INTRODUCTION

This Cruise Control Kit is a microprocessor based Cruise Control. It is designed for ease of installation and can be used with most cars, light trucks and vans. Carefully follow the installation procedures in this manual for best results.

Your vehicle must have a VSS (Vehicle Speed Sensor) wire or available signal generator for installation of this Cruise Control. Please consult Application Guide.

Low displacement engines with limited vacuum will get better performance if a vacuum reservoir is installed. Vacuum reservoirs, pumps, regulators and other accessories are available from your dealer, automotive service center, or most automotive parts outlets.

All through the instructions there are WARNINGS, CAUTIONS, AND NOTES which are meant to make it easier for you to put the Cruise Control on your car and safer to use it. We have gathered these tips from people across the country who have told us about their problems and how they worked around them.

Even with all these reports from the field, we cannot cover every condition which you might encounter, there are just to many different car makes and models. We do our best to tell you how to handle most vehicles, but we must Depend On Your Good Judgement for Dealing with the rest.

Therefore, we believe you can understand why we strongly urge you to think carefully about what could happen to you, your passengers, and your car if you use any tools, parts, fastening methods, routing or procedures which are not described in this manual.

There is no drain on the battery if the control switch is left on. The Cruise Control needs no regular service.

WARNING

Failure to follow the instruction manual could not only cause the Cruise Control to work improperly, but could cause the Cruise Control not to function correctly, possibly causing damage to your vehicle and/or injury or death to both you and your passengers.

WARNING

If you question the applications of the Cruise Control, please consult the applicable application guide. Only install on approved applications.

ROSTRA PRECISION CONTROLS, INC.
2519 Dana Drive, Laurinburg, North Carolina 28352
# TABLE OF CONTENTS

I. Parts List and Diagram ............................................................................. 4-5

II. Tools Needed .......................................................................................... 6

III. Notes to the Installer ............................................................................. 6

IV. Installation Procedures .......................................................................... 6
    A. Setting of Cruise Control Module Switches ......................................... 6
    B. Cruise Control Module Mounting Location ....................................... 8
    C. Cruise Control Module Cable Throttle Attachment and Adjustment ................................. 8
        1. Measuring the Distance the Throttle Moves .................................... 8
        2. Allowing for Lost Motion in Throttle Attachment ......................... 9
        3. Attaching Cruise Control Module Cable to Throttle .................. 10
        4. Anchoring the Cruise Control Module Cable ............................ 14
    D. Vacuum Line Installation .................................................................. 15
    E. Tachometer Signal Wire Connection .................................................... 16
    F. VSS Signal Wire Connection .............................................................. 17
    G. Harness Assembly-Main Wiring Connections  
        (engine compartment) .................................................................. 17
    H. Cruise Control Module Mounting Procedure .................................... 18
    J. Control Switch Installation .............................................................. 18
    K. Harness Assembly-Main Wiring Connections  
        (passenger compartment) ................................................................. 19

V. Operating Procedures ............................................................................. 20
    A. Road Testing ..................................................................................... 20

VI. Trouble Shooting Guidelines ................................................................ 21-23

VII. Electrical Test with Closed Circuit Control Switch ............................. 24

VIII. Electrical Test with Open Circuit Control Switch .............................. 25

IX. Wiring Diagram .................................................................................... 27

X. Technical Service .................................................................................. 28
## PARTS LIST

<table>
<thead>
<tr>
<th>Item</th>
<th>Part #</th>
<th>Description</th>
<th>Qty.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>250-3211</td>
<td>Cruise Control Module</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>250-3424</td>
<td>Harness Ass’y-Main Wiring</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>250-3016</td>
<td>Tube-Vacuum 5/32” x 48”</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>*</td>
<td>Reducer-Tube 1/4” x 3/16”</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>*</td>
<td>Tube Vacuum-7/32” x 1-3/8”</td>
<td>1</td>
</tr>
<tr>
<td>6</td>
<td>*</td>
<td>Tee-Vacuum-Various Sizes</td>
<td>3</td>
</tr>
<tr>
<td>7</td>
<td>*</td>
<td>Adaptor-Throttle-Threaded Snap In</td>
<td>1</td>
</tr>
<tr>
<td>8</td>
<td>*</td>
<td>Nut &amp; Lockwasher Ass’y 1/4”-20</td>
<td>3</td>
</tr>
<tr>
<td>9</td>
<td>*</td>
<td>Adaptor-Throttle-Wire-Loop</td>
<td>1</td>
</tr>
<tr>
<td>10</td>
<td>*</td>
<td>Adaptor Throttle Clip with Cable</td>
<td>1</td>
</tr>
<tr>
<td>11</td>
<td>*</td>
<td>Cover-Bead Chain Connector</td>
<td>3</td>
</tr>
<tr>
<td>12</td>
<td>*</td>
<td>Connector-Bead Chain (Doubled Ended)</td>
<td>3</td>
</tr>
<tr>
<td>13</td>
<td>*</td>
<td>Coupling-Chain (Eyelet Type)</td>
<td>1</td>
</tr>
<tr>
<td>14</td>
<td>*</td>
<td>Bead Chain</td>
<td>1</td>
</tr>
<tr>
<td>15</td>
<td>*</td>
<td>Clamp-Tube-Various</td>
<td>3</td>
</tr>
<tr>
<td>16</td>
<td>*</td>
<td>Adaptor-Throttle-Two Bead Connector</td>
<td>1</td>
</tr>
<tr>
<td>17</td>
<td>*</td>
<td>Threaded Tube Clamp</td>
<td>1</td>
</tr>
<tr>
<td>18</td>
<td>*</td>
<td>Nut &amp; Lockwasher Ass’y #10-32</td>
<td>3</td>
</tr>
<tr>
<td>19</td>
<td>*</td>
<td>Screw #10-32 Round head</td>
<td>3</td>
</tr>
<tr>
<td>20</td>
<td>*</td>
<td>Screw-Hex Head 1/4” x 3/4”</td>
<td>4</td>
</tr>
<tr>
<td>21</td>
<td>*</td>
<td>Throttle Retaining Clip-GM</td>
<td>1</td>
</tr>
<tr>
<td>22</td>
<td>250-3425</td>
<td>Convoluted Split Tubing 3/8</td>
<td>1</td>
</tr>
<tr>
<td>23</td>
<td>250-3086</td>
<td>Bracket-Cable mounting</td>
<td>1</td>
</tr>
<tr>
<td>24</td>
<td>*</td>
<td>Tie Strap-Nylon 7 1/2”</td>
<td>10</td>
</tr>
<tr>
<td>25</td>
<td>*</td>
<td>Tie Strap-Nylon 4”</td>
<td>1</td>
</tr>
<tr>
<td>26</td>
<td>*</td>
<td>Conn.Self Strip 18-22 AWG</td>
<td>2</td>
</tr>
<tr>
<td>27</td>
<td>*</td>
<td>Terminal 1/4” Female</td>
<td>1</td>
</tr>
<tr>
<td>28</td>
<td>*</td>
<td>Conn. Self Strip 14-18 AWG</td>
<td>2</td>
</tr>
<tr>
<td>29</td>
<td>*</td>
<td>Putty Sealing</td>
<td>1</td>
</tr>
</tbody>
</table>

