



Model name:

For commercial use

TCB-LD2-UK

LEAK DETECTION, ISOLATION & PUMP BACK MODULE

ENGLISH

TBC-LD2-UK

+

LPR-272D010
A18025

+

AW17861
AW17867



Please read this Installation Manual carefully before installing the Leak Detection, Isolation & Pump Back Module.

- This Manual describes the installation method of the TCB-LD2-UK (LD2) Controller, Isolation Valves and Pressure Relief Valve (PRV).
- You must also refer to the Installation and Owner's Manual attached to the Toshiba outdoor unit.
- Please follow the manual(s) for your Air Handling Unit (AHU - local supply).
- Carrier Solutions UK Ltd does not take any responsibility on the local design.
- This product is exclusively designed to be connected to a Toshiba VRF "e-series" outdoor unit. Do not use the LD2 Controller for any other application.
- Do not modify or alter the LD2 Controller. Do not try to fix the controller if there is a malfunction

This appliance is for commercial use only and should not be accessible to the general public. This appliance is not intended for use by person (including children) with reduced physical, sensory or mental capabilities, or lack of experience and knowledge, unless they have been given supervision or instruction concerning use of the appliance by a person responsible for their safety. Children should be supervised to ensure that they do not play with the appliance.

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This symbol mark is for EU countries only. This symbol mark is according to the directive 2002/96/EC Article 10 Information for users and Annex IV.

This product is designed and manufactured with high quality materials and components which can be recycled and reused.

This symbol means that electrical and electronic equipment, at the end-of-life, should be disposed of separately from your household waste.

Please dispose of this equipment at your local community waste collection / recycling centre.

In the European Union there are separate collection systems for used electrical and electronic product.



Thank you for purchasing Toshiba air conditioning products.

This Installation Manual describes the installation method of the outdoor unit. For installation of indoor units, follow the Installation Manual supplied with the indoor unit.

Moreover, as this installation manual includes the important articles concerning the "Machinery" Directive (Directive 2006/42/ EC), please read through the manual and make sure you understand it. After installation, give this Installation Manual, the Owner's Manual and the Installation Manual supplied with the indoor unit to the customer and tell the customer to keep them safe.

Prepare an exclusive power source for indoor units, independent to that for outdoor units.

Y-shaped branching joints or a branching header (separately purchased) are required for connecting pipes between indoor and outdoor units. Choose either of them considering the system capacity concerning piping. For installing branching pipes, refer to the installation manual of the Y-shaped branching unit or branching header (separately purchased).

Outdoor connecting branching joints are required for connecting between outdoor units.

Generic Denomination: Air Conditioner

Definition of Qualified Installer or Qualified Service Person

The air conditioner must be installed, maintained, repaired and removed by a qualified installer or qualified service person. When any of these jobs is to be done, ask a qualified installer or qualified service person to do them for you.

A qualified installer or qualified service person is an agent who has the qualifications and knowledge described in the table below.

Agent	Qualifications and knowledge which the agent must have
Qualified installer	• The qualified installer is a person who installs, maintains, relocates and removes the air conditioners made by Carrier Corporation. He or she has been trained to install, maintain, relocate and remove the air conditioners made by Carrier Corporation or, alternatively, he or she has been instructed in such operations by an individual or individuals who have been trained and is thus thoroughly acquainted with the knowledge related to these operations. • The qualified installer who is allowed to do the electrical work involved in installation, relocation and removal has the qualifications pertaining to this electrical work as stipulated by the local laws and regulations, and he or she is a person who has been trained in matters relating to electrical work on the air conditioners made by Carrier Corporation or, alternatively, he or she has been instructed in such matters by an individual or individuals who have been trained and is thus thoroughly acquainted with the knowledge related to this work. • The qualified installer who is allowed to do the refrigerant handling and piping work involved in installation, relocation and removal has the qualifications pertaining to this refrigerant handling and piping work as stipulated by the local laws and regulations, and he or she is a person who has been trained in matters relating to refrigerant handling and piping work on the air conditioners made by Carrier Corporation or, alternatively, he or she has been instructed in such matters by an individual or individuals who have been trained and is thus thoroughly acquainted with the knowledge related to this work. • The qualified installer who is allowed to work at heights has been trained in matters relating to working at heights with the air conditioners made by Toshiba Carrier Corporation or, alternatively, he or she has been instructed in such matters by an individual or individuals who have been trained and is thus thoroughly acquainted with the knowledge related to this work.
Qualified service person	• The qualified service person is a person who installs, repairs, maintains, relocates and removes the air conditioners made by Carrier Corporation. He or she has been trained to install, repair, maintain, relocate and remove the air conditioners made by Carrier Corporation or, alternatively, he or she has been instructed in such operations by an individual or individuals who have been trained and is thus thoroughly acquainted with the knowledge related to these operations. • The qualified service person who is allowed to do the electrical work involved in installation, repair, relocation and removal has the qualifications pertaining to this electrical work as stipulated by the local laws and regulations, and he or she is a person who has been trained in matters relating to electrical work on the air conditioners made by Carrier Corporation or, alternatively, he or she has been instructed in such matters by an individual or individuals who have been trained and is thus thoroughly acquainted with the knowledge related to this work. • The qualified service person who is allowed to do the refrigerant handling and piping work involved in installation, repair, relocation and removal has the qualifications pertaining to this refrigerant handling and piping work as stipulated by the local laws and regulations, and he or she is a person who has been trained in matters relating to refrigerant handling and piping work on the air conditioners made by Carrier Corporation or, alternatively, he or she has been instructed in such matters by an individual or individuals who have been trained and is thus thoroughly acquainted with the knowledge related to this work. • The qualified service person who is allowed to work at heights has been trained in matters relating to working at heights with the air conditioners made by Toshiba Carrier Corporation or, alternatively, he or she has been instructed in such matters by an individual or individuals who have been trained and is thus thoroughly acquainted with the knowledge related to this work.

Definition of Protective Gear

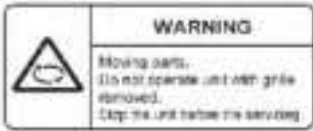
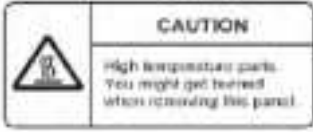
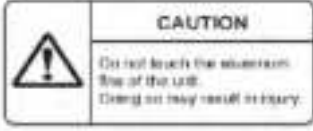
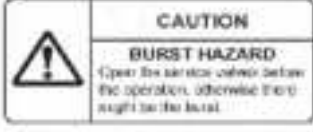
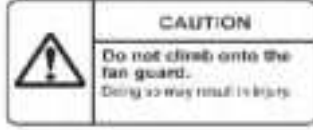
When the air conditioner is to be transported, installed, maintained, repaired or removed, wear protective gloves and 'safety' work clothing.

In addition to such normal protective gear, wear the protective gear described below when undertaking the special work detailed in the table below.

Failure to wear the proper protective gear is dangerous because you will be more susceptible to injury, burns, electric shocks and other injuries.

Work undertaken	Protective gear worn
All types of work	Protective gloves 'Safety' working clothing
Electrical-related work	Gloves to provide protection for electricians and from heat Insulating shoes Clothing to provide protection from electric shock
Work done at heights (50 cm or more)	Helmets for use in industry
Transportation of heavy objects	Shoes with additional protective toe cap
Repair of outdoor unit	Gloves to provide protection for electricians and from heat

■ Warning Indications on the Air Conditioner Unit

Warning indication	Description
	WARNING ELECTRICAL SHOCK HAZARD Disconnect all remote electric power supplies before servicing.
	WARNING Moving parts. Do not operate unit with grille removed. Stop the unit before the servicing.
	CAUTION High temperature parts. You might get burned when removing this panel.
	CAUTION Do not touch the aluminium fins of the unit. Doing so may result in injury.
	CAUTION BURST HAZARD Open the service valves before the operation; otherwise there might be the burst.
	CAUTION Do not climb onto the fan guard. Doing so may result in injury.

1 Precautions for safety

The manufacturer shall not assume any liability for the damage caused by not observing the description of this manual.

WARNING

General

- Before starting to install the air conditioner, read through the Installation Manual carefully, and follow its instructions to install the air conditioner. Otherwise, falling down of the unit may occur, or the unit may cause noise, vibration or water leakage.
- Only a qualified installer (*1) or qualified service person (*1) is allowed to do installation work. If installation is carried out by an unqualified individual, a fire, electric shocks, injury, water leakage, noise and/or vibration may result.
- If using separately sold products, make sure to use Toshiba specified products only. Using unspecified products may cause fire, electric shock, water leak or other failure.
- Do not use any refrigerant different from the one specified for complement or replacement. Otherwise, abnormally high pressure may be generated in the refrigeration cycle, which may result in a failure or explosion of the product or an injury to your body.
- Before opening the service panel of the outdoor unit, set the circuit breaker to the OFF position. Failure to set the circuit breaker to the OFF position may result in electric shocks through contact with the interior parts. Only a qualified installer (*1) or qualified service person (*1) is allowed to remove the service panel of the outdoor unit and do the work required.
- Before carrying out the installation, maintenance, repair or removal work, be sure to set the circuit breakers for both the indoor and outdoor units to the OFF position. Otherwise, electric shock may result.
- Place a "Work in progress" sign near the circuit breaker while the installation, maintenance, repair or removal work is being carried out. There is a danger of electric shocks if the circuit breaker is set to ON by mistake.
- Only a qualified installer (*1) or qualified service person (*1) is allowed to undertake work at heights using a stand of 50 cm or more or to remove the intake grille of the indoor unit to undertake work.
- Wear protective gloves and safety work clothing during installation, servicing and removal.
- Do not touch the aluminium fin of the outdoor unit. You may injure yourself if you do so. If the fin must be touched for some reason, first put on protective gloves and safety work clothing, and then proceed.
- Do not climb onto or place objects on top of the outdoor unit. You may fall or the objects may fall off of the outdoor unit and result in injury.
- When working at height, put a sign in place so that no-one will approach the work location before proceeding with the work. Parts or other objects may fall from above, possibly injuring a person below. Also, be sure that workers put on helmets.
- When cleaning the filter or other parts of the outdoor unit, set the circuit breaker to OFF without fail, and place a "Work in progress" sign near the circuit breaker before proceeding with the work.
- When working at heights, put a sign in place so that no-one will approach the work location, before proceeding with the work. Parts and other objects may fall from above, possibly injuring a person below.
- The refrigerant used by this air conditioner is the R410A.
- You shall ensure that the air conditioner is transported in stable condition. If you find any part of the product broken, contact your dealer.
- Do not disassemble, modify, repair or move the product yourself. Doing so may cause fire, electric shock, injury or water leaks. Ask a qualified installer or qualified service person to do any repairs or to move the product.
- Selection of installation location
- If you install the unit in a small room, take appropriate measures to prevent the refrigerant from exceeding the limit concentration even if it leaks. Consult the dealer from whom you purchased the air conditioner when you implement the measures. Accumulation of highly concentrated refrigerant may cause an oxygen deficiency accident.
- Do NOT use leak detection with HWM, DX and Multi-tenant Kit. It is not possible to connect leak detection sensors if CN80 connector on indoor unit is already in use.
- When installing leak detection onto 3-pipe system, it is not possible for the internal SSH control to operate in simultaneous mode. System cannot be set in Heating only mode (cooling made unavailable), via optional accessories or local system setup, as pump back control will not be able to operate correctly.
- Do not install in a location where flammable gas may leaks are possible. If the gas should leak and accumulate around the unit, it may ignite and cause a fire.
- When transporting the air conditioner, wear shoes with protective toe caps, protective gloves and other protective clothing.
- When transporting the air conditioner, do not take hold of the bands around the packing carton. You may injure yourself if the bands should break.
- Install the indoor unit at least 2.5 m above the floor level since otherwise the users may injure themselves or receive electric shocks if they poke their fingers or other objects into the indoor unit while the air conditioner is running.
- Do not place any combustion appliance in a place where it is directly exposed to the wind of air conditioner, otherwise it may cause imperfect combustion.
- Places where the operation sound of the outdoor unit may cause a disturbance. (Especially at the boundary line with a neighbour, install the air conditioner while considering the noise.)
- Installation
- Follow the instructions in the Installation Manual to install the air conditioner. Failure to follow these instructions may cause the product to fall down or topple over or give rise to noise, vibration, water leakage or other failure.
- The designated bolts (M12) and nuts (M12) for securing the outdoor unit must be used when installing the unit.
- Install the outdoor unit properly in a location that is durable enough to support the weight of the outdoor unit. Insufficient durability may cause the outdoor unit to fall, which may result in injury.
- Install the unit in the prescribed manner for protection against strong wind and earthquake. Incorrect installation may result in the unit falling down, or other accidents.
- Be sure to fix the screws back which have been removed for installation or other purposes.

