Use a lineman's buttset in **MONITOR MODE** and connected to Telguard's "T" and "R" test pins to "listen" to communications between the C/C and Telguard. The ACK LED will come on solid while waiting for an acknowledgement.

If you are having problems getting reliable alarm signal transmissions, additional adjustments may be necessary.

- ◆ Recheck signal strength. You need **TWO LEDS ON SOLID AND THE THIRD LED FLASHING** for adequate signal strength. Also, check antenna connector and make sure it is seated correctly.
- ◆ **Call Telular Technical Service, 1-800-229-2326**, and request the Communication Center operator to check the Telguard programming configuration for proper operation and *proper communications format*. The C/C **MUST** be programmed to use Contact ID to report alarm signals.

5.4 STEP 4: CONNECT SUPERVISORY TRIP OUTPUTS

Connect and test the supervisory trip outputs to the C/C.

NOTE: Activation of a local alarm or strobe light may be desirable when a trip is declared. The STC trip output can be used directly to activate a local signaling device, provided that the trip output is not needed to trip the host control/communicator at the same time. If both a local signal and a control trip input is required, then external relays are needed to provide additional uncommitted contacts.

5.4.1 *Decide on a STC Trip Output Strategy*

The Telguard provides the host C/C with two supervisory trip outputs for reporting a Telguard system trouble code to the central station. The supervisory trip outputs are programmable via a touch-tone telephone or buttset to suit various installation requirements. The programming options for these supervisory trip outputs can be any combination of the following:

- a. **Always Off:** Disables all relay supervisory functions.
- b. **ACFC:** Trips 6-hours after loss of AC power. Restores 60 seconds after AC power is restored.
- c. **LBC:** Trips within 60 seconds on low battery condition. Restores when battery voltage ≥ 12.1 vdc.
- d. **LFC:** Trips 30/60-sec. on Telco line fault condition. Restores 30/60 seconds after Telco line restores.
- e. **NSC:** Trips 30/60-sec. on no service condition due to loss of RF signal strength. Restores 30/60 seconds after RF signal strength is available.
- f. **RFC:** Trips on radio failure to communicate with the Telular Communication Center

5.4.2 Check Telguard Supervisory Trip to C/C

After you have connected the STC trip outputs, check to be sure that they operate correctly.

5.4.2.1 Reprogram C/C to Send Proper Code

Reprogram C/C, if necessary, to send proper alarm code when tripped by the Telguard's supervisory output. Program zone restoral as desired.

5.4.2.2 Check Proper Operation of Telguard Supervisory Output

Check for proper operation of each programmed supervisory output by causing it to trip the C/C and be sure the proper LED illuminates and that the proper trouble code is reported to the central station. Skip the testing of any supervisory functions that have not been enabled. Note that the yellow mode LED starts to flash when the C/C goes off-hook to report the alarm signal over cellular.

- **Low Battery Condition (LBC):** Disconnect the battery and during the next 60 seconds check to see that the STC LED flashes 2 times indicating that the battery is missing. Check to see that the C/C transmits the STC trouble code (over cellular) to the central station. Reconnect the battery and check during the next 60 seconds to see that the STC LED goes off, indicating the missing battery condition has been restored.
- **Line Fault Condition (LFC):** Disconnect J/J cable at RJ-11. Check to see that the STC LED flashes 3 times in 30/60 seconds and the C/C transmits the STC trouble code (over cellular) to the central station indicating the incoming telco line is disconnected. Reconnect J/J cable and check to see that the STC LED goes off in 30/60-seconds indicating telco line restoral.
- **No Service Condition (NSC):** Disconnect the antenna from the Telguard. Check to see that the STC LED flashes 4 times in 30/60 seconds and the C/C transmits the STC trouble code over the telco line indicating loss of RF signal strength. Reconnect the antenna and check to see that the STC LED goes off in 30/60-seconds indicating RF signal strength restoral.
Note: The Received Signal Strength (RSSI) must be less than -114 dBm in order to cause a NSC condition. If the Telguard is located in a high signal strength area (close to a cellular tower), it is possible for the signal strength to be greater than -114 dBm even with the antenna disconnected.
- **AC Fail Condition (ACFC):** Disconnect the 10VA AC transformer and check to see that the AC POWER LED goes out and the STC LED flashes once indicating that AC power is missing. Reconnect the AC transformer and check to see that the AC POWER LED goes on and the STC LED goes off indicating that AC power has been restored. No transmissions will be sent to the central station. The AC power must be off, continuously, for 6-hours before the STC relay causes the C/C to send a trouble code. If the AC power is restored for 60 seconds or more, then the 6-hour timer restarts.

5.5 STEP 5: COMPLETE THE TELGUARD INSTALLATION

Last step is to handle loose ends.

5.5.1 Check Settings

Check the jumper setting of J10 (LED mode, out = normal).

