TRANE XV95
Series Furnace

Addressing
TRANE XV95 Series
Furnace RFI Issues.

This document may apply to other Trane models including the XC95 with variable speed inducer motors. Methods could also be applied to furnaces manufactured by others with similar problems.

For more information visit the following links:

http://amfone.net/Amforum/index.php?topic=29720.0
lists.contesting.com/_rfi/2009-10/msg00004.html
www.eham.net/ehamforum/smf/index.php?action=printpage;topic
furnacefeed.info/trane-furnace-rfi-suppression/
groups.yahoo.com/group/rochester_hams/message/526

This is only a partial list. Google “Trane furnace RFI” or “furnace RFI”

Pictures and documents were contributed by Jim Horvat, W8WRP and Ed Sieb, VA3ES. Compiled and made into a PDF by Doug Crompton, WA3DSP - 11/2011

For further information or updates on this problem, manufacturers response, and FCC intervention contact Doug Crompton, WA3DSP, doug@crompton.com

Ed Sieb, who is working with Canadian officials in this matter, can be reached at esieb@sympatico.ca

Jim Horvat can be reached at w8wrp@windstream.net

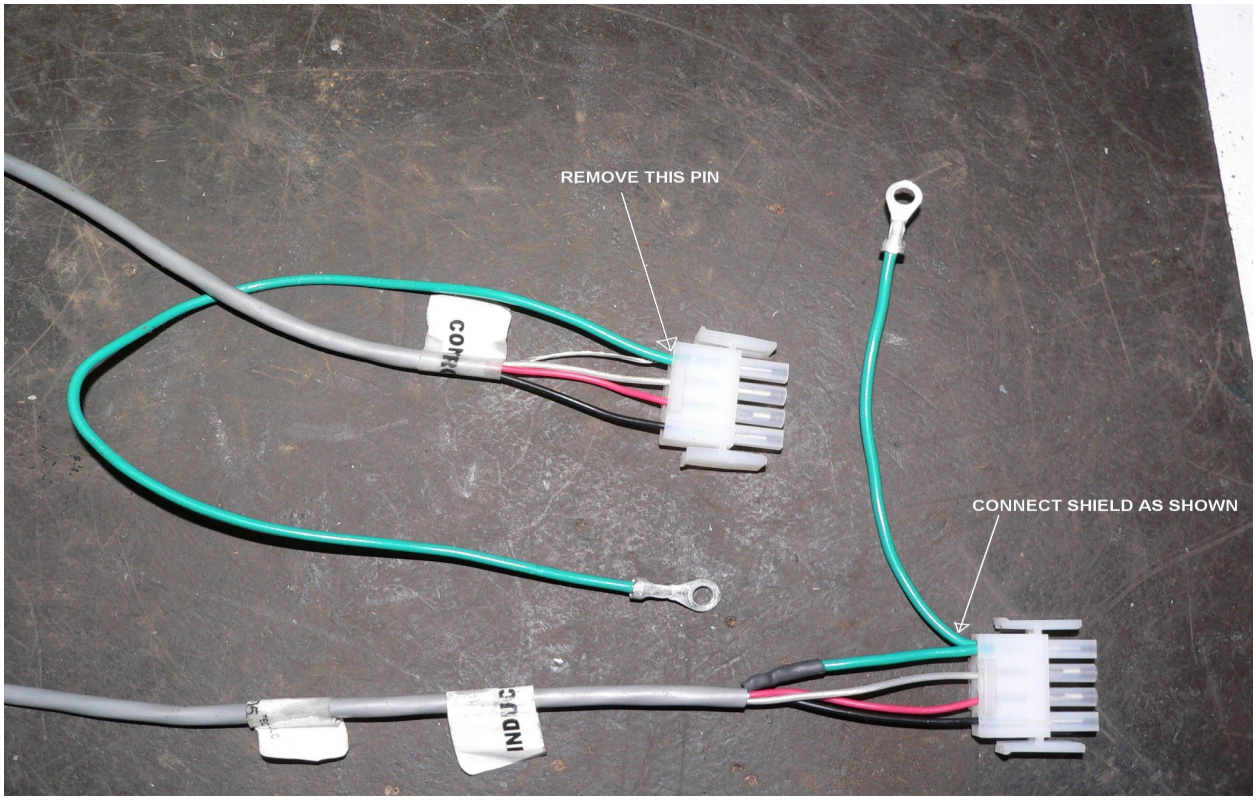


Fig. 1 Cable modification

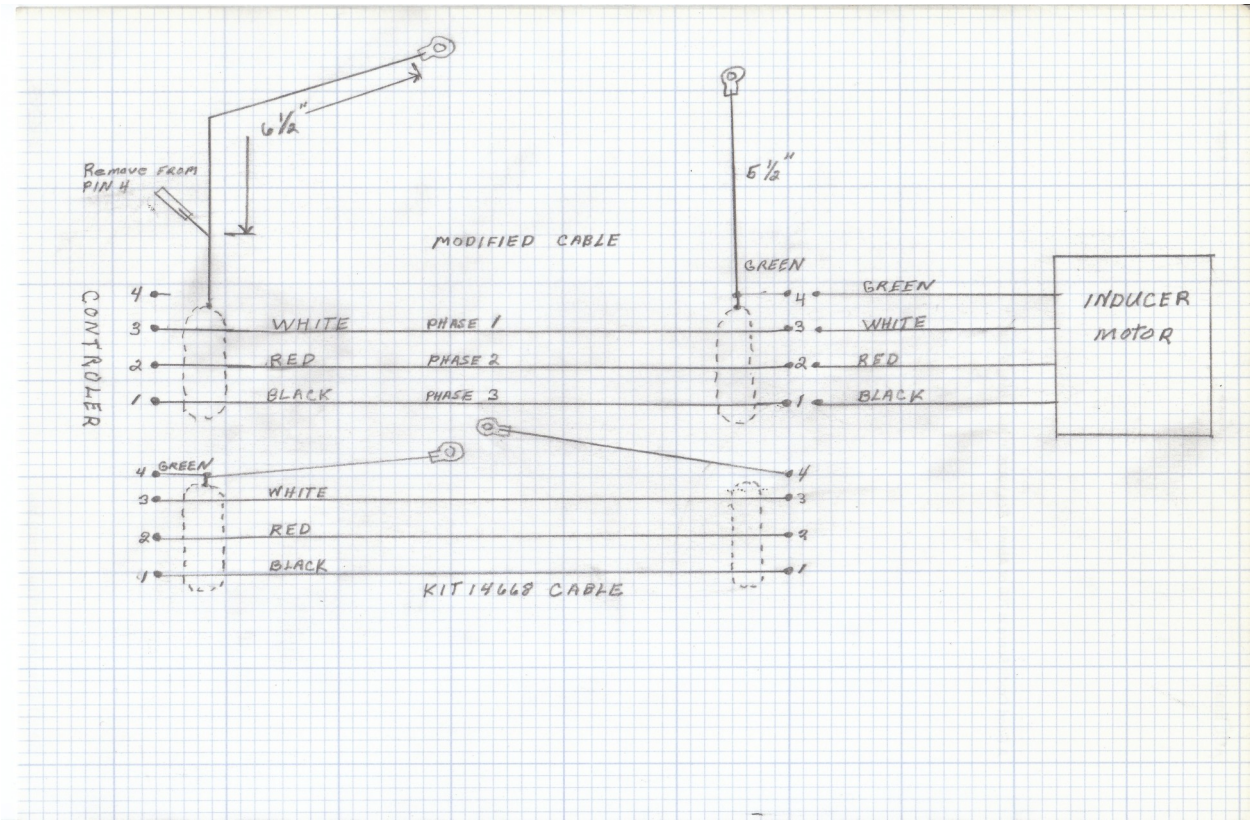
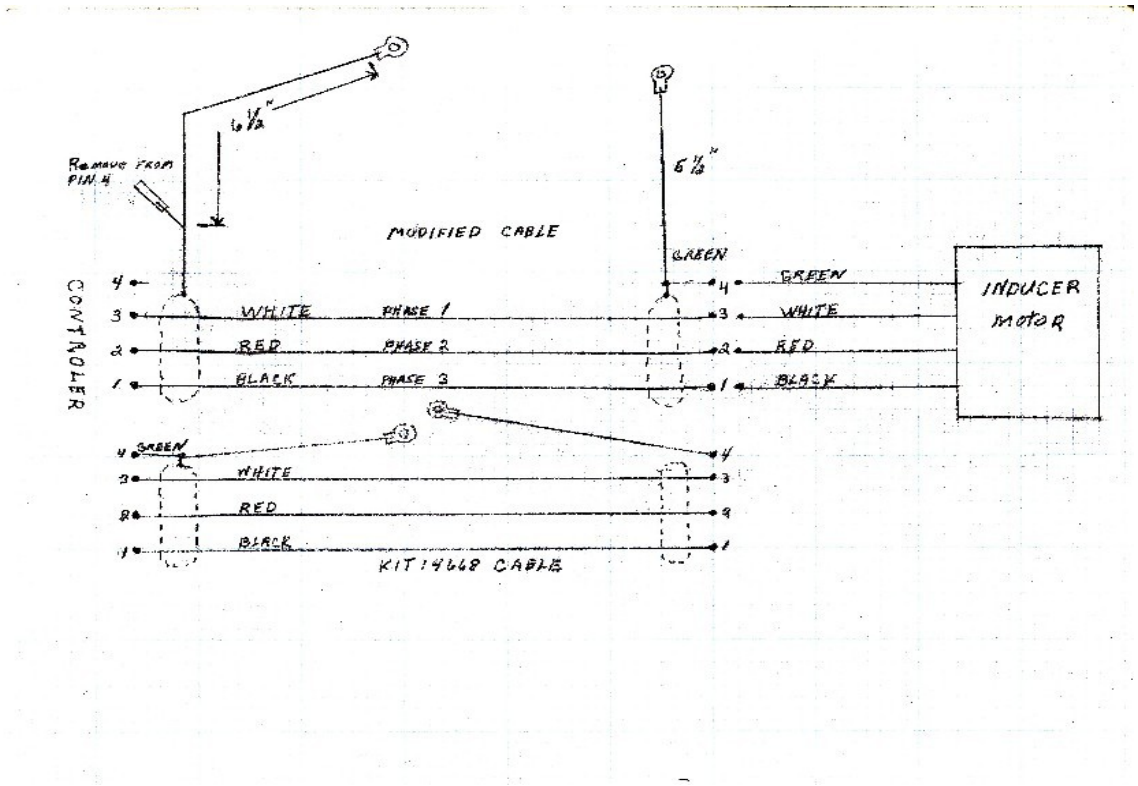


