GENESIS Handheld Stationary
User's Manual

715 Bright Street • Decatur, Illinois 62522 • (800) 428-4315 • FAX: (217) 428-5302
Revised March 18, 1997
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Update on Possible Hazards of Traffic Radar Devices

July 20, 1992

TO: CITY, COUNTY, STATE, AND FEDERAL POLICE OFFICIALS

Recent stories in the news media have focused attention on the possibility that the traffic radar devices used by police officers might increase their risk of cancer, particularly testicular cancer. The Food and Drug Administration (FDA) has prepared the following information to inform police officers about what is known — and what remains unknown — about this question. We urge you to make this Update available to the officers under your jurisdiction. Feel free to photocopy this Update as needed.

What kind of radiation is emitted by traffic radar units?

These devices emit microwave radiation similar to the type produced inside microwave ovens, but at a power level more than 10,000 times lower. The radiation travels from the front of the radar device in a narrow, cone-shaped beam, although some of it may be reflected back from hard surfaces such as metal and glass. The amount of radiation decreases rapidly with distance from the source, so that the farther the devices are kept from the body the lower the exposure.

Is there any experimental evidence that the levels of microwave radiation from a traffic radar device can be dangerous?

Although it is known that very high levels of microwave radiation can be harmful, there is no firm experimental evidence at present that the much lower levels of radiation emitted by traffic radar devices can be hazardous. There are some animal studies that suggest that low levels of radiation can cause biological changes, but it is not known whether these results apply to humans. Also, most of these studies were done with a different type of microwave radiation than that produced by traffic radar devices.

What about the cancers that have occurred in police officers who used traffic radar devices for long periods of time?

It is true that some officers who have used these devices have experienced cancer. But it is important to understand that these types of cancers also occur among people who haven’t used radar devices. That’s why it is not possible to tell whether any individual officer’s cancer arose because of the radar, or whether it would have happened anyway. The key question is whether the risk of getting a particular form of cancer is greater among people who work with the radar devices than among the rest of the population. And the only way to answer that question is to compare the cancer rates among radar using police officers with people who don’t work with radar, or with the cancer rates that would be expected in the general population.

FDA has made a preliminary comparison between the number of cancers reported in police officers who use traffic radar devices and cancer rates in the general population. Based on case reports we have so far, the comparison does not appear to show a greater cancer rate among the police, but it is too soon to conclude that there is no risk.
Update on Possible Hazards of Traffic Radar Devices (continued)

What's FDA doing to address the question of cancer risk?

FDA will continue to evaluate the research performed by microwave scientists around the world to see if their results apply to traffic radar devices. In addition, FDA will work with police organizations to collect more data about the cancer experience of police officers, to see whether they are developing more than the expected number of cancers. To assist us in this effort, any known cases of cancer in police officers using radar should be reported to FDA by calling 1-800-638-6725. Be sure to provide as much information as possible, including the type of radar unit used, how long the individual worked with radar devices, and the specific type of cancer.

In the meantime, what can be done to reduce the risk, if there is one?

Although it is not known for sure whether traffic radar devices can produce health problems, police officers can take some simple steps which will sharply reduce their exposure to the low-level microwave radiation which these devices emit.

1. Always point the device away from your body, or your partner's body, while it is turned on.

2. Mount fixed radar antennas so that the beam is not pointed at any occupant of the patrol car.

3. Whenever possible, turn off a hand-held unit when it is not in use. If your unit has a "standby" mode, always use it when not measuring the speed of a vehicle. Never rest the unit against your body.

4. When it is on, try to avoid pointing the device toward metal surfaces inside your car, such as the floor or a door, to avoid microwave reflection. (Measurements have shown that the radiation reflected from nonmetallic surfaces, such as glass in the car's windows, is much less intense than that reflected from metal surfaces.)