5.5.2 Permanently Mount and Properly Ground the Telguard Chassis

Attach earth ground to the green grounding screw located on lower left-hand corner of printed circuit board assembly and permanently mount the Telguard enclosure.

Using the enclosure as a template, mark the top mounting holes on the mounting surface

Pre-start the mounting screws (not supplied) for these two holes. Slide the enclosure onto these screws so that the screws move up into the thinner section of the holes. Tighten the screws.

Screw in the remaining two screws in the bottom set of mounting holes.

Knock out the desired wire entrance on the enclosure.

A1.2 JACK AND PIN ASSIGNMENTS

Jack Designation	Connects To	Pin Assignment	Function	Status LED Reference
J6 Telco RJ-11.	Incoming Telco RJ-45 Jack.	1 Black 2. Red R(Ring) 3. Green T(Tip) 4. Yellow	Connects telco line to Telguard.	STC LED Flash 3 times when telco voltage is lost.
J5 C/C Digital Dialer	Digital Dialer input/output of host C/C.	1 Brown R1 2. Gray 4 Red R(Ring) 5 Green T(Tip) 7. Blue 8 White T1	Connects C/C digital dialer input/output through unit.	MODE LED will flash when C/C is communicating over cellular
JP 5 Cellular Phone	POTS Equipment	1. Red R(Ring) 2. Green T(Tip)	Connects telephone to digital cellular network.	None.

A1.3 TERMINAL STRIP PIN ASSIGNMENTS

Terminal Strip Pin	Definition	Connects To	Function	Status LED Reference
1 STC2 2 STC2	Supervisory Relay1 Trip output for programmable trouble conditions.	24-hour trip zone input on host C/C.	Enables transmission of programmed supervisory trouble code: ◆ AC Power Fail (ACFC). - AC failure detected at 102 VAC. - ◆ Low/Missing Battery Condition (LBC) due to: - Low Battery detected at 11.6 VDC. ◆ Radio Communications Failure (RFC) due to: - Failure to receive Ack after 3 attempts. ◆ Loss of Telguard Dial Tone Voltage (DTF) due to: - Improper dial tone voltage. ≤ 28 VDC. ◆ No Service Condition (NSC) due to: - Received Signal Strength ≤ -114 dBm.	When fault condition occurs: AC Power LED OFF STC LED Flashes 1 time. STC LED Flashes 2 times. STC LED Flashes 5 times. STC LED Flashes 6 times. STC LED Flashes 4 times.
3 STC1 4 STC1	Supervisory Relay2 Trip output for programmable trouble conditions.	24-hour trip zone input on host C/C.	◆ Line Fault Condition (LFC) due to: - Improper Telco voltage (LFC) ≤ 2 VDC.	STC LED Flashes 3 times.
1 AC 2 AC	AC power input. 12 VAC, 01VA.	120 VAC 60Hz unswitched circuit.	Provides primary operational power to Telguard and battery charging circuit.	AC Power LED ON when AC is normal. AC power LED OFF And STC LED Flashes 1 time when AC is low

A2.0 Operational Quick Reference Table

Telguard Event		LED Response	Relay Output	Radio Message	Internal Action
Typical C/C Alarm Cycle over Telco		None	None	None	Monitors Telco line voltage and C/C attempts
STC Telguard System Trouble Conditions	ACFC – AC Fail Condition	Yes AC Power off and STC flashes 1 time.	If Selected	None	Switch to standby battery if present, monitor battery, monitor AC for restoral.
	LBC - Low Battery Condition	Yes STC flashes 2 times.	If Selected	None	Wait for LBC restoral, charge battery.
	LFC – Telco Line Fault Condition	Yes STC flashes 3 times.	If Selected	None	Transmit alarm via radio if necessary, when telco is restored, remove LFC condition
	NSC – No Service Condition (Low Signal Strength)	Yes STC flashes 4 times.	If Selected	None	Continue to validate signal strength, remove NSC when signal returns
	RFC – Radio Failure to Communicate due to: <i>RFC1</i> : No Link Request ACK. OR <i>RFC2</i> : No Link Termination ACK.	Yes STC flashes 5 times.	If Selected	None	Switch to Telco so that C/C can communicate directly with Central Station.
	DTF - Dial Tone Failure	Yes STC flashes 6 times.	Yes	Yes	Internal 50V supply circuit failure. Return unit for repair on RMA.
	Not Active for Cellular alarm Transmission	Yes STC on steady.	Yes	None	Telguard will not function until operating parameters are downloaded to the Telular Communication Center Telguard remains in Telco only mode.
CF - Catastrophic Failure		None	Yes	None	Telguard not working. Remains in Telco only mode.
RFC – C/C communication failure over cellular path.		None	None	None	Switch to Telco, transmit alarm via Telco, switch back to cellular
Automatic Self-Test		Yes Radio TX When transmitting	None	Yes (Self-test))	Send Self-test information to central station via Communication Center, return to ready state
Telguard Remote Query – Communication Center Activated by Customer Service.		Yes Radio TX When transmitting	None	Yes (Status data)	Send Status data to Communication Center for review customer service
Telguard Enable and Configuration Upload –		Yes Radio TX When transmitting	None	Configuration Data (Setup data)	Telguard sends setup configuration to the Communication Center and switches to READY state to begin operation. Mode LED turns on and STC LED turns off.
Disable TX – Communication Center Activated.		Yes Radio TX When transmitting.	Yes	Yes (Status data)	TX capability is disabled until further notice. Telguard can still receive radio signals from Communication Center.

