

HVAC OUTDOOR UNITS

Part 1 - General

1.01 SYSTEM DESCRIPTION

The variable capacity, heat pump heat recovery air conditioning system shall be a Mitsubishi Electric CITY MULTI VRZ (Variable Refrigerant Flow Zoning) or equivalent. Refer to manufacture requirements for all supportive system.

The system shall consist of a outdoor unit, BC (Branch Circuit) Controller, multiple indoor units, and M-NET DDC (Direct Digital Controls). Each indoor unit or group of indoor units shall be capable of operating in any mode independently of other indoor units or groups. System shall be capable of changing mode (cooling to heating, heating to cooling) with no interruption to system operation. To ensure owner comfort, each indoor unit or group of indoor units shall be independently controlled and capable of changing mode automatically when zone temperature strays 1.8 degrees F from set point for ten minutes. The sum of connected capacity of all indoor air handlers shall range from 50% to 150% of outdoor rated capacity.

1.02 QUALITY ASSURANCE

- A. The units shall be listed by Electrical Testing Laboratories (ETL) and bear the ETL label.
- B. All wiring shall be in accordance with the National Electrical Code (N.E.C.).
- C. The units shall be manufactured in a facility registered to ISO 9001 and ISO14001 which is a set of standards applying to environmental protection set by the International Standard Organization (ISO).

- D. All units must meet or exceed the 2010 Federal minimum efficiency requirements and the proposed ASHRAE 90.1 efficiency requirements for VRF systems. Efficiency shall be published in accordance with the DOE alternative test procedure, which is based on the Air-Conditioning, Heating, and Refrigeration Institute (AHRI) Standards 340/360, 1230 and ISO Standard 13256-1.
- E. A full charge of R-410A for the condensing unit only shall be provided in the condensing unit.

1.03 DELIVERY, STORAGE AND HANDLING

- A. Unit shall be stored and handled according to the manufacturer's recommendation.

1.04 CONTROLS

- A. The control system shall consist of a low voltage communication network of unitary built-in controllers with on-board communications and a web-based operator interface. A web controller with a network interface card shall gather data from this system and generate web pages accessible through a conventional web browser on each PC connected to the network. Operators shall be able to perform all normal operator functions through the web browser interface.
- B. System controls and control components shall be installed in accordance with the manufacturer's written installation instructions.
- C. Furnish energy conservation features such as optimal start, night setback, request-based logic, and demand level adjustment of overall system capacity as specified in the sequence.
- D. System shall provide direct and reverse-acting on and off algorithms based on an input condition or group conditions to cycle a binary output or multiple binary outputs.
- E. Provide capability for future system expansion to include monitoring and use of occupant card access, lighting control and general equipment control.
- F. System shall be capable of email generation for remote alarm annunciation.

G. Control system start-up shall be a required service to be completed by the manufacturer or a duly authorized, competent representative that has been factory trained in Mitsubishi controls system configuration and operation. The representative shall provide proof of certification for Mitsubishi CMCN Essentials Training and/or CMCN Hands-On Training indicating successful completion of no more than two (2) years prior to system installation. This certification shall be included as part of the equipment and/or controls submittals. This service shall be equipment and system count dependent and shall be a minimum of one (1) eight (8) hour period to be completed during normal working hours.

Part 2 - Warranty

2.01 The units shall be covered by the manufacturer's limited warranty for a period of one (1) year from date of installation.

If the systems are:

- 1) designed by a certified Designer,
- 2) installed by a contractor that has experience with the system
And training, AND

then the units shall be covered by an extended manufacturer's limited warranty for a period of five (5) years from date of installation.

In addition the compressor shall have a manufacturer's limited warranty for a period of seven (7) years from date of installation.

If, during this period, any part should fail to function properly due to defects in workmanship or material, it shall be replaced or repaired at the discretion of the manufacturer.

This warranty shall not include labor.

2.02 Manufacturer shall have a minimum of twenty-nine years of HVAC experience in the U.S. market.

2.03 All manufacturer technical and service manuals must be readily available for download by any local contractor should emergency service be required. Registering and sign-in requirements which may delay emergency service reference are not allowed.

2.04 The CITY MULTI VRFZ system shall be installed by a contractor with extensive CITY MULTI install and service training. The mandatory contractor service and install training should be performed by the manufacturer.

Part 3 - Products

3.01 OUTDOOR UNIT

A. General:

The outdoor unit shall be used specifically same manufacturer's components. The outdoor units shall be equipped with multiple circuit boards that interface to the manufacturer's recommended controls system and shall perform all functions necessary for operation. Each outdoor unit module shall be completely factory assembled, piped and wired and run tested at the factory.

1. The model nomenclature and unit requirements are shown below.

All units requiring a factory supplied twinning kits shall be piped together in the field, without the need for equalizing line(s). If an alternate manufacturer is selected, any additional material, cost, and labor to install additional lines shall be incurred by the contractor.