*Order Small Parts Package 250-2213 and receive parts indicated.*
TOOLS NEEDED

Most of these tools may be needed to install the Cruise Control.

- A set of wrenches
- Screwdrivers - 1med & 1sm. blade, 1 sm. cross-recess, 1-#15 torx.
- Pliers-plain & side cutter
- Drill bits-3/16” & 1/4”
- 1” hole saw
- Hammer
- Center punch
- Electric drill
- Bench Vise
- Half-round or rat-tail file
- Knife
- 12-Volt test light
- Hack saw
- 7/16” Box End Wrench

NOTES TO THE INSTALLER

A. Cruise Control Module (No. 1) should be mounted at least 10” away from ignition coil.
B. The Harness Assembly-Main Wiring (No. 2) must be able to reach from the Cruise Control Module (No. 1) to the area under the dash where the Control Switch Assembly connection will be made.
C. The Cruise Control Module cable must be able to reach the throttle attachment point. The Cruise Control Module cable should not be bent severely.

WARNING: Failure to follow the instruction manual could not only cause the Cruise Control to work improperly, but could cause the throttle to hang up, possibly causing damage to your vehicle and injury to you and your passengers.

INSTALLATION PROCEDURES

A. SET CRUISE CONTROL MODULE SWITCHES

When using this Cruise Control (Figure 1) on any vehicle with 2000, 4000, or 8000 pulses per mile road speed input, the 10 switches will be set one of eighteen ways depending on engine, transmission and number of pulses per mile.

NOTE 1: If using an “OPEN CIRCUIT” control switch with the Cruise Control, SWITCH NUMBER 7 will have to be OFF
NOTE 2: SWITCH NUMBER 10 no longer needs to be turned ON for G.M. distributorless ignition. Switch 10 has no function at present.

NOTE: Both the Gray (VSS) and Blue (TACH) wires must be connected. (If gray wire is not used, an alternative road speed signal generator source must be used.)

NOTE:
IF ANY OF THE 10 SWITCHES NEED TO BE CHANGED AFTER INSTALLATION OF THE CRUISE CONTROL, CONTROL SWITCH AND THE VEHICLE IGNITION SWITCH MUST BE IN THE OFF POSITION. THIS IS TO ALLOW THE MICROPROCESSOR TO RESET.
<table>
<thead>
<tr>
<th>CYLINDERS/TRANSMISSION TYPE</th>
<th>SWITCH NUMBERS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1  2  3  4  5  6  7  8  9  10</td>
</tr>
<tr>
<td><strong>2000 PULSES PER MILE VSS</strong></td>
<td></td>
</tr>
<tr>
<td>3/4 CYL AUTO</td>
<td>2000 ON ON OFF OFF ON OFF ON OFF ON OFF</td>
</tr>
<tr>
<td>3/4 CYL MANUAL</td>
<td>2000 ON ON OFF OFF ON OFF ON OFF ON OFF</td>
</tr>
<tr>
<td>6 CYL AUTO</td>
<td>2000 ON ON OFF OFF OFF ON OFF ON OFF ON</td>
</tr>
<tr>
<td>6 CYL MANUAL</td>
<td>2000 ON ON OFF OFF OFF ON OFF ON OFF ON</td>
</tr>
<tr>
<td>8 CYL AUTO</td>
<td>2000 ON ON OFF OFF OFF OFF ON OFF ON OFF</td>
</tr>
<tr>
<td>8 CYL MANUAL</td>
<td>2000 ON ON OFF OFF OFF OFF ON OFF ON OFF</td>
</tr>
<tr>
<td><strong>4000 PULSES PER MILE VSS</strong></td>
<td></td>
</tr>
<tr>
<td>3/4 CYL AUTO</td>
<td>4000 ON ON ON OFF ON OFF ON OFF ON OFF</td>
</tr>
<tr>
<td>3/4 CYL MANUAL</td>
<td>4000 ON ON ON OFF ON OFF ON OFF ON OFF</td>
</tr>
<tr>
<td>6 CYL AUTO</td>
<td>4000 ON ON ON OFF ON OFF ON OFF ON OFF</td>
</tr>
<tr>
<td>6 CYL MANUAL</td>
<td>4000 ON ON ON OFF ON OFF ON OFF ON OFF</td>
</tr>
<tr>
<td>8 CYL AUTO</td>
<td>4000 ON ON ON OFF OFF ON OFF ON OFF ON</td>
</tr>
<tr>
<td>8 CYL MANUAL</td>
<td>4000 ON ON ON OFF OFF ON OFF ON OFF ON</td>
</tr>
<tr>
<td><strong>8000 PULSES PER MILE VSS</strong></td>
<td></td>
</tr>
<tr>
<td>3/4 CYL AUTO</td>
<td>8000 ON ON ON ON OFF ON OFF ON OFF ON</td>
</tr>
<tr>
<td>3/4 CYL MANUAL</td>
<td>8000 ON ON ON ON OFF ON OFF ON OFF ON</td>
</tr>
<tr>
<td>6 CYL AUTO</td>
<td>8000 ON ON ON ON OFF ON OFF ON OFF ON</td>
</tr>
<tr>
<td>6 CYL MANUAL</td>
<td>8000 ON ON ON ON OFF ON OFF ON OFF ON</td>
</tr>
<tr>
<td>8 CYL AUTO</td>
<td>8000 ON ON ON ON OFF OFF ON OFF ON OFF</td>
</tr>
<tr>
<td>8 CYL MANUAL</td>
<td>8000 ON ON ON ON OFF OFF ON OFF ON OFF</td>
</tr>
</tbody>
</table>