Refrigerant Piping

- Install the refrigerant pipe securely during the installation work before operating the air conditioner. If the compressor is operated with the valve open and without refrigerant pipe, the compressor sucks air and the refrigeration cycles is over pressurized, which may cause an injury.
- Tighten the flare nut with a torque wrench in the specified manner. Excessive tighten of the flare nut may cause a crack in the flare nut after a long period, which may result in refrigerant leakage.
- Ventilate the air if the refrigerant gas leaks during installation. If the leaked refrigerant gas comes into contact with fire, toxic gas may be produced.
- After the installation work, confirm that refrigerant gas does not leak. If refrigerant gas leaks into the room and flows near a fire source, such as a cooking range, noxious gas may be generated.
- When the air conditioner has been installed or relocated, follow the instructions in the Installation Manual and purge the air completely so that no gases other than the refrigerant will be mixed in the refrigerating cycle. Failure to purge the air completely may cause the air conditioner to malfunction.
- Nitrogen gas must be used for the airtight test.
- The charge hose must be connected in such a way that it is not slack.
- If refrigerant gas has leaked during the installation work, ventilate the room immediately. If the leaked refrigerant gas comes in contact with fire, noxious gas may be generated.

Electrical Wiring

- Only a qualified installer (*1) or qualified service person (*1) is allowed to carry out the electrical work of the air conditioner. Under no circumstances must this work be done by an unqualified individual since failure to carry out the work properly may result in electric shocks and/or electrical leaks.
- When connecting the electrical wires, repairing the electrical parts or undertaking other electrical jobs, wear gloves to provide protection for electricians and from heat, insulating shoes and clothing to provide protection from electric shocks. Failure to wear this protective gear may result in electric shocks.
- When executing address setting, test run, or troubleshooting through the checking window on the electrical control box, put on insulated heat-proof gloves, insulated shoes and other clothing to provide protection from electric shock. Otherwise you may receive an electric shock.
- Use wiring that meets the specifications in the Installation Manual and the stipulations in the local regulations and laws. Use of wiring which does not meet the specifications may give rise to electric shocks, electrical leakage, smoking and/or a fire.
- Check that the product is properly earthed. (grounding work) Incomplete earthing may cause electric shock.
- Do not connect the earth wire to a gas pipe, water pipe, lightning conductor, or a telephone earth wire.
- After completing the repair or relocation work, check that the ground wires are connected properly.
- Install a circuit breaker that meets the specifications in the installation manual and the stipulations in the local regulations and laws.
- Install the circuit breaker where it can be easily accessed by the agent.
- When installing the circuit breaker outdoors, install one which is designed to be used outdoors.
- Under no circumstances must the power cable be extended. Connection trouble in the places where the cable is extended may give rise to smoking and/or a fire.
- Electrical wiring work shall be conducted according to law and regulation in the community and installation manual. Failure to do so may result in electrocution or short circuit.
- Do not supply power from the power terminal block equipped on the outdoor unit to another outdoor unit. Capacity overflow may occur on the terminal block and may result in fire.
- When carrying out electric connection, use the wire specified in the Installation Manual and connect and fix the wires securely to prevent them applying external force to the terminals. Improper connection or fixing may result in fire.

Test Run

- Before operating the air conditioner after having completed the work, check that the electrical control box cover of the indoor unit and service panel of the outdoor unit are closed, and set the circuit breaker to the ON position. You may receive an electric shock if the power is turned on without first conducting these checks.
- When you have noticed that some kind of trouble (such as when an error display has appeared, there is a smell of burning, abnormal sounds are heard, the air conditioner fails to cool or heat or water is leaking) has occurred in the air conditioner, do not touch the air conditioner yourself but set the circuit breaker to the OFF position, and contact a qualified service person. Take steps to ensure that the power will not be turned on (by marking "out of service" near the circuit breaker, for instance) until qualified service person arrives. Continuing to use the air conditioner in the trouble status may cause mechanical problems to escalate or result in electric shocks or other failure.
- After the work has finished, be sure to use an insulation tester set (500 V Megger) to check the resistance is 2 MΩ or more between the charge section and the non-charge metal section (Earth section). If the resistance value is low, a disaster such as a leak or electric shock is caused at user's side.
- Upon completion of the installation work, check for refrigerant leaks and check the insulation resistance and water drainage. Then conduct a test run to check that the air conditioner is operating properly.

Explanations Given To User

- Upon completion of the installation work, tell the user where the circuit breaker is located. If the user does not know where the circuit breaker is, he or she will not be able to turn it off in the event that trouble has occurred in the air conditioner.
- If you have discovered that the fan grille is damaged, do not approach the outdoor unit but set the circuit breaker to the OFF position, and contact a qualified service person(*1) to have the repairs done. Do not set the circuit breaker to the ON position until the repairs are completed.
- After the installation work, follow the Owner's Manual to explain to the customer how to use and maintain the unit.

Relocation

- Only a qualified installer (*1) or qualified service person (*1) is allowed to relocate the air conditioner. It is dangerous for the air conditioner to be relocated by an unqualified individual since a fire, electric shocks, injury, water leakage, noise and/or vibration may result.
- When carrying out the pump-down work shut down the compressor before disconnecting the refrigerant pipe. Disconnecting the refrigerant pipe with the service valve left open and the compressor still operating will cause air or other gas to be sucked in, raising the pressure inside the refrigeration cycle to an abnormally high level, and possibly resulting in rupture, injury or other trouble.
- Never recover the refrigerant into the outdoor unit. Be sure to use a refrigerant recovery machine to recover the refrigerant when moving or repairing. It is impossible to recover the refrigerant into the outdoor unit. Refrigerant recovery into the outdoor unit may result in serious accidents such as explosion of the unit, injury or other accidents.

(*1) Refer to the "Definition of Qualified Installer or Qualified Service Person."



CAUTION

New refrigerant air conditioner installation

- **This air conditioner adopts the new HFC refrigerant (R410A) which does not destroy ozone layer.**
- The characteristics of R410A refrigerant are; easy to absorb water, oxidizing membrane or oil, and its pressure is approx. 1.6 times higher than that of refrigerant R22. Accompanied with the new refrigerant, refrigerating oil has also been changed. Therefore, during installation work, be sure that water, dust, former refrigerant, or refrigerating oil does not enter the refrigerating cycle.
- To prevent charging an incorrect refrigerant and refrigerating oil, the sizes of connecting sections of charging port of the main unit and installation tools are changed from those for the conventional refrigerant.
- Accordingly the exclusive tools are required for the new refrigerant (R410A).
- For connecting pipes, use new and clean piping designed for R410A, and please care so that water or dust does not enter.

Disconnection of the appliance from mains power supply.

- This appliance must be connected to the main power supply by means of a switch with a contact separation of at least 3 mm.

The installation fuse (all type can be used) must be used for the power supply line of this conditioner.

2 Installation of New Refrigerant Air Conditioner

This air conditioner adopts the new HFC refrigerant (R410A) which does not deplete the ozone layer.

- R410A refrigerant is vulnerable to impurities such as water, oxidizing membranes, or oils because the pressure of R410A refrigerant is higher than that of the former refrigerant by approximately 1.6 times.
- As well as the adoption of the new refrigerant, the refrigerating oil has been also changed. Therefore, pay attention so that water, dust, former refrigerant, or refrigerating oil does not enter the refrigerating cycle of the new refrigerant air conditioner during installation.
- To prevent mixing of refrigerant or refrigerating oil, the size of the charge port of the main unit or connecting section of the installation tool differs to that of an air conditioner for the former refrigerant. Accordingly, exclusive tools are required for the new refrigerant (R410A) as shown below.
- For connecting pipes, use new and clean piping materials so that water or dust does not enter.

■ Required Tools and Cautions on Handling

It is necessary to prepare the tools and parts for installation as described below. The tools and parts which will be newly prepared in the following items should be restricted to exclusive use.

Explanation of symbols

- △ : Newly prepared (It is necessary to use it exclusively with R410A, separately from those for R22 or R407C.)
○ : Former tool is available.

Used Tools	Usage	Proper Use of Tools / Parts
Gauge manifold	Vacuuming, charging refrigerant and operation check	△ Exclusive to R410A
Charging hose		△ Exclusive to R410A
Charging cylinder	Charging refrigerant	Unusable (Use the Refrigerant charging balance.)
Gas leak detector	Checking gas leak	△ Exclusive to R410A
Vacuum pump	Vacuum drying	Usable if a counter-flow preventive adapter is attached
Vacuum pump with counter flow	Vacuum drying	○ R22 (Existing article)
Flare tool	Flare processing of pipes	○ Usable by adjusting size
Bender	Bending processing of pipes	○ R22 (Existing article)
Refrigerant recovery device	Recovering refrigerant	△ Exclusive to R410A
Torque wrench	Tightening flare nut	△ Exclusive to Ø12.7 mm and Ø15.9 mm
Pipe cutter	Cutting pipes	○ R22 (Existing article)
Refrigerant canister	Charging refrigerant	△ Exclusive to R410A Enter the refrigerate name for identification
Welding machine / Nitrogen gas cylinder	Welding of pipes	○ R22 (Existing article)
Refrigerant charging balance	Charging refrigerant	○ R22 (Existing article)

3 Selection of Installation Place

Upon customer's approval, install the air conditioning apparatus in a place which satisfies the following conditions:

- Place where it can be installed correctly.
- Place which can reserve a sufficient service space for safe maintenance or checks.
- Place where there is no problem even if the drained water overflows.