Again, there is no proof at this point that traffic radar devices can be harmful to the police officers who use them. Future information may reveal that these devices are indeed harmless. But until the question is settled, taking the simple precautions outlined above should reduce any possible risk. In the meantime, FDA will continue to provide updates as more information becomes available.
1 Specifications

1.1 Antenna Parameters

K-Band

<table>
<thead>
<tr>
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<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>IACP Type</td>
<td>III</td>
</tr>
<tr>
<td>Transmission Frequency</td>
<td>24.150 GHz</td>
</tr>
<tr>
<td>Horizontal Beamwidth</td>
<td>12°</td>
</tr>
<tr>
<td>Polarization</td>
<td>Circular</td>
</tr>
<tr>
<td>Nominal Microwave Power Output</td>
<td>15 mW</td>
</tr>
<tr>
<td>Maximum Aperture Power Density</td>
<td>( \leq 1 \text{ mW/cm}^2 )</td>
</tr>
</tbody>
</table>

Environment

- Ambient Operating Temperatures: -30°C to +60°C
- Maximum Humidity: 90% relative humidity at 37°C
1.2 FCC/ISC Documents

FEDERAL COMMUNICATIONS COMMISSION

WASHINGTON, D.C. 20554

GRANT OF EQUIPMENT AUTHORIZATION

Certification

Decatur Electronics Inc.
715 Bright Street
Decatur, IL 62522

Attention: Robert James Sanner, President

NOT TRANSFERABLE

EQUIPMENT AUTHORIZATION is hereby issued to the named GRANTEE, and is VALID ONLY for
the equipment identified herein for use under the Commission's Rules and Regulations listed below.

FCC IDENTIFIER

Name of Grantee

FCC Rule Part(s): 15

Frequency (MHz): 24114

Equipment Class: Field Disturbance Sensor

Police Radar Gun

This device has been approved for use as described under
Docket 87-389. It is listed in Section 15 of the Commission's Rules.

In correspondence concerning the grant, please refer
to the FCC IDENTIFIER, File No., and date of grant.

FCC 731A
October 1991

me 8315348001

3
CERTIFICATE OF TECHNICAL ACCEPTABILITY FOR RADIO EQUIPMENT

CERTIFICA'TE D'ACCEPTABILITE TECHNIQUE DE MATERIEL RADIO

CERTIFICATION NO.
No. DE CERTIFICATION

1270 B237

ISSUED TO
DEVIRE A

DECATUR ELECTRONICS INC.

TYPE OF EQUIPMENT
GENRE DE MATERIEL

POLICE RADAR

TRADE NAME AND MODEL
MARQUE ET MODELE

GENESIS HANDHELD STATIONARY

FREQUENCY RANGE
BANDE DE FREQUENCES

24.05 GHz TO 24.25 GHz

EMISSION DESIGNATION
DESIGNATION D'EMISSION

6OHONON

R.F. POWER RATING
PUISSANCE NOMINALE H.F.

15 mWATT

CERTIFIED TO
CERTIFI E SELON LE

SPECIFICATION
CAHIER DES CHARGES

RSS210

ISSUE
EDITION

-FAMILY APPROVAL WITH MODEL GENESIS, REFERENCE CERTIFICATE NO. 2590.
-EXPANSION OF THE MODEL DESCRIPTION.

Certification of equipment means only that the equipment has met the requirements of the above noted specification. License applications, where applicable to use certified equipment, are acted on accordingly by the issuing office and will depend on the existing radio environment, service and location of operation.

Le certificat du matériel signifie seulement qu'il est conforme aux exigences du cahier des charges mentionné ci-dessus. Les demandes de licence, le cas échéant en vue de l’utilisation de matériel certifié seront traitées en conséquence par le bureau chargé de délivrer lesdites licences, en tenant compte du milieu radioélectrique ambiant, du service radio existant et de l'emplacement de la station.

This certificate is issued on condition that the holder complies and will continue to comply with the requirements of the radio standards specifications and procedures issued by the department.

Le présent certificat est délivré à condition que le détenteur se conforme et continue à se conformer aux catégories des charges et procédures sur les normes radioélectriques publiées par le ministère.

