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## POWER AND GROUND INPUTS

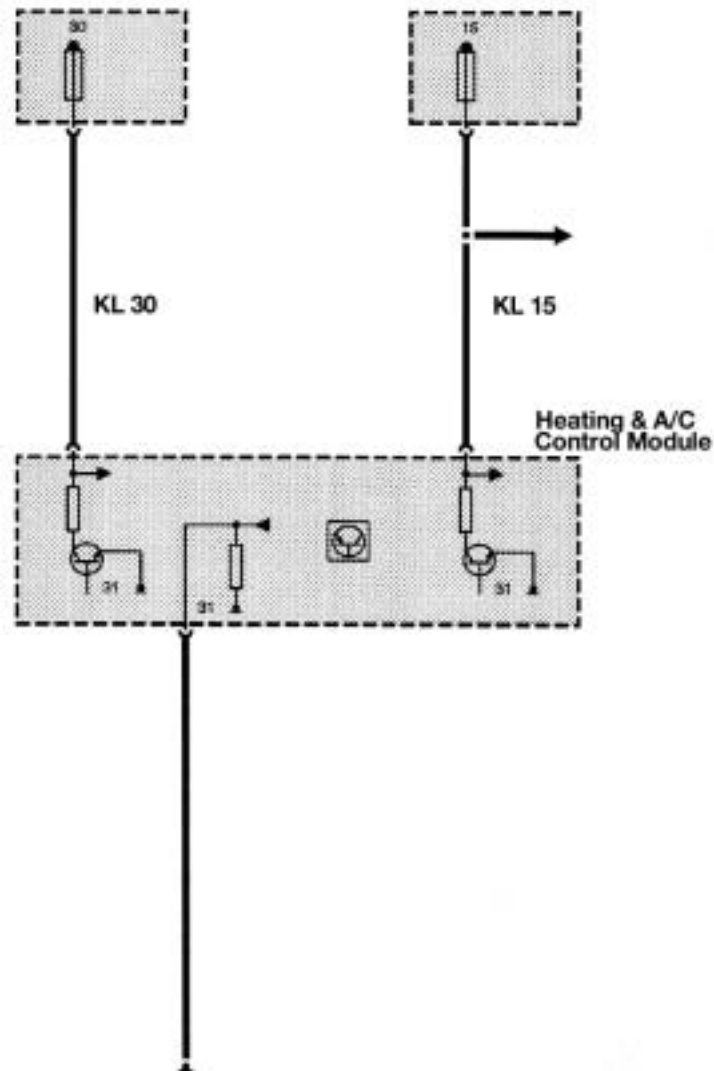
Constant battery power supply (KL30) is necessary for IHKA operation as well as memory (early systems).

For the “battery draw test” see the repair manual referring to 16 minute “sleep” mode.

Switched ignition power (KL15) is required for IHKA operation when the ignition is in the “run” position. This allows the system to operate after the vehicle has been started (or limited IHKA operation if the engine is not running).

Grounds KL 31

Ground paths are provided to the IHKA to complete the circuits of the inputs, processing, and output control functions.



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**NAME OF SIGNAL OR FUNCTION:** \_\_\_\_\_

**Vehicle:** \_\_\_\_\_ **M.Y.:** \_\_\_\_\_ **System:** \_\_\_\_\_ **DIS CD Version:** \_\_\_\_\_

**What type of output signal provides current to activate this circuit?**  Switched Power

Switched Ground  Pulse Width Modulated (PWM)  Linear Voltage  Linear Resistance  Digital

**Source:** \_\_\_\_\_

**How will the control system react if this signal becomes impaired or lost ?**

\_\_\_\_\_

**Substitute Value?**  Yes  No **If yes what is it?** \_\_\_\_\_

**Was a fault code(s) present with this defective signal/component?**  Yes  No

**If yes what is (are) the specific code(s)?** \_\_\_\_\_

**Does the DIS software provide a Status Display for this signal?**  Yes  No

**If "yes", what is it?** \_\_\_\_\_

**Is "component activation" possible with this signal/function?**  Yes  No

**If yes what does it do?** \_\_\_\_\_

**Does this help you with diagnosis?**  Yes  No **Why?** \_\_\_\_\_

\_\_\_\_\_

**Pin Numbers: What is the control module pin number for the signal?** \_\_\_\_\_

**Is there an associated ground wire?**  Yes  No **If "yes", pin number?** \_\_\_\_\_

**Are there any other signals/systems sharing the wire to consider?**  Yes  No

**If "yes" are there faults present in that system as well?**  Yes  No

**What is (are) the most suitable measurement(s) for this signal/component?**

Voltage  Resistance  Capacitance  Inductance  Temperature  Current  Pressure  Scope