Avoid the following places:

- Salty places (seaside area) or places with much gas sulphide (hot spring area) (If selecting such a place, special maintenance is required.)
- Places where oil (including machine oil), steam, oil smoke or corrosive gas is generated.
- Places where iron or other metal dust is present. If iron or other metal dust adheres to or collects on the interior of the air conditioner, it may spontaneously combust and start a fire.
- Places where an organic solvent is used.
- Chemical plants with a cooling system using liquid carbon dioxide.
- Places where a device generating high frequency (inverter, non-utility generator, medical apparatus, or communication equipment) is set. (Malfunction or abnormal control of the air conditioner, or interference to devices listed above may occur.)
- Places unable to bear the weight of the apparatus.
- Places with poor ventilation.
- Places where ambient temperature falls below -15°C for more than 72 hours running.

4 Refrigerant Piping

■ F-GAS Label

The air conditioning product contains fluorinated greenhouse gases covered by the Kyoto Protocol

Chemical Name of Gas R410A

Global Warming Potential (GWP) of Gas 1975



CAUTION

1. Stick the enclosed refrigerant label adjacent to the charging and/or recovering location.
 2. Clearly write the charged refrigerant quantity on the refrigerant label using indelible ink. Then, place the included transparent protective sheet over the label to prevent the writing from rubbing off.
 3. Prevent emission of the contained fluorinated greenhouse gas. Ensure that the fluorinated greenhouse gas is never vented to the atmosphere during installation, service or disposal. When any leakage of the contained fluorinated greenhouse gas is detected, the leak shall be stopped and repaired as soon as possible.
 4. Only qualified service personnel are allowed to access and service this product.
 5. Any handling of the fluorinated greenhouse gas in this product, such as when moving the product or recharging the gas, shall comply under (EC) Regulation No. 842/2006 on certain fluorinated greenhouse gases and any relevant local legislation.
 6. Periodical inspections for refrigerant leaks may be required depending on European or local legislation.
 7. Contact dealers, installers, etc., for any questions.
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WARNING

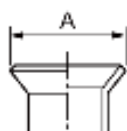
- If the refrigerant gas leaks during installation, ventilate the room. If the leaked refrigerant gas comes into contact with fire, noxious gas may be generated.
- After installation, check that the refrigerant gas does not leak.
- If the refrigerant gas leaks into the room and comes into contact with fire such as a fan heater, stove, or kitchen range, noxious gas may be generated.

REQUIREMENT

- For a brazing work of the refrigerant pipes, be sure to use nitrogen gas in order to prevent oxidation of the inside of the pipes; otherwise clogging of the refrigerating cycle due to oxidized scale may occur.
- Use clean and new pipes for the refrigerant pipes and perform piping work so that water or dust does not contaminate the refrigerant.
- *Remove all flux after brazing.
- Be sure to use a double spanner to loosen or tighten the flare nut. If a single spanner is used, the required level of tightening cannot be obtained. Tighten the flare nut with the specified torque. (If it is hard to loosen or tighten the flare nut of the balance pipe or packed valve of the liquid side with a double spanner, loosen or tighten the flare nut while holding the valve mounting plate with a spanner.)

Extruding margin of copper pipe with flare tools: A (Unit: mm)

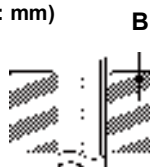
Copper pipe outer dia.	+0 A -0.4
9.5	13.2
12.7	16.6
15.9	19.7
19.1	24.0



Connected section	
External size	Internal size

Extruding margin of copper pipe with flare machining: B (Unit: mm)

Copper pipe outer dia.	When using R410A tool	When using conventional tool
9.5 12.7 15.9 19.1	0 to 0.5	1.0 to 1.5



- When using the conventional flare tool, to connect R410A pipes with flaring, make a margin approx. 0.5 mm longer than that of an R22 pipe so that the flare size matches the one specified. It is convenient to use a copper pipe gauge for size adjustment of the extruding margin. Half hard or hard materials may be cracked and may cause leakage of refrigerant when it is flared.
- After flaring the connection, be sure the flared part is not damaged, deformed, uneven, or flattened, and that there are no cutting chips on it. Coupling size of brazed pipe

Standard outer dia. of connected copper pipe	Connected section					Min. thickness of coupling
	External size	Internal size	Min. depth of insertion		Oval value	
	Standard outer dia. (Allowable difference)					
	C	F	K	G		
6.35	6.35 (±0.03)	6.45 ^(+0.04) _(-0.02)	7	6	0.06 or less	0.50
9.52	9.52 (±0.03)	9.62 ^(+0.04) _(-0.02)	8	7	0.08 or less	0.60
12.70	12.70 (±0.03)	12.81 ^(+0.04) _(-0.02)	9	8	0.10 or less	0.70
15.88	15.88 (±0.03)	16.00 ^(+0.04) _(-0.02)	9	8	0.13 or less	0.80
19.05	19.05 (±0.03)	19.19 ^(+0.03) _(-0.03)	11	10	0.15 or less	0.80
22.22	22.22 (±0.03)	22.36 ^(+0.03) _(-0.03)	11	10	0.16 or less	0.82
28.58	28.58 (±0.04)	28.75 ^(+0.06) _(-0.02)	13	12	0.20 or less	1.00
34.92	34.90 (±0.04)	35.11 ^(+0.04) _(-0.04)	14	13	0.25 or less	1.20
38.10	38.10 (±0.05)	38.31 ^(+0.06) _(-0.02)	15	14	0.27 or less	1.26
41.28	41.28 (±0.05)	41.50 ^(+0.06) _(-0.02)	15	14	0.28 or less	1.35

Warnings on Refrigerant Leakage

Check of Concentration Limit

The room in which the air conditioner is to be installed requires a design that in the event of refrigerant gas leaking out, its concentration will not exceed a set limit.

The refrigerant R410A which is used in the air conditioner is safe, without the toxicity or combustibility of ammonia, and is not restricted by laws to be imposed which protect the ozone layer. However, since it contains more than air, it poses the risk of suffocation if its concentration should rise excessively. Suffocation from leakage of R410A is almost non-existent. With the recent increase in the number of high concentration buildings, however, the installation of multi air conditioner systems is on the increase because of the need for effective use of floor space, individual control, energy conservation by curtailing heat and carrying power etc.

Most importantly, the multi air conditioner system is able to replenish a large amount of refrigerant compared with conventional individual air conditioners. If a single unit of the multi conditioner system is to be installed in a small room, select a suitable model and installation procedure so that if the refrigerant accidentally leaks out, its concentration does not reach the limit (and in the event of an emergency, measures can be made before injury can occur).

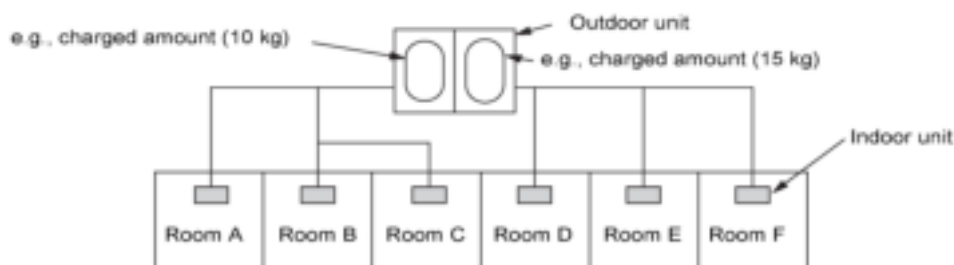
1. In a room where the concentration may exceed the limit, create an opening with adjacent rooms, or install mechanical ventilation combined with a gas leak detection device. The concentration is calculated as detailed below.

$$\frac{\text{Total amount of refrigerant (kg)}}{\text{Min. volume of the indoor unit installed room (m}^3\text{)}} \leq \text{Concentration limit (kg/m}^3\text{)}$$

The concentration limit of R410A which is used in multi air conditioners is 0.3 kg/m³.

▼ NOTE 1

If there are 2 or more refrigerating systems in a single refrigerating device, the amounts of refrigerant should be as charged in each independent device.

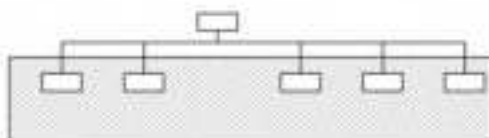


For the amount of charge in this example:

The possible amount of leaked refrigerant gas in rooms A, B and C is 10 kg. The possible amount of leaked refrigerant gas in rooms D, E and F is 15 kg.

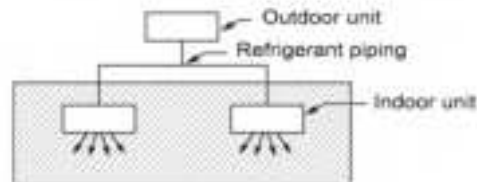
▼ NOTE 2

The standards for minimum room volume are as follows. 1) No partition (shaded portion)

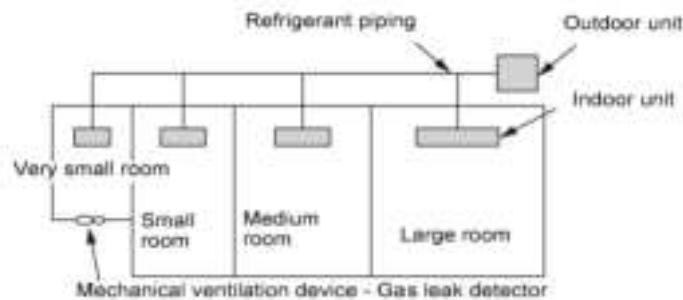


IMPORTANT

2. When there is an effective opening with the adjacent room for ventilation of leaking refrigerant gas (opening without a door, or an opening 0.15 % or larger than the respective floor spaces at the top or bottom of the door).

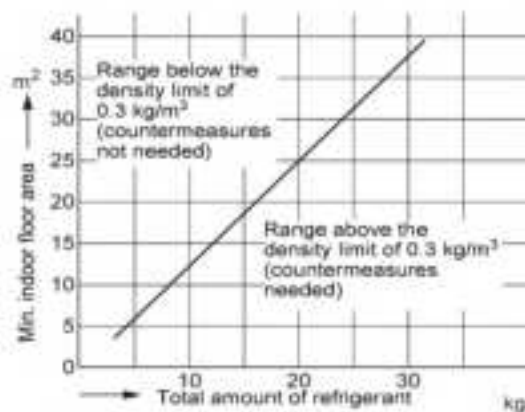


3. If an indoor unit is installed in each partitioned room and the refrigerant piping is interconnected, the smallest room of course becomes the object. But when a mechanical ventilation is installed interlocked with a gas leakage detector in the smallest room where the density limit is exceeded, the volume of the next smallest room becomes the object.



▼ NOTE 3

The minimum indoor floor area compared with the amount of refrigerant is roughly as follows: (When the ceiling is 2.7 m high)



5 Electric wiring



WARNING

The appliance shall be installed in accordance with national wiring regulations.
Capacity shortages of the power circuit or an incomplete installation may cause an electric shock or fire.