**NOTE:**
IF YOU ARE INSTALLING THIS CRUISE ON A VEHICLE THAT DOES NOT HAVE A VSS WIRE OR NO AVAILABLE SIGNAL GENERATOR PACKAGE, THIS CRUISE CONTROL IS NOT RECOMMENDED. CONSULT THE APPLICATION GUIDE.
B. CRUISE CONTROL MODULE MOUNTING LOCATION

NOTE
DO NOT MOUNT THE SERVO ASSEMBLY IN THE FOLLOWING AREAS:

* Under the fender.
* Under the vehicle.
* Directly to the engine or bulkhead.
* With the cable pointed down.
* Near sharp, hot or moving objects.
* Near ignition coil [No closer than 255mm (10’)].
* In the passenger compartment (Noise).
* Where it will interfere with service checks.

1. Select a possible location to mount your CRUISE CONTROL MODULE, set the CRUISE CONTROL MODULE unmounted in that area. The reason for leaving the CRUISE CONTROL MODULE unmounted is to make sure the HARNESS ASSEMBLY-MAIN WIRING will reach the CRUISE CONTROL MODULE and the CRUISE CONTROL MODULE cable will reach the throttle attaching point.

2. Once you have confirmed that the HARNESS ASSEMBLY and the CRUISE CONTROL MODULE will reach their respective locations, mount the CRUISE CONTROL MODULE in the spot you have selected with Screws provided in the kit. (Figure 2)

CAUTION: Failure to follow the instruction manual could not only cause the Cruise Control to work improperly, but could cause the throttle to hang up, possibly causing damage to your vehicle and injury to you and your passengers.

NOTE: After Cruise Control Module cable has been attached, manually move the throttle to assure the Cruise Control Module cable does not hang up on any part of the vehicle.
C. CRUISE CONTROL MODULE CABLE THROTTLE ATTACHMENT AND ADJUSTMENT

1. MEASURING THROTTLE CABLE TRAVEL

THIS IS A VERY IMPORTANT STEP. FAILURE TO DETERMINE THROTTLE CABLE TRAVEL COULD CAUSE DAMAGE TO YOUR VEHICLE AND/OR CRUISE CONTROL.

MEASURE ONLY WITH THE ENGINE OFF. The CRUISE CABLE moves 41mm (1-5/8”).

To measure throttle travel, measure the distance from Position “A” (Idle) to Position “B” (Wide Open Throttle).

a. Make a mark on the throttle cable when the throttle is in the idle position. Figure 3
b. Depress accelerator pedal and make a mark on the throttle cable when the throttle is in the wide open position. Figure 4

c. Measure the Distance “C” between the two marks. Figure 5 If the distance is greater than 41mm (1-5/8”), go to Page 10; If it is less, go to Step d.

d. If the throttle travel is less than 41mm (1-5/8”), you must use BEAD CHAIN to provide slack.

NOTE: Slack is the distance the CABLE ASSEMBLY moves before the throttle starts to move.

Each bead of the chain added will give you 1/8” (3 mm), you will need one (1) bead.

NOTE: To add beads you must use the BEAD CHAIN, BEAD CHAIN CONNECTOR and the BEAD CHAIN COVER. Do not count the bead used with the BEAD CHAIN CONNECTOR.

After determining your throttle travel, continue to the next section.

CAUTION: When using the Connector Bead Chain to connect the Bead Chain to the Cruise Control Module cable you must always use the Cover-Bead Chain Connector. The Cover-Bead Chain Connector must also be used when using the Coupling Chain. Failure to use the Cover-Bead Chain Connector could possibly cause the Bead Chain or the Cruise Control Module cable to hang in the Connector bead Chain causing the throttle to be held in partially open position. This condition could occur when the Cruise Control is not being used.
3. Attaching Cruise Control Module Cable to Throttle

This section will cover the proper ways to use the hardware available. After each section, there will be sample illustrations showing how the connector is used in an actual installation. It must be noted however, that you should have an understanding of how each attachment method works so that a proper installation is achieved.

There are 6 basic ways of making the attachment to the throttle:

a. ADAPTOR-THROTTLE-TWO BEAD CONNECTOR
b. CONNECTOR-BEAD CHAIN AND CLAMP-TUBE
c. PEDAL ATTACHMENT
d. THROTTLE CLIP WITH CABLE
e. ADAPTOR-THROTTLE-WIRE LOOP
f. ADAPTOR-THROTTLE-WIRE W/BARREL

a. ADAPTOR-THROTTLE-TWO BEAD CONNECTOR

When the distance between the pin and the Cruise Control Module cable mounting is close, the attaching point for connecting the throttle cable to the throttle lever, the ADAPTOR-THROTTLE-TWO BEAD CONNECTOR can be used. Most GM & Chrysler applications can use this method. Attach Bead Chain to the ADAPTOR-THROTTLE-TWO BEAD CONNECTOR and secure beads by folding the 2 metal tabs. Remove clip or pin which retains throttle cable (and washer if provided) and install TWO BEAD CONNECTOR on the same side of throttle cable as the Cruise Control cable will be attached. (This is necessary so that Cruise Control cable and throttle cable will not cross) The ADAPTOR-THROTTLE-TWO BEAD CONNECTOR may need to be bent so that it clears the throttle cable. (See Figure 7) Also, TIE STRAP-NYLON 4” can be used to hold the ADAPTOR-THROTTLE-TWO BEAD CONNECTOR to the sleeve of the throttle cable.

