



CABLE HANGING INSTRUCTION MANUAL

There are several types of grain storage tanks and bins. Parts of these instructions may need to be modified to fit the circumstances.

Care should be taken in handling the cables and leadwire; avoid crushing, cuts and knots. Keep in dry area.

Cables should be sorted according to length and put in the respective tanks before adding other hardware.

- A. Locate the position for the respective cables on the bin floor, making sure that cables will not be hanging in the grain stream when bins are being filled.
- B. Hang cables according to the bin manufacturer's specifications.

NOTE: Due to the many differences among steel tanks, no specific location instructions can be given.

The cable location diagram provided with this order is a guideline.

In most cases, the roof itself is not strong enough to support the cables. Some tanks have roof stiffeners to support the cables; some have beams or trusses; and some have special braces for hanging cables. It is up to the cable installer to determine exactly where to hang the cables so that the roof will support them. (Refer to bin manufacturer's recommendation).

- C. If an eyebolt is used, tape the leadwire to the eyebolt below the bottom nut. Leave enough slack in the leadwire so that the cable may swing without pulling the splice at the top of the cable apart (see *Figure 1*).
- D. Place the eyebolt through the hole, in the beam, roof support or roof where the cable should be hung and secure with a washer and nut.
- E. If the roof itself is drilled through, seal the roof, the washer, the nut and eyebolt with silicone caulk to prevent water leaks.
- F. Run the leadwires to the peak of the roof in such a manner so they will not be in the grain stream or sag into the grain. On larger diameter tanks, weave or tape them to the trusses and around the support ring or collar near the bin peak.
- G. Bring leadwires through the roof by installing proper size LB conduit fitting or weatherproof splice box of sufficient size for all leadwire(s). Do not bring leadwires through the roof in such a manner that they could be cut or pinched by the roof, cap or anything else.
- H. Coil leadwires on roof out of the way of foot traffic, machinery, welding or cutting, etc. and tie off to keep them from falling back into the bin.

IF THE CABLES ARE NOT PROPERLY HUNG, THE BIN ROOF AND SIDEWALLS CAN BE DAMAGED BY THE PULL OF THE CABLES. YOU MUST DETERMINE THE STRUCTURAL STRENGTH OF THE BIN OR CABLE SUPPORTS SUPPLIED BY THE MANUFACTURER TO BE SURE THAT THEY ARE ADEQUATE AND WILL NOT DAMAGE THE ROOF OR SIDEWALLS.

TAPE
LEADWIRE TO
EYEBOLT AS
SHOWN.

TAPE

←RIGHT

←WRONG

CABLE WEIGHTS
(as shown) are
recommended
for use on
CONCRETE SILOS
ONLY.