CAUTION

- Perform wiring of power supply complying with the rules and regulations of the local electric company.
- Refer to H07RN-F or 60245 IEC 66 regarding specifications of the power supply wire.
- Do not connect 380 V - 415 V power to the terminal blocks for control cables (U1, U2, U3, U4, U5, U6); otherwise, the unit may break down.
- Be sure that electric wiring does not come into contact with high-temperature parts of piping; otherwise, the coating of cables may melt and cause an accident.
- After connecting wires to the terminal block, take off the traps and fix the wires with cord clamps.
- Follow the same structure for both the control wiring and refrigerate piping.
- Do not conduct power to indoor units until vacuuming of the refrigerant pipes has finished.
- Refer to the installation manuals of indoor unit and flow selector unit for power wiring and communication wiring of indoor unit and flow selector unit.
- Communication wiring and central control wiring use 2-core non-polarity wires. Use 2-core shield wires to prevent noise trouble.
- Connecting the closed end terminal of shield wire. (Connected to all connecting sections in each unit)
- Use 2-core non-polarity wire for remote controller. (A, B terminals) Use 2-core non-polarity wire for wiring of group control. (A, B terminals)

Table-1 Communication wiring between indoor and outdoor units (L1, L2, L3), Central control wiring (L4)

Wiring	2-core, non-polarity
Type	Shield wire
Size / Length	1.50mm ² (min. 1.25 mm ²): Up to 1000m 2.50mm ² (min. 2.00 mm ²): Up to 2000m (*1)

(*1): Total length of Communication wiring length for all refrigerant circuits (L1 + L2 + L3 + L4)

Table-2 Communication wiring between outdoor units (L5)

Wiring	2-core, non-polarity
Type	Shield wire
Size / Length	1.50mm ² (min. 1.25 mm ² to 2.0 mm ²) up to 100m (L5)

Table-3 Remote controller wiring (L6, L7)

Wire	2-core, non-polarity
Size	1.50mm ² (min. 0.5 mm ² to 2.0 mm ²)
Length	Up to 500m (L6 + L7) Up to 400m in case of wireless remote controller in group control. Up to 200m total length of communication wiring between indoor units L6

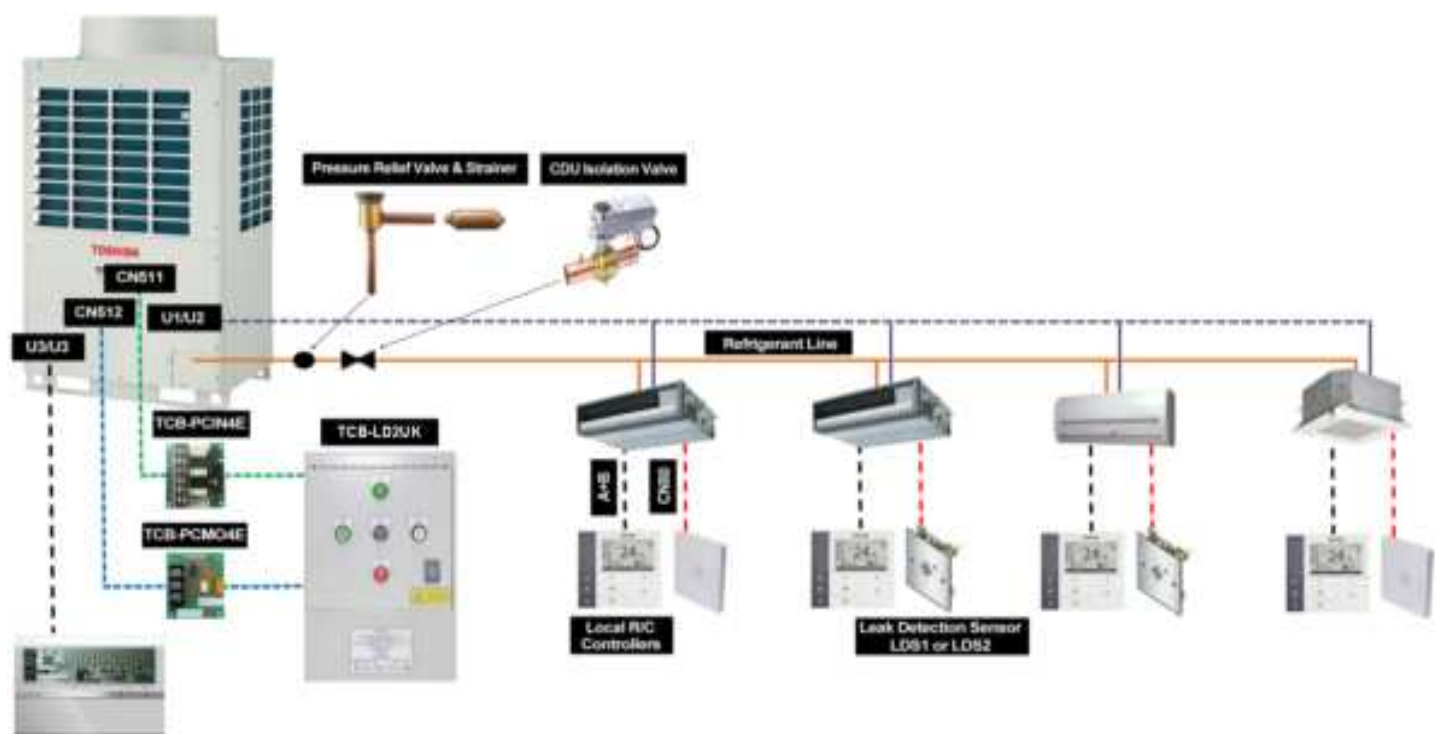
6 Overview: Leak Detection Isolation & Pump Back Module

The new Leak Detection Isolation & Pump Back Module enables automatic pump back of refrigerant from indoor side to outdoor, based on the detection of either an L30 fault code (activated via the external leak detection sensor – TCB-LDS1 and TCB-LDS2) or via an internal CDU based refrigeration detection control algorithm that continually monitors key system parameters.

Internal leak detection is completed via the continued monitoring of key system temperatures and pressures. When the software identifies that the refrigerant level within the system has dropped, a signal is sent from the CDU to the new LD2 control module activating a pump back operation (similar to that of test cool operation), returning refrigerant from the indoor side to the CDU. CDU isolation is achieved via dedicated isolation valves fitted to the main pipe work. On completion of the pump back a P15 fault code is displayed on both the 7 segment display on the CDU and the local / central remotes.

External leak detection (TCB-LDS1 or TCB-LDS2 sensors): Please refer to Installation Manual.

Refrigerant Detection & Pump Back Example:-



CAUTION

To Disconnect the Appliance from Main Power Supply

This appliance must be connected to the main power supply by means of a switch with a constant separation of at least 3mm.

7 Supplied Parts

- VRF applications require the LD2 Controller plus appropriately sized isolation valves and a pressure release valve (PRV).
- The PRV and strainer is a kit the installer needs to assemble on site (including brazing).
- The Isolation Valves will require installation on site (including brazing). There are 7 different size models depending on system specification (see page 6).

Box Contents TCB-LD2-UK Controller

Item	Description	Qty	Item	Description	Qty
	LD2 Controller	1		PRV (LPR-272D010)	1
	IOM: Installation & Owner's Manual (EN)	1		Strainer (A18025)	1

Required Accessories

Item	Description	Qty
	Isolation Valve (AW 17861 - AW 17867)	2*
	TCB-PCIN4E	1
	TCB-PCM04E	1

* Customers will need to purchase three isolation valves for 3 pipe systems (MMY-MAP-6FT8P-E).



CAUTION

- Ensure that all Local, National and International regulations are satisfied.
- Read this "PRECAUTIONS FOR SAFETY" carefully before installation.
- The precautions described below include the important items regarding safety. Observe them without fail.
- After the installation work, perform a trial operation to check for any problem.
- Read this Manual to explain how to use and maintain the unit.
- Turn off the main power supply switch (or breaker) before the unit maintenance.
- Ask the customer to keep this installation owner's manual.

8 Installation

■ PRODUCT SPECIFICATION

LD2 Controller

Model Name		TCB-LD2-UK	
Model Group		VRF (SMMSe / SHRMe / Mini SMMSe)	
Function		Leak Detection & Pump Back Control Module	
Function Summary		Automatic Pump back of refrigerant from indoor side to outdoor, based on the detection of either a L30 fault code (activated via the external leak detection sensor - LDS1 and LDS2) or via an internal CDU based refrigeration detection control algorithm that continually monitors key system parameters.	
Target Application		All VRF (SMMSe / SHRMe / Mini SMMSe) installations, where refrigerant concentration levels could exceed 0.44Kg/Cm ² (EN378), within an occupied space.	
Height	mm	400	
Width	mm	300	
Depth	mm	155	
Weight	kg	10	
Switch/Indicator Protection *		Hinged Perspex Cover	
Standard Rating	IP	65	
Low Ambient Protection Heater *	W	14	
Audible Alarm		Yes	
Audible Alarm Sound Level	dB	80	
Alarm Mute		Yes	
Remote Indication Relay *	V	0	
Visual Indicator (Neon)		Yes (Leak Detection - External and Internal)	
Fault Code generated to Local Remote Controller		Yes (L30 or P15 depending on system setup and fault location)	
Fault Code generated on CDU 7-Segment display		Yes (L30 or P15 depending on system setup)	
Power Supply		1 Phase 230V 50Hz	
Fused Supply	A	5	
Number of Inputs		6	
Number of Outputs		8	



* Fitted accessory

Refrigerant Line Filter

Model Name		Pressure Relief Valve - Strainer	
Model Group		Mueller Refrigeration Line Filters	
Function		Provides protection to the Pressure Relief Valve from debris within the pipework	
Refrigerant Pipe Connection (In/Out)	mm	9.4	
Mesh Rating		Stainless Steel 100 mesh	



Pressure Regulating Valve

Model Name		Pressure Relief Valve	
Model Group		Saginomiya	
Function		Pressure Regulating Valve (Liquid to Suction Lines)	
Refrigerant Pipe Connection (In/Out)	mm	6.35	
Setting Pressure	Mpa	4.15	
Maximum Working Pressure	MPa	4.3	



Refrigerant Isolation Valve

Model Name		AW17861	AW17862	AW17863	AW17864	AW17865	AW17866	AW17867
Model Series		I	I	I	I	II	II	II
Refrigerant Pipe Connection (In/Out)	mm	12.7	15.9	19.0	22.2	28.6	34.9	41.3
A	mm	102	102	107	107	116	128	136
B	mm	94.23	94.23	60	60	60	60	60
C	mm	94	94	94	94	94	150	150
D	mm	70	70	70	70	70	81	81
Weight	Kg	1.00	1.08	1.09	1.10	1.41	2.51	3.15
Running Time (Open - Close)	Sec	90 @ 60 Hz 125 @ 50 Hz	90 @ 60 Hz 125 @ 50 Hz	90 @ 60 Hz 125 @ 50 Hz	90 @ 60 Hz 125 @ 50 Hz	125 @ 60 Hz 150 @ 50Hz	125 @ 60 Hz 150 @ 50Hz	125 @ 60 Hz 150 @ 50Hz
Ambient Operation Limitations	°C	-32 to 55	-32 to 55	-32 to 55	-32 to 55	-32 to 55	-32 to 55	-32 to 55
Ambient Humidity Limitations	rh %	95	95	95	95	95	95	95
Power Consumption	VA	2.3	2.3	2.3	2.3	3	3	3
Operating Voltage	Vac	24 +20%, -15%	24 +20%, -15%	24 +20%, -15%	24 +20%, -15%	24 ±20%	24 ±20%	24 ±20%
Operation Frequency	Hz	50/60	50/60	50/60	50/60	50/60	50/60	50/60
IP Rating	IP	54	54	54	54	54	54	54
Model Group	Cyclemaster Actuated Ball Valves							
Function	Isolation of Refridgerant Pipework (Gas & Liquid)							
Series I		Series II						
								

■ System Compatibility Tables

The leak Detection System (LD2) is designed to operate within all current Toshiba VRF systems (Mini SMMSe, SMMSe and SHRMe).

