

REFRIGERANT CHARGE VERIFICATION

CEC-CF2R-MCH-25b-H (Revised 06/16)

CALIFORNIA ENERGY COMMISSION



CERTIFICATE OF INSTALLATION		CF2R-MCH-25b-H
Refrigerant Charge Verification		(Page 1 of 5)
Project Name:	Enforcement Agency:	Permit Number:
Dwelling Address:	City	Zip Code

A. System Information

Each system requiring refrigerant charge verification will be documented on a separate certificate.

01	System Identification or Name	
02	System Location or Area Served	
03	Condenser (or package unit) make or brand	
04	Condenser (or package unit) model number	
05	Nominal Cooling Capacity (tons) of Condenser	
06	Condenser (or package unit) serial number	
07	Refrigerant Type	
08	Other Refrigerant Type (if applicable)	
09	System Installation Type	
10	Charge Indicator Display (CID) Status (Note: Even systems with a CID must have refrigerant charge verified by installer)	
11	Is the system of a type that the minimum airflow can be verified using an approved measurement procedure (RA3.3 or RA3.2.2.7)?	
12	Is the system of a type that approved refrigerant charge verification procedures can be used to verify compliance with the refrigerant charge verification requirements when temperatures are $\geq 55^{\circ}\text{F}$ (RA3.2.2, or RA1)?	
13	Date of Refrigerant Charge Verification for this system	
14	Refrigerant charge verification method used.	
15	Person who performed the Refrigerant Charge Verification reported on this Certificate of Installation:	
16	HERS Verification Compliance Requirement Status	

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MCH-25b - Refrigerant Charge Verification - Subcooling Method**B. Metering Device Verification**

Subcooling Method can only be used on systems that have a variable metering device.

01	Refrigerant metering device	
02	Subcooling Method applicability status	

C. Instrument Calibration

Procedures for instrument calibration are given in Reference Residential Appendix RA3.2.2 and RA3.2.2.2

01	Date of Digital Refrigerant Gauge Calibration	
02	Date of Digital Thermocouple Calibration	
03	Digital Refrigerant Gauge Calibration Status	
04	Digital Thermocouple Calibration Status	

D. Measurement Access Hole (MAH) Verification

Procedures for installing MAH are specified in Reference Residential Appendix RA3.2.2.3

01	Method used to demonstrate compliance with the Measurement Access Hole (MAH) requirement	
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E. Minimum System Airflow Rate Verification

Procedures for verifying minimum system airflow are specified in Reference Residential Appendix RA3.2.2.7.

01	Minimum Required System Airflow Rate (cfm)	
02	System Airflow Rate Verification Status	



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F. Data Collection and Calculations

Procedures for determining Refrigerant Charge using the Standard Charge Verification Procedure are given in Reference Residential Appendix RA3.2.2.

01	Lowest return air dry bulb temperature that occurred during the refrigerant charge verification procedure (degreeF)	
02	Measured Condenser air entering dry-bulb temperature ($T_{\text{condenser, db}}$)	
03	Outdoor Temperature Qualification Status	
04	Measured Liquid Line Temperature (T_{liquid}) (degreeF)	
05	Measured Liquid Line Pressure (P_{liquid}) (psig)	
06	Condenser saturation temperature ($T_{\text{condensor, sat}}$) from digital gauge or P-T Table using Line F05 (degreeF)	
07	Measured Subcooling (Line F06 – Line F04) (degreeF)	
08	Target Subcooling from Manufacturer (degreeF)	
09	Compliance Statement:	

G. Metering Device Verification

Procedures for the verification of proper metering device operation are specified in RA3.2.2.6.2

01	Measured Suction line temperature (T_{suction}) (degreeF)	
02	Measured Suction line pressure (P_{suction}) (psig)	
03	Evaporator saturation temperature ($T_{\text{evaporator, sat}}$) from digital gauge or P-T Table using line G02 (degreeF)	
04	Measured Superheat (Line G01 – Line G03) (degreeF)	
05	Measured Superheat (Line G04) is between 4 and 25 deg F (inclusive)	
06	Measured Superheat (Line G04) is within manufacturer's specifications, if known.	
07	Compliance Statement:	



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MCH-25d - Refrigerant Charge Verification - Charge Indicator Display (CID)
H. Charge Indicator Display

Procedures for the Charge Indicator Display Verification are detailed in RA3.4.2

01	CID Manufacturer Name/Make	
02	CID Model Number	
03	The display module is mounted adjacent to the system thermostat	
04	The manufacturer has certified to the Energy Commission that the CID model meets the requirements of Reference Joint Appendix JA6 (Make and model found on CEC list of approved CID devices)	
05	The system has operated for at least 15 minutes and the CID reports that the system is operating within acceptable parameters.	