Outdoor Unit Model Nomenclature		
208/230 Volt		Twinning Kit
Model Number	Units	
PURY-P264TSKMU	(1) PURY-P120TKMU (1) PURY-P144TKMU	CMY-R100XLCBK

Outdoor Unit Model Nomenclature

Outdoor Unit Model Nomenclature		
460 Volt		Twinning Kit
Model Number	Units	
PURY-P264YSKMU	(1) PURY- P120YKMU	CMY- R100CBKXL
	(1) PURY- P144YKMU	

2. Outdoor unit shall have a sound rating no higher than 60 dB(A) individually or 64 dB(A) twinned. Units shall have a sound rating no higher than 50 dB(A) individually or 53 dB(A) twinned while in night mode operation. If an alternate manufacturer is selected, any additional material, cost, and labor to meet published sound levels shall be incurred by the contractor.
3. Both refrigerant lines from the outdoor unit to the BC (Branch Circuit) Controller (Single or Main) shall be insulated.
4. There shall be no more than 3 branch circuit controllers connected to any one outdoor unit.
5. Outdoor unit shall be able to connect to up to 50 indoor units depending upon model.
6. The outdoor unit shall have an accumulator with refrigerant level sensors and controls.
7. The outdoor unit shall have a high pressure safety switch, over-current protection, crankcase heater and DC bus protection.
8. The outdoor unit shall have the ability to operate with a maximum height difference of 164 feet and have total refrigerant tubing length of 1804-2625 feet. The greatest length is not to exceed 541 feet between outdoor unit and the indoor units without the need for line size changes or traps.

9. The outdoor unit shall be capable of operating in heating mode down to -4°F ambient temperatures or cooling mode down to 23°F ambient temperatures, without additional low ambient controls. If an alternate manufacturer is selected, any additional material, cost, and labor to meet low ambient operating condition and performance shall be incurred by the contractor.
 10. The outdoor unit shall be capable of operating in cooling mode down to -10°F with optional manufacturer supplied low ambient kit.
 11. Manufacturer supplied low ambient kit shall be provided with predesigned control box rated for outdoor installation and capable of controlling kit operation automatically in all outdoor unit operation modes.
 12. Manufacturer supplied low ambient kit shall be listed by Electrical Laboratories (ETL) and bear the ETL label.
 13. Manufacturer supplied low ambient kit shall be factory tested in low ambient temperature chamber to ensure operation. Factory performance testing data shall be available when requested.
 14. The outdoor unit shall have a high efficiency oil separator plus additional logic controls to ensure adequate oil volume in the compressor is maintained.
 15. The outdoor unit shall be provided with a manufacturer supplied 20 gauge hot dipped galvanized snow /hail guard. The snow/hail guard protects the outdoor coil surfaces from hail damage and snow build-up in severe climates.
 16. Unit must defrost all circuits simultaneously in order to resume full heating more quickly. Partial defrost which may extend "no or reduced heating" periods shall not be allowed.
- B. Unit Cabinet:
1. The casing(s) shall be fabricated of galvanized steel, bonderized and finished. Units cabinets shall be able to

withstand 960 hours per ASTM B117 criteria for seacoast protected models (-BS models)

C. Fan:

1. Each outdoor unit module shall be furnished with one direct drive, variable speed propeller type fan. The fan shall be factory set for operation under 0 in. WG external static pressure, but capable of normal operation under a maximum of 0.24 in. WG external static pressure via dipswitch.
2. All fan motors shall have inherent protection, have permanently lubricated bearings, and be completely variable speed.
3. All fan motors shall be mounted for quiet operation.
4. All fans shall be provided with a raised guard to prevent contact with moving parts.
5. The outdoor unit shall have vertical discharge airflow.

D. Refrigerant

1. refrigerant shall be required for outdoor unit systems.
2. Polyolester (POE) oil shall be required. Prior to bidding, manufacturers using alternate oil types shall submit material safety data sheets (MSDS) and comparison of hygroscopic properties for alternate oil with list of local suppliers stocking alternate oil for approval at least two weeks prior to bidding.

E. Coil:

1. The outdoor coil shall be of nonferrous construction with lanced or corrugated plate fins on copper tubing.
2. The coil fins shall have a factory applied corrosion resistant blue-fin finish.
3. The coil shall be protected with an integral metal guard.
4. Refrigerant flow from the outdoor unit shall be controlled by means of an inverter driven compressor.
5. The outdoor coil shall include 4 circuits with two position valves for each circuit, except for the last stage.

F. Compressor:

1. Each outdoor unit module shall be equipped with one inverter driven scroll hermetic compressor. Non inverter-driven

compressors, which cause inrush current (demand charges) and require larger wire sizing, shall not be allowed.

2. A crankcase heater(s) shall be factory mounted on the compressor(s).
3. The outdoor unit compressor shall have an inverter to modulate capacity. The capacity shall be completely variable with a turndown of 19%-5% of rated capacity, depending upon unit size.
4. The compressor will be equipped with an internal thermal overload.
5. The compressor shall be mounted to avoid the transmission of vibration.
6. Field-installed oil equalization lines between modules are not allowed. Prior to bidding, manufacturers requiring equalization must submit oil line sizing calculations specific to each system and module placement for this project.