ISSUED UNDER THE AUTHORITY OF MINISTER OF COMMUNICATIONS DÉLIVRÉ AVEC L'AUTORISATION DU MINISTRE DES COMMUNICATIONS

DATE
March 30, 1995

Canada
1.3 Speed Range Parameters

<table>
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<th>Speed Display Ranges</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
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<tr>
<td>Target: mph Option</td>
<td>15</td>
<td>200</td>
</tr>
<tr>
<td>kph Option</td>
<td>24</td>
<td>321</td>
</tr>
</tbody>
</table>

1.4 Power Consumption Parameters

Supply Voltage Range 10.8 to 16.5 VDC with a 2A Fast Blow Fuse
Low Voltage Threshold 10.8 VDC with Visual Indicator

Nominal Current Draw with a Supply Voltage of 13.6 VDC

<table>
<thead>
<tr>
<th>Situation</th>
<th>Current with Antenna OFF</th>
<th>Current with Antenna ON</th>
</tr>
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<tbody>
<tr>
<td>Segment Check (&quot;888 888 888&quot;)</td>
<td>0.580</td>
<td>0.580</td>
</tr>
<tr>
<td>No Target Present</td>
<td>0.232</td>
<td>0.442</td>
</tr>
<tr>
<td>Target Present (Target=55)</td>
<td>0.232</td>
<td>0.484</td>
</tr>
</tbody>
</table>

Current Requirements for GENESIS Handheld Stationary, in Amperes
2 Controls

When pressing a button on the front panel, the computer acknowledges a command with a beep.

Figure 1: GENESIS Handheld Controls

2.1 Front Panel

POWER

The POWER button turns on the GENESIS Handheld. When depressed, there is a “beep.” The GENESIS Handheld activates all of the RANGE indicators and displays “888” in the TARGET and LOCKED windows. The computer then initiates a self test of the time base, memory, and display. When first turned on, the system is set to maximum range, one-half and squelched audio. Once the self-test sequence is complete, there are three tones to indicate that the system has passed the self-test and is ready for use.

Figure 2: POWER Up
TEST
The TEST button starts an operator self-test of the system. This test checks the display and Doppler processing circuitry. If there are any errors with the system, the computer unit indicates a system fault and no longer processes Doppler signals.

AUDIO
The AUDIO buttons control the volume of the Doppler audio. The left hand arrow decreases the volume while the right hand button raises the volume level (there are sixteen possible volume levels). Regardless of the volume level selected, the Doppler tones will always be heard.

SQUELCH
The SQUELCH button determines the type of Doppler audio heard. When powered up, the GHS has the SQUELCHED mode activated. In SQUELCHED mode, the only sound heard is the Doppler tone for the displayed target. When UNSQUELCHED, the operator hears all of the Doppler tones -- targets, interference, and noise -- received by the antenna.

RANGE
The RANGE buttons control the maximum acquisition distance, in five (5) levels\(^1\). The left arrow decreases the RANGE, until the first indicator is lit, meaning minimum range. The right arrow increases the RANGE until the fifth indicator is lit, indicating maximum range. Initially, start with maximum RANGE and decrease the RANGE until attaining the desired performance.

2.2 Trigger
The trigger for the GENESIS Handheld controls the RF-hold and LOCK features.

When the trigger is depressed, the system is transmitting and receiving microwave energy. Once the trigger is fully released, the system is in RF-hold status.

To transfer a TARGET speed into the LOCKED window, quickly release and depress the trigger\(^2\). Before the system transfers the speed to the LOCKED window, the computer performs a self-test to verify the accuracy of the TARGET reading. A beep informs the user that the TARGET is successfully locked. After LOCKING, the unit still processes and displays target speeds in the TARGET window, as long as the trigger is depressed. To clear the LOCKED window, use one of the following methods

- Depress the trigger twice, in quick succession, when a target is not present.
- Turn the system off (this method is not recommended).

\(^1\) Under the recommendation of the Michigan Radar Task Force, the GENESIS Handheld has a minimum range level of zero feet. For systems sold in the state of Michigan, the system indicates zero range by flashing the leftmost range indicator.

\(^2\) For systems sold in the state of Florida, the LOCKED window is cleared approximately 15 minutes after the TARGET speed is LOCKED.
3 System Status Lights
The GENESIS Handheld has a variety of status indicators on the front panel. There are two (2) speed display windows and five (5) range indicators.

NOTE: The Windows are used for indicating error conditions that might exist.

![Windows and Indicators for the GENESIS Handheld](image)

3.1 Windows

TARGET
This window displays the speed of the target vehicle. The system updates the speed display continuously, as long as a valid target is present in the beamwidth of the antenna and in range of the unit.

LOCKED
When the operator double clicks the trigger, to request a LOCK, this window holds the speed of the target vehicle at that instant. The system also runs a self-test of the internal clock to verify the accuracy of the displayed speed. The speed will remain displayed until the operator clears the display.