Fig. 2 Schematic



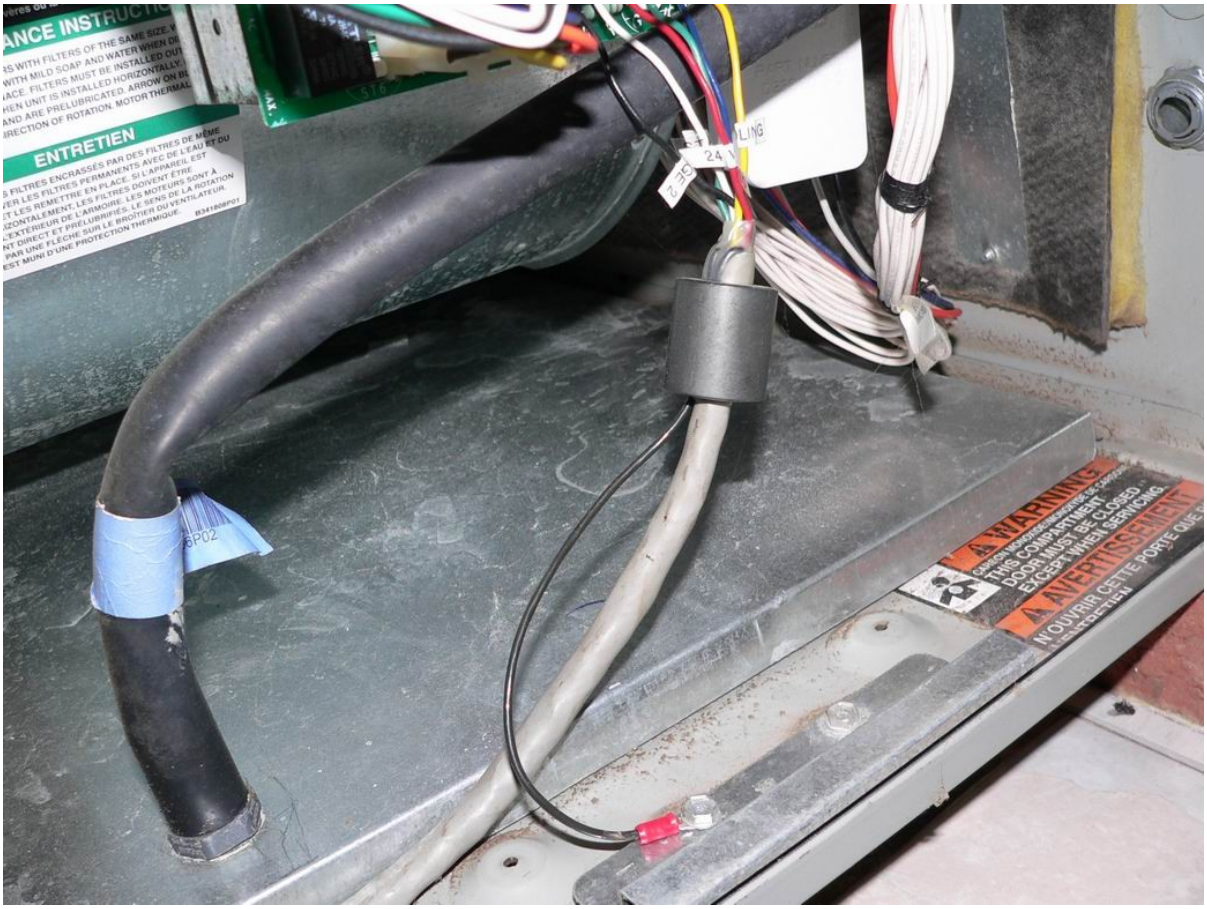


Fig. 3 Control cable

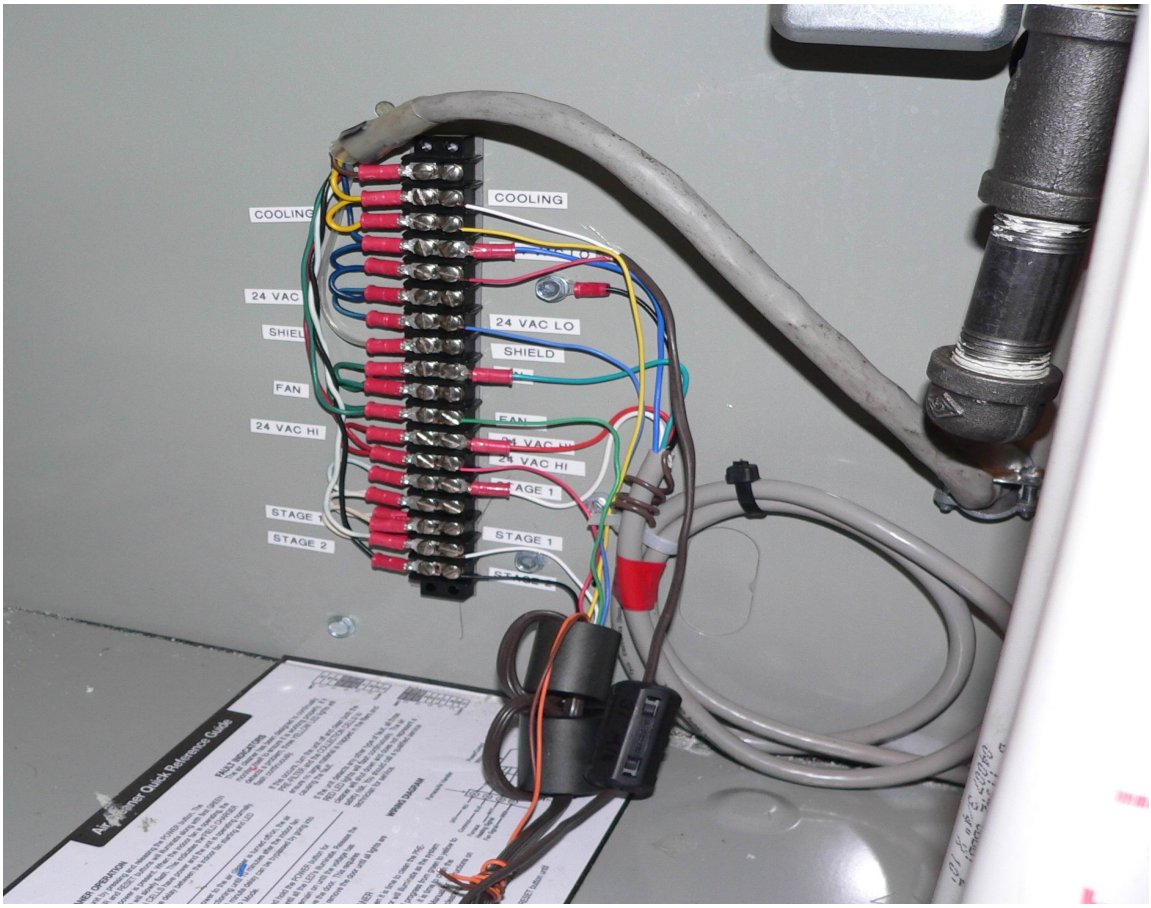


Fig. 4 Control terminal strips

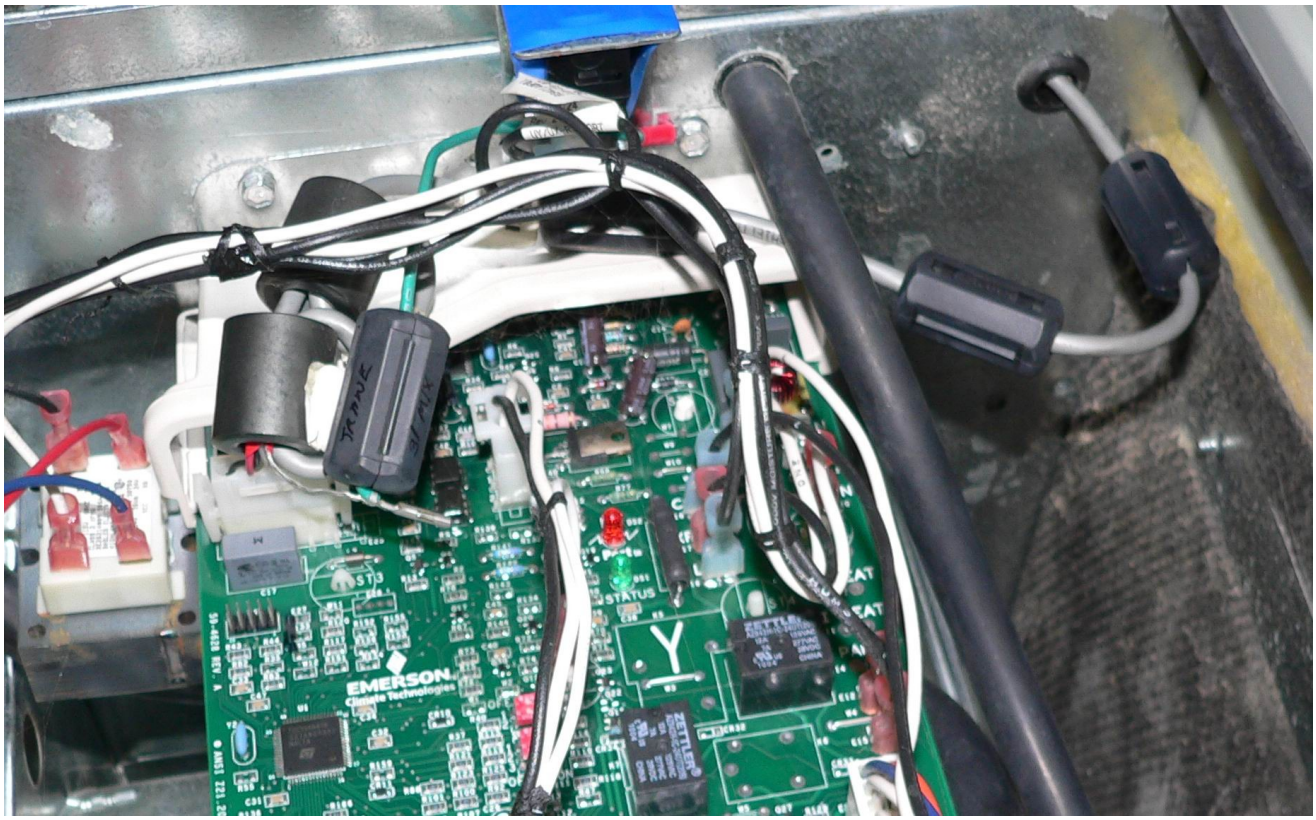


Fig. 5 Controller side

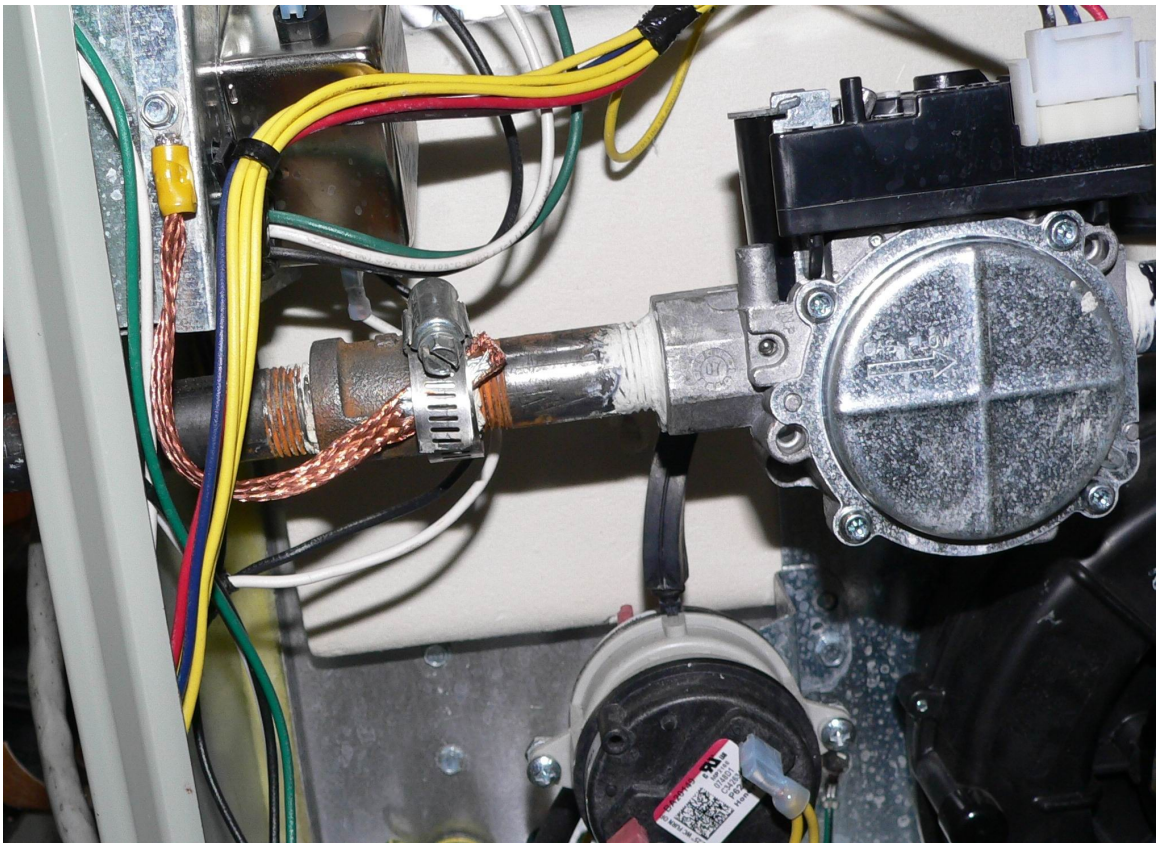


Fig. 6 Gas pipe ground

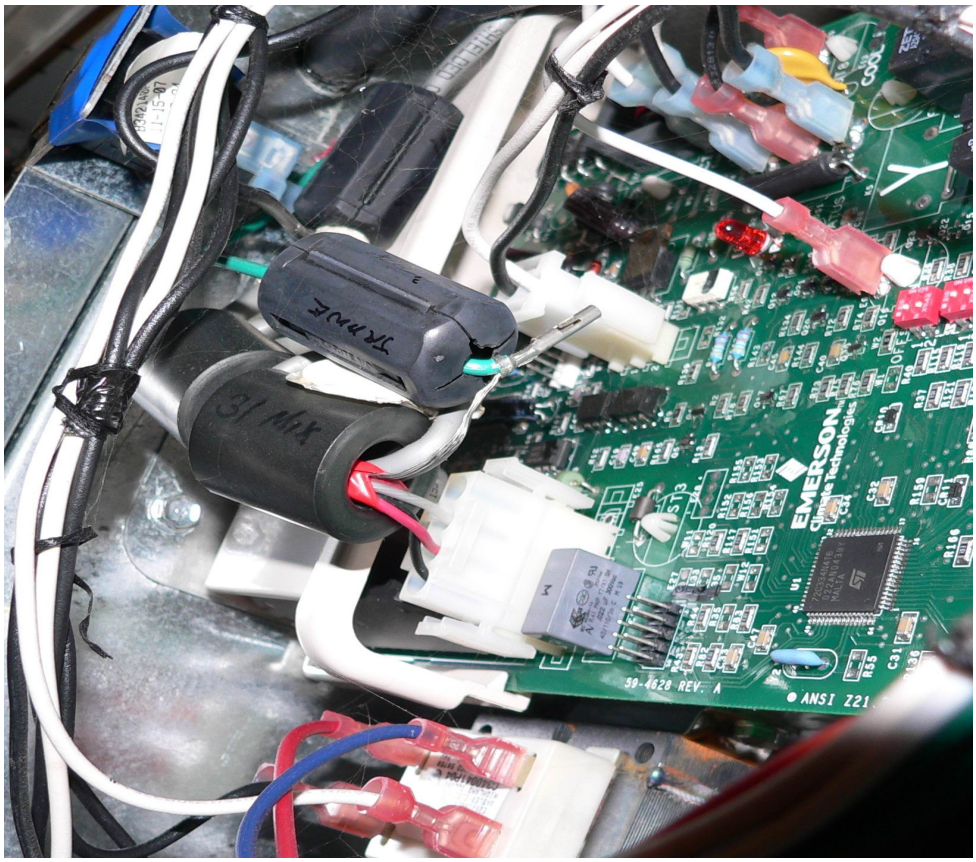


Fig. 7 Ground pin removed

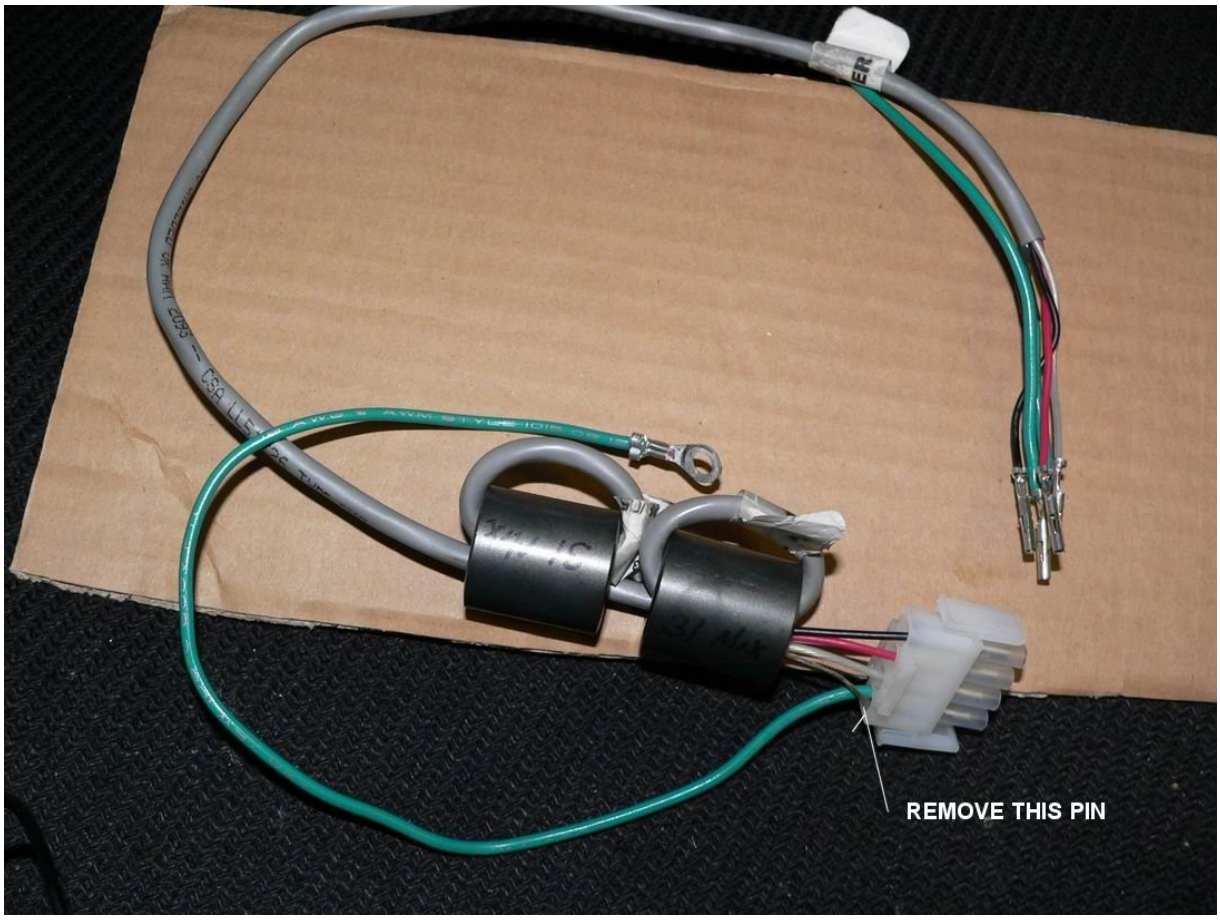


Fig. 8 Inducer cable ferrites

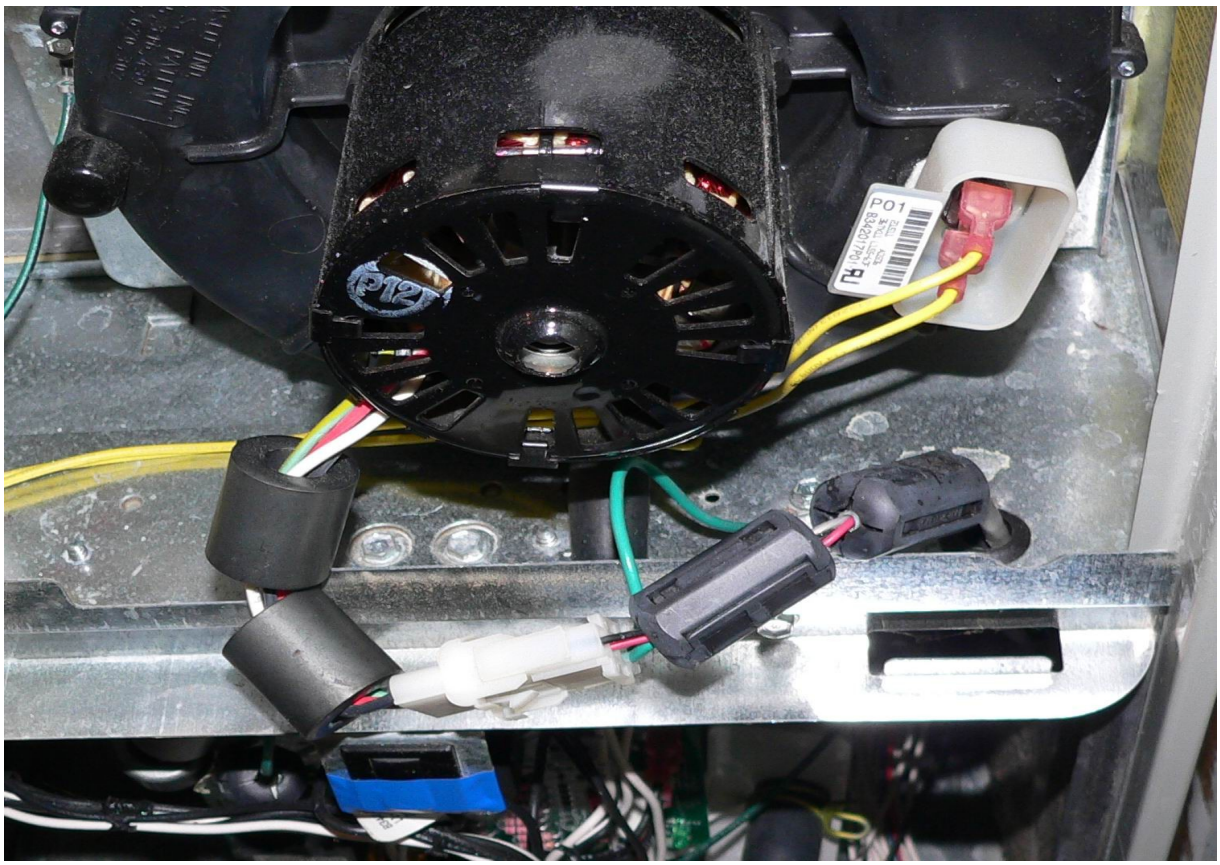


Fig. 9 Inducer side

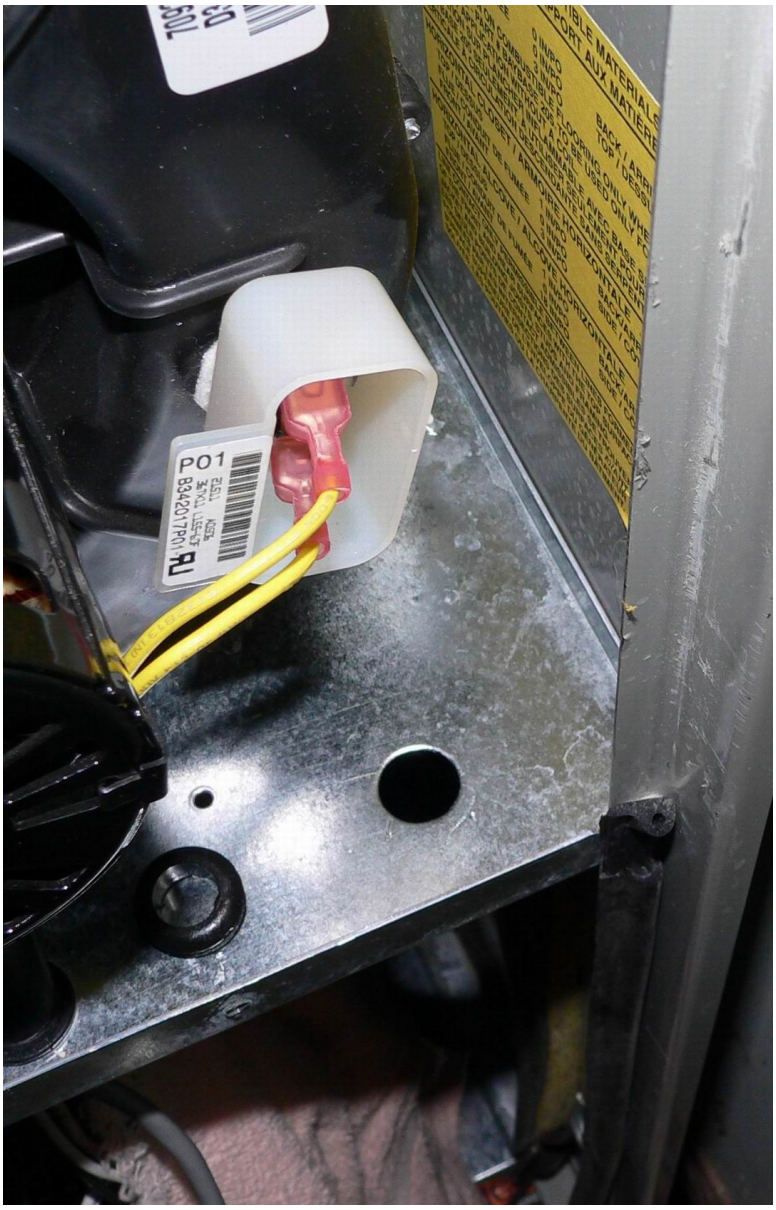
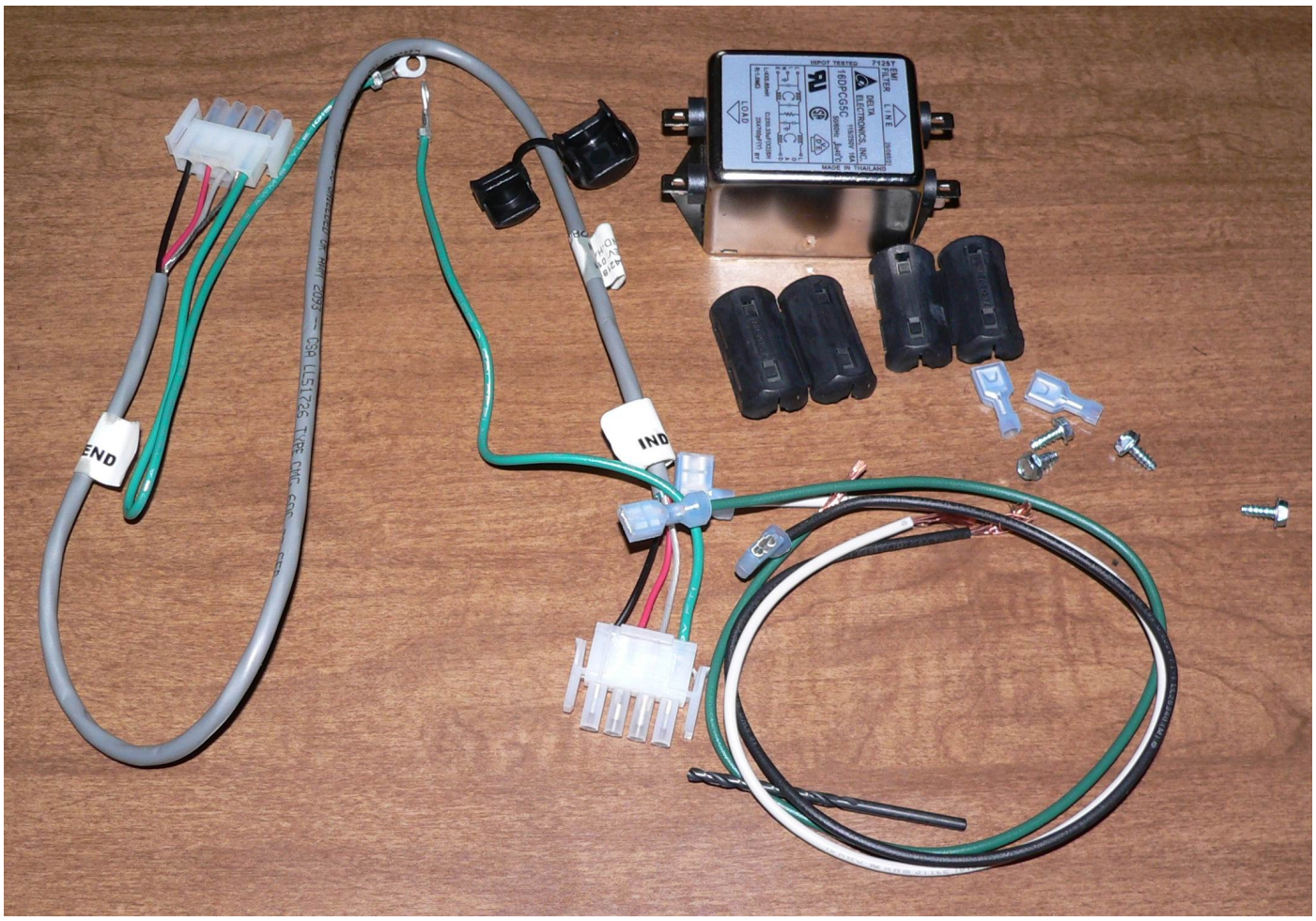


Fig. 10 New hole



Trane Kit 14668

This is the contents of the RFI kit supplied by Trane for the XV95 furnace. It includes a Delta electronics 16DPCG5C line filter, a replacement shielded motor cable, clamp-on ferrites for the cables and wire and connectors to install the line filter.