**Signal Range?:** \_\_\_\_\_ **Nominal Value?:** \_\_\_\_\_

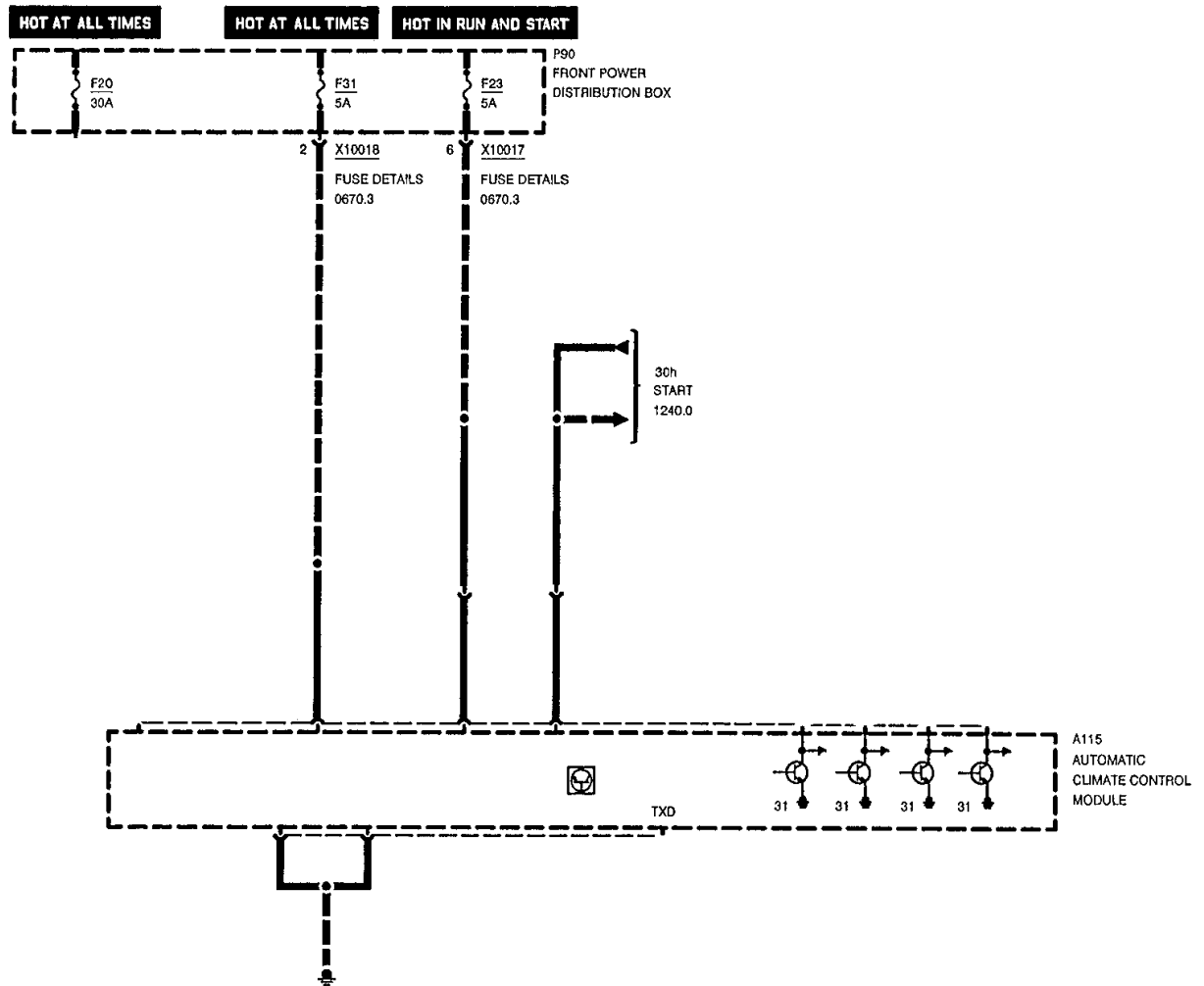
**Notes:** \_\_\_\_\_

\_\_\_\_\_

# STARTING INPUT

The starting (cranking KL50) input is monitored by the IHKA to “unload” consumers during engine cranking. This is a momentary signal that will cause the IHKA to deactivate heavy power consumers.

This signal has a dedicated circuit on E31/36 models, and is transmitted via BUS communication on all other models.



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**NAME OF SIGNAL OR FUNCTION:** \_\_\_\_\_

**Vehicle:** \_\_\_\_\_ **M.Y.:** \_\_\_\_\_ **System:** \_\_\_\_\_ **DIS CD Version:** \_\_\_\_\_

**What type of output signal provides current to activate this circuit?**  Switched Power

Switched Ground  Pulse Width Modulated (PWM)  Linear Voltage  Linear Resistance  Digital

**Source:** \_\_\_\_\_

**How will the control system react if this signal becomes impaired or lost ?**

\_\_\_\_\_

**Substitute Value?**  Yes  No **If yes what is it?** \_\_\_\_\_

**Was a fault code(s) present with this defective signal/component?**  Yes  No

**If yes what is (are) the specific code(s)?** \_\_\_\_\_

**Does the DIS software provide a Status Display for this signal?**  Yes  No

**If "yes", what is it?** \_\_\_\_\_

**Is "component activation" possible with this signal/function?**  Yes  No

**If yes what does it do?** \_\_\_\_\_

**Does this help you with diagnosis?**  Yes  No **Why?** \_\_\_\_\_

\_\_\_\_\_

**Pin Numbers: What is the control module pin number for the signal?** \_\_\_\_\_

**Is there an associated ground wire?**  Yes  No **If "yes", pin number?** \_\_\_\_\_

**Are there any other signals/systems sharing the wire to consider?**  Yes  No

**If "yes" are there faults present in that system as well?**  Yes  No

**What is (are) the most suitable measurement(s) for this signal/component?**

Voltage  Resistance  Capacitance  Inductance  Temperature  Current  Pressure  Scope

**Signal Range?:** \_\_\_\_\_ **Nominal Value?:** \_\_\_\_\_

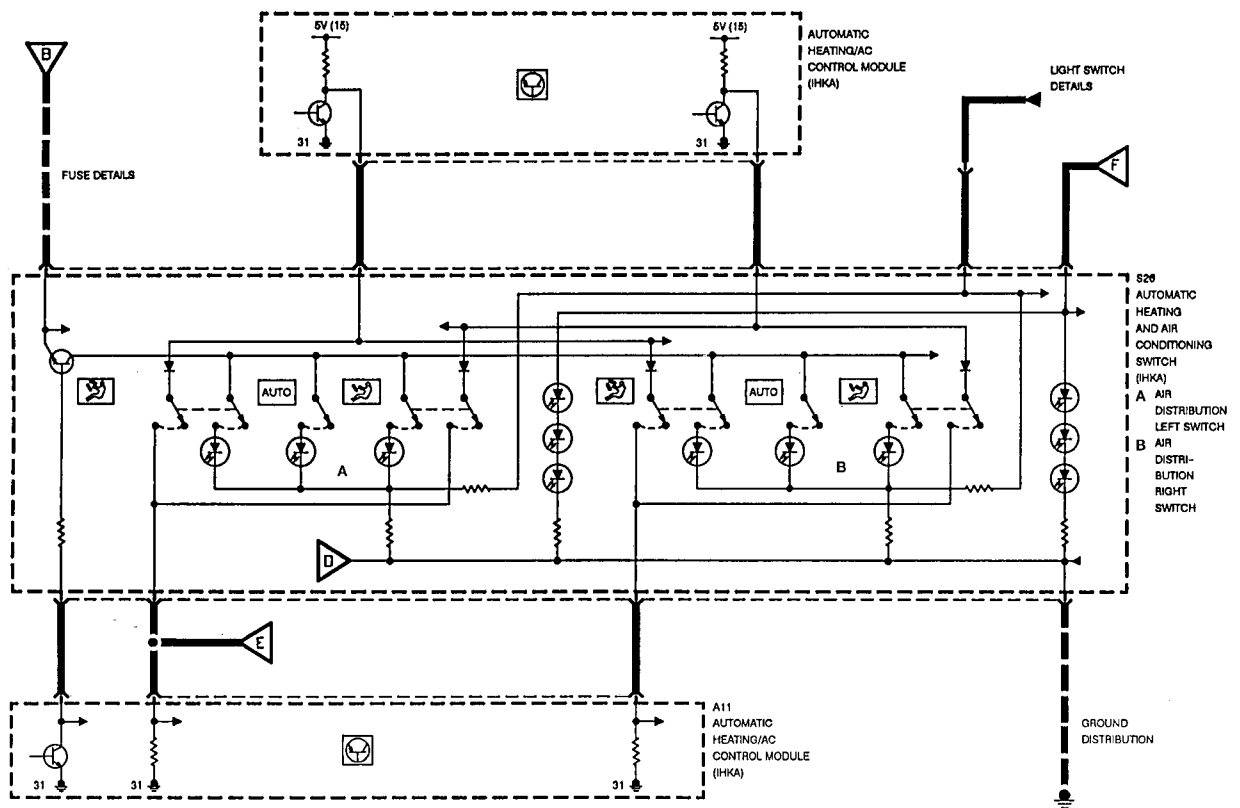
**Notes:** \_\_\_\_\_

\_\_\_\_\_

# DISTRIBUTION/ AIR DELIVERY SELECTION

Distribution/air delivery selections are made at the control panel. On E31 models, the requested selection is monitored by the control module which is remotely mounted. On all other models, the requested input selection is internally monitored because the control panel and control module are a combined unit.