← →

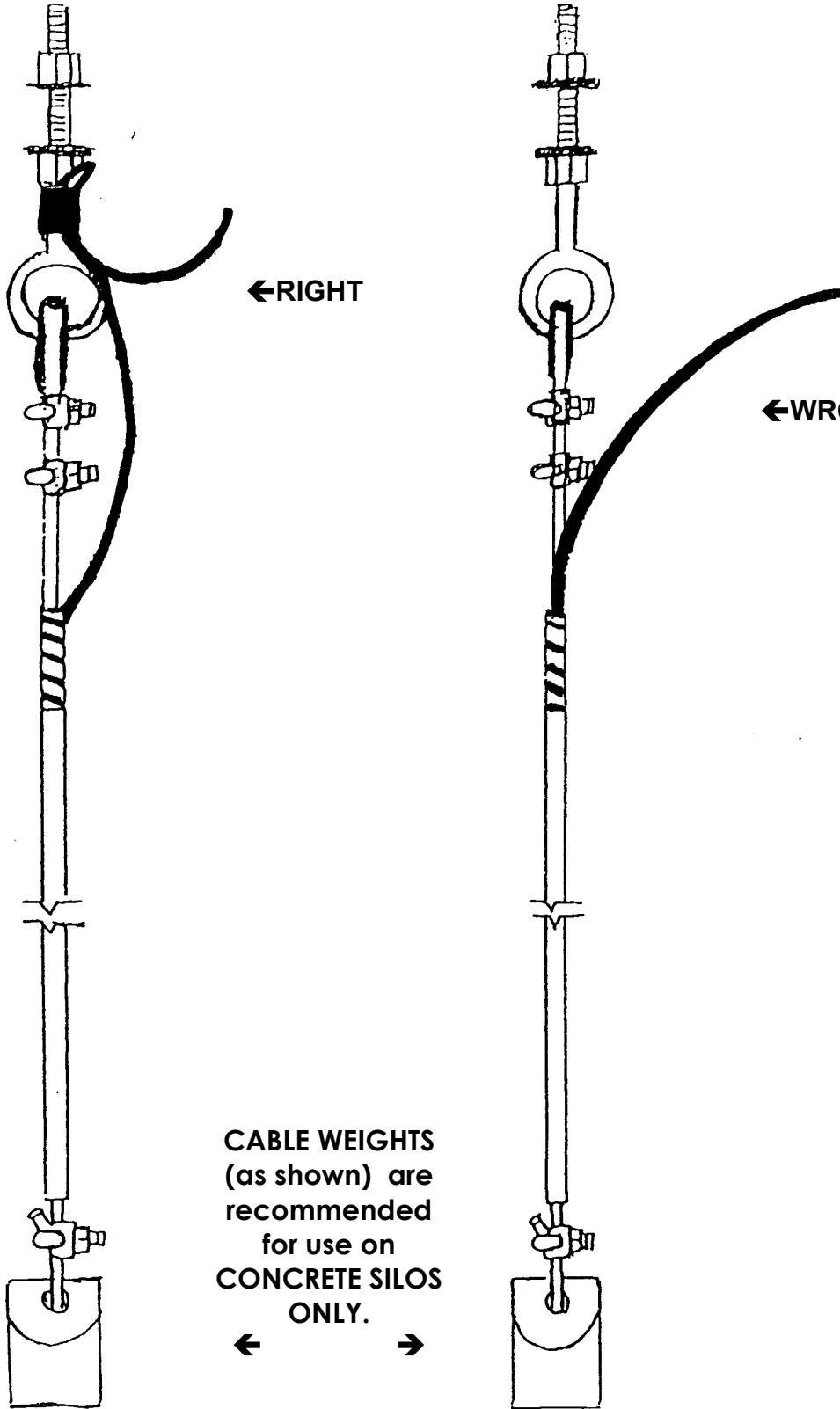


FIGURE 1.

ANCHORING CABLES TO FLOOR

The temperature cables must be secured to the bin floor in steel tanks to prevent them from drifting to the side wall of the bin while being filled.

ANCHOR PLATES

1/2" or 5/8"
EYEBOLT
NUTS/
WASHERS

NOTE:
Tape leadwire to
eyebolt as shown.

THIMBLE

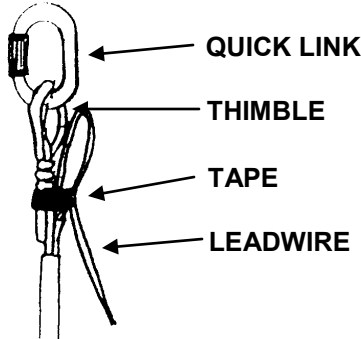
1. Make sure anchor plate lies flat on floor beneath cable.
2. Tie down with recommended material.
3. Repeat every time bin is empty.

NOTE:
Binder twine or
50 to 110# test
fishing line may
be used to secure
cable bottom loop
to anchor plate on
floor.