As of 11/2011 Trane's policy appears to not pay for this kit or its installation. Customers have had varying luck at getting Trane to pay some of the cost. My installer quoted his cost for the kit at $189 which is outrageous based on what is supplied. I would advise anyone that has this problem to stand firm and press Trane to assume the entire cost. This apparently must be done through your installer. Also the kit number may have changed, just reference XV95 RFI kit.

Costs of the parts in this kit are minimal and can be bought off the shelf. I purchased the same Delta line filter on Ebay for $15. The ferrites are Mouser 623-0431164181 for clamp on and 623-2631102002 solid round . This is a Fairite mix 31 which is probably far better then those supplied in the kit and shown above.. They are $2-$3 each and I would buy at least 5 of each.

The following pages show the Trane installation instructions for the kit as shown above.

SERVICE INSTALLER'S GUIDE

ALL phases of this installation must comply with NATIONAL, STATE AND LOCAL CODES

Models:
KIT14668

KIT14668- VARIABLE SPEED INDUCER

IMPORTANT—This Document is customer property and is to remain with this unit.
Please return to service information pack upon completion of work.

⚠ WARNING DISCONNECT POWER BEFORE SERVICING

KIT14668, VARIABLE SPEED INDUCER KIT COMPONENTS

See Figure 1

Item No	Drawing No	Description	Quantity
1	B342853P01	FILTER-EMI	1
2	A342856P01	BEAD-FERRITE	2
3	B342181P01	HARNESS-SHIELDED	1
4	B342004P10	WIRE-MSC -RPS	1
5	B342004P09	WIRE-MSC -RPS	1
6	B342004P08	WIRE-MSC -RPS	1
7	A903105P06	STRAIN RELIEF	1
8	A342970P01	DRILL-TWIST	1
9	N156P1506B	SCREW 8-15 HXW 3/8	3
10	A342946P01	QUICK CONNECT	2
11	A343030P01	LABEL-WIRING DIAGRAM	1
12	A342854P01	LABEL-CONVERSION	1

APPLICATION:

The Variable Speed Inducer Kit is to be used on *UY/*DY, *UX-R/*DX-R, *UX2/*DX2, *UH2/*DH2 models. This Kit helps to reduce the frequency noise generated by running the inducer motor.

UPFLOW INSTRUCTIONS

1. Install EMI Filter. (See instructions on Page 3)
2. Install Ferrite Beads. (See instructions on Page 5 and Figure 11)
3. Disconnect the 4 pin connector from the inducer motor.
4. Disconnect the 4 pin connector from the control board.

NOTE: The existing harness is secured within the main wiring harness bundle. It can remain in place and does not have to be removed from the furnace.

5. Remove the door mounting channel from the blower deck in order to route the new shielded cable harness from the control board to the inducer.