Mini SMMSe

	Outdoor Unit Capacity Type (HP)		
Model Name	0404 (4)	0504 (5)	0604 (6)
TCB-LD2-UK	1	1	1
AW17861	1*	1*	1
AW17862	1	1	
AW17863			1
AW17864			
AW17865			
AW17866			
AW17867			

* Smallest valve size available is ½” (12.7mm) make adjustment to pipework to fit.

SMMSe

	Total Capacity codes of all outdoor units. Equivalent to HP							
Model Name	8 to below 10	10 to below 12	12 to below 14	14 to below 22	22 to below 24	24 to below 26	26 to below 36	36 or more
TCB-LD2-UK	1	1	1	1	1	1	1	1
AW17861	1	1	1					
AW17862				1				
AW17863	1				1	1	1	
AW17864		1						1
AW17865			1	1	1			
AW17866						1	1	
AW17867								1

SHRMe

	Total Capacity codes of all outdoor units. Equivalent to HP							
Model Name	8 to below 10	10 to below 12	12 to below 14	14 to below 22	22 to below 24	24 to below 26	26 to below 36	36 or more
TCB-LD2-UK	1	1	1	1	1	1	1	1
AW17861	2	2	2					
AW17862				2				
AW17863	1				2	2	2	
AW17864		1						2
AW17865			1	1	1			
AW17866						1	1	
AW17867								1

■ TCB-LD2-UK Controller (LD2)

The LD2 controller **must not** be installed outside. To maintain waterproof integrity IP65 glands **must be** used through the gland plate (To avoid damage; when making holes for cable glands, please first remove the gland plate from the LD2 controller).

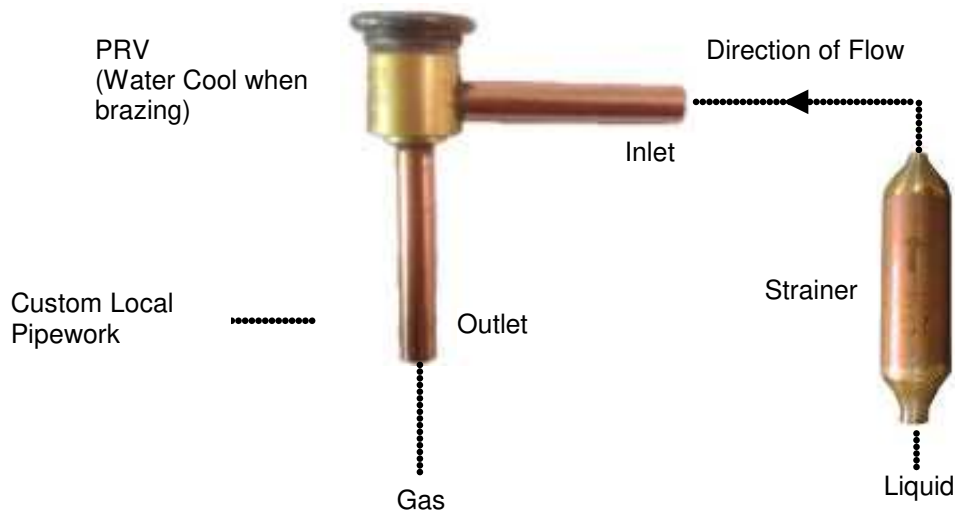


■ Pressure Relief Valve (PRV) Assembly

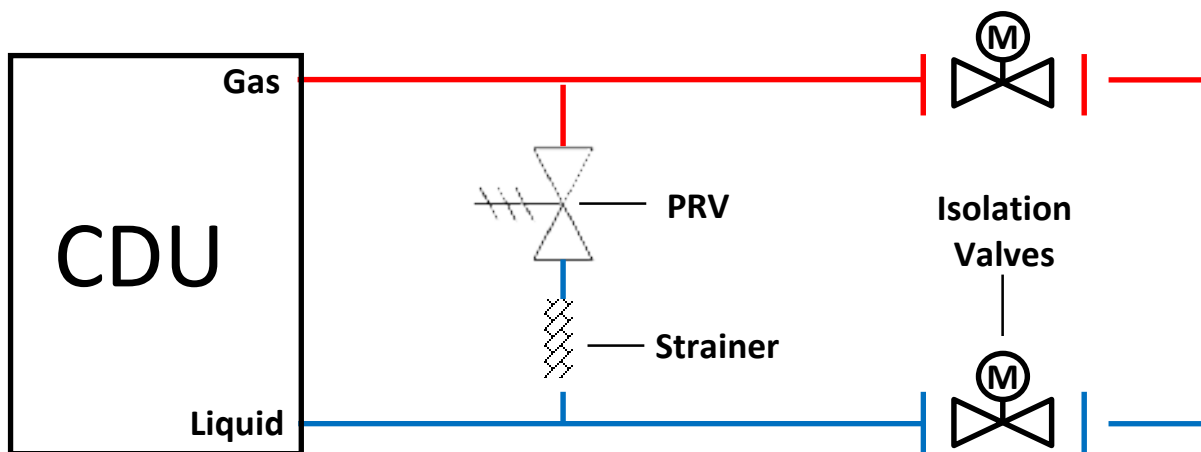
The supplied components **must be** installed into the refrigerant pipework locally. When installing the PRV please take note of the following guidelines.

- The PRV has a diameter of 6.35mm and the Strainer has a diameter of 9.4mm, therefore a locally sourced reducer must be used for this assembly.
- The PRV **must be** installed in an upright position with the strainer fitted on the inlet side of the PRV (Shown below).
- The PRV **must be** installed between the CDU and Isolation valves.
- The PRV body **must be** water cooled whilst brazing.

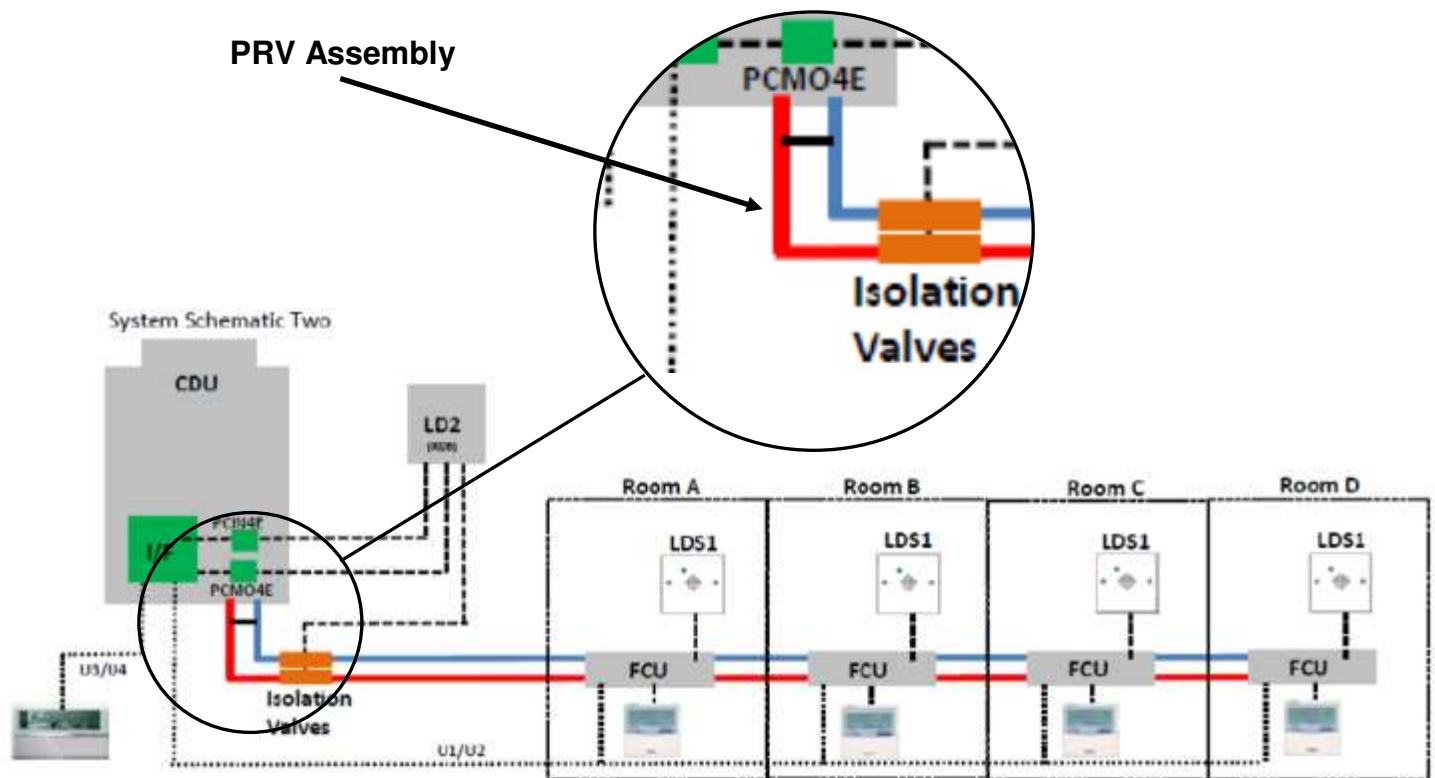
■ PRV Part Diagram



■ PRV & Isolation Valve Pipe Schematic



■ PRV & Isolation Valve Full Schematic Example



NOTES

1. Carefully handle and prepare the PRV when fitting to prevent ingress of foreign matter such as dust or water.
2. Cautions when Brazing PRV
 - a) Whilst brazing, the PRV body **must be** water cooled to keep the component's temperature below 100°C.
 - b) Whilst brazing, nitrogen gas **must be** flowed through the PRV valve and pipework to prevent internal oxidation.
 - c) Prevent cooling water from getting inside the PRV during brazing.

■ Isolation Valve Installation Summary

- The isolating valves are to be fitted in accordance with the instructions supplied with them.
- Ensure the valves are located inside the building
- Do not install within the protected refrigerant detection area.
- Do not install inside an area that is noise sensitive.
- Connect the isolation valve wiring to the dedicated terminals within the LD2 control panel, as detailed within this installation manual.
- Where indoor pipework diameter is smaller than the valve pipe diameter, a reducer should be used (locally procured).



WARNING

- DO NOT OPEN THE ACTUATOR. IF THE ACTUATOR IS INOPERATIVE, REPLACE THE UNIT.
- Do not wire different types of actuators in parallel with these models.
- Personal injury/loss of life may occur if a procedure is not performed as specified.
- Equipment damage or loss of data may occur if the user does not follow a procedure as specified.
- To avoid injury or loss of life, pay attention to any hazardous voltage when performing checks.