9 1/2" 9 1/2"

OPTIONS

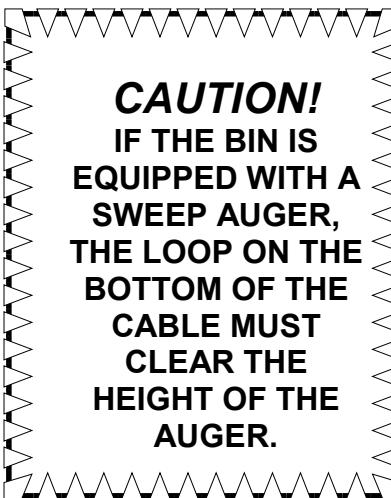
NOTE: Cables hung with Quick Links - tape leadwire to cable top as shown below.



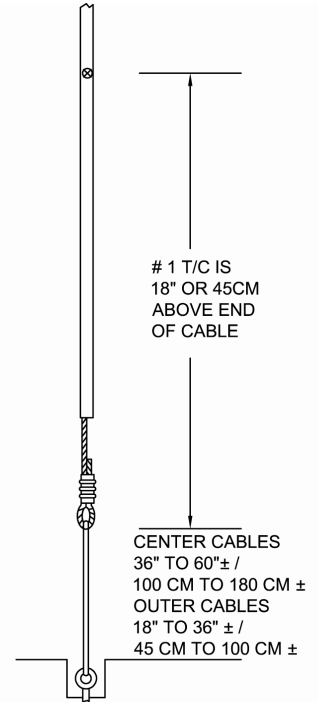
IMPORTANT

Nut on eyebolt must be threaded down as closely as possible to the eye.

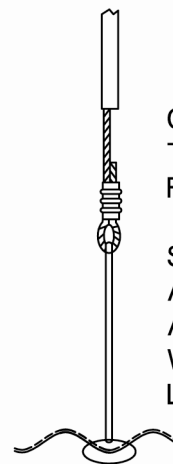
Eye on eyebolt must run parallel to roof rafter or cable support.



ANCHORS



BOTTOM LOOP FOR FLAT FLOOR TIE DOWN. SECURE WITH LIGHT LINE OR TWINE. COUNTERSINK EYEBOLT TO AVOID BIN SWEEP. ONLY USE SASH WEIGHT ON HOPPER BOTTOM SLOPE SILOS.



CABLE ATTACHMENT TO PERFORATED FLOOR.

SIMPLY MAKE A WIRE LOOP AND SECURE WITH LIGHT LINE OR TWINE.

FIGURE 2.

CABLE LOCATION

If a center cable is used, it is the #1 cable. When there is not a center cable, the #1 cable is in the inner perimeter, clockwise of the manhole. Cables then continue clockwise. The lowest cable number of any perimeter of cables is always the first cable clockwise of the manhole.

NOTE: Always refer to the Cable Location Diagram provided to you by Tri States Grain Conditioning.