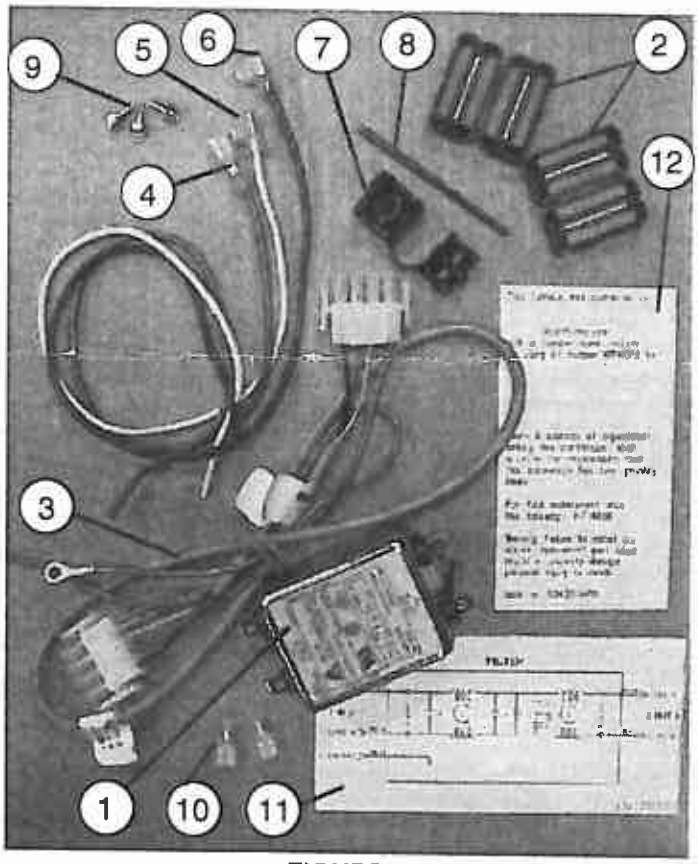


FIGURE 1

6. Locate the end of the shielded cable harness labeled "INDUCER END" and connect the 4 pin connector to the inducer. Secure the Green ground lead found on the 4 pin connector to the pressure switch mounting plate. See Figure 2.

⚠ WARNING

The cabinet must have an uninterrupted or unbroken ground according to National Electrical Code, ANSI/NFPA 70 - "latest edition" and Canadian Electrical Code, CSA C22.1 or local codes to minimize personal injury if an electrical fault should occur.
Failure to follow this warning could result in an electrical shock, fire, injury, or death.

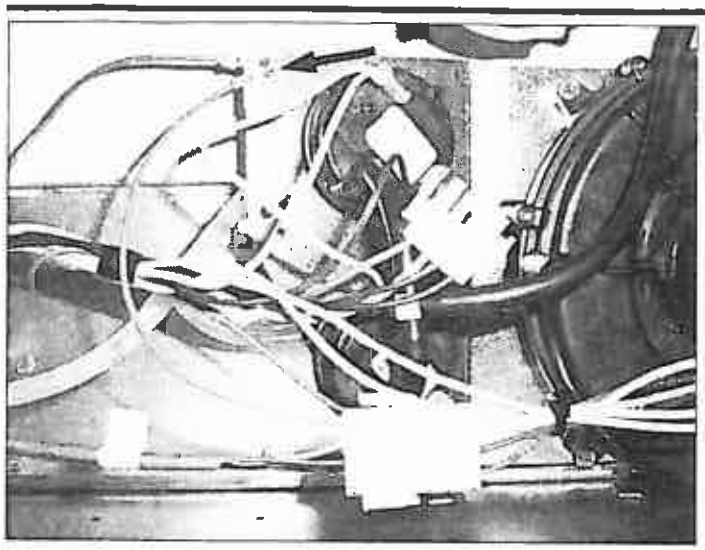


FIGURE 2 UPFLOW

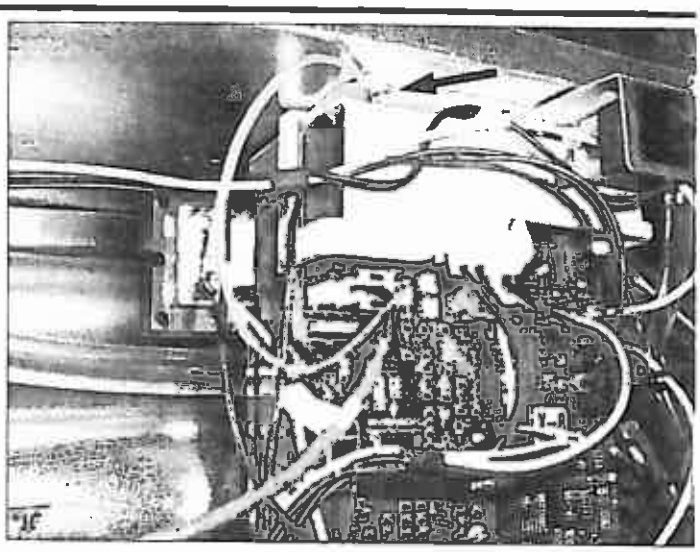


FIGURE 3 UPFLOW

7. Locate the end of the shielded cable harness labeled "CONTROL END" and connect the 4 pin connector to the control. Secure the Green ground lead found on the 4 pin connector to the sheet metal control mounting platform using one of the existing mounting screws. See Figure 3.

***NOTE:** Proper grounding of the shielded harness is critical in providing for reduction of electrical noise interference. Confirm that the green ground leads are adequately secured to the sheet metal.*

⚠ WARNING

Disconnect power to the unit before removing the blower door.
Failure to follow this warning could result in personal injury from moving parts.

⚠ CAUTION

Label all wires prior to disconnection when servicing controls. Wiring errors can cause improper and dangerous operation. Verify proper operation after servicing.

DOWNFLOW INSTRUCTIONS

1. Install EMI Filter. (See instructions on Page 3)
2. Install Ferrite Beads. (See instructions on Page 5 and Figure 11)
3. Disconnect the 4 pin connector from the control board.
4. Disconnect the 4 pin connector from the inducer motor.

NOTE: The existing harness is secured within the main wiring harness bundle. It can remain in place and does not have to be removed from the furnace.

5. Route the new shielded cable harness from the control board to the inducer.
6. Locate the end of the shielded cable harness labeled "INDUCER END" and connect the 4 pin connector to the inducer. Secure the Green ground lead found on the 4 pin connector to the blower deck. See Figure 4.

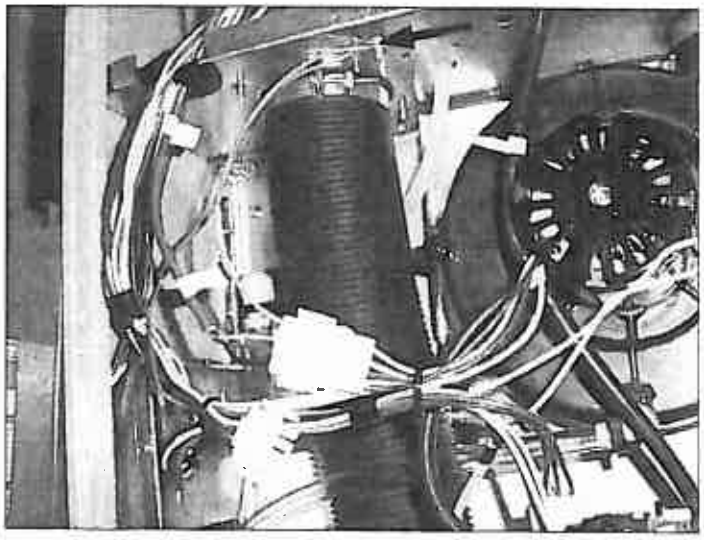


FIGURE 4 DOWNFLOW

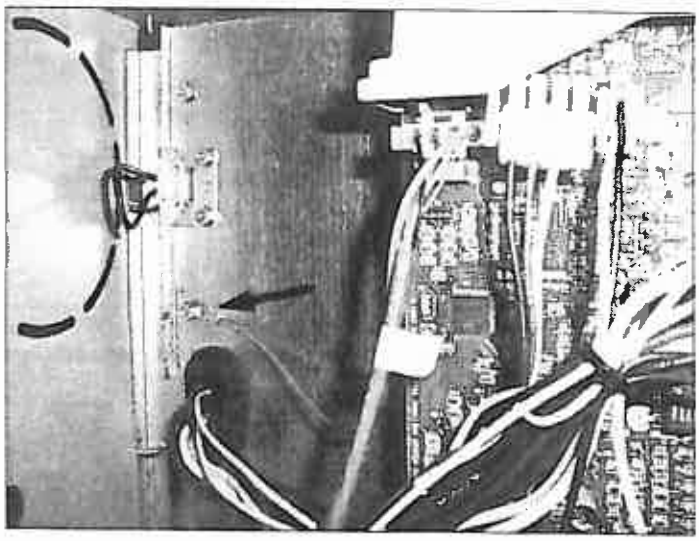


FIGURE 5 DOWNFLOW

7. Locate the end of the shielded cable harness labeled "CONTROL END" and connect the 4 pin connector to the control. Secure the Green ground lead found on the 4 pin connector to the sheet metal blower panel found behind the control mounting platform using one of the existing mounting screws. See Figure 5.

NOTE: Proper grounding of the shielded harness is critical in providing for reduction of electrical noise interference. Confirm that the Green ground leads are adequately secured to the sheet metal.

EMI Filter Install Procedure

1. Unscrew screw holding junction box cover onto Junction Box.
2. Remove wire tie pin from junction box cover.
3. Remove Junction Box Cover from furnace.
4. Using appropriate guide from Installer's Guide, drill 2 holes with provided drill bit. See Figure 6.
5. Remove bottom left knockout from junction box cover (if knockout is in use – use alternate knockout).