IMPORTANT - Before commencing brazing of valve and pipe connection joints the valve **must be** in the "Open" position. Failure to manually open the valve may result in damage to internal components and malfunction in operation.

ISOLATION VALVE FITTING INSTRUCTIONS

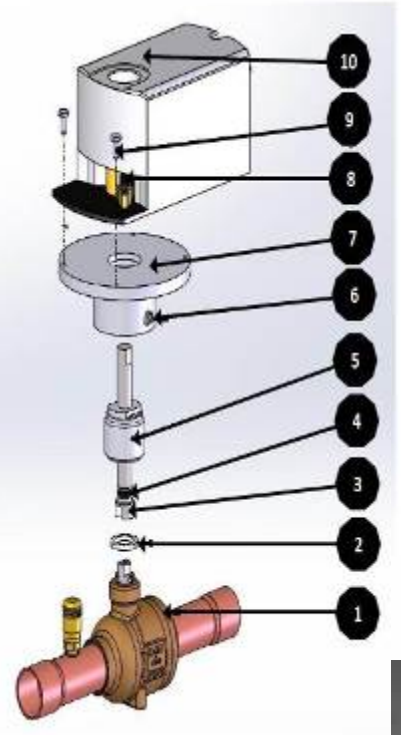
1. To prevent damage to the valve assembly during installation, it is recommended that both the actuator (10) and the hub assembly (2-7) be removed prior to brazing. If this is not possible it is essential that the actuator and hub assembly be kept cool and isolated from the heat source, without the actuator getting wet.
2. To remove the actuator (10) from the hub assembly it is necessary to 1st loosen the adjustment lever (8) and then unscrew the two retaining Hex bolts (9) from the hub assembly (7). The actuator (10) can then be safely lifted and removed away from the hub (7).
3. The hub assembly (2-7) can then be removed from the valve body, by unscrewing the two retaining set screws (6) and then rotating the hub assembly in an anti-clockwise direction.
4. The ball valve (1) can then be brazed into the refrigeration pipework. Ensure the Schrader valve is removed (not fitted out of the box). It is recommended a wet rag is wrapped around the valve body, during brazing.
5. To refit Hub assembly and actuator reverse steps 1-4 above.

Additional Notes:

1. During the removal of the actuator (10), the shaft adapter inside the actuator may come loose. To refit align the shaft adapter with the Adjustment lever as shown in the picture. Ensure the raised tabs on the adapter are inserted last, as the act as the end stop
2. The Hub (7) needs not to be tightened all the way to the bottom of the valve body. Instead ensure orientation is correct and then secure with set screws (6) provided.

ISOLATION VALVE ASSEMBLY

Ballon #	Description
1	Ball Valve
2	Seal Cap Gasket
3	Sealed Hub Stem
4	O-ring Seals (2)
5	Seal Mechanism
6	Set Screws (2)
7	Hub
8	Adjustment Lever
9	Hex Head Bolts (2)
10	Actuator (Motor)



Shaft Adapter



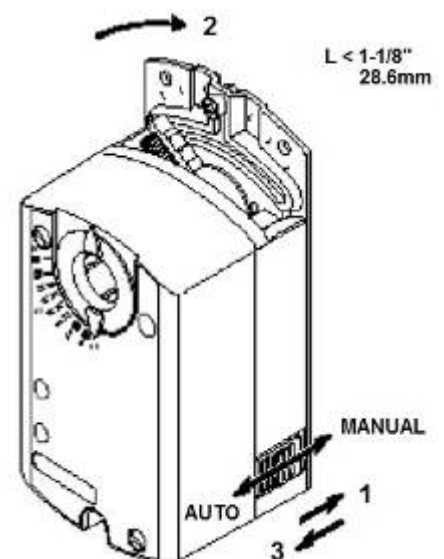
Shaft Adapter Aligned with Adjustment Lever

Isolation Valve Manual Override Procedure

To move the valve and lock the position with no power present:

1. Slide the red manual override knob toward the back of the actuator.
2. Make adjustments to the valve position
3. Slide the red manual override knob toward the front of the actuator.

Once power is restored, the actuator returns to automatic control.



9 Electrical Work

WARNING

- **Using the specified wires, ensure to connect the wires, and fix wires securely so that the external tension to the wires does not affect the connecting part of the terminals.**
Incomplete connection or fixation may cause a fire, etc.
- **Be sure to connect earth wire (grounding work).**
Incomplete grounding causes an electric shock. Do not connect ground wires to gas pipes, water pipes, lightning rods or ground wires for telephone wires.
- **Appliance shall be installed in accordance with national wiring regulations.**
Capacity shortage of power circuit or incomplete installation may cause an electric shock or a fire.

CAUTION

- If incorrect / incomplete wiring is carried out, it will cause an electrical fire or smoke.
- Be sure to install an earth leakage breaker that is not tripped by shock waves. If an earth leakage breaker is not installed, an electric shock may be caused.
- Do not damage or scratch the conductive core and inner insulator of power and inter-connecting wires when stripping the insulation.
- Use the power cord and inter-connecting wire of specified thickness, type and protective devices required

REQUIREMENT

- For power supply wiring, strictly conform to the Local Regulation for each country.
- For wiring of power supply of the outdoor units, follow the Installation manual of each outdoor unit.
- Perform the electric wiring so that it does not come in to contact with the high-temperature part of the pipe. The cable insulation may melt in an accident
- Be sure to remove the gland plate from the LD2 CONTROLLER when drilling gland holes. Use IP65 cable glands when installing wires through the gland plate of the LD2 CONTROLLER.
- Run the refrigerant piping and control wiring line in the same line.
- Do not turn on the power of the LD2 CONTROLLER until vacuuming of the refrigerant pipes is complete.

■ Power Supply Wire and Interconnecting Wires Specifications

Power supply wire and interconnecting wires are procured locally.

For the power supply specifications, see page 11 and follow the table. If the current carrying capacity of the cable is low then the cable may overheat.

For specifications of the power capacity of the outdoor unit and the power supply wires, refer to the Installation manual attached to the outdoor unit.

Cable size must be calculated for site condition and correct glands fitted. All cables should be in conduit or armoured cables correctly glanded. This has to be done by the site installer.

LD2 CONTROLLER power supply

- For the power supply of the LD2 CONTROLLER, prepare the exclusive power supply separated from that of the outdoor unit.
- Power supply wire specification: Cable 3-Core 1.5mm², **in conformity with Design 60245 IEC 57.**

▼ Power supply wire

Power supply	220~240V ~ 50Hz	
Power supply switch / Earth leakage breaker or power supply wirings / fuse rating for LD2 CONTROLLER should be selected by the accumulated total current values of the LD2 controller		
Power supply wiring	Below 50m	1.5mm ²
Recommended internal low voltage fuse (24VAC)	T500mA	
Recommended internal high voltage fuse (230VAC)	T1A	

■ Wire Specification Table

Power Supply Cable			
Wire Description	No. Cores	Max Length	Ø
Single Phase Power Cable	3	50m	1.5 mm ²
LD2 Input			
I1	2 (Screen)	≤200	0.75mm ²
I2	2 (Screen)	≤200	0.75mm ²
I4	2 (Non-screen)	≤100	0.5 – 1.00 mm ²
LD2 Output			
Q1	2 (Screen)	≤500	0.75mm ²
Q2	3 (Non-screen)	100	0.5 – 1.00 mm ²
Q3	3 (Non-screen)	100	0.5 – 1.00 mm ²
Q4	3 (Non-screen)	100	0.5 – 1.00 mm ²
EQ1	3 (Non-screen)	100	0.5 – 1.00 mm ²
EQ4	2 (Screen)	≤500	0.75mm ²

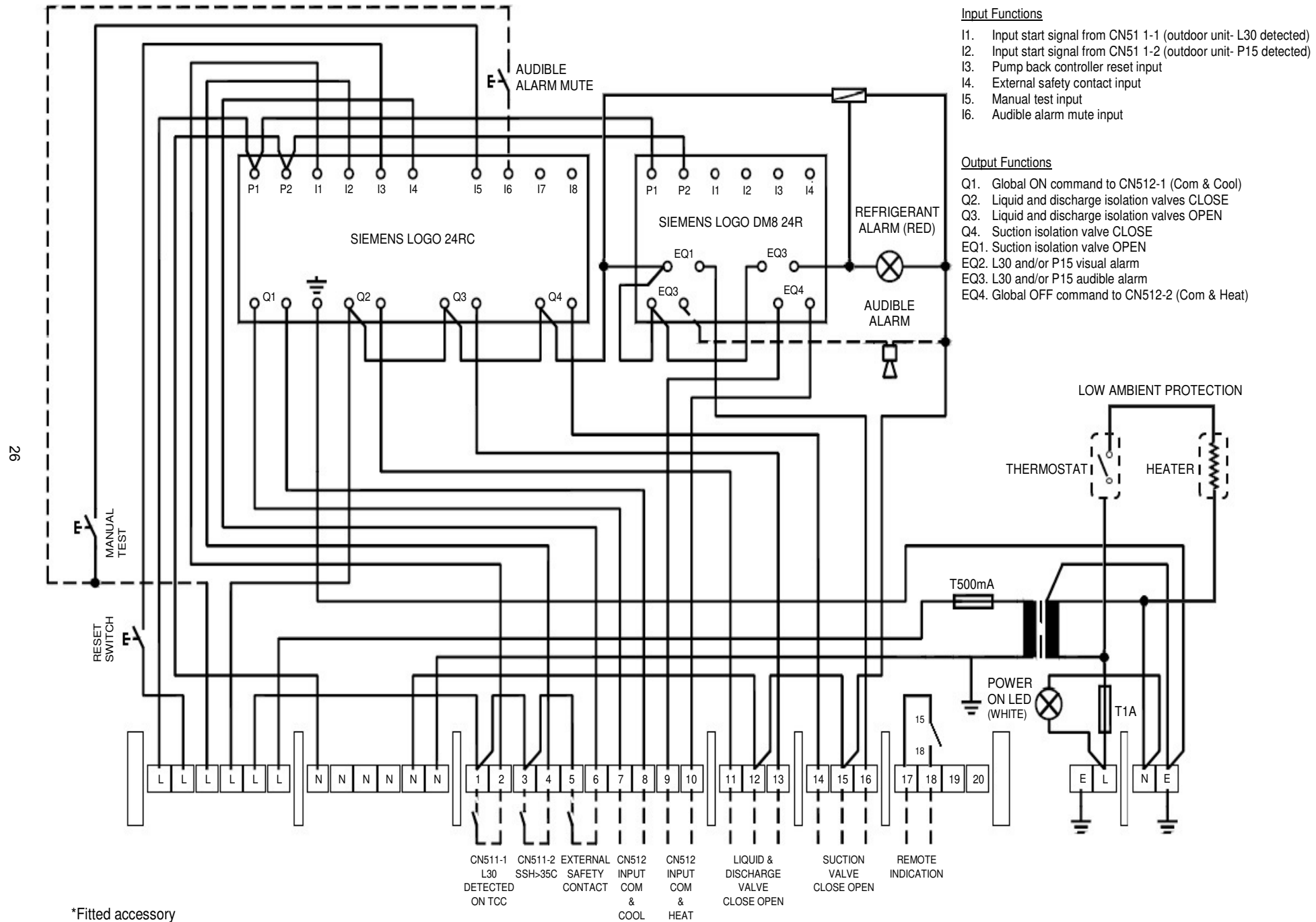
■ Summary of Inputs and Outputs

Key	Description	Type	Terminal
I1	Input start signal from CN511_1 (Outdoor unit – L30 detected)	DI	1 & 2
I2	Input start signal from CN511_2 (Outdoor unit – P15 detected)	DI	3 & 4
I3	Pump back controller reset input	DI	No External Connection
I4	External safety contact input	DI	5 & 6
I5	Manual test input	DI	No External Connection
I6	Audible alarm mute input	DI	No External Connection
Q1	Global ON command to CN512_1 (Com & Cool)	DO	7 & 8
Q2	Liquid and discharge isolation valves CLOSE	DO	11 & 12
Q3	Liquid and discharge isolation valves OPEN	DO	12 & 13
Q4	Suction isolation valve CLOSE	DO	14 & 15
EQ1	Suction isolation valve OPEN	DO	15 & 16
EQ2	L30 and / or P15 visual alarm	DO	No External Connection
EQ3	L30 and / or P15 audible alarm	DO	No External Connection
EQ4	Global OFF command to CN512_2 (Com & Heat)	DO	9 & 10