When the distance between the pin and the Cruise Control Module cable mounting is close, the ADAPTOR-THROTTLE-TWO BEAD CONNECTOR can be shortened by using a double fold in connector. (See Figure 8)

When ADAPTOR-THROTTLE-TWO BEAD CONNECTOR is properly used, the following parts will be used:

(See Figure 9)

ADAPTOR-THROTTLE-TWO BEAD CONNECTOR
BEAD CHAIN at least 3 exposed beads for lost motion
CONNECTOR BEAD CHAIN
COVER-BEAD CHAIN CONNECTOR

For some applications, it may be necessary to enlarge the hole in the ADAPTOR-THROTTLE-TWO BEAD CONNECTOR so that it will fit over the pin on throttle lever.
b. COUPLING-CHAIN AND CLAMP TUBE
When you have a throttle cable, and the ADAPTOR-THROTTLE-TWO BEAD CONNECTOR cannot be used, use the COUPLING-CHAIN and a CLAMP-TUBE Figure 11. Select a CLAMP-TUBE that fits the throttle cable. Make sure the tabs of the CLAMP-TUBE point away from the carburetor or air throttle, this will prevent the throttle from hanging. Put SCREW #10-32 ROUND HEAD through the holes in the CLAMP-TUBE. Attach BEAD CHAIN to the CONNECTOR-BEAD CHAIN.

NOTE: Use the COVER-BEAD CHAIN CONNECTOR No. 11. Slide the COUPLING-CHAIN over the SCREW #10-32 ROUND HEAD and tighten with NUT & LOCK WASHER Ass’y #10-32. See Figure 11

C. PEDAL ATTACHMENT
When the accelerator pedal is used as an attachment point. The COUPLING-CHAIN and CLAMP-TUBE can be used. See Figure 13.

CAUTION: Failure to follow the instruction manual could not only cause the Cruise Control to work improperly, but could cause the throttle to hang up, possibly causing damage to your vehicle and injury to you and your passengers.
d. **GM, Ford, and Chrysler Throttle Using Throttle Clip with Cable**

1. Some GM, Ford, and Chrysler vehicles have an attachment stud on the throttle pulley.
2. Slide a Bead Chain Connector Cover over the cruise cable, then attach the Bead Chain Connector to the cable. Attach the Throttle Clip with Cable to the Bead Chain Connector and slide the Connector Cover over the Bead Chain Connector. (Figure 14)
3. Slide the Throttle Clip over the throttle pulley attachment stud. Push Throttle Clip onto the stud until it snaps firmly onto the stud.

---

**WARNING**

If the Adaptor Throttle Wire Loop (No.15) is not secured to the existing throttle cable, it could come out of the pulley segment possibly causing the throttle to be held in a partially open position.

---

e. **Adaptor-Throttle-Wire Loop (No. 9)**

On some vehicles it may be necessary to remove the air cleaner so the throttle pulley segment is showing. Then set the pulley segment in an "open" throttle position, and remove the throttle cable from the pulley. Hold the loop end of the Adaptor-Throttle-Wire Loop between the holes in each side of the pulley. Slide the barrel at the end of the throttle cable through the slotted hole, then through the Adaptor-Throttle-Wire Loop and into the second hole. See Figure 15.

Connect the Adaptor-Throttle-Wire Loop to the Bead Chain using the Connector-Bead Chain. Cut the desired amount of Bead Chain and connect to the Cruise Control Module cable. Always use the Cover-Bead Chain Connector as shown in Figure 15.

To secure the Adaptor-Throttle-Wire Loop to the throttle cable. Punch a small hole in the Cover-Bead Chain Connector and slide the Tie-Strap-Nylon 4” through the hole and secure to the existing throttle cable as shown in Figure 16.
f. ADAPTOR-THROTTLE-WIRE WITH BARREL (NO.10)

Remove air cleaner to expose the dual pulley segments. Find the blank anchor that is located above the throttle anchor. This anchor is hollow except at one end. Use a 1/4” bit and drill as shown in **Figure 17**.

Place the **NUT & LOCKWASHER ASS’Y 1/4”-20** on the Cruise Control Module cable. Using a 7/16” box end wrench turn clockwise as shown in **Figure 18**.

Continue to turn clockwise until the formed threads are between 1-3/8” as shown in **Figure 18**.

Insert the Cruise Control Module cable through the blank anchor and thread the other **NUT & LOCKWASHER ASS’Y 1/4”-20** in place and attach the **CONNECTOR-BEAD CHAIN** to the Cruise Control Module cable as shown in **Figure 19**.

Attach the **ADAPTOR-THROTTLE-WIRE W/ BARREL** to the top pulley segment. Slide the **COVER-BEAD CHAIN CONNECTOR** onto the **ADAPTOR-THROTTLE-WIRE W/ BARREL** to the **CONNECTOR-BEAD CHAIN** as shown in **Figure 20**. Make sure to slide **COVER-BEAD CHAIN CONNECTOR** over **CONNECTOR-BEAD CHAIN**.

Install the **CLAMP-TUBE** 6 to 7 inches from the anchor as shown in **Figure 21**.
4. Anchoring The Cruise Control Module

Cable

These are three (3) types of connectors used to anchor the Cruise Control Module cable.

a. **CLAMP-TUBE**

b. **ADAPTOR-THROTTLE-THREADED SNAP-IN**

c. **NUT & LOCK WASHER ASS’Y 1/4”-20**

**CAUTION:** When using Clamp-Tube on Cruise Control Cable, Sleeve-Adjustable MUST be used to prevent slippage or binding of cable.

a. **CLAMP-TUBE**

Two **CLAMP-TUBES** may be used to anchor the Cruise Control Module cable to the existing throttle cable as shown in Figure 22.

**NOTE:** When anchoring to the existing throttle cable keep as close to the throttle cable bracket as possible to minimize flexing which can cause a pulsating accelerator pedal.

One **1/4” CLAMP-TUBE** may be used to anchor the Cruise Control Module cable to the existing throttle cable bracket. See Figure 23. In some cases there is an existing hole, in other cases you can drill a 3/16” hole in the bracket.

One **1/4” CLAMP-TUBE** may also be used to anchor the Cruise Control Module cable using the **BRACKET-CABLE MOUNTING** as shown in Figure 24.

b. **ADAPTOR-THROTTLE-THREADED SNAP-IN**

Before using the **ADAPTOR-THROTTLE-THREADED SNAP-IN** remove the **SLEEVE-ADJUSTABLE** from the Cruise Control Module Cable.