⚠ CAUTION

The integrated furnace control is polarity sensitive. The hot leg of the 115 VAC power must be connected to the BLACK field lead.

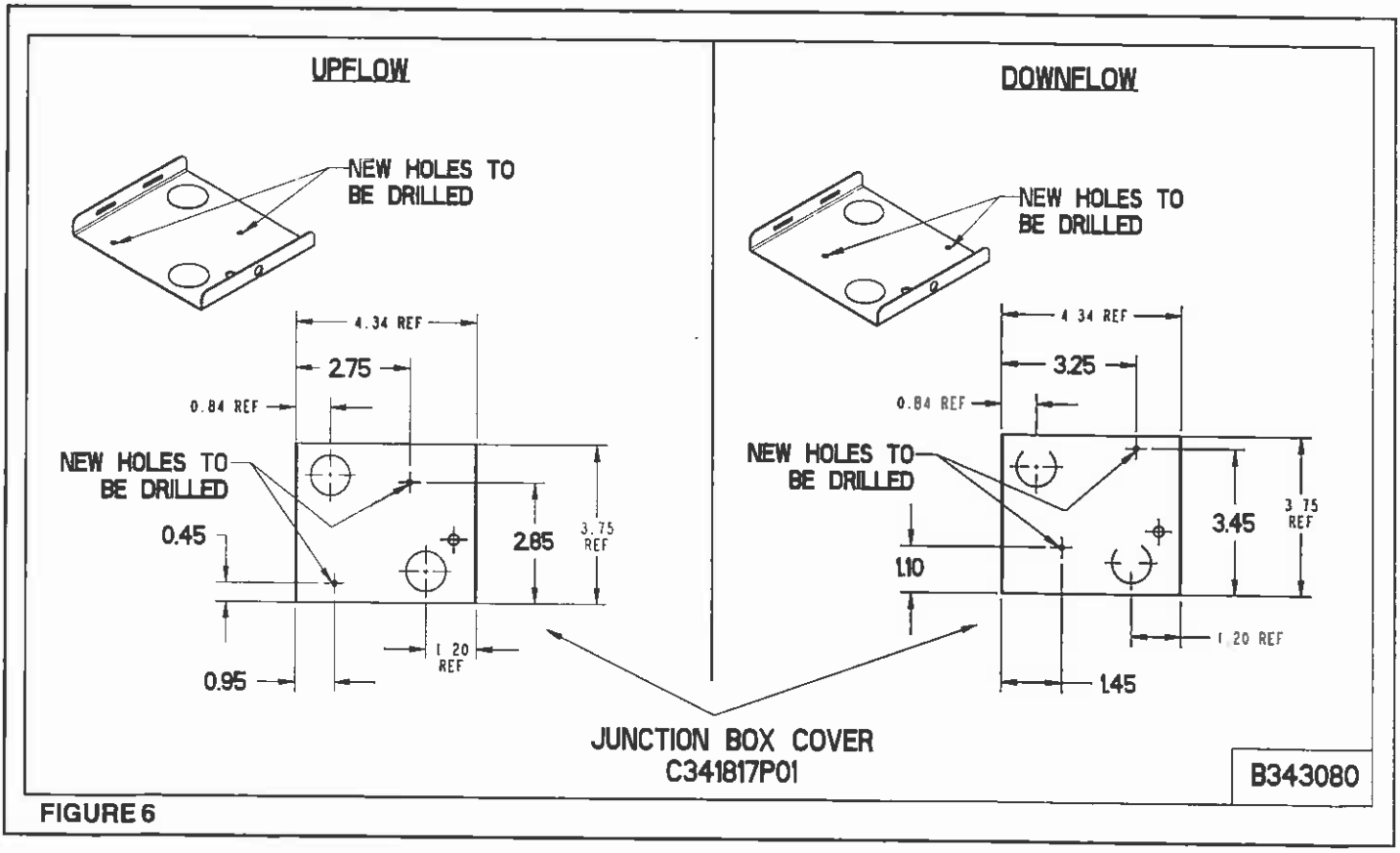


FIGURE 6

6. Attach the EMI Filter with provided screws to the modified junction box cover. See Figure 7.

7. Set Junction Box cover with EMI filter aside.

8. Pull out the two factory installed stripped power leads out of the junction box and out of the bushing in the junction box.

9. Attach provided terminals to the power leads pulled out of junction box in step #8.

10. Attach terminated leads from previous step to Load side of Filter. See Figure 8 and 9 depending on orientation.

11. Attach provided 3 wires to Line side of Filter as shown in provided wiring diagram. See Figure 10.

NOTE: Attach the Wiring Diagram #A343030P01 label into the furnace.

12. Route the free ends of the 3 wires installed in previous step through stress relief bushing provided.

13. Install bushing with wires into knockout cleared in step #5 routing all 3 wires through junction box to the outside of the furnace.

14. Connect the two ground wires to each other now on the outside of the unit.

15. The black and white wires from step # 12 are now the new power leads.

16. Attach junction box cover back onto junction box with screw provided.

⚠ WARNING

Prevent all wires from touching any hot surfaces. Failure to follow this warning could result in dangerous operation, serious injury, death or property damage.

VERIFICATION OF PROPER OPERATION

1. Place the thermostat in the heating mode.

2. Initiate a call for heat by raising the thermostat setting 5 degrees above the room temperature.

3. Observe the furnace: If properly wired, the following start-up sequence should be observed:

   a. The Red LED on the IFC should start a flash sequence.

   b. The draft inducer should energize, and then the ignitor should start to glow.

   c. After the ignitor heat up time has expired, the gas valve should be energized. Listen for the "click", the gas will then ignite.

   d. After 45 seconds, the main blower will turn on.

When proper operation has been verified, set the thermostat back to the desired comfort set point.