■ TCB-LD2-UK Electrical Connections

[illegible]

Terminal Label	Item	Description
24VAC L	Internal Power (x4)	No connection required - <i>internal use only</i>
24VAC N	Internal Power (x2)	No connection required - <i>internal use only</i>
1 & 2	Input CN511.1	Cable connection from Output 1 on PCB (TCB-PCIN4E Output 1)
3 & 4	Input CN511.2	Cable connection from Output 2 on PCB (TCB-PCIN4E Output 2)
5 & 6	External Safety Input	Safety switch connection
7 & 8	Global ON	Input 512_1 Cable connection from option PCB (TCB-PCMO4E - COM & COOL)
9 & 10	Global OFF	Input 512_2 Cable connection from option PCB (TCB-PCMO4E - COM & HEAT)
11	Liquid & Discharge Isolation Valve Connection	Isolation valve CLOSE connection (Violet)
12		Isolation valve COMMON connection (Red)
13		Isolation valve OPEN connection (Orange)
14	Suction Isolation Valve Connection	Isolation valve CLOSE connection (Violet)
15		Isolation valve COMMON connection (Red)
16		Isolation valve OPEN connection (Orange)
17 ~ 18	Remote Indication	0 volt connection (used with other monitoring panels)
19 ~ 20	Spare Terminals	No connection required - <i>No operation</i>
L & N & $\equiv$ (E)	Power Supply	The LD2 CONTROLLER should be connected to the main power supply by means of a switch with a contact separation of at least 3mm.



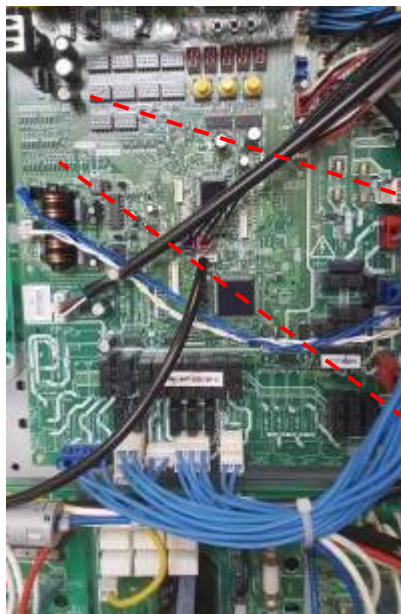
*Fitted accessory

10 Applicable Controls

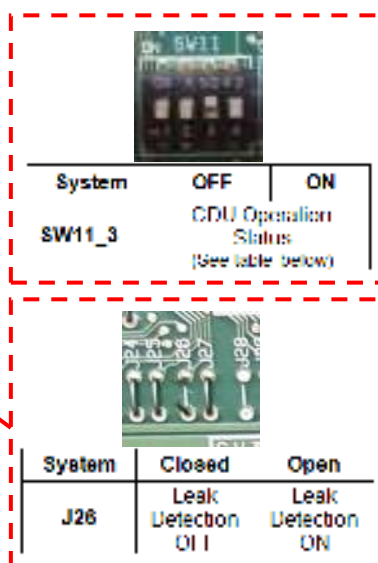
- **CDU requires configuration change to set system for Leak Detection Operation**
- The following options can be set:
 - ❖ Leak detection ON/OFF
 - ❖ CDU operation
 - ❖ SSH detection temperature
- **See configuration set up below**

■ System Configuration

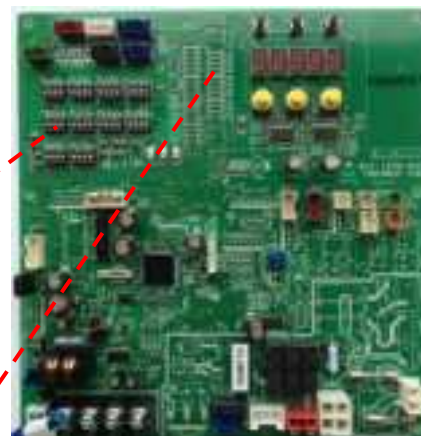
SMMS-e / SHRM-e CDU I/F PCB



The CDU requires leak detection (TCB-LD2-UK) activation through set up of control I/F PCB



Mini SMMS-e CDU I/F PCB



■ Option 1: External Leak Detection Activation (LDS1/2 Activation)

The software has been designed to maximise as far as possible the flexibility of the leak detection control. Depending on the setup chosen by the end user, the control can effectively be split into four (4) different setups (control methods). These are detailed within the table below –

System Setup

Control Method	Outdoor PCB Configuration		TCB-PCIN4E Connection Status (CN511)	TCB-PCMO4E Connection Status (CN512)
	Jumper 26	Switch 11 Bit 3		
1	Cut	Off	Connect	Connect
2	Cut	Off	NOT Connect	Connect
3	Cut	On	Connect	Connect
4	Cut	On	NOT Connect	Connect

System Control Procedure

Control Method	Leak Detection Sensor Activation Status (CN80)	CDU Operation Status	CDU 7 Segment Display	FCU Error Unit (CN80 Short Circuit)		Other FCU Unit (CN80 Open)		LD2 Controller Operation	
				R/C On Display	R/C Off Display	R/C On Display	R/C Off Display	Liq / Dis / Suc Valve Operation	Visual & Audible Alarms
1	Activated	Pump Back Operation	P15	L30	R/C Off > On = L30	P15	R/C Off > On = P15	Off (Open) > On (Close)	Off > On
2	Activated	Normal Operation	No Error Displayed	L30	R/C Off > On = L30	Normal	No Display (Std)	No Action	No Action
3	Activated	System STOP	L30	L30	R/C Off > On = L30	Ready	No Display (Std)	Off (Open) > On (Close)	Off > On
4	Activated	System STOP	L30	L30	R/C Off > On = L30	Ready	No Display (Std)	No Action	No Action

■ Option 2: Internal Leak Detection Activation (SSH Activation)

The internal leak detection software, based on the detection of Suction Superheat levels (SSH) provides the end user with four (4) options. These are detailed within the tables below –

System Setup

Control Method	Outdoor PCB Configuration		TCB-PCIN4E Connection Status (CN511)	TCB-PCMO4E Connection Status (CN512)
	Jumper 26	Switch 11 Bit 3		
5	Cut	Off	Connect	Connect
6	Cut	Off	NOT Connect	Connect
7	Cut	On	Connect	Connect
8	Cut	On	NOT Connect	Connect

System Control Procedure

Control Method	Internal Detection Control Activated	CDU Operation Status	CDU 7 Segment Display	FCU Units		LD2 Controller Operation	
				R/C On Display	R/C Off Display	Liq / Dis / Suc Valve Operation	Visual & Audible Alarms
5	Activated	Pump Back Operation	P15	P15	R/C Off > On = P15	Off (Open) > On (Close)	Off > On
6	Activated	Normal Operation	No Error Displayed	Normal	No Display (Std)	No Action	No Action
7	Activated	Pump Back Operation	P15	P15	R/C Off > On = P15	Off (Open) > On (Close)	Off > On
8	Activated	Normal Operation	No Error Displayed	Normal	No Display (Std)	No Action	No Action

■ SSH Set Up

- **Suction Super Heat (SSH)** detection value may be adjusted for your system.
- This is adjusted using a combination of the following;
 - ❖ Rotary switches (SW01, SW02 & SW03)
 - ❖ SW15 for interaction & setting
 - ❖ SW04 & SW05 for temperature adjustment
- Minimum & maximum settings are 20 & 99 respectively
- See below for detailed operation



- System no operation (compressor OFF)
- Set Rotary switches SW01 [2], SW02 [12] & SW03 [14]
- 7-SEG shows [SH] [35] (If J26 NOT cut, 7-SEG display is blank) *
- SW15 push for over 15 sec (7-SEG blink)
- SW04 push over 1 sec SSH +1K. SW04 push over 2sec SSH +5K
- SW05 push over 1 sec SSH -1K. SW05 push over 2sec SSH -5K
- SW15 push over 5 sec, SSH data set
- Change rotary switch (SW01, SW02 & SW03) to position 0 to release SSH setting.



CAUTION

- The SSH default control temperature is set to 35°C. Changes to this value may result in false or no operation of SSH detection.

11 Test Run

■ Preparation

- Before turning on the power supply, carry out the following procedure.
 - 1) Using 500V-Megger, check that the resistance of 1MΩ or more exists between the terminal block of the power supply and the earth (grounding).
If resistance of less than 1MΩ is detected, do not run the unit.
 - 2) Check the service valve of the outdoor unit is fully opened.
- To protect the compressor at activation time, leave power-ON for 12 hours or more before operating.
- Before starting a test run, be sure to set addresses following the installation manual supplied with the outdoor unit.

■ How to Execute a Test Run

Turn on power to the Indoor Unit(s), CDU(s) and LD2 controller, using this order of operation.

All units will initialise on power ON.

The LD2 initialises for a duration of 2 minutes and the isolation valves are forced open during the process.

Insert the key into the MANUAL test switch on the front of the LD2 controller

Turn the key switch clockwise and hold until the alarm activates.

The switch has an auto return facility and on release the key the switch will return to the standby position.

Observe the actions below to ensure test run is successful.

- **Visual and Audible alarms will sound and system will enter pump back mode.**
- During Manual test operation the following may be observed:
 - ❖ CDU operation (compressor ON)
 - ❖ Liquid & Discharge valves close
 - ❖ Suction valve close
 - ❖ System stop and check codes displayed
- **On completion of Manual test operation the LD2 can be reset using the RESET button mounted inside the controller.**
- **The buzzer may be silenced during the test run and normal operation by using the following procedures;**
 - ❖ Press Buzzer Mute button ≤ 1 second – Buzzer 2hrs Off then constant operation
 - ❖ Press Buzzer Mute button ≥ 5 seconds – Buzzer OFF

N.B. System cannot be RESET until the test operation has been completed.