I. Charge Indicator Display – Additional Requirements

The responsible persons signature on this document indicates the installation complies with the following requirements:

01	Charge indicator display devices is factory installed by the space-conditioning system manufacturer, or field installed according to the space-conditioning system manufacturer's requirements and the CID manufacturer's specifications.
02	The installer shall ensure that a copy of the CID manufacturer's user instructions documentation has been made available to the building owner.

The responsible person's signature on this compliance document affirms that all applicable requirements in this table have been met.

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DOCUMENTATION AUTHOR'S DECLARATION STATEMENT

1. I certify that this Certificate of Installation documentation is accurate and complete.

Documentation Author Name:	Documentation Author Signature:
Documentation Author Company Name:	Date Signed:
Address:	CEA/HERS Certification Identification (If applicable):
City/State/Zip:	Phone:

RESPONSIBLE PERSON'S DECLARATION STATEMENT

I certify the following under penalty of perjury, under the laws of the State of California:

- The information provided on this Certificate of Installation is true and correct.
- I am eligible under Division 3 of the Business and Professions Code in the applicable classification to accept responsibility for the system design, construction, or installation of features, materials, components, or manufactured devices for the scope of work identified on this Certificate of Installation and attest to the declarations in this statement (responsible builder/installer), otherwise I am an authorized representative of the responsible builder/installer.
- The constructed or installed features, materials, components or manufactured devices (the installation) identified on this Certificate of Installation conforms to all applicable codes and regulations, and the installation conforms to the requirements given on the plans and specifications approved by the enforcement agency.
- I understand that a HERS rater will check the installation to verify compliance, and that if such checking identifies defects; I am required to take corrective action at my expense. I understand that Energy Commission and HERS Provider representatives will also perform quality assurance checking of installations, including those approved as part of a sample group but not checked by a HERS rater, and if those installations fail to meet the requirements of such quality assurance checking, the required corrective action and additional checking/testing of other installations in that HERS sample group will be performed at my expense.
- I reviewed a copy of the Certificate of Compliance approved by the enforcement agency that identifies the specific requirements for the scope of construction or installation identified on this Certificate of Installation, and I have ensured that the requirements that apply to the construction or installation have been met.
- I will ensure that a registered copy of this Certificate of Installation shall be posted, or made available with the building permit(s) issued for the building, and made available to the enforcement agency for all applicable inspections. I understand that a registered copy of this Certificate of Installation is required to be included with the documentation the builder provides to the building owner at occupancy.

Responsible Builder/Installer Name:	Responsible Builder/Installer Signature:	
Company Name: (Installing Subcontractor or General Contractor or Builder/Owner)	Position With Company (Title):	
Address:	CSLB License:	
City/State/Zip:	Phone	Date Signed:
Third Party Quality Control Program (TPQCP) Status:	Name of TPQCP (if applicable):	