To use the **ADAPTOR-THROTTLE-THREADED SNAP-IN**, it will be necessary to form threads on the end of the Cruise Control Module cable. This is easily accomplished by placing the **NUT & LOCK WASHER ASS’Y 1/4”-20** on the end of the Cruise Control Module cable with your fingers, then place a 7/16” box end wrench and turn clockwise, see Figure 26, until the desired amount of threads have been formed. See Figure 25.

After the threads have been formed, screw the Threaded Snap-In-Adaptor on to the Cruise Control Module cable as shown in Figure 26.

**NOTE:** CONTROL CABLE MUST EXTEND PAST THE END OF THE ADAPTOR THROTTLE THREADED SNAP-IN ON ALL APPLICATIONS.
The **Threaded Snap-In-Adaptor** snaps into an existing square hole as shown in **Figure 30** (common on GM vehicles) or snaps into the **Bracket-Cable Mounting** as shown in **Figure 27**.

**c. Nut and Lockwasher Ass’y (No.32) and/or Blank Anchor**

To use **Nut and Lockwasher Ass’y 1/4”-20**, it will be necessary to form threads on the end of the Cruise Control Module cable. This is easily accomplished, see **Figure 25**.

The cable anchor can be in two forms see **Figure 29 or 30**. Use a 1/4” drill bit or an existing 1/4” hole as shown in **Figure 31 or 32**. Insert the Cruise Control Module cable through the 1/4” hole and thread the other **Nut & Lockwasher Ass’y 1/4”-20** and attach the **Bead Chain Connector** and **Bead Chain Connector Cover** to the Cruise Control Module cable as shown in **Figure 31**.

**D. Vacuum Line Installation**

**WARNING**

DO NOT cut the power brake vacuum supply line. An improper connection to this line could impair the function of the vehicle’s brakes.

**Suggested Vacuum Source Locations**

- **Existing Vacuum Line**
- **Factory Installed Tee**
- **Remove cap and use vacuum tee for Cruise Control Vacuum**
- **Tee-Tube (4 sizes provided)**
- **Manifold Vacuum Tree**
- **Reducer-Tube 1/4” x 3/16”**
- **Remove cap and use vacuum port for Cruise Control vacuum**
- **Vacuum Line**
- **Tube Vacuum 7/32” x 1 3/8”**
- **Tube Vacuum 5/32” x 48”**
VACUUM RESERVOIR: Usually mounted on inner fenderwell or engine bulkhead. Maintains vacuum of other vehicle accessories. Figure 33

After locating a vacuum source and making a connection, route TUBE-VACUUM-5/32" x 48” from this source and attach to the vacuum port on Servo. DO NOT forget to remove the Protective cap, prior to installing TUBE-VACUUM-5/32” x 48”.

VACUUM CHECK

Run the engine at idle. Unplug the TUBE-VACUUM from the CRUISE CONTROL SERVO and place your finger over the end of the tube. You should feel a strong suction. If not you should find another location for a stronger vacuum source.

E. TACHOMETER SIGNAL WIRE CONNECTIONS

This Cruise Control system requires the input of a tachometer signal on ALL gasoline powered vehicles so that engine speed(RPM) can be monitored. On diesel powered vehicles, use a 250-4206 kit instead of tachometer signal.

NOTE: Use blue tach wire when using grey VSS for engine protection and clutch disengagement.

2. Locate the tachometer signal on the vehicle.

   POSSIBLE LOCATIONS
   A. The negative (-) side of the ignition coil. See Figure 35.
   B. A terminal on the distributor marked “Tach” (most GM high energy ignition systems) See Figure 36.
   C. On distributorless ignition systems, there is a tach signal wire located at the ignition control module. Consult a shop manual if necessary. See Figure 38.

3. Route the wire from the CRUISE CONTROL ELECTRONIC REGULATOR to the tach signal. Keep wire away from hot, moving, or sharp objects.
4. Cut excess wire from tach wire harness and attach to the signal in one of the following ways.
   A. For terminal on GM distributor Figure 37, crimp the Terminal-1/4” Female on the end of tach wire and plug into distributor.
   B. If you cannot use procedure A, use a Connector- Self Stripping and attach to a wire coming from a tach signal.

See Figure 35.
F. VSS SIGNAL WIRE CONNECTION

Once you have found the proper Vehicle Speed Sensor Wire, (see Vehicle Technical Information Guide) it will be necessary to attach the Speed Sensor Wire from the **HARNES ASSEMBLY-MAIN WIRING (NO.2)** to this wire.

1. Route the unterminated end of the Speed Sensor Wire from the Harness Assembly-Main Wiring to the Vehicle Speed Sensor Wire. Use care when routing the wire to ensure that it will not come in contact with any hot, sharp, or moving objects.
2. Connect the unterminated end of the Speed Sensor Wire to the Vehicle Speed Sensor Wire with a connector-Self Stripping (No. 28)
3. Insert the terminated end of the Speed Sensor Wire into the vacant side of the Tach Wire Harness Connector. A click will be heard when the terminal is fully inserted. See Figure 39.

---

**G. HARNES ASSEMBLY-MAIN WIRING CONNECTIONS (ENGINE COMPARTMENT)**

1. Plug the **HARNES ASSEMBLY-MAIN WIRING** into the Cruise Control Module (No.1). Be sure the connector fits securely in place. Fit the **COVER-CRUISE CONTROL MODULE** over the wires and reinstall the two screws provided to hold the **COVER-CRUISE CONTROL MODULE** in place. **Figure 40.**
2. Attach the ground wire (Black) to a vehicle ground point which is a clean unpainted metal surface.

**DO NOT USE THE ENGINE AS A GROUNDING POINT FOR THE BLACK WIRE.**
H. CRUISE CONTROL MODULE MOUNTING PROCEDURE

NOW THAT HARNESS ASSEMBLY-MAIN WIRING IS ATTACHED TO THE CRUISE CONTROL MODULE, MOUNT THE MODULE IN THE LOCATION YOU SELECTED IN SECTION IV Item B.

Hold the CRUISE CONTROL MODULE in the location you selected. Secure with two SCREW-HEX WASHER-1/4”-14 through the holes provided. See Figure 41. Be sure that the CRUISE CONTROL MODULE is securely in place before you start to work inside the vehicle.