Error Messages
The system indicates a fault with the unit by displaying a short message in the windows. These messages notify the operator of a condition that could affect proper operation of the GENESIS Handheld. When the messages are on, the system will not process and display speeds until the problem ceases.

---

3 GHS systems, sold in the state of Florida, automatically clear the LOCKED window approximately 15 minutes after the TARGET speed is LOCKED.
Radio Frequency Interference
When the TARGET window displays rFl, there is a source of radio-frequency interference inhibiting the proper operation of the unit. Typically, patrol vehicle FM communication systems may cause this condition. Other possible causes are proximity to radio stations and other broadcast equipment. If the user has LOCKed a speed, and the computer displays rFl, the system retains the LOCKed speed, but will not display the speed. The system redisplay the LOCKed speed once the interference ends.

Low Voltage
The computer indicates a low voltage problem by displaying Lo bAt in the display windows. The Lo bAt message notifies the operator that the supply voltage is below 10.8 VDC. The correct operating voltage for the GENESIS Handheld is 10.8 to 16.5 VDC. Check the cigar plug, and verify that the plug is firmly inserted into the lighter socket.

System Error
When the message Sys, and a unique number, is active, the computer found an internal problem with the system. If this message appears, remove the unit for repairs.

3.2 RANGE Indicators
The RANGE lights indicate the relative maximum range that the unit is detecting targets. When the leftmost light is lit, the range is at the minimum setting. The system indicates maximum range by lighting all five (5) indicators.

---

4 GHS systems, sold for use in the state of Michigan, have a zero feet minimum range setting. When the leftmost range indicator is flashing, the effective range is zero feet. However, the microwave transmitter is still active and may be detected.
4 Field Tests
There are two field tests to verify the accuracy of the GENESIS Handheld.

4.1 Operator TEST
Pressing the TEST button on the display initiates a self test\(^5\). This test checks the numeric displays of the two speed windows and runs a simulation of the target speeds. While the computer unit is executing a test, the system will not power down until the completion of the test. During the test, the system will display the **Sys** error message and no longer process Doppler signals IF ANY PART OF THE TEST FAILED.

Display Test
The display test allows the operator to check the range indicators and speed windows. During a display test, the system will initiate the following steps.

- Activate all of the TEST indicators.
- The “ones,” “tens,” and “hundreds” positions, in the TARGET and LOCKED speed windows, count from 1 to 8, leaving the number 8 displayed.
- The system displays “888” in both windows. Verify none of the segments are burnt out.

\(^{(1)}\) Range Indicator Subtest
\(^{(2)}\) Digit Counting Subtest
\(^{(3)}\) Full Lights Subtest

![Figure 7: Display Test Sequence](image)

\(^5\) For systems sold in the state of Florida, the GHS displays “888” in both windows. The system then simulates a TARGET speed of 60 mph or 100 kph (see the Speed Simulation Test section). This test is performed every 15 minutes. The LOCKED window is cleared at the end of the test.
Speed Simulation Test
The system verifies target acquisition using synthesized Doppler frequencies corresponding to 15, 30, 45, and 60 mph (or 25, 50, 75, and 100 kph). The computer unit tests the target acquisition system, using the following sequence:

- The TARGET window displays 15, 30, 45, 60 (sequentially) when the system locks onto the synthesized Doppler signal.

![Figure 8: Speed Simulation Test](image)

- The corresponding Doppler audio is heard as each speed is processed.
- If the system passed the test, three (3) rapid beeps are heard and normal operation resumes.

4.2 Tuning Fork Test
In addition to the system test, the operator can verify the overall system accuracy by using a tuning fork.

After tapping one of the tines of a tuning fork, the fork vibrates at the frequency stamped on the handle. When the operator places the tuning fork in front of the antenna, the system detects the fork and displays a speed. Compare the speed displayed to the speed stamped on the fork. The displayed speed must be within one (1) mph of the speed stamped on the fork.

![Figure 9: DEI Tuning Fork](image)

Tapping the tines against surfaces like metal and concrete MAY DAMAGE THE TINES AND INVALIDATE THE FORK FOR FUTURE TESTS. Tap the tines against hard plastics or wood to avoid unnecessary damage. Using the fork at temperature extremes may also affect the readings.
The tuning fork test consists of the following steps.