The E31 control panel is provided as an example. The IHKA control module provides the power supply for the control panel, then monitors the return voltage to determine the distribution/air delivery selection. Notice that the "AUTO" selection only illuminates the LED. The input is not monitored, therefore if no other selection is taken the system is in the auto program.



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**NAME OF SIGNAL OR FUNCTION:** \_\_\_\_\_

**Vehicle:** \_\_\_\_\_ **M.Y.:** \_\_\_\_\_ **System:** \_\_\_\_\_ **DIS CD Version:** \_\_\_\_\_

**What type of output signal provides current to activate this circuit?**  Switched Power

Switched Ground  Pulse Width Modulated (PWM)  Linear Voltage  Linear Resistance  Digital

**Source:** \_\_\_\_\_

**How will the control system react if this signal becomes impaired or lost ?**

**Substitute Value?**  Yes  No **If yes what is it?** \_\_\_\_\_

**Was a fault code(s) present with this defective signal/component?**  Yes  No

**If yes what is (are) the specific code(s)?** \_\_\_\_\_

**Does the DIS software provide a Status Display for this signal?**  Yes  No

**If "yes", what is it?** \_\_\_\_\_

**Is "component activation" possible with this signal/function?**  Yes  No

**If yes what does it do?** \_\_\_\_\_

**Does this help you with diagnosis?**  Yes  No **Why?** \_\_\_\_\_

**Pin Numbers: What is the control module pin number for the signal?** \_\_\_\_\_

**Is there an associated ground wire?**  Yes  No **If "yes", pin number?** \_\_\_\_\_

**Are there any other signals/systems sharing the wire to consider?**  Yes  No

**If "yes" are there faults present in that system as well?**  Yes  No

**What is (are) the most suitable measurement(s) for this signal/component?**

Voltage  Resistance  Capacitance  Inductance  Temperature  Current  Pressure  Scope

**Signal Range?:** \_\_\_\_\_ **Nominal Value?:** \_\_\_\_\_

**Notes:** \_\_\_\_\_

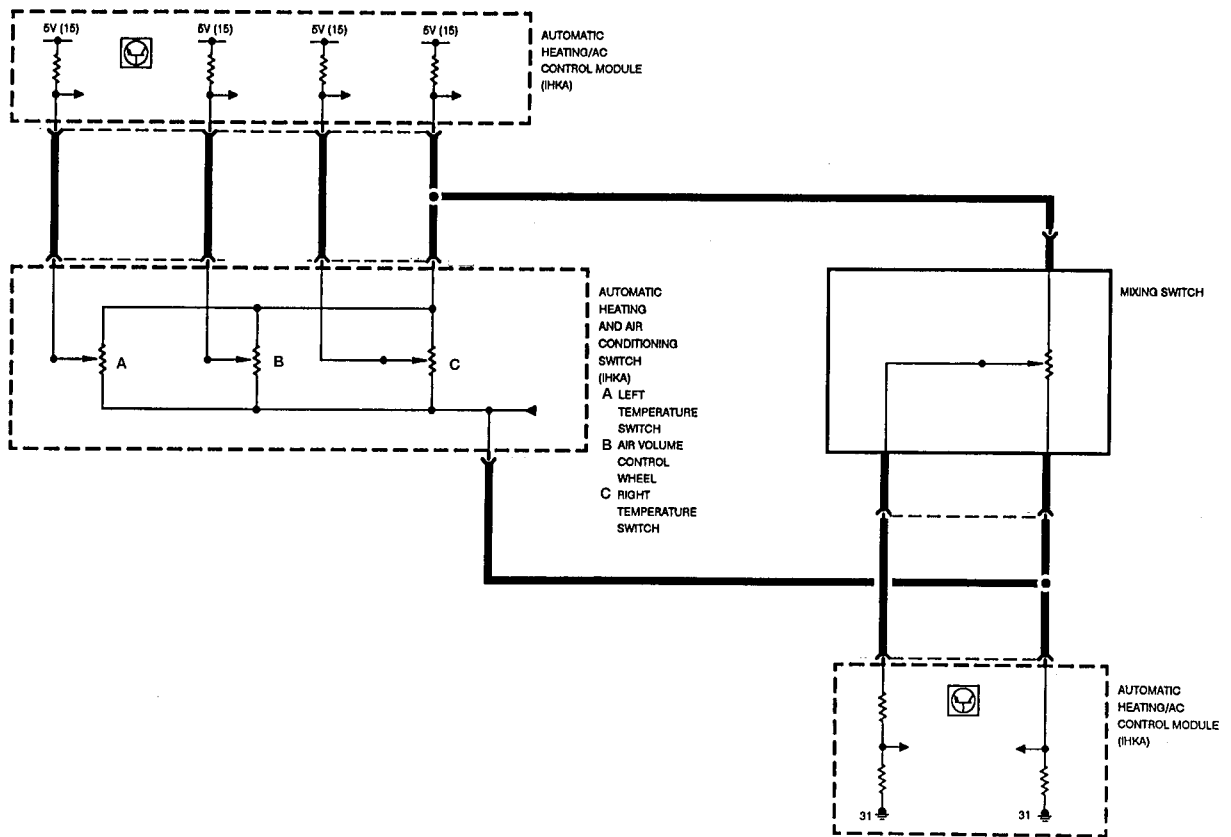
\_\_\_\_\_

\_\_\_\_\_

# TEMPERATURE SELECTION

Temperature selections are made via thumbwheels (early systems), and rocker switches (later systems). On E31 models, the requested temperature selection is monitored by the control module which is remotely mounted. On all other models, the requested input selection for temperature is internally monitored because the control panel and control module are a combined unit.

The E31 control panel is provided as an example. The IHKA control module provides the power and ground supply for the control panel potentiometers, then monitors the return voltage from the potentiometers to determine the temperature selection.