CAUTION

- Do not use the forced test run for cases other than a system test because it applies excessive load to the devices.
-

12 Reset

This procedure **must not** be completed until an engineer with the relevant qualifications has inspected, repaired and verified the system integrity.

■ Preparation

- The LD2 controller cannot be reset when the CDU(s) and/or the Indoor Unit(s) have error codes in relation to leak detection protocols; the result is continuous operation of the LD2 controller and alarms.
- Before pressing the reset button mounted on the inside of the controller ensure the following has been completed;
 - 1) Power supply to CDU(s) **must be** power OFF.
 - 2) Power supply to Indoor Unit(s) **must be** power OFF.

■ How to Execute Reset

- Open the TCB-LD2-UK controller panel door
 - Press and hold the Reset button ≥ 1 second
 - The TCB-LD2-UK controller now starts the reset process as follows;
 - ❖ Liquid, discharge & suction valves open
 - ❖ Audio & visual alarms active
 - **On completion of reset operation, the LD2 controllers audio & visual alarms will silence**
 - Power OFF LD2 Controller
 - Power ON Indoor Unit(s)
 - Power ON CDU(s)
 - Power ON LD2 controller
 - **The air conditioner is now ready to be operated**
-



CAUTION

- Do not use the reset function if the system has not been investigated by an engineer with the relevant qualifications to inspect the air conditioner

13 Trouble Shooting

■ Using a Wired Remote Controller

■ Confirmation and Check

When a trouble occurred in the air conditioner, the check code and the indoor unit No. appear on the display part of the remote controller.

The check code is only displayed during the operation.

If the display disappears, operate the air conditioner according to the following "Confirmation of error history" for confirmation.

■ Confirmation of Error History

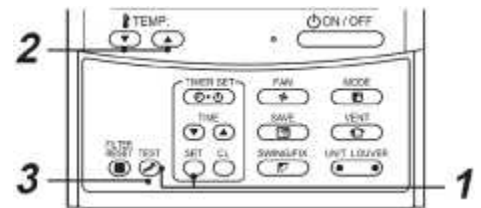
When a trouble occurred on the air conditioner, the trouble can be confirmed with the following procedure. (The trouble history is stored up to 4 troubles.)

The history can be confirmed from both operating status and stop status.



Check code

Indoor unit No. in which an error occurred

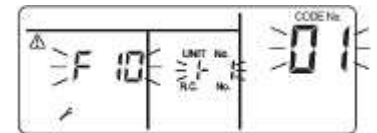


Procedure 1

When pushing and buttons at the same time for 4 seconds or more, the following display appears.

If [service check] is displayed, the mode enters in the trouble history mode.

- [01: Order of trouble history] is displayed in CODE No. window.
- [Check code] is displayed in CHECK window.
- [Indoor unit address in which an error occurred] is displayed in Unit No.



Procedure 2

Every pushing of "TEMP." button used to set temperature, the trouble history stored in memory is displayed in order.

The numbers in CODE No. indicate CODE No. [01] (latest) → [04] (oldest).

REQUIREMENT

Do not push button because all of trouble history will be deleted.

Procedure 3

After confirmation, push button to return to the usual display.

▼ Common Check Codes Relating to Leak Detection

Check Code	Description
L30	External Interlock of Indoor Unit – refrigerant leak detected at indoor unit on activation of LDS1 or LDS2 sensors.
P15	Gas Leak Detection – refrigerant leak detected at CDU when SSH is $\geq 35^{\circ}\text{C}$ for 15 minutes or over.

■ LD2 Visual Fault Sequences

The LED visual alarm (FCU/CDU) on the front panel of the LD2 controller will activate in different sequences to indicate a specific fault on the connected system. The specific faults and corresponding LED sequences are listed below.

Fault	LED Sequence
L30 (Indoor)	Continuous Light
External Safety	Continuous Light
Manual Test	Continuous Light
P15 (CDU)	Flashing Light (1s ON, 1s OFF)
Power Failure	Flashing Light (10s ON, 10s OFF)

14 Declaration of Conformity

DECLARATION OF CONFORMITY

Directives: 2002/95/EC: Restriction of the use of certain hazardous substances (RoHS)
2014/35/EU: Low Voltage Directive
2004/108/EC: Electromagnetic compatibility

Manufacturer: Carrier Solutions UK Ltd.

Address: Porsham Close
Belliver Industrial Estate
Plymouth
PL6 7DB

Apparatus: TCB-LD2UK
Air conditioning Control Accessory

**Standards to which
conformity is declared:** EN 60529: 1992
EN 61439-1: 2011
EN 61439-2: 2011
EN 61000-6-2: 2005
EN 61000-6-4: 2007

Note: This declaration becomes invalid if technical or operational modifications
are introduced without the manufacturers consent.

Signed:



Position: Engineering Director, Carrier Solutions UK Ltd.
Date of Issue: 17th November 2016
Place Issued: United Kingdom

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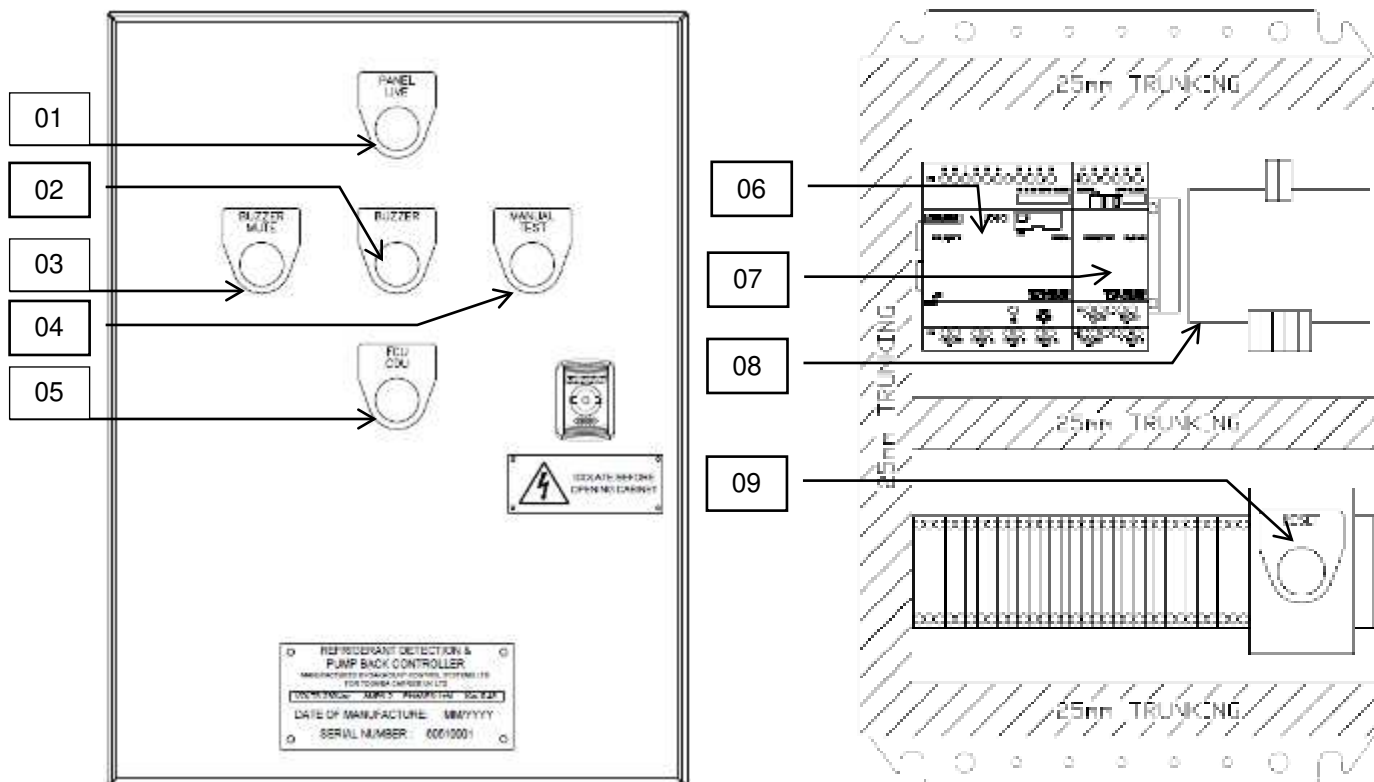
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15 Service Parts

■ **TCB-LD2-UK Controller**



Location No.	Part No.	Description	Qty
01	43AOAK01	Green LED 240V (Power ON)	1
02	43AOAK02	Buzzer Element 24V AC/DC	1
03	43AOAK03	Push Button 1NO (Black) (Buzzer Mute)	1
04	43AOAK04	2 Position Spring Return Key Switch (Manual Test)	1
05	43AOAK06	Red LED 24V AC/DC (Alarm ON)	1
06	43AOAK07	Siemens 24RCo Logic Module	1
07	43AOAK08	Siemens DM8 24R Expansion Module	1
08	43AOAK09	Siemens Transformer	1
09	43AOAK10	Push Button 1NO (Green) (Reset)	1

Accessory Fitted	Part No.	Description	Qty
01	RBC-LAHL D2	Low Ambient Protection Heater	1
02	RBC-LATLD2	Low Ambient Thermostat	1
03	RBC-RICLD2	Remote Indication Relay	1
04	RBC-HPCLD2	Hinged Perspex Cover to Protect Switch/Indicators	1

■ PRV, Strainer & Valves



Location No.	Part No.	Description	Qty
101	43APJ010	Pressure Relief Valve (PRV)	1
102	43APJ025	Strainer	1
103	43APJ08A	Valve Actuator (AW17861 1/2" / 12.7mm)	1
	43APJ08B	Valve Actuator (AW17862 5/8" / 15.9mm)	1
	43APJ08C	Valve Actuator (AW17863 3/4" / 19.0mm)	1
	43APJ08D	Valve Actuator (AW17864 7/8" / 22.2mm)	1
	43APJ08E	Valve Actuator (AW17865 1 1/8" / 28.6mm)	1
	43APJ09A	Valve Actuator (AW17866 1 3/8" / 34.9mm)	1
	43APJ09B	Valve Actuator (AW 17867 1 5/8" / 41.3mm)	1
104	43APJ861	Ball Valve (AW17861 1/2" / 12.7mm)	1
	43APJ862	Ball Valve (AW17862 5/8" / 15.9mm)	1
	43APJ863	Ball Valve (AW17863 3/4" / 19.0mm)	1
	43APJ864	Ball Valve (AW17864 7/8" / 22.2mm)	1
	43APJ865	Ball Valve (AW17865 1 1/8" / 28.6mm)	1
	43APJ866	Ball Valve (AW17866 1 3/8" / 34.9mm)	1
	43APJ867	Ball Valve (AW17867 1 5/8" / 41.3mm)	1

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Fault code diagnosis apps now available
For
Apple iPhone & Android



24 Hour Technical Helpline: 0330 236 8630 option 5

Fault & DN Code Apps: Android & iPhone Web Page

toshiba-calc.co.uk/fault-codes/
technical.enquiries@toshiba-ac.com

Technical Department

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