![Figure 41](image)

J. CONTROL SWITCH INSTALLATION

If your control switch is the type which clamps on the turn signal lever, or which requires cutting the turn signal lever or is mounted on the instrument panel, follow instructions packaged with it. If you have a switch which replaces the complete original equipment turn signal lever, remove the existing lever and install the Cruise Control switch and lever assembly as instructed in the vehicle shop service manual.

WARNING

Failure to follow the instruction manual could cause the Cruise Control to work improperly possibly causing damage to your vehicle and injury and/or death to you and your passengers.

CAUTION:

If a two way radio is in the vehicle or is later installed, the Cruise Control regulator should be located as far from the radio transceiver as practical (at least 3”) and the Cruise Control wiring should be routed as far from the radio wires and coaxial cable as practical. The radio should be wired directly to battery ground connection and the standing wave ratio of the antenna should be as low as possible.
K. THE WIRING HARNESS
(PASSENGER COMPARTMENT)

1. To find a place to get electrical power, you will need to “ground” one lead of your volt ohm meter. Find electrical ground by turning on the ignition switch and touching one lead to a hot fused terminal at fuse panel; touch other lead to unpainted metal part of vehicle. The metal you touch to make continuity, is ground. Turn ignition switch off.

NOTE: Some fuse panels are behind shields which must be removed first. On other vehicles the screw that mounts the panel must be removed to get to the fuses.

2. Locate the fuse panel, the BROWN FUSED WIRE of the HARNESS ASSEMBLY-MAIN WIRING must be attached to a fuse that is energized (battery voltage) when the ignition switch is on and is de-energized (zero volts) when ignition switch is turned OFF or to the START (CRANK) position.

3. Attach terminated BROWN WIRE to fuse panel as shown in Figure 43.

DO NOT use the following power supplies:
* Turn Signal
* Hazard Lights
* Windshield Wipers
* Blower Fan
* Hot side of Brake Switch
  (same wire as red wire)

4. Locate the vehicle brake switch - the switch which makes your brake lights go on when you apply your brakes. One of the two wires to this switch is “hot” all of the time, other wire is energized only when you apply the brakes. It is called the “cold side” of the brake switch.

5. Touch one lead to ground (located in step A), touch other lead to one of the brake light switch terminals. If test shows voltage (12 volts) that is the hot side of switch. Check color of wire connected to that terminal. Red fused wire of Cruise Control harness will be spliced to that wire.

6. Touch test lead to other brake light switch terminal. Test should show no voltage until brake pedal is pressed. Violet wire of harness will be spliced to this wire on “cold” side of the switch.

7. Use blue plastic splicing connector to splice Red fused harness wire to “hot” side of brake switch and Violet wire to “cold” side of switch.

8. Connect Flat 4-wire connector that plugs into the Control Switch.

9. The Grey wire is to be attached to the VSS (Vehicle Speed Sensor) wire (See other Form for locations or consult shop manual.)

10. The Blue wire is to be attached to the Tach (Tachometer) wire (See other Form for locations or consult shop manual.)
OPERATING PROCEDURES

If your Cruise Control was installed correctly, it should perform as indicated in this section. The Control Switch is used to operate the system.

**ON/OFF:** The first time you use the Cruise Control you should be on straight, paved road away from heavy traffic. Slide the ON/OFF switch of the Control Switch to the ON position. Nothing will happen, this simply prepares the system for use.

Remember, each time you turn OFF the ignition switch, or slide the Control Switch to OFF, you de-energize the system. To re-energize it, the ignition switch must be ON and the slide switch must be in the ON position. You can leave the Control Switch ON all the time without damaging the system.

**SET SPEED:** After turning the system ON, wait at least three seconds before trying to set your speed. To operate the system, drive your car at a steady speed above 35 mph.

Press the SET/COAST button, and release it. Slowly remove your foot from the accelerator. Your speed is now in the Cruise Control Module’s memory. Your driving speed should remain with 2-1/2 mph of your set speed.

If you want to increase your speed, press the accelerator pedal. When you release the pedal, you will return to your SET SPEED.

**ACCEL:** You may also increase speed using the RESUME/ACCEL feature. Your vehicle will accelerate as you hold the slide switch to the RESUME/ACCEL position. When you release the switch, you will have a new higher SET SPEED.

You can also increase your speed gradually, by quickly sliding and releasing the RESUME/ACCEL switch. Each time you slide and release the button, your speed will increase by one or two mph.

**COAST:** To reduce your SET SPEED, press and hold the SET/COAST button. This erases the old set speed, and allows your vehicle to coast. Just before reaching the speed you want, release the button. This will be your new SET SPEED, providing you are above 35 mph.

**RESUME:** When you use the brake to slow down or stop, the cruise control will remember your set speed. To return to the set speed, and you are above 30 mph, drive to a speed within 15 mph of your preset speed. Slide the RESUME/ACCEL switch, then release it. Your vehicle will automatically accelerate to the SET SPEED and hold there.

When using the RESUME feature with standard transmission, you must be in the correct gear for your SET SPEED.

- After braking, the RESUME function will NOT work if you:
  - Move the control button to OFF
  - Turn OFF the ignition

If this happens, you need to SET SPEED again.

**DISENGAGE:** You may disengage from your set speed in two or three ways depending on the type of transmission (manual or automatic) you have in your car.

- Gently depress the brake pedal to activate the brake lights.
- Turn the cruise control switch to the OFF position
- For manual transmissions depress the clutch. This will cause the engine to rev before disengaging.

A. **ROAD TESTING**

Be sure to road test your Cruise Control after installation.