- Grasp the tuning fork by the handle and tapping one of the tines against a firm surface.

- Hold the vibrating tuning fork approximately three (3) inches from the front of the antenna

- Verify that the TARGET display and speed marked on the tuning fork are within one (1) mph of each other. If there is a large difference between the display and the fork, check the tuning fork for damage. Repeat the procedure with another, certified tuning fork. If the error is still greater than one (1) mph, remove the unit from service.

- Verify that the Doppler audio is correct for the speed displayed and not corrupted by noise.

- The TARGET display should return to "---" when the fork is not in front of the antenna or the vibrations have ceased.

![Figure 10: Tuning Fork Placement](image)

![Figure 11: Displays During the Tuning Fork Test](image)
5 Care, Cleaning, and Storage
The GENESIS Handheld can withstand wide variations in temperature. DO NOT SPILL FOOD, BEVERAGES, OR OTHER LIQUIDS AND SUBSTANCES ON THE SYSTEM.

DO NOT ATTEMPT TO REMOVE THE POWER CORD. The power cord is permanently mounted to the trigger housing. Other than replacing the fuse in the cigar plug, DO NOT ALTER THE CIGAR PLUG. YOUR WARRANTY WILL NOT COVER UNAUTHORIZED MODIFICATIONS TO THE SYSTEM.

When the GENESIS Handheld is not in use, store the unit in the original packaging. Also, store the unit in the original packaging during transport to and from the patrol vehicle.

To clean the components, dust them lightly with a soft, clean cloth - free of any cleaning solutions.

6 Limitations to Doppler RADAR
When properly used, the Doppler radar system is extremely accurate and reliable. However, the variations in the environment can cause situations and circumstances which may create speeds that appear incorrect.

6.1 Cosine Effect
The cosine effect causes the system to display a target’s speed lower than actual. This condition exists whenever the target vehicle’s path is not parallel to the antenna, including curves and hills. In all uses of police radar, there is always a slight angle between the patrol and target vehicle to avoid collisions.

Whenever the angle between the beam of the antenna and the target increases, the displayed speed decreases. Ideally, an angle of zero (0) degrees is preferable, since the displayed speed will be the actual target speed. The following table shows the effects that an increasing angle can have on the speed displayed.

At angles less than 10°, there is not much difference between the target and actual speed. As the angle increases, the error increases. At 90°, the TARGET speed is zero mph - grossly incorrect.

![Figure 12: Possible Cosine Effect on a Curve]

<table>
<thead>
<tr>
<th>Actual Speed</th>
<th>Angle, in degrees</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0</td>
</tr>
<tr>
<td>30 mph</td>
<td>30</td>
</tr>
<tr>
<td>40 mph</td>
<td>40</td>
</tr>
<tr>
<td>50 mph</td>
<td>50</td>
</tr>
<tr>
<td>60 mph</td>
<td>60</td>
</tr>
<tr>
<td>70 mph</td>
<td>70</td>
</tr>
<tr>
<td>80 mph</td>
<td>80</td>
</tr>
</tbody>
</table>

Table 1: Actual and Displayed Speeds at Different Antenna-to-Target Angles
6.2 Interference
Radar systems, like any other radio system, are subject to external interference. There are many kinds of interference. The two most common kinds are radio frequency and undesired moving objects.

Radio Frequency
The system may inadvertently process radio frequency energy from airport radar, street lights, high-tension power lines, microwave transmission towers, CB radio transmitters, and AM/FM transmission towers as Doppler speeds. The GENESIS unit has a radio frequency interference (RFI) detection circuit, designed to detect excess radio frequency energy. When stray radio frequency energy reaches an excessive level, the system will display RFI in the TARGET window. Once the source of radio interference ends, the system will resume normal operation. Also, any LOCKed speeds will return to the LOCKED window.

Moving Objects
The system may also detect other moving objects in the antenna’s beam. Fan blades and alternators, in the patrol vehicle, can generate an undesired Doppler signals.