A4.0 Detailed Specifications

A4.1 DIALER TO INTERFACE ELECTRONICS

The patented integrated interface by Telular, Inc. allows digital dialers to dial into the cellular radio network and simultaneously process wireless voice calls.

- Line voltage: -26 vdc into standard telephone device when on-hook.
- Dial tone: Precision 350 + 440Hz +/- 1% @ -13 dBm +/- 2 dBm. 10 digits dial out capability.
- Ringer equivalence: 5.0 A REN
- Mode: Loop start only. 25mA +/- 10% off-hook.
- Protected by U.S. Patents: 4,658,096; 4,775,997; 4,922,517; 4,737,975; 4,868,519; 5,134,644.

A4.2 POWER

- Power Input Rating: 120 VAC, 0.23A
- Battery Supply: Max full charge DC voltage = 13.8V +/- 0.2V. Max ripple = 30 mV
Battery charging system: Constant current, Electronic short circuit protection
Max. charging current of 250ma
Max voltage drop at max current = 1%
- Transformer Supplied: 12 VAC1VA, UL, plug-in

A4.3 DIGITAL CELLULAR RADIO

The Telguard TG-5 radio supports GSM/GPRS cellular protocols. It is equipped with an integrated radio transceiver conforming to all the requirements of the GSM Phase 2+ tests specified in GSM 11.10. The TG-5 transceiver is FCC compliant, meeting all of the requirements of Part 24 and SAR testing. It is also compliant to the PCTRB NAPRD03 requirements.

- Frequency range: GSM 850/1900MHz,
 1. 824MHz-849MHz
 2. 1850MHz-1909MHz
- Voice Features: The TG-5 supports telephony, emergency calls and all approved vocoders (full rate, enhanced full rate, and half rate) while in the GSM mode. The TG-5 also supports phone book management and fixed number dialing.
- Mobile Equipment Personalization (MEP): Personalization features check information stored in the TG-5 that limits the SIMs with which the TG-5 will operate. The check is performed whenever a SIM is inserted into the TG-5, or the TG-5 is powered up with a SIM in place. If a check fails, the TG-5 enters the "non-registered service" state in which only emergency calls can be attempted.
- Antenna Port: TNC connector (female), 50-ohm
- Receiver Sensitivity: -TBD dBm
- Transmit Power: EGSM 850MHz: Class 4 (2 watts) GSM 1900MHz: Class 1 (1 watt)
- FCC I.D.: MTFTG5112597
- Supplied Antenna: Dipole
- A4.4 Physical
- Size: 9.0"H x 10.0"W x 3.5"D.
- Shipping weight: TBD lbs.
- FCC Registration: MTFTG5112597
- Operating Environment: 0° C to +49° C; 0 - 85% humidity (non-condensing).

A4.5 WARRANTY

Telular will repair or replace (our option) inoperative units for up to two years from date of shipment. Excludes damage due to lightning or installer error. Unauthorized modifications void this warranty. Not responsible for incidental or consequential damages. Liability limited to price of unit. This is the exclusive warranty and no other warranties will be honored, whether expressed or implied.

A5.0 Parts List

Part No.	Description
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Basic Hardware:

Model TG-5 Model TG-5 has a metal enclosure and dipole antenna

TG-5 is UL Listed for the following:

- ☐ **UL Household Burglary**
- ☐ **UL Household Fire**
- ☐ **UL Household Burg/Fire Combination**

General Accessories:

TBD	Transformer, 12v, 800mA Supplied with all models.
MMA-3	Magnetic mount antenna (3dB gain), 12 ft. cable with TNC connector.
MMA-35	Magnetic mount antenna (3dB gain) with 35 ft. of low loss cable.
MMA-50	Magnetic mount antenna (3dB gain) with 50 ft. of low loss cable.
MMA-100	Magnetic mount antenna (3dB gain) with 100 ft. of low loss cable.
HGA-35	High Gain Directional Antenna Kit (9dB gain) with 35 ft. of low loss cable.
HGA-50	High Gain Directional Antenna Kit (9dB gain) with 50 ft. of low loss cable.
HGA-100	High Gain Directional Antenna Kit (9dB gain) with 100 ft. of low loss cable.