EXAMPLES ONLY

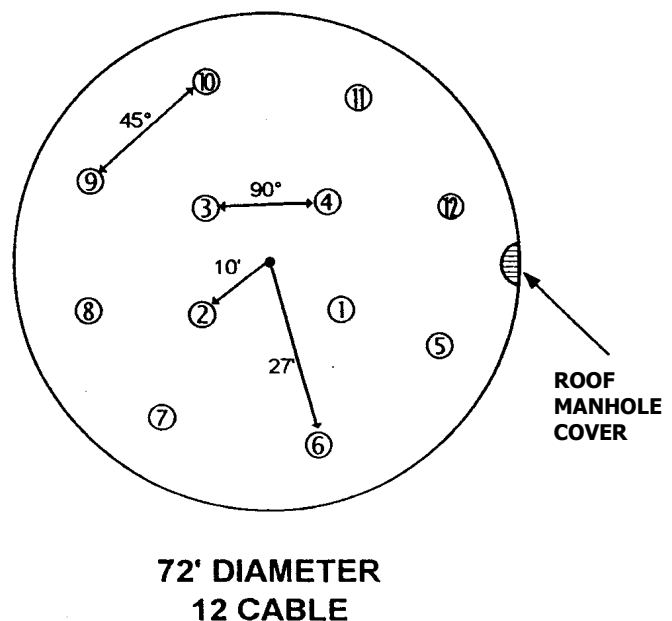
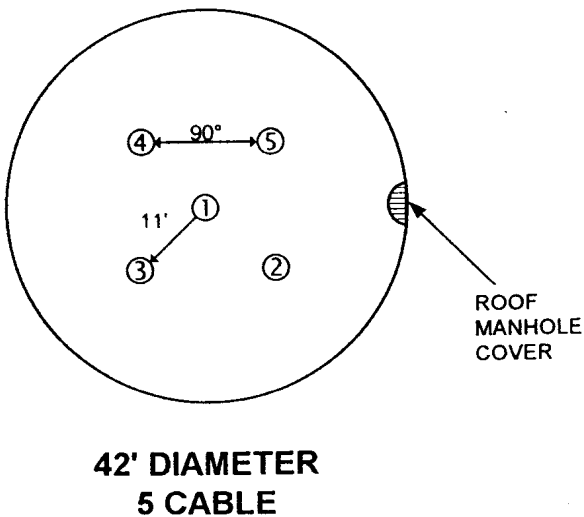
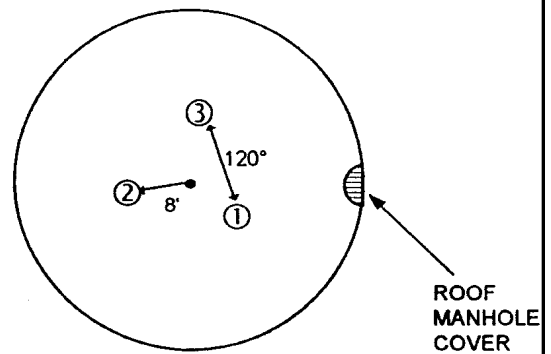
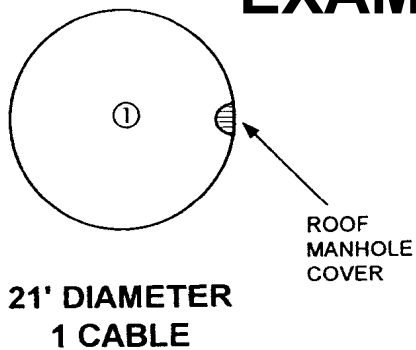


FIGURE 3.

INSTALLING LEADWIRE FOR CONDUIT

Conduit is used to protect wires from weather, rodents or mechanical damage.

Rigid conduit must be used for any outside work which will be exposed to the weather and may be required on some installations for inside runs as well.

Conduit size is determined by the number of wires being housed. The maximum should be 75% filled. Proper fittings must be used in each run for ease in pulling wires. **See table below.**

All conduit runs must be kept away from high-voltage wires as much as possible to prevent inductance "pick up".

No more than two 90 degree bends or combination of bends totaling 180 degrees should be in the run between conduit fittings.

Requirements regarding perpendiculars, horizontals, supports, fittings, and "expansion joints" are the same as for general electrical work.

LEADWIRE & CONDUIT

CONDUIT SIZE	1/2"	3/4"	1"	1 1/4"	1 1/2"	2"
6 T/C Leadwire	9	16	27	50	70	100
12 T/C Leadwire	3	5	12	20	30	60
18 T/C Leadwire	3	5	11	18	28	46
21 T/C Leadwire	3	5	11	18	28	46

CRS BOX INSTALLATION

The central reading station box (CRS box) should be located at a convenient, non-obstructed area for easy access. Normally, it is mounted on the sidewall of the tank approximately 4 feet above ground level.

- A. Remove the reading plug panel from the enclosure. **See Figure 4.**
- B. Drill a hole in the side of the box. This is for the conduit entrance. The hole should be sized according to the size of conduit being used. **See table at right.**
- C. Mount CRS Box 4 feet above ground level using proper fastener.