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**NAME OF SIGNAL OR FUNCTION:** \_\_\_\_\_

**Vehicle:** \_\_\_\_\_ **M.Y.:** \_\_\_\_\_ **System:** \_\_\_\_\_ **DIS CD Version:** \_\_\_\_\_

**What type of output signal provides current to activate this circuit?**  Switched Power

Switched Ground  Pulse Width Modulated (PWM)  Linear Voltage  Linear Resistance  Digital

**Source:** \_\_\_\_\_

**How will the control system react if this signal becomes impaired or lost ?**

**Substitute Value?**  Yes  No **If yes what is it?** \_\_\_\_\_

**Was a fault code(s) present with this defective signal/component?**  Yes  No

**If yes what is (are) the specific code(s)?** \_\_\_\_\_

**Does the DIS software provide a Status Display for this signal?**  Yes  No

**If "yes", what is it?** \_\_\_\_\_

**Is "component activation" possible with this signal/function?**  Yes  No

**If yes what does it do?** \_\_\_\_\_

**Does this help you with diagnosis?**  Yes  No **Why?** \_\_\_\_\_

**Pin Numbers: What is the control module pin number for the signal?** \_\_\_\_\_

**Is there an associated ground wire?**  Yes  No **If "yes", pin number?** \_\_\_\_\_

**Are there any other signals/systems sharing the wire to consider?**  Yes  No

**If "yes" are there faults present in that system as well?**  Yes  No

**What is (are) the most suitable measurement(s) for this signal/component?**

Voltage  Resistance  Capacitance  Inductance  Temperature  Current  Pressure  Scope

**Signal Range?:** \_\_\_\_\_ **Nominal Value?:** \_\_\_\_\_

**Notes:** \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

# BLOWER CONTROL

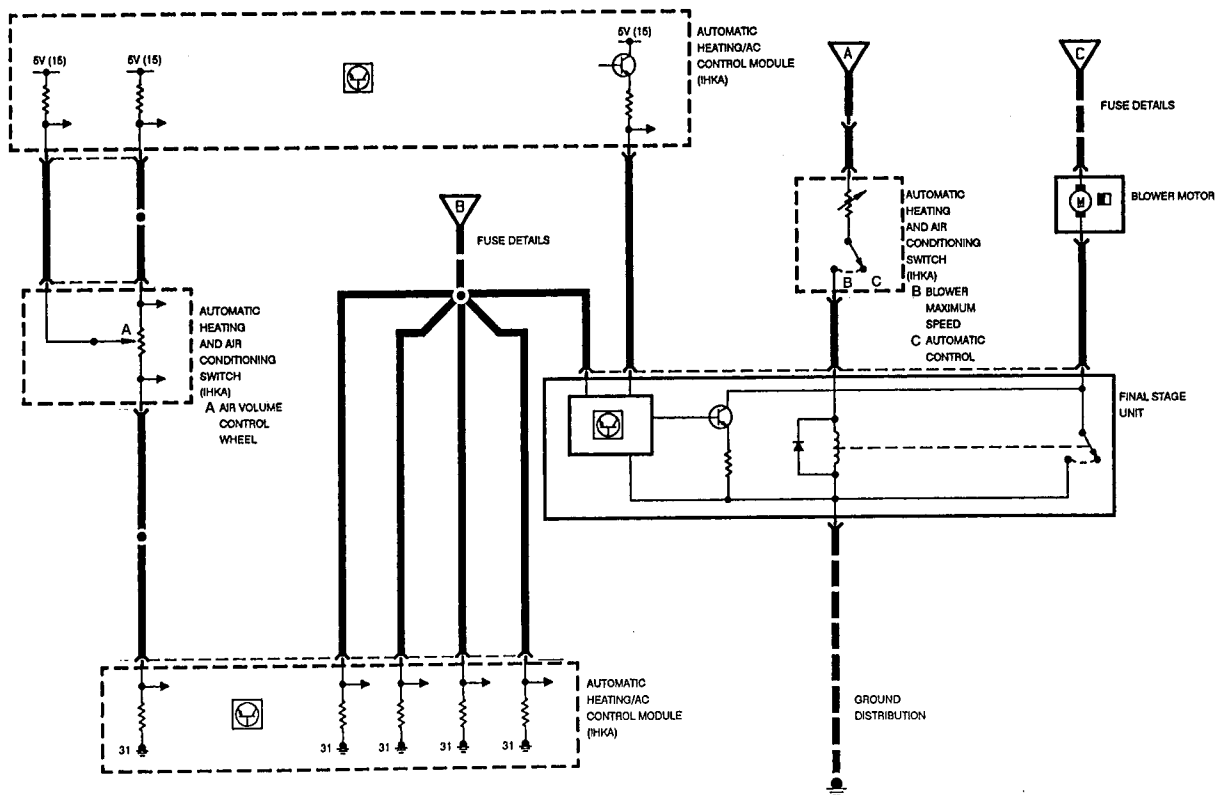
Blower control operation is in operation with the ignition switched on (KL15). The blower speed is controlled by regulating (varying) the ground circuit through the use of transistors (final stage unit).

The IHKA control module determines the appropriate blower speed using these primary inputs:

- Blower control thumbwheel/rocker switch inputs
- The “Y-factor”

The On E31 models, the requested blower speed selection is monitored by the control module which is remotely mounted. On all other models, the requested input selection for blower speed is internally monitored because the control panel and control module are a combined unit.

The E31 control panel is provided as an example. The IHKA control module provides the power and ground supply for the potentiometer, then monitors the return voltage to determine the blower speed selection.



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**NAME OF SIGNAL OR FUNCTION:** \_\_\_\_\_

**Vehicle:** \_\_\_\_\_ **M.Y.:** \_\_\_\_\_ **System:** \_\_\_\_\_ **DIS CD Version:** \_\_\_\_\_

**What type of output signal provides current to activate this circuit?**  Switched Power

Switched Ground  Pulse Width Modulated (PWM)  Linear Voltage  Linear Resistance  Digital

**Source:** \_\_\_\_\_

**How will the control system react if this signal becomes impaired or lost ?**

**Substitute Value?**  Yes  No **If yes what is it?** \_\_\_\_\_

**Was a fault code(s) present with this defective signal/component?**  Yes  No

**If yes what is (are) the specific code(s)?** \_\_\_\_\_

**Does the DIS software provide a Status Display for this signal?**  Yes  No

**If "yes", what is it?** \_\_\_\_\_

**Is "component activation" possible with this signal/function?**  Yes  No

**If yes what does it do?** \_\_\_\_\_

**Does this help you with diagnosis?**  Yes  No **Why?** \_\_\_\_\_

**Pin Numbers: What is the control module pin number for the signal?** \_\_\_\_\_

**Is there an associated ground wire?**  Yes  No **If "yes", pin number?** \_\_\_\_\_

**Are there any other signals/systems sharing the wire to consider?**  Yes  No

**If "yes" are there faults present in that system as well?**  Yes  No

**What is (are) the most suitable measurement(s) for this signal/component?**

Voltage  Resistance  Capacitance  Inductance  Temperature  Current  Pressure  Scope