**TEST DRIVE:** Follow the operating instructions to test drive your new Cruise Control. Try all functions on your Cruise Control to be sure it's operating correctly.
TROUBLE SHOOTING GUIDELINES

Condition
Not Working at Installation

POSSIBLE CAUSES

CRUISE CONTROL MODULE PROGRAMMING SWITCHES SET IMPROPERLY

CHECK SET-UP MODULE SWITCHES. CORRECT IF NECESSARY

THROTTLE NOT CONNECTED

CHECK THROTTLE CONNECTION

INCORRECT TACH SIGNAL INPUT

USE A TACHOMETER TO VERIFY ENGINE RPM'S

NO VACUUM TO SERVO

CHECK VACUUM SOURCE

NO VOLTAGE AT RED WIRE AT CONTROL SWITCH

DISCONNECT 6-PIN CONNECTOR AT CONTROL MODULE TURN CONTROL SWITCH ON GROUND LEAD WIRE OF TEST LIGHT

TEST

CHECK IF 4-AMP IN-LINE FUSE IS BLOWN

CHECK IF VEHICLES BRAKE LIGHT FUSE IS BLOWN

CHECK FOR GOOD CONNECTION AT "HOT" SIDE OF BRAKE SWITCH

CHECK GROUND WIRE (BLACK) FOR CORRECT GROUNDING

NO VOLTAGE AT BROWN WIRE AT 6-PIN CRUISE CONTROL MODULE CONNECTOR

TEST

CHECK IF 4-AMP IN-LINE FUSE IS BLOWN

CHECK FOR GOOD CONNECTION AT ATTACHMENT POINT

POOR GROUND CONNECTION

REPLACE BURNED OUT BULBS OR CHECK FOR OPEN CIRCUIT

BRAKE LIGHT CIRCUIT OPEN

TEST

RED WIRE AT 6-PIN CONNECTOR. LIGHT SHOULD BE ON.

REPLACE BURNED OUT BULBS OR CHECK FOR OPEN CIRCUIT

DARK GREEN WIRE AT 6-PIN CONNECTOR. LIGHT SHOULD BE ON DEPRESS TO "SET"-LIGHT SHOULD GO OFF

TEST

YELLOW WIRE AT 6-PIN CONNECTOR LIGHT SHOULD BE OFF. SLIDE TO "RESUME"-LIGHT SHOULD BE ON

BRACE SWITCH WIRES CONNECTED INCORRECTLY

FAULTY CONTROL SWITCH

FAULTY CRUISE CONTROL MODULE

TEST

RED IN-LINE FUSED WIRE SHOULD HAVE CONSTANT 12 VOLTS

VIOLET WIRE SHOULD HAVE 12 VOLTS ONLY WHEN BRAKE PEDAL IS DEPRESSED

SEE WARRANTY
TROUBLE SHOOTING GUIDELINES (cont)

Condition
Eratic Operation

CONDITIONS
SURGING
POSSIBLE CAUSES

POSSIBLE CAUSES
LosING SPEED
POSSIBLE CAUSES

CRUISE CONTROL MODULE PROGRAMMING SWITCHES SET IMPROPERLY CORRECT IF NECESSARY

POOR THROTTLE CONNECTION

CRUISE CONTROL MODULE CABLE NOT SECURELY ATTACHED

INADEQUATE VACUUM SUPPLY
INSTALL VACUUM* RESERVOIR

FAULTY CRUISE CONTROL MODULE

NOTICE
IF THE BLUE (TACH) AND GREY (VSS) WIRE ARE CONNECTED IN REVERSE, SEVERE SURGING WILL OCCUR

POSSIBLE CAUSES
RANDOM DISENGAGEMENT

DISENGAGE WHILE USING TURN SIGNAL

POSSIBLE CAUSES

POOR GROUND AND/OR 12 VOLT POWER SUPPLY

POOR CONNECTION TO "HOT" SIDE OF THE BRAKE SWITCH

POOR CONNECTION OF MAIN HARNESS ASSEMBLY TO CRUISE CONTROL MODULE ASSEMBLY

*Optional - Consult the Auto Center

POSSIBLE CAUSES
INADEQUATE 12 VOLT POWER SUPPLY

ONE OF MORE BRAKE LIGHTS BURNED OUT

LOSS OF GROUND THROUGH "COLD" SIDE OF BRAKE SWITCH
TROUBLE SHOOTING GUIDELINES (cont)

Condition
Quit Working After Installation

POSSIBLE CAUSES

TEST
4-AMP IN-LINE FUSE (RED WIRE) USED FOR "HOT" SIDE OF BRAKE SWITCH
4-AMP IN LINE FUSE (BROWN WIRE) USED FOR 12 VOLT CONNECTION
VEHICLES BRAKE LIGHT FUSE
REPLACE IF NECESSARY

BLOWN FUSE(S)

CRUISE CONTROL MODULE CABLE IS BROKEN OR DISCONNECTED

FAULTY CONTROL SWITCH

CHECK CABLE REATTACH OR REPLACE AS NECESSARY

DISCONNECT 6-PIN CONNECTOR AT CONTROL MODULE. TURN CONTROL SWITCH ON. GROUND LEAD OF TEST LIGHT

TEST
DISCONNECT 6-PIN CONNECTOR AT CONTROL MODULE. CONNECT TEST LIGHT BETWEEN 12 VOLT SOURCE AND VIOLET WIRE

BRAKE LIGHTS CIRCUIT OPEN

CHECK GROUND WIRE (BLACK) FOR PROPER GROUNDING

VERIFY SPEED SIGNAL
CONSULT SHOP MANUAL

VERIFY VACUUM SOURCE AT MODULE

FAULTY CRUISE CONTROL MODULE

SEE WARRANTY

TEST
LIGHT ON - BRAKE LIGHTS ARE WORKING
LIGHT OFF - BRAKE LIGHTS NEED REPAIR
ELECTRICAL TEST  
WITH CLOSED CIRCUIT CONTROL SWITCH

This system can be checked with a test light at the 6 pin connector of the main wiring harness.

Test made at this point will check:
1. Brake Light fuse
2. Connection at “hot side” of brake switch
3. In-line 4 amp fuse in red wire
4. Connections at flat four pin connection
5. Control switch function
6. Connection at “cold side” of brake light switch
7. Brake light switch
8. Brake light bulbs
9. Turn signal switch
10. Ground connection of black wire
11. Connection and power source of brown wire
12. In-line fuse in brown wire

You do not need to unplug the 6 pin connector from the cruise control module for these tests; simply back probe the connections.

To make the test:
1. Ground the test light lead and verify that the test light works by probing a known power source.
2. Follow the test charts below for these tests when using a closed circuit controls switch.