CONDUIT SIZE	HOLE SAW SIZE
1/2"	7/8"
3/4"	1 1/6"
1"	1 3/8"
1 1/4"	1 5/8"
1 1/2"	1 7/8"

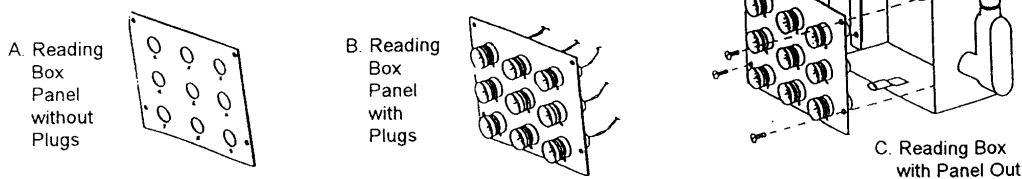


Figure 4.

PULLING LEADWIRE THROUGH CONDUIT

Leadwire is used to connect the cable to the plug in the CRS box.

NOTE: *Leadwire requires special care when handling; avoid crushing, cuts, knots and ALWAYS keep dry.*

- Tape all leadwires to form a tapered end.
- Feed leadwires through conduit down bin slope to CRS Box.
- Before any cutting is done, tape numbered leadwire from cable top to corresponding numbered plug wire (Example: #1 leadwire to #1 plug wire) about 3 feet from CRS box. Cut off excess leadwire.

NOTE: The leadwire marking tags should be moved up or renumbered before cutting the leadwire.

LEADWIRE COMPOSITION

A "group" consists of 7 wires—Black, Blue, Green, Red, Yellow and Clear, plus a common White, Brown or Orange.

6TC - Leadwire has a White Group.

12TC - Leadwire has a White Group and a Brown Group.

18TC - Leadwire has a White Group, Brown Group and an Orange Group.

The Black wire in the White Group reads the very bottom of the cable. **See Figure 5.**

21TC Leadwire has 3 Groups, however, a Purple copper wire is added to each group as the last reading.

Figure 5 illustrates the wires in the 3 groups which make up 18TC Leadwire.