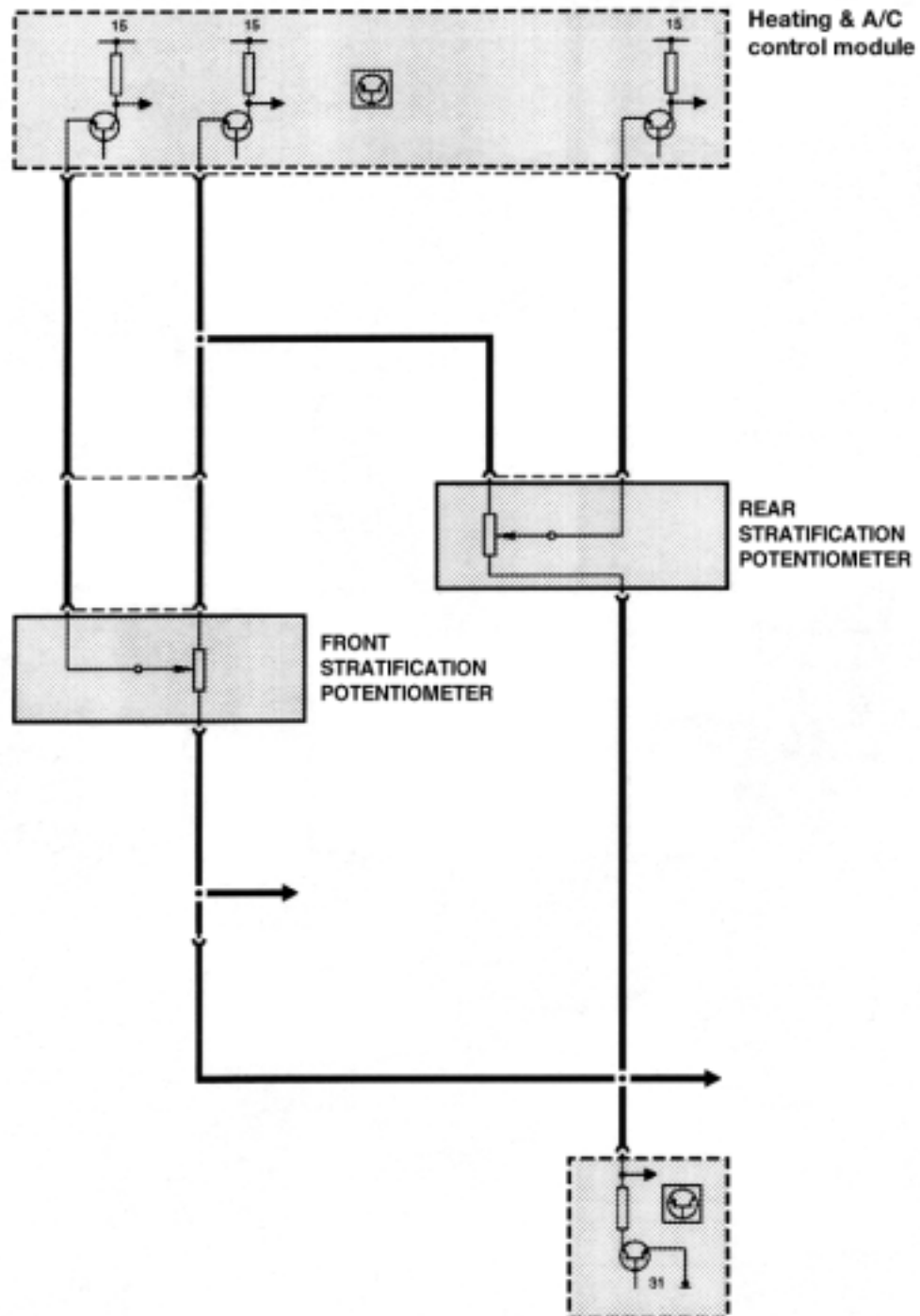
**Signal Range?:** \_\_\_\_\_ **Nominal Value?:** \_\_\_\_\_

**Notes:** \_\_\_\_\_

\_\_\_\_\_

## STRATIFIED AIR

The request for air temperature stratification is made by a thumbwheel located in the front center face vent outlet and the rear passenger console outlet (if equipped). The thumbwheel potentiometer receives power and ground from the IHKA control module which also monitors the variable return voltage. In addition, the rear console outlet contains a micro-switch (on/off request) that signals to the IHKA control module to allow air flow to the rear console.



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**NAME OF SIGNAL OR FUNCTION:** \_\_\_\_\_

**Vehicle:** \_\_\_\_\_ **M.Y.:** \_\_\_\_\_ **System:** \_\_\_\_\_ **DIS CD Version:** \_\_\_\_\_

**What type of output signal provides current to activate this circuit?**  Switched Power

Switched Ground  Pulse Width Modulated (PWM)  Linear Voltage  Linear Resistance  Digital

**Source:** \_\_\_\_\_

**How will the control system react if this signal becomes impaired or lost ?**

**Substitute Value?**  Yes  No **If yes what is it?** \_\_\_\_\_

**Was a fault code(s) present with this defective signal/component?**  Yes  No

**If yes what is (are) the specific code(s)?** \_\_\_\_\_

**Does the DIS software provide a Status Display for this signal?**  Yes  No

**If "yes", what is it?** \_\_\_\_\_

**Is "component activation" possible with this signal/function?**  Yes  No

**If yes what does it do?** \_\_\_\_\_

**Does this help you with diagnosis?**  Yes  No **Why?** \_\_\_\_\_

**Pin Numbers: What is the control module pin number for the signal?** \_\_\_\_\_

**Is there an associated ground wire?**  Yes  No **If "yes", pin number?** \_\_\_\_\_

**Are there any other signals/systems sharing the wire to consider?**  Yes  No

**If "yes" are there faults present in that system as well?**  Yes  No

**What is (are) the most suitable measurement(s) for this signal/component?**

Voltage  Resistance  Capacitance  Inductance  Temperature  Current  Pressure  Scope