<table>
<thead>
<tr>
<th>CLOSED CIRCUIT CONTROL SWITCH</th>
<th>WIRE COLORS</th>
</tr>
</thead>
<tbody>
<tr>
<td>IGNITION SWITCH POSITIONS</td>
<td>CONTROL SWITCH POSITIONS</td>
</tr>
<tr>
<td>OFF</td>
<td>OFF</td>
</tr>
<tr>
<td>OFF</td>
<td>ON</td>
</tr>
<tr>
<td>OFF</td>
<td>ON &amp; press &amp; HOLD SET/COAST</td>
</tr>
<tr>
<td>ON</td>
<td>ON</td>
</tr>
<tr>
<td>START</td>
<td>ON</td>
</tr>
</tbody>
</table>
ELECTRICAL TEST
WITH OPEN CIRCUIT CONTROL SWITCH

Test at 6 Pin Connection with OPEN CIRCUIT Control Switch

<table>
<thead>
<tr>
<th>IGNITION SWITCH POSITIONS</th>
<th>CONTROL SWITCH POSITIONS</th>
<th>WIRE COLORS</th>
</tr>
</thead>
<tbody>
<tr>
<td>OFF</td>
<td>OFF</td>
<td>RED</td>
</tr>
<tr>
<td></td>
<td></td>
<td>DARK GREEN</td>
</tr>
<tr>
<td></td>
<td></td>
<td>YELLOW</td>
</tr>
<tr>
<td></td>
<td></td>
<td>BROWN</td>
</tr>
<tr>
<td>OFF</td>
<td>ON</td>
<td>OFF</td>
</tr>
<tr>
<td></td>
<td></td>
<td>OFF</td>
</tr>
<tr>
<td>OFF</td>
<td>ON &amp; press &amp; HOLD SET/COAST</td>
<td>OFF</td>
</tr>
<tr>
<td></td>
<td></td>
<td>OFF</td>
</tr>
<tr>
<td>OFF</td>
<td>ON &amp; slide &amp; hold RESUME/ACCEL</td>
<td>OFF</td>
</tr>
<tr>
<td></td>
<td></td>
<td>OFF</td>
</tr>
<tr>
<td>ON</td>
<td>ON</td>
<td>OFF</td>
</tr>
<tr>
<td></td>
<td></td>
<td>OFF</td>
</tr>
<tr>
<td>START</td>
<td>ON</td>
<td>OFF</td>
</tr>
<tr>
<td></td>
<td></td>
<td>OFF</td>
</tr>
</tbody>
</table>

Test for Black and Violet wire grounding circuits is same as with closed circuit control switch.

<table>
<thead>
<tr>
<th>PROBLEM</th>
<th>PROBABLE CAUSES</th>
</tr>
</thead>
<tbody>
<tr>
<td>No power on red wire (power)</td>
<td>Brake Light Fuse</td>
</tr>
<tr>
<td>NOTE: If any problems are found on red wire, correct before proceeding to others</td>
<td>Connection at hot side of brake switch</td>
</tr>
<tr>
<td></td>
<td>In-Line 4 amp Fuse</td>
</tr>
<tr>
<td></td>
<td>Connection at Flat Four Pin Connection Control Switch</td>
</tr>
<tr>
<td>Incorrect operation of Dark Green wire (SET/COAST)</td>
<td>Connection at Flat 4 pin connector Control Switch</td>
</tr>
<tr>
<td>Incorrect operation of Yellow wire (RESUME/ACCEL)</td>
<td>Connection of Flat 4 pin connector Control Switch</td>
</tr>
<tr>
<td>Incorrect operation of Brown wire (accessory power-radio fuse)</td>
<td>Wrong Power Source</td>
</tr>
<tr>
<td></td>
<td>In-Line 9 amp Fuse</td>
</tr>
</tbody>
</table>

At this point the black and the violet wire of the 6 pin connector are to be tested. (Unplug 6 pin connector for these tests)
Attach the test light lead to a power source and verify test light operation by touching the “Probe End” to ground; the test light should burn.

1. **PROBE THE BLACK WIRE:** If the black wire is properly grounded the test light will burn.

2. **PROBE THE VIOLET WIRE:** If the violet wire is attached to the cold side of the brake light switch and has continuity to ground through the brake light bulbs the test light will burn. Pressing the brake pedal will make the test light go out when the brake lights come on.

3. A. With the test light still probing the violet wire, turn on the ignition switch and turn on the left turn signal light. If the test light goes out, check the right side brake lamp bulb and its grounding.

   B. Now, turn on the right side turn signal. If the test light goes out, check the left side brake lamp bulb and its grounding.

**NOTE:** If, during these tests of the violet wire, the test light oscillates with turn signal operation, you may need to install a separate brake disengagement switch due to poor brake light grounding on the vehicle or poor contact of the switching mechanism in the turn signal switch.

(Part #250-4206 suggested)
TECHNICAL SERVICE

In the event that you need technical assistance with trouble shooting, please have the following information when calling the Technical Service Department 910-277-1828.

This information is important for a proper and speedy diagnosis of the problems encountered.

1. The model number and manufacture code of the Cruise Control Module (No.1) which is printed on the case is required.

2. Vehicle make, model and year.

3. Transmission type: AUTOMATIC MANUAL

4. Brake Switch wiring connections. Ensure that the following is correct!
   “HOT SIDE” connected to red wire from Main Wiring Harness (No.2)
   “COLD SIDE” connected to violet wire from Main Wiring Harness (No.2)

5. Power Supply wiring connection. Brown wire from Main Wiring Harness (No.2)

6. Vacuum Source:

7. Speed Signal Source:
   VSS (Vehicle Speed Signal)?
   Signal Generator?

8. Tachometer wiring connection. Blue wire from Main Wiring Harness (No.2)

9. Cruise Control Module (No.1) programming switch setting:

<table>
<thead>
<tr>
<th>ON</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

10. Item numbers of parts used for throttle connection and cable anchor. Refer to the Parts List and Parts Diagram on Pages 4-5 of this manual.

<table>
<thead>
<tr>
<th>ITEM</th>
<th>YES</th>
<th>NO</th>
<th>ITEM</th>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td></td>
<td></td>
<td>16</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td></td>
<td></td>
<td>17</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td></td>
<td></td>
<td>18</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td></td>
<td></td>
<td>19</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td></td>
<td></td>
<td>20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td></td>
<td></td>
<td>21</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td></td>
<td></td>
<td>22</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td></td>
<td></td>
<td>23</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Page 28