CF2R-MCH-25b User Instructions**Section A. System Information**

1. This information is automatically pulled from the Certificate of Installation (MCH-01).
2. This information is automatically pulled from the Certificate of Installation (MCH-01).
3. This information is automatically pulled from the Certificate of Installation (MCH-01).
4. This information is automatically pulled from the Certificate of Installation (MCH-01).
5. This information is automatically pulled from the Certificate of Installation (MCH-01).
6. This information is automatically pulled from the Certificate of Installation (MCH-01).
7. Choose the type of refrigerant used by the system being verified. R-22 and R-410A are the most common, but other types may occasionally be encountered.
8. If "Other" is chosen in Row A07, then indicate the type of refrigerant being used. If R-22 or R-410A is being used (regardless of trade name, Puron, Genetron, etc.) it should be indicated in Row A07. This row is only for refrigerants other than R-22 and R-410a. Documentation of refrigerant may be requested.
9. Indicate whether the HVAC system is Completely New, Replacement or an Alteration. These are defined in detail the Residential Compliance Manual.
10. Select the appropriate choice regarding whether this system has a Charge Indicator Display (CID). Qualifying CID's may exempt a system from HERS refrigerant charge verification. CID's are described in Joint Appendix JA6.1. Qualifying CID's must appear on a list of approved devices kept by the Commission. Installation of a CID does not exempt the installer from proper refrigerant charge verification. It may only exempt the need for third party refrigerant charge verification. Third party verification of the CID is required. Other requirements may also be triggered.
11. This information is automatically pulled from the Certificate of Installation (MCH-01). Most ducted split systems and package systems are of the type that minimum airflow can be verified using an approved measurement procedure. Examples of systems that do not meet this description are ductless systems. A "No" response here may subject the project to additional scrutiny by enforcement personnel.
12. Most ducted split systems and package systems are of the type that approved refrigerant charge verification procedures detailed in Residential Appendix RA3.2.2 or RA1 can be used (i.e., Standard Charge Verification or Winter Setup Verification procedures). Examples of systems that may not meet this description are "mini splits" or variable refrigerant flow systems that may only be charged using weigh-in procedures. Selecting "No" here may subject the project to additional scrutiny.
13. Specify the date the refrigerant charge verification was performed by the installer.
14. Select the refrigerant charge verification method used from the choices provided:
 - Superheat (outdoor temperature must be ≥ 55 degF); This verification method can only be used when the outdoor temperature is at or above 55 degF. It is only used on systems with fixed orifice refrigerant metering devices (non-variable metering devices). This method is detailed in Reference Appendix RA3.2.2.6.1. Systems verified using this method may be eligible for HERS verification compliance using Group Sampling. Choosing this option will generate a CF2R-MCH-25a.
 - Subcooling (outdoor temperature must be ≥ 55 degF); This verification method can only be used when the outdoor temperature is at or above 55 degF. It is only used on systems with variable metering devices (TXV or EXV). This method is detailed in Reference Appendix RA3.2.2.6.2. Systems verified using this method may be eligible for HERS verification compliance using Group Sampling. Choosing this option will generate a CF2R-MCH-25b.
 - Weigh-in; This verification method can be used at any outdoor temperature allowed by the equipment manufacturer. This method is detailed in Reference Appendix RA3.2.3. Systems verified using this method are NOT eligible for HERS verification compliance using Group Sampling. Choosing this option will generate a CF2R-MCH-25c.
 - Winter Setup (applicable when outdoor temperature is < 55 degF); The Winter Setup verification method is a special version of the Subcooling method. It can be used when the outdoor temperature is between 37 and 55 degF. It can only be used on equipment where the manufacturer has specifically approved it for the equipment being tested. The Winter Setup procedure is details in Residential Appendix RA1.2. Choosing this option will generate a CF2R-MCH-25e.
 - New Package Unit Factory Charge; Choose this option when a new package unit is being installed that has an AHRI rating. This helps ensure that the unit was properly charged at the factory. HERS verification of refrigerant charge may not be required in this case. Choosing this option will generate a CF2R-MCH-25f.
15. Identify who will be performing the verification that is documented on this Certificate of Installation, select from the two options. Note that HERS verification compliance by Group Sampling requires that the installer perform their own refrigerant charge verification as part of the installation of the equipment prior to the system being put into a sample group for possible selection by a HERS rater for verification. If Group Sampling is not intended, the HERS Rater may perform the

refrigerant charge verification on behalf of the Installing Contractor (applies to any method but Weigh-In) and the Rater will enter same results on both the CF2R and CF3R.

16. The Group Sampling status is automatically displayed based on the input results of Row A14 and Row A15. Group Sampling procedures are detailed Residential Appendix RA2.3.

Section B. Metering Device Verification

1. Select the correct metering device used on the system being verified. This will check against the refrigerant charge verification method selected in Row A14. An error message will appear in Row B02 if the wrong verification method has been selected. Superheat verification can only be used on systems with fixed orifice and Subcool verification can only be used on systems with variable metering devices (TXV or EXV).
2. An error message here indicates that the wrong verification method may have been selected. Superheat verification can only be used on systems with fixed orifice and Subcool verification can only be used on systems with variable metering devices (TXV or EXV).

Section C. Instrument Calibration

1. Enter the date of most recent Digital Refrigerant Gauge Calibration Field Check. Analog gauges are not allowed for verification purposes under the 2013 Standards. Specification for pressure gauges is found in Residential Appendix RA3.2.2.2.3. Procedures for the field check procedure are detailed in RA3.2.2.4.2. Calibration field check must happen at least once every 30 days.
2. Enter the date of the most recent Digital Thermocouple Calibration. Specifications for thermocouples and temperature sensors can be found in Residential Appendix RA3.2.2.2.2. Procedures for calibration are detailed in RA3.2.2.4.1. Calibration must happen at least once every 30 days.
3. Digital Refrigerant Gauge Calibration status will appear automatically. If the date entered in Row C01 is more than 30 days prior to date of verification this row will indicate that calibration is required and you will not be allowed to continue filling out this document until calibration is performed.
4. Digital Thermocouple Calibration status will appear automatically. If the date entered in Row C02 is more than 30 days prior to date of verification this row will indicate that calibration is required and you will not be allowed to continue filling out this document until calibration is performed.

Section D. Measurement Access Hole (MAH) Verification

1. Indicate the method used to demonstrate compliance with the MAH requirement by selecting the appropriate method from the drop down list. Procedures for installing MAH's are detailed in RA3.2.2.3. Selecting that the MAH cannot be installed consistent with Figure 3.2-1 may result in additional scrutiny by enforcement personnel.