**Signal Range?:** \_\_\_\_\_ **Nominal Value?:** \_\_\_\_\_

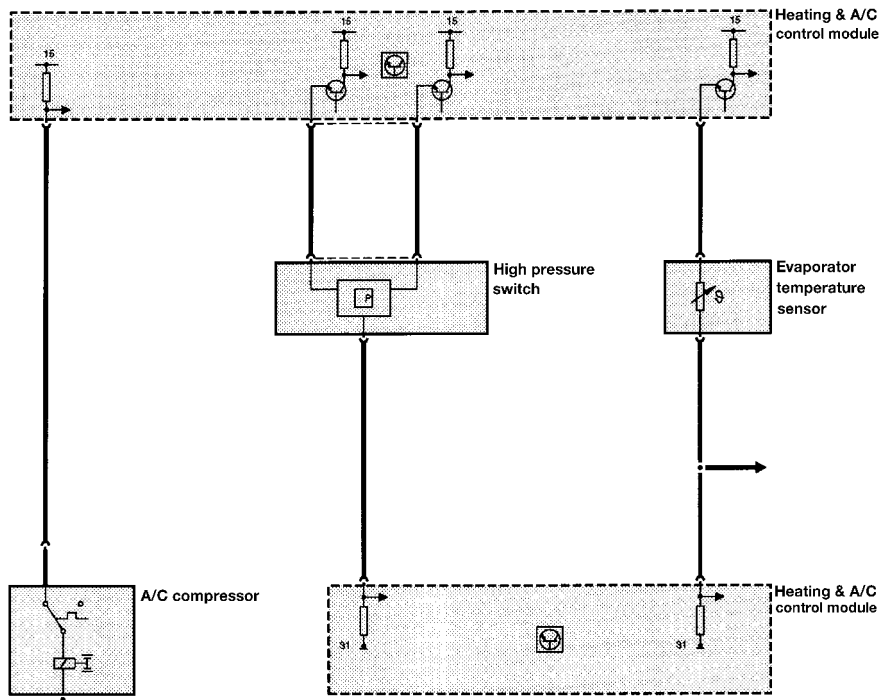
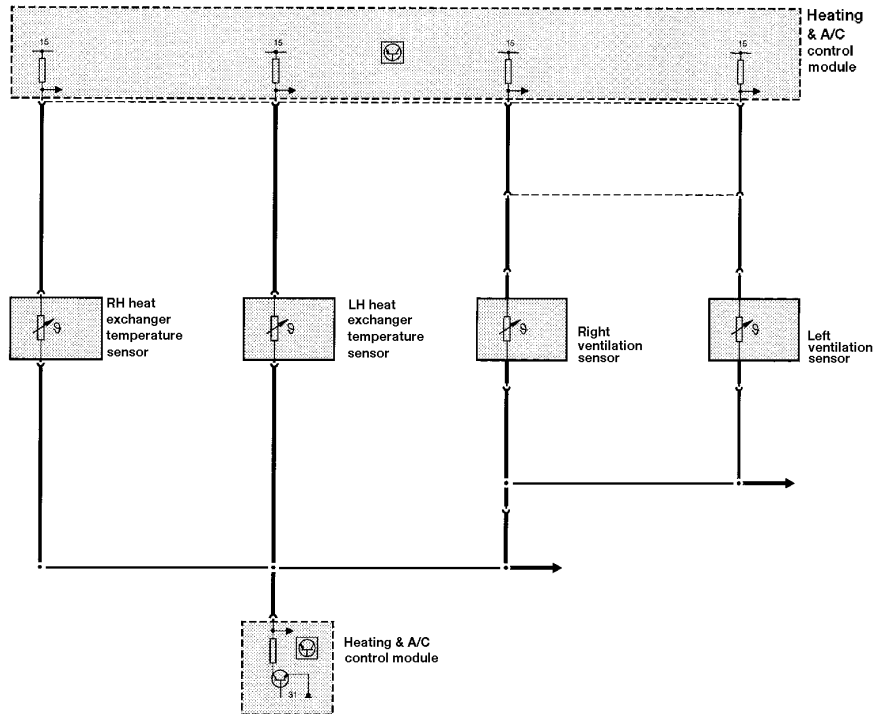
**Notes:** \_\_\_\_\_

\_\_\_\_\_

# TEMPERATURE SENSOR MONITORING

Several different temperature sensors provide inputs to the IHKA control module. As previously covered, they are the NTC type. The IHKA control module provides the power and ground paths. The module also monitors the circuit voltage variation to determine temperatures. This test applies to the following sensors:

- Interior (internal control module circuit for all models except E31)
- Ambient (dedicated for E31/36, all other models supplied from Instrument cluster via K-bus)
- Heater core
- Evaporator
- Face vent (E38 only)



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**NAME OF SIGNAL OR FUNCTION:** \_\_\_\_\_

**Vehicle:** \_\_\_\_\_ **M.Y.:** \_\_\_\_\_ **System:** \_\_\_\_\_ **DIS CD Version:** \_\_\_\_\_

**What type of output signal provides current to activate this circuit?**  Switched Power

Switched Ground  Pulse Width Modulated (PWM)  Linear Voltage  Linear Resistance  Digital

**Source:** \_\_\_\_\_

**How will the control system react if this signal becomes impaired or lost ?**

**Substitute Value?**  Yes  No **If yes what is it?** \_\_\_\_\_

**Was a fault code(s) present with this defective signal/component?**  Yes  No

**If yes what is (are) the specific code(s)?** \_\_\_\_\_

**Does the DIS software provide a Status Display for this signal?**  Yes  No

**If "yes", what is it?** \_\_\_\_\_

**Is "component activation" possible with this signal/function?**  Yes  No

**If yes what does it do?** \_\_\_\_\_

**Does this help you with diagnosis?**  Yes  No **Why?** \_\_\_\_\_

**Pin Numbers: What is the control module pin number for the signal?** \_\_\_\_\_

**Is there an associated ground wire?**  Yes  No **If "yes", pin number?** \_\_\_\_\_

**Are there any other signals/systems sharing the wire to consider?**  Yes  No

**If "yes" are there faults present in that system as well?**  Yes  No

**What is (are) the most suitable measurement(s) for this signal/component?**

Voltage  Resistance  Capacitance  Inductance  Temperature  Current  Pressure  Scope