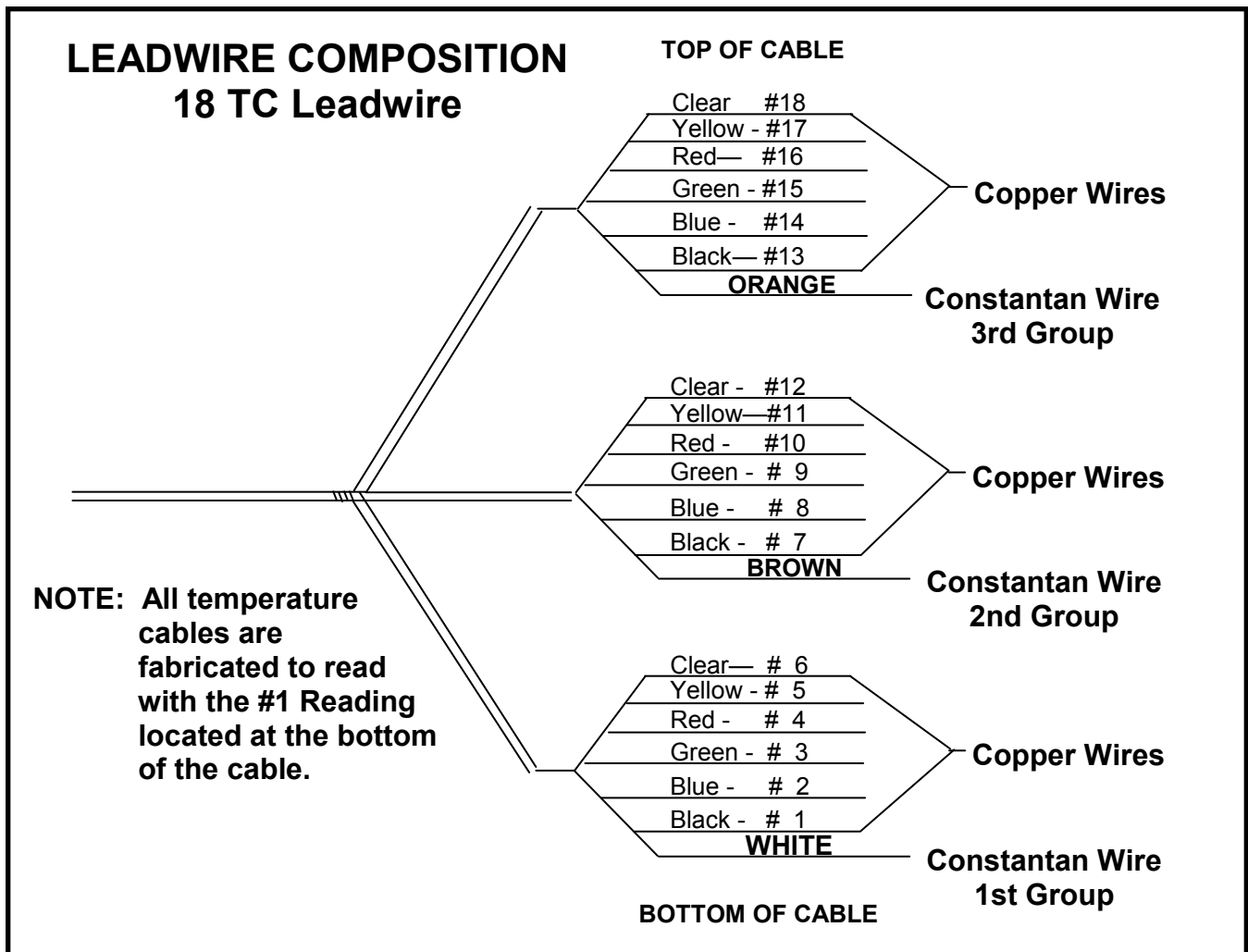


FIGURE 5.

SPLICING WITH COMPRESSION CONNECTORS

The wires are spliced color-to-color and group-to-group. Each pair of wires is inserted completely into the connector and crimped. They are insulated outside and grease-filled inside. The grease retards corrosion and resists water, thus making a good conductive splice. The outside of the crimp is insulated, so no further insulation is required. The splice, when completed, is then taped to help retard water (will not be waterproof) and to keep the splice neat looking. The connectors can be crimped with a pair of lineman's pliers, but we prefer the crimping tool that was designed for them.

The crimping tools and connectors are available through TSGC, Inc. and can be purchased with the temperature equipment.

The tools and materials required are as follows:

1. A pair of good wire cutters
2. A very sharp knife
3. A pair of pliers—long nose
4. Crimping tool (alternative—lineman's pliers)
5. Compression crimps
6. Good quality electrical tape

DETAILED STEPS TO BE FOLLOWED IN SEQUENCE

1. Tape the two pieces of leadwire together about 4" from the ends.
2. Using a sharp knife, cut along the ridge on the leadwire about one inch, exposing the ripcord. Do this to both pieces.
3. Pull the ripcord with the long-nose pliers, slitting the outer coating of the leadwire back to the tape.

NOTE: Should the ripcord break, slit the outer coating along the top of the ripcord ridge and repeat Step 2.