4. Sign and attach the mnemonic conversion label (item #12) to the front of the blower door.

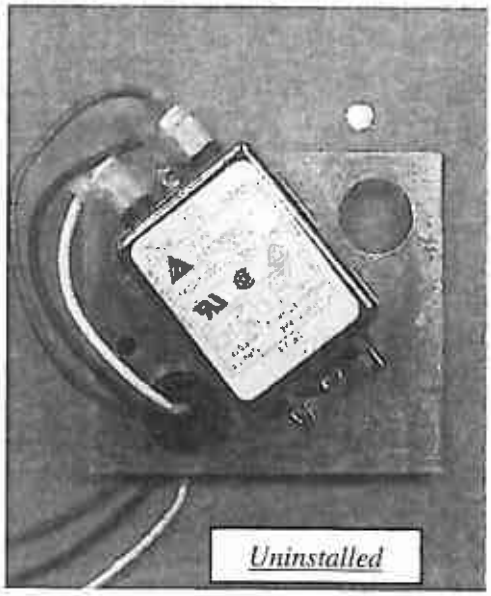


FIGURE 7

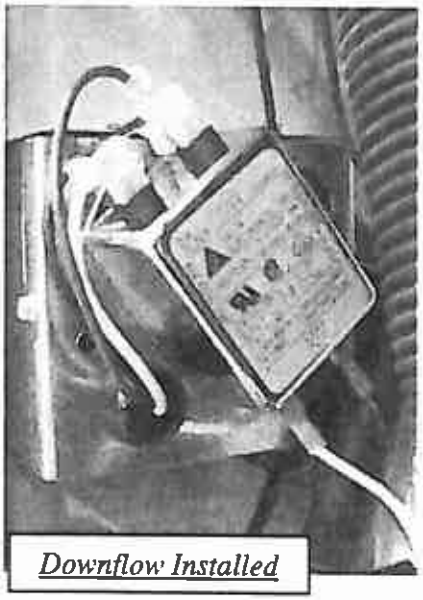


FIGURE 8

FIGURE 9

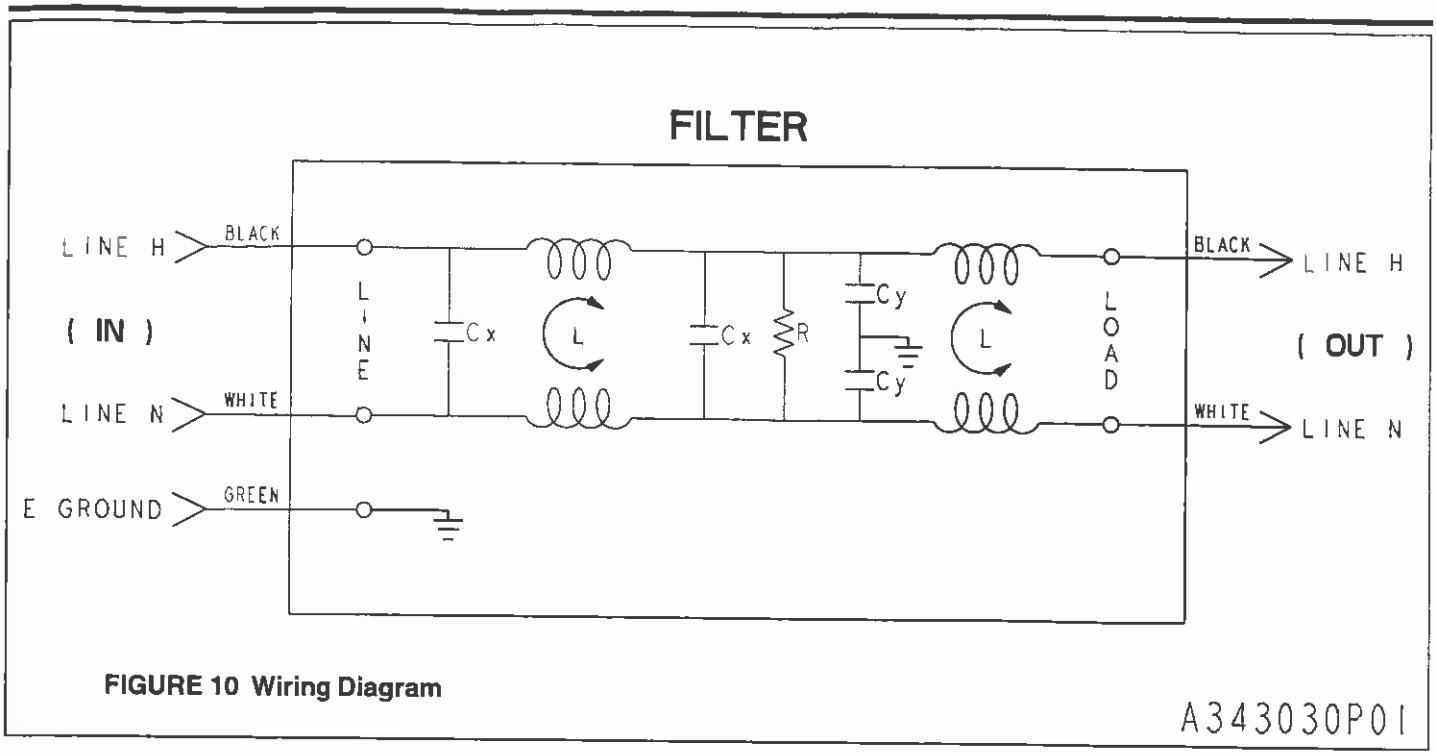
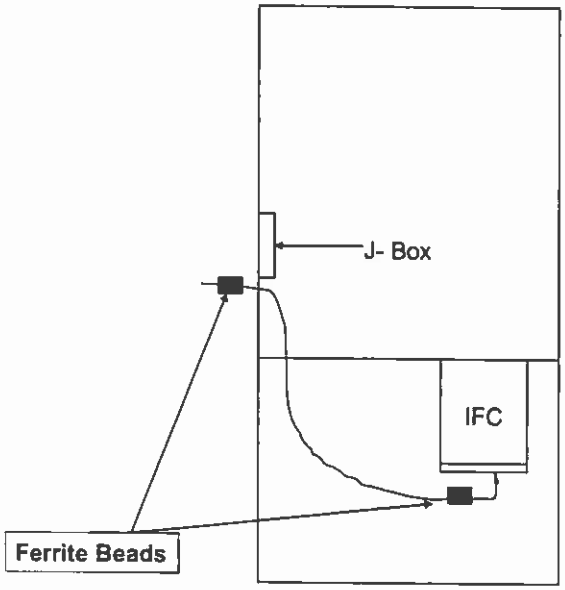


FIGURE 10 Wiring Diagram

A343030P01

Ferrite Bead Installation Procedure



Place Ferrite Beads on Tstat wire at positions shown

FIGURE 11

• Install one ferrite bead on thermostat wire just before the circuit board and the other on the thermostat wire just outside of the cabinet.

NOTES

American Standard, Inc.
6200 Troup Highway
Tyler, TX 75707
www.americanstandard.com

For more information contact your local dealer (distributor)

P.I. 04/07

Trane KIT 14668-Variable Speed Inducer Cable Modifications

1. Remove ground pin from pin 4 of the controller side of the cable. Add 1 clamp on ferrite bead to the ground wire. Cover the exposed pin with shrink tubing. See Fig 1, 2, and 7.

2. Add 2 doughnut ferrite beads as shown in the picture with 1 turn wound in each bead. See Fig 8.

3. Connect the shield to pin 4 of the inducer side of the cable and add 5 ½ inches of wire with a spade lug. See Fig 1, 2.

4. Put a hole in the furnace shelf with a grommet so the cable can be rerouted through it. See Fig 10 and Fig 5.

5. Add clamp on ferrites as shown in the pictures. See Fig 5, 9.

The ferrites I use are 31 mix

Mouser part number for the clamp on beads is 623-0431164281
Fair-Rite part number is 0431164281

Mouser part number for the donut beads is 623-2631102002
Fair-Rite part number is 2631102002

Notes:

Remove the original unshielded inducer cable from the furnace.

The two clamp-on ferrites furnished by Trane are 31 mix.

Rerouted shielded inducer cable should be away from the other wires in the furnace. I spot-tied the original cabling to make it easier to control how the wires lie. Try not to have wiring run in parallel with the inducer cable. If wires need to cross the inducer cable make sure it crosses at a right angle.

I put 2 doughnut ferrites on the inducer motor when I had the connector off. See Fig 9.

I added clamp-on ferrites as needed one at a time to the inducer cable checking for interference. See Fig 5, 9.

I put 2 doughnut ferrites on the thermostat wire with one turn wrapped on each, at the terminal strip. See Fig 4.

I put one clamp-on ferrite on the air-conditioner control line, at the terminal strip.
The terminal strip was added for ease of testing, and as a termination point for the added internal shielded control cable. Make sure you ground the shield at the terminal strip as the picture doesn't show it grounded. See Fig 4.

I put one doughnut ferrite on the shielded control cable at the controller board. See picture. See Fig 3.

Ground the gas line as it leaves the furnace. See picture. See Fig 6.

Add a dedicated ac power cable from the furnace to the circuit breaker panel.

All testing for radiated interference is done with a battery operated short wave radio tuned to one of the carrier frequency on 18.xxx MHz or where ever the strongest interference is present. Make sure you check the natural gas line, and high and low pressure lines to the air-conditioner unit.

Make sure all grounds are connected to the furnace **frame** with a good electrical connection.

I know adding a bunch of ferrites to the shielded inducer cable looks like over-kill.
Probably a high quality 3 phase common mode filter would work better, but this would void the furnace warranty unless Trane did the design and included it with the kit.

End W8WRP

From: Jim Horvat [mailto:w8wrp@windstream.net]
Sent: December 26, 2008 1:22 PM
To: 'Ed Sieb'
Subject: RE: XV-95 furnace

Ed

I had my furnace installed this time last year. When I checked for any noise from the furnace I found white noise S-9 on 20 meters and on 17 and 15 meters S-9 with a carrier every 10 to15 khz. which changed freq as the blower changed speed. I contacted the installer and asked if any-one else had this problem they said they would check and see.

Trane has made a attempt to fix the problem with there (KIT14668 variable speed inducer) I had the installer get the kit and put it in the furnace at no cost to me. Don't let them try and make you pay for it. I found the kit made only a slight improvement and the installer had no idea how to trouble shoot a RF radiation problem. So I said I would fix the problem if they would give me in writing the ok to go into the furnace with out voiding the warranty.

I used my battery operated AM radio tuned to one of the carriers on 17 meters and checked all the wires coming and going to the furnace. This is what I found.

Thermostat wires, control wires out side at the AC unit, 115 volt wires feeding the furnace, the gas line out side at the gas meter were radiating very strong rf energy.

The draft inducer motor is the problem or I should say the cable. This is the motor that comes on before the furnace igniter starts and runs as long as a flame is on. The circulation blower is very quiet and I couldn't hear any noise from it.

The power from the controller board to the draft inducer motor is 3 phase square wave. This is the problem it radiates into everything.

This is what I found that would reduce the radiated noise.

Dedicated AC power line from the circuit barker box to the furnace.

Ground the gas line ware it comes into the furnace.

Drill a hole next to the draft inducer motor and rough the modified shielded cable away from the mane furnace harness wiring.

Installed a shielded control cable from the controller board to the out side of the furnace to ter-minal strips.

Ed the attachments I have sent you should help. I am drawing a schematic of the inducer motor cable modifications I have made and will send it to you as soon as I get it done. I would start by contacting your furnace installer and have them get the kit from Trane and then start checking for radiated noise after the kit is installed. You may not have as bad a problem I had. I don't think you will have any luck with Trane but you need to go your installer.

I don't have any antennas for 160, 80, and 40 meters but do have a TH11 on a 70 foot motor-ized tower that I used for testing. I would lower the tower as far as it will go and point the front of the antenna in the direction of the furnace (worst case). I can't hear any signs or the furnace running now I use head phones and work a lot of DX.

More to Come

Jim W8WRP