**Signal Range?:** \_\_\_\_\_ **Nominal Value?:** \_\_\_\_\_

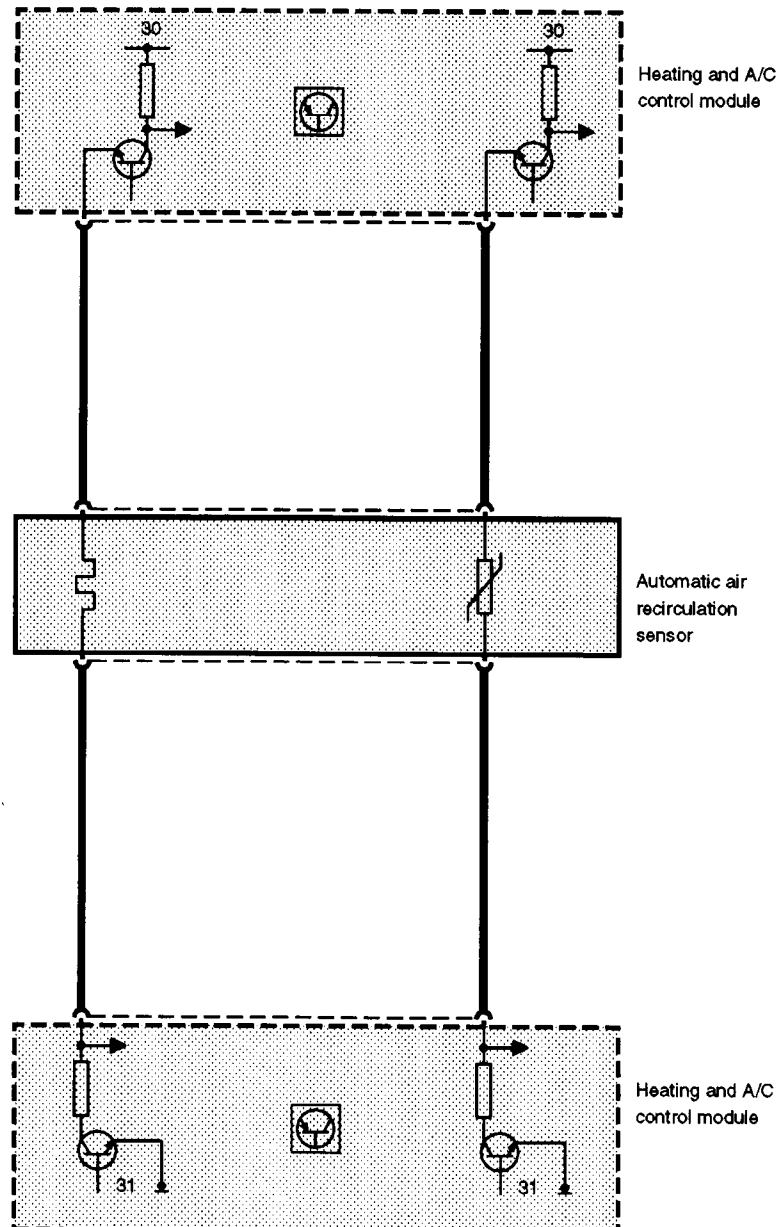
**Notes:** \_\_\_\_\_

\_\_\_\_\_

## AUTOMATIC RECIRCULATED AIR (AUC if equipped)

The IHKA control module uses data from the AUC sensor to determine whether recirculating air mode is necessary. The AUC sensor samples ambient air that has entered the engine compartment. The sensor contains a gas sensor, which measures the level of oxidizable gasses in the air. These include hydrocarbons, NO<sub>x</sub>, SO<sub>x</sub>, and CO.

The IHKA control module monitors the change in the voltage signal as these gasses influence the sensor. The second circuit shown is a heating circuit which enhances the sensor's reaction time. When starting the vehicle, fresh air is always supplied for 90 seconds due to the AUC sensor heat-up time.





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**NAME OF SIGNAL OR FUNCTION:** \_\_\_\_\_

**Vehicle:** \_\_\_\_\_ **M.Y.:** \_\_\_\_\_ **System:** \_\_\_\_\_ **DIS CD Version:** \_\_\_\_\_

**What type of output signal provides current to activate this circuit?**  Switched Power

Switched Ground  Pulse Width Modulated (PWM)  Linear Voltage  Linear Resistance  Digital

**Source:** \_\_\_\_\_

**How will the control system react if this signal becomes impaired or lost ?**

**Substitute Value?**  Yes  No **If yes what is it?** \_\_\_\_\_

**Was a fault code(s) present with this defective signal/component?**  Yes  No

**If yes what is (are) the specific code(s)?** \_\_\_\_\_

**Does the DIS software provide a Status Display for this signal?**  Yes  No

**If "yes", what is it?** \_\_\_\_\_

**Is "component activation" possible with this signal/function?**  Yes  No

**If yes what does it do?** \_\_\_\_\_

**Does this help you with diagnosis?**  Yes  No **Why?** \_\_\_\_\_

**Pin Numbers: What is the control module pin number for the signal?** \_\_\_\_\_

**Is there an associated ground wire?**  Yes  No **If "yes", pin number?** \_\_\_\_\_

**Are there any other signals/systems sharing the wire to consider?**  Yes  No

**If "yes" are there faults present in that system as well?**  Yes  No

**What is (are) the most suitable measurement(s) for this signal/component?**

Voltage  Resistance  Capacitance  Inductance  Temperature  Current  Pressure  Scope

**Signal Range?:** \_\_\_\_\_ **Nominal Value?:** \_\_\_\_\_

**Notes:** \_\_\_\_\_

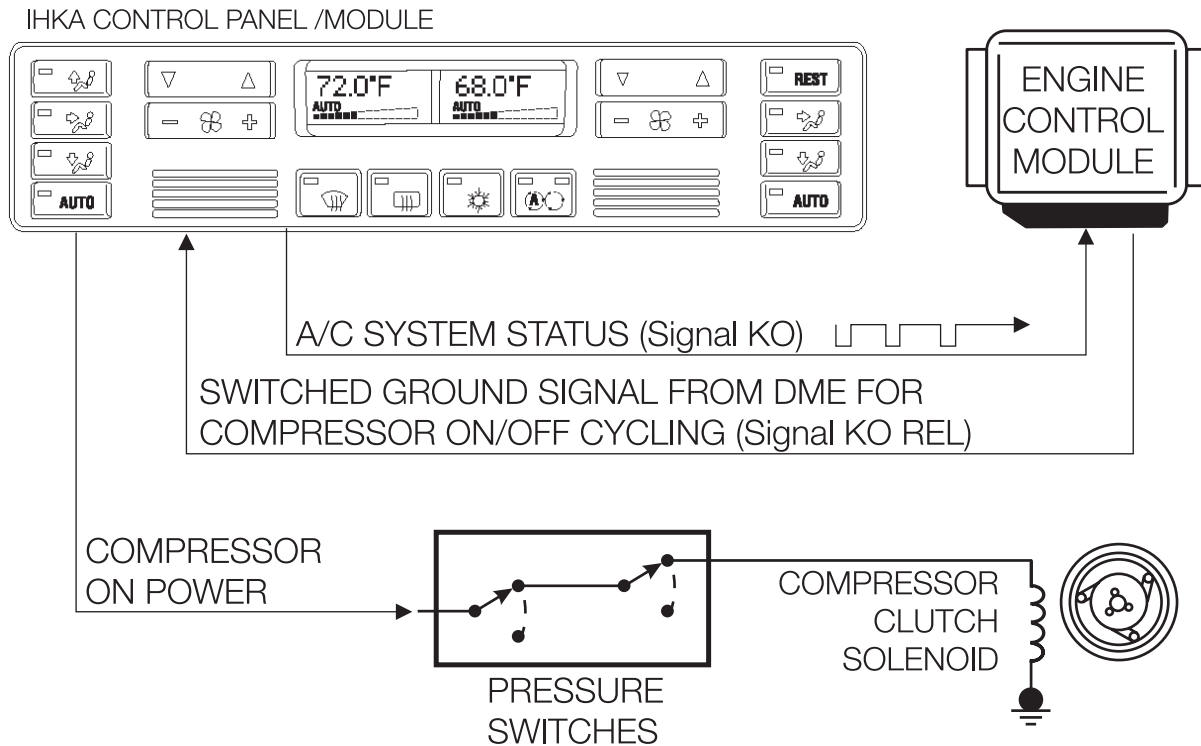
\_\_\_\_\_

## COMPRESSOR SHUT OFF SIGNAL (if applicable)

The IHKA module monitors the full load input from the ECM. If the ECM detects “full load” conditions, it signals (KOREL) the IHKA control module to disengage the A/C compressor. The conditions for full load are:

- Vehicle speed less than 10 mph, **and**
- Throttle is wide open **or**
- Engine coolant temperature is too high

The compressor is turned off for a **maximum** of 4 minutes (actual duration differs per system).