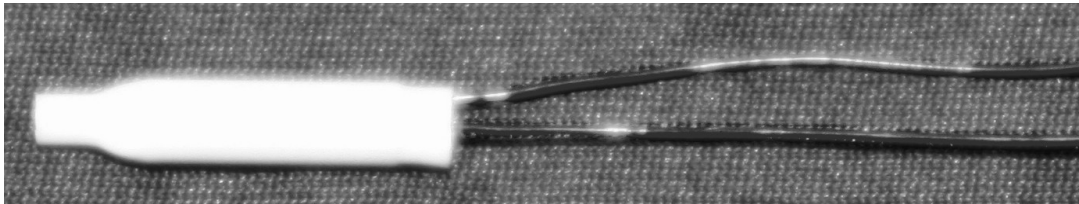
4. Separate the wires into their respective groups so you are splicing the WHITE group of one leadwire into the WHITE group of the other leadwire.
5. Twist the wires together slightly, color-to-color, for each group so they will not separate. **Do this one group at a time so as not to mix up the groups.**
6. Taking a pair of side cutters, cut off the excess wire so the wires are about 3" longer than the black outer coating.
7. Place a connector over each pair of wires and using the crimping tool, crimp the connectors tightly closed. Be sure that the crimps are seated as far on the wires as possible, and that the tool crimps the connectors fully.
8. After all of the wires are crimped, wrap the bundle one or two times with electrical tape.
9. The splice is complete.

SYSTEM CHECKOUT

Upon completion of the installation, all thermo-couples (T/Cs) should be checked.

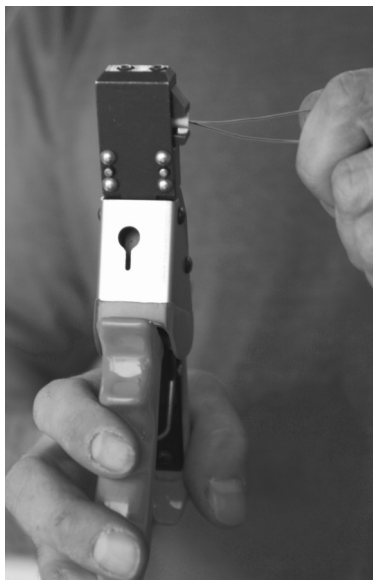
This check is done by simply plugging your instrument into the plug(s) and reading through each cable. If an open or non-functioning T/C is discovered, remove the

CRS Box Panel and check the relative splice to make sure a good connection has been made. ***An open T/C will be designated differently depending on what type of instrument is being used. Refer to your instrument operation manual to determine its symptoms of an open T/C.***

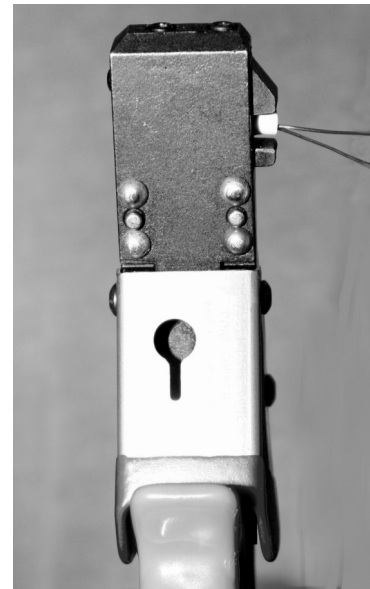


WIRES SAME LENGTH

INSERT WIRES INTO CONNECTOR



**SQUEEZE
TOOL
UNTIL TOOL
RELEASES.
MAKE SURE
WIRES STAY
ALL THE
WAY
IN THE
CONNECTOR**



KEY POINTS IN TAKING GRAIN TEMPERATURES

1. Take temperatures at least once per week. Get into the habit of completing this task every Monday or Friday morning.
2. When taking temperatures, turn the air off at least 20 minutes prior to reading or you'll be reading air temperature, not grain temperatures.
3. Record grain temperatures in the log book or print temperatures for comparative week to week readings. Read temperatures more frequently if a trend in rising temperature is noted.
4. If a portable instrument is being used, let the instrument standardize for 10 to 15 minutes prior to reading temperatures. Otherwise you could get false high temperatures on the first few cables being read.
5. Take note of and record the ambient outside temperature each time grain temperatures are taken. This will give you an idea of what the actual grain temperatures are compared to the air temperatures you are putting into the grain if aerating. It will also give you an idea of how full your bin is by temperature comparison.

Grain is a good insulator. Typically, the outside (ambient) temperature will be different than the grain temperatures.