Section E. Minimum System Airflow Rate Verification

1. This information is automatically calculated based on the information given in line A09. This is the target minimum system airflow required for the system being verified.
2. This information is automatically calculated based on the MCH-23 or MCH-28, which documents the measured airflow (or alternative method) of the system being verified. If the measured airflow is not adequate it will not comply with the airflow requirements and refrigerant charge verification cannot be performed until the airflow meets the requirement.

Section F. Subcooling Charge Verification Method – Data Collection

1. Measure and record the lowest return air dry-bulb temperature that occurred during the refrigerant charge procedure in degrees F. This temperature must remain above 70 degF during the verification procedure. This requirement is detailed in Residential Appendix RA3.2.2.5.
2. Measure and record the condenser air dry-bulb temperature ($T_{\text{condenser}}$) in degrees F. This value must be at least 55 degF and no more than 115 degF to use the Subcooling Charge Verification Method.
3. If a value less than 55 degF or greater than 115 degF is entered in Row F02 the Subcooling Method cannot be used.
4. Measure and record the liquid line temperature (T_{liquid}) in degrees F. This procedure is detailed in RA3.2.2.5. This value is used to calculate the measured subcool temperature.
5. Measure and record the liquid line pressure (P_{liquid}) in psig. This procedure is detailed in RA3.2.2.5. This value is used to determine the condenser saturation temperature ($T_{\text{condenser,sat}}$) from a pressure temperature chart for the appropriate refrigerant (can be internal to a digital gauge), which is entered into Row F06.

6. Enter the condenser saturation temperature ($T_{\text{condenser,sat}}$) from the digital gauge or a separate pressure-temperature chart that corresponds to the liquid line pressure entered in Row F05, in degrees F.
7. Measured Subcooling is automatically calculated as the difference between the liquid line temperature (Row F04) and the condenser saturation temperature (Row F06)
8. Enter target subcooling from manufacturer. This may be a challenge to find for older equipment. Internet searches can sometimes result in archived equipment specifications for the equipment in question, or sometimes a very similar model. If the manufacturer's target cannot be found the Commission's Executive Director may provide additional guidance for compliance.
9. System passes Subcooling method when Row F08 is within plus or minus 5 degrees of Row F07.

Section G. Metering Device Verification

1. Measure and record the suction line temperature (T_{suction}) in degrees F. This procedure is detailed in RA3.2.2.5. This value is used to calculate the measured superheat.
2. Measure and record the suction line pressure (P_{suction}) in psig. This procedure is detailed in RA3.2.2.5. This value is used to determine the evaporator saturation temperature ($T_{\text{evaporator,sat}}$) from a pressure temperature chart for the appropriate refrigerant (can be internal to a digital gauge), which is entered into Row G03.
3. Enter the evaporator saturation temperature ($T_{\text{evaporator,sat}}$) from the digital gauge or a separate pressure-temperature chart that corresponds to the suction line pressure entered in Row G02, in degrees F.
4. Measured superheat is automatically calculated as the difference between the suction line temperature (Row G01) and the evaporator saturation temperature (Row G03)
5. There are two possible criteria for passing. If the manufacturer's specification is known it should be used, otherwise the CEC requirement is that the superheat be between 4 and 25 degF, inclusive. This row checks the CEC requirement.
6. If the manufacturer's target superheat for ensuring proper metering device operation is known, it supersedes the CEC requirement of being between 4 and 25 degF. If "Yes, documentation to be provided upon request." is selected, the installer should be prepared to provide documentation for the target values used.
7. There are two possible criteria for passing. If the manufacturer's specification is known it should be used, otherwise the CEC requirement is that the superheat be between 4 and 25 degF, inclusive. If "Yes, documentation to be provided upon request." is selected in Row G06, the installer should be prepared to provide documentation for the target values used.

Section H. Verification of Charge Indicator Display

1. Enter the manufacturer name or make of the approved Charge Indicator Display. Must match name shown on the list of approved devices kept by the Commission.
2. Enter the manufacturer model number of the approved Charge Indicator Display. Must match name shown on the list of approved devices kept by the Commission.
3. The installer must confirm that the CID display module is mounted adjacent to thermostat that controls the system being verified. This requirement is detailed in Residential Appendix RA3.4.2.
4. The installer must confirm that the installed CID is approved and appears the list of approved devices kept by the Commission. This requirement is detailed in Residential Appendix RA3.4.2.
5. The installer must confirm that the system has operated for at least 15 minutes and that they system is operating within acceptable parameters as specified by the CID and equipment manufacturers. This requirement is detailed in Residential Appendix RA3.4.2.