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**NAME OF SIGNAL OR FUNCTION:** \_\_\_\_\_

**Vehicle:** \_\_\_\_\_ **M.Y.:** \_\_\_\_\_ **System:** \_\_\_\_\_ **DIS CD Version:** \_\_\_\_\_

**What type of output signal provides current to activate this circuit?**  Switched Power

Switched Ground  Pulse Width Modulated (PWM)  Linear Voltage  Linear Resistance  Digital

**Source:** \_\_\_\_\_

**How will the control system react if this signal becomes impaired or lost ?**

**Substitute Value?**  Yes  No **If yes what is it?** \_\_\_\_\_

**Was a fault code(s) present with this defective signal/component?**  Yes  No

**If yes what is (are) the specific code(s)?** \_\_\_\_\_

**Does the DIS software provide a Status Display for this signal?**  Yes  No

**If "yes", what is it?** \_\_\_\_\_

**Is "component activation" possible with this signal/function?**  Yes  No

**If yes what does it do?** \_\_\_\_\_

**Does this help you with diagnosis?**  Yes  No **Why?** \_\_\_\_\_

**Pin Numbers: What is the control module pin number for the signal?** \_\_\_\_\_

**Is there an associated ground wire?**  Yes  No **If "yes", pin number?** \_\_\_\_\_

**Are there any other signals/systems sharing the wire to consider?**  Yes  No

**If "yes" are there faults present in that system as well?**  Yes  No

**What is (are) the most suitable measurement(s) for this signal/component?**

Voltage  Resistance  Capacitance  Inductance  Temperature  Current  Pressure  Scope

**Signal Range?:** \_\_\_\_\_ **Nominal Value?:** \_\_\_\_\_

**Notes:** \_\_\_\_\_

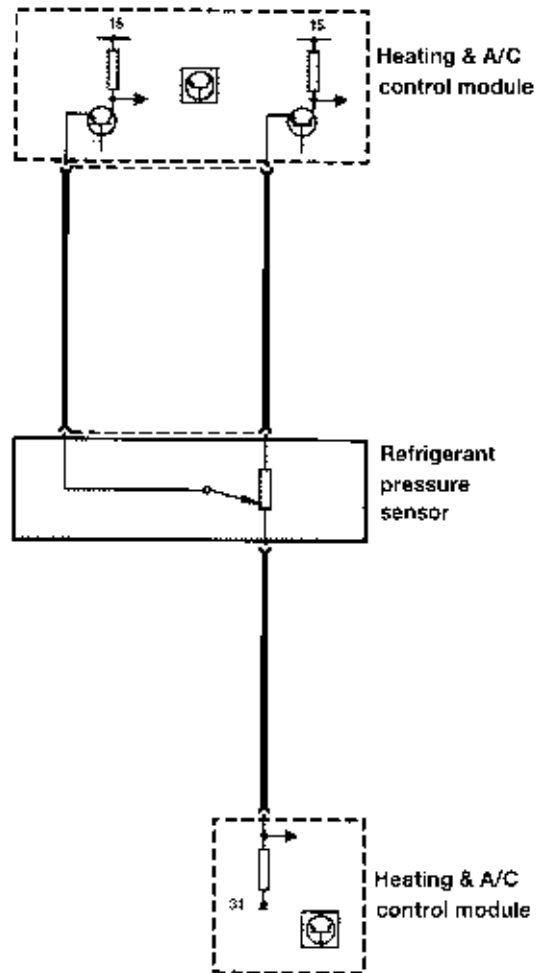
\_\_\_\_\_

## REFRIGERANT PRESSURE SENSOR (if applicable)

The IHKA control module supplies the power and ground paths, as well as monitoring the variable voltage signal from the refrigerant pressure sensor (located in the receiver/dryer). Based on the refrigerant pressure, the IHKA module “anticipates” the the start up torque of the A/C compressor. If the pressure is too low or high the compressor will be deactivated.

This input is also used to vary the auxiliary fan speed and transfers this information on to the ECM via the K-bus.

Pressure in bar	Fan stage
8	0
9	1
11	2
13	3
14	4
15	5
16	6
17	7
18	8
19	9
20	10
21	11
22	12
23	13
24	14
> 24	15



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**NAME OF SIGNAL OR FUNCTION:** \_\_\_\_\_

**Vehicle:** \_\_\_\_\_ **M.Y.:** \_\_\_\_\_ **System:** \_\_\_\_\_ **DIS CD Version:** \_\_\_\_\_

**What type of output signal provides current to activate this circuit?**  Switched Power

Switched Ground  Pulse Width Modulated (PWM)  Linear Voltage  Linear Resistance  Digital

**Source:** \_\_\_\_\_

**How will the control system react if this signal becomes impaired or lost ?**

**Substitute Value?**  Yes  No **If yes what is it?** \_\_\_\_\_

**Was a fault code(s) present with this defective signal/component?**  Yes  No

**If yes what is (are) the specific code(s)?** \_\_\_\_\_

**Does the DIS software provide a Status Display for this signal?**  Yes  No

**If "yes", what is it?** \_\_\_\_\_

**Is "component activation" possible with this signal/function?**  Yes  No

**If yes what does it do?** \_\_\_\_\_

**Does this help you with diagnosis?**  Yes  No **Why?** \_\_\_\_\_

**Pin Numbers: What is the control module pin number for the signal?** \_\_\_\_\_

**Is there an associated ground wire?**  Yes  No **If "yes", pin number?** \_\_\_\_\_

**Are there any other signals/systems sharing the wire to consider?**  Yes  No

**If "yes" are there faults present in that system as well?**  Yes  No

**What is (are) the most suitable measurement(s) for this signal/component?**

Voltage  Resistance  Capacitance  Inductance  Temperature  Current  Pressure  Scope

**Signal Range?:** \_\_\_\_\_ **Nominal Value?:** \_\_\_\_\_

**Notes:** \_\_\_\_\_