Since these signals are similar to moving cars, the operator needs to discern between a valid target and a source of interference. Usually, a source of moving interference exhibits the following characteristics:

- A reading when there is not a target vehicle in the operational range of the antenna.
- A target vehicle, upon entering the operational range, will override the interference signal causing the TARGET speed to change suddenly.
- The Doppler audio will be corrupted with noise, unlike a good, clear Doppler tone.
- Interference is irregular and does not provide a valid tracking history.
- If the TARGET window changes speed proportionally to the engine speed of the patrol vehicle, the alternator is causing interference to the system. Shut down less critical accessories until the problem desists. If the problem continues, with all other accessories disconnected, connect the power for the radar directly to the battery, or to an auxiliary 12 VDC power supply.

6.3 Multi-path Beam Cancellation
When multi-path beam cancellation occurs, the TARGET speed will sporadically blank and reappear. This occurs when the radar looses track of a target at semi-random intervals. The target is reflecting two signals that are interfering with one another. When the phase of the two signals is 180°, maximum interference occurs and the signals cancel, causing the system to ignore the target. When there is only one target vehicle, the system will reacquire the speed of the target. However, when more targets are present, the system could lock onto another vehicle. The operator can minimize the confusion of multi-path beam cancellation with an accurate tracking history of the original target.

6.4 Scanning
All radar antennas, for police applications, are designed to be operated from a fixed mounting or to be hand-held in a steady position. Moving or "scanning" the antenna past stationary objects can cause the system to detect the motion. A speed reading obtained from scanning requires DELIBERATE MISUSE.
7 Warranty

7.1 Terms

TWO YEAR RADAR WARRANTY

Decatur Electronics, Inc. guarantees their radar to be free from defects in workmanship and material, and to operate within specifications for a period of two years. During this period, Decatur Electronics, Inc. will repair or replace, at its option, any component found to be defective, without cost to the owner, provided the unit is returned to the factory.

The full warranty on parts and workmanship does not include normal wear and tear, crushing, dropping, fire, impact, immersion, or damage from attempted repair or modifications by unauthorized service agents, or improper voltage and fusing (including removal of the cigar plug).

Simply return the unit (transportation prepaid) directly to the factory or to an Authorized Decatur Electronics Warranty Service Center near you.

If you have any questions, or want a quick problem diagnosis, please call our customer service hot-line and ask for the service department:

TWO YEAR WARRANTY EXCEPTION

If the unit was purchased under a special buying program (state purchase contract, etc.), then the above warranty may not apply. Please refer to the buying program contract for the appropriate warranty terms or contact Decatur Electronics, Inc. at the above phone number.

EXTENDED WARRANTY OPTIONS

If you are interested in an extended warranty, contact your sales representative to discuss extended warranty options.

7.2 Service Return Procedure

If it becomes necessary to return the GHS to the factory, please follow the procedure below:

- Return ALL pieces of the GENESIS Handheld in the original packaging.
- Include a note describing the malfunction of the system, or the incident that resulted in a malfunction. Failure to do so may delay the return of the system.
- Telephone the Customer Service Department, at Decatur Electronics: [phone number], to obtain a return authorization (RA) number. Write the RA number on the note and shipping label.
- Return the system via UPS to:

  MEGA-TECH
  1-800-700-7937
  Phone: (403) 438-9330
  Fax: (403) 455-7606
  B.C.: (250) 359-7024
  Fax: (250) 359-5949
  10370 - 65 Ave.
  Edmonton, AB T6H 1T9

  [Website URL] Electronics, Inc., is the responsibility of the customer.
If a system, still under warranty, is received COD from a customer, the customer will be charged for the amount of the COD freight charges plus an additional 10% for handling, after the system is repaired. The COD and 10% handling fee will be added to the repair bill as out-of-warranty repairs.

Decatur Electronics, Inc. will pay the freight (up to $10.00 US) for shipment of the system from the repair facility to the customer, provided that the system is still under warranty. Any shipping charges, above the initial $10.00, will be charged to the customer. If Express or Next Day Air is desired, the customer will be invoiced for the freight charges, even if the system is still under warranty.

An estimate can be furnished for repairs that are out-of-warranty, at the customer’s request, for $50.00 US. Even if the customer decides to not have the repairs completed, they will be invoiced for the $50.00, plus return freight. If Decatur Electronics proceeds with the repairs, there will be no charge for the estimate.
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TARGET ............................................ 8