G. Controls:

1. The outdoor unit shall have the capability of up to 8 levels of demand control for each refrigerant system

H. Electrical:

1. The outdoor unit electrical power shall be 208/230 volts, 3-phase, 60 hertz. or 460 volts, 3-phase, 60 hertz.
2. The outdoor unit shall be capable of satisfactory operation within voltage limits of 187-228 volts (208V/60Hz), 207-253V (230V/60Hz) or 414-506V (460V/60Hz).
3. Unit shall be controlled by integral microprocessors.
4. The control circuit between the indoor units, BC Controller and the outdoor unit shall be 24VDC completed using a 2-conductor, twisted pair shielded cable to provide total integration of the system.

Electrical:

1. The outdoor unit electrical power shall be 208/230 volts, 3-phase, 60 hertz.
2. The outdoor unit shall be capable of satisfactory operation within voltage limits of 187-228 volts (208V/60Hz), 207-253V (230V/60Hz).

3. The outdoor unit shall be controlled by integral microprocessors.
4. The control circuit between the indoor units, BC Controller and the outdoor unit shall be 24VDC completed using a 2-conductor, twisted pair shielded cable to provide total integration of the system.

I. Electrical:

1. The outdoor unit electrical power shall be 460 volts, 3-phase, 60 hertz.
2. The outdoor unit shall be capable of satisfactory operation within voltage limits of 414-506 volts.
3. The outdoor unit shall be controlled by integral microprocessors.
4. The control circuit between the indoor units, BC Controller and the outdoor unit shall be 24VDC completed using a 2-conductor, twisted pair shielded cable to provide total integration of the system.

3.02 BRANCH CIRCUIT (BC) CONTROLLERS

A. General

The BC (Branch Circuit) Controllers shall include multiple branches to allow simultaneous heating and cooling by allowing either hot gas refrigerant to flow to indoor unit(s) for heating or subcooled liquid refrigerant to flow to indoor unit(s) for cooling.

Refrigerant used for cooling must always be subcooled for optimal indoor unit LEV performance; alternate branch devices with no subcooling risk bubbles in liquid supplied to LEV and are not allowed.

The BC (Branch Circuit) Controllers shall be specifically used with systems. These units shall be equipped with a circuit board that interfaces to the controls system and shall perform all functions necessary for operation. The unit shall have a galvanized steel finish. The BC Controller shall be completely factory assembled, piped and wired. Each unit shall be run tested at the factory.

This unit shall be mounted indoors, with access and service clearance provided for each controller. The sum of connected capacity of all indoor air handlers shall range from 50% to 150% of rated capacity.

B. BC Unit Cabinet:

1. The casing shall be fabricated of galvanized steel.
2. Each cabinet shall house a liquid-gas separator and multiple refrigeration control valves.
3. The unit shall house two tube-in-tube heat exchangers.

C. Refrigerant

1. R410A refrigerant shall be required.

D. Refrigerant valves:

1. The unit shall be furnished with multiple branch circuits which can individually accommodate up to 54,000 BTUH and up to three indoor units. Branches may be twinned to allow more than 54,000 BTUH.
2. Each branch shall have multiple two-position valves to control refrigerant flow.
3. Service shut-off valves shall be field-provided/installed for each branch to allow service to any indoor unit without field interruption to overall system operation.
4. Linear electronic expansion valves shall be used to control the variable refrigerant flow.

E. Future Use

1. Each VRF system shall include at least one (1) unused branches or branch devices for future use. Branches shall be fully installed & wired in central location with capped service shutoff valve & service port.

F. Integral Drain Pan:

1. An Integral drain pan and drain shall be provided

G. Electrical:

1. The unit electrical power shall be 208/230 volts, 1 phase, 60 Hertz.
2. The unit shall be capable of satisfactory operation within voltage limits of 187-228 (208V/60Hz) or 207-253 (230/60Hz).

3. The BC Controller shall be controlled by integral microprocessors

4. The control circuit between the indoor units and outdoor units shall be 24VDC completed using a 2-conductor, twisted pair shielded cable to provide total integration of the system.

3.03 PLFY-P36NBMU-ER2 (4-WAY CEILING-RECESSED CASSETTE WITH GRILLE) INDOOR UNIT OR EQUIVALENT.

A. General

1. The unit shall be a four-way cassette style indoor unit that can be anchor to existing ceiling. The indoor unit shall be factory assembled, wired and run tested. Contained within the unit shall be all factory wiring, piping, electronic modulating linear expansion device, control circuit board and fan motor. The unit shall have a self-diagnostic function, 3-minute time delay mechanism, an auto restart function, an emergency operation function, a test run switch, and the ability to adjust airflow patterns for different ceiling heights. Indoor unit and refrigerant pipes shall be charged with dehydrated air before shipment from the factory.

B. Unit Cabinet:

1. The cabinet shall be space-saving ceiling-recessed cassette.
2. The cabinet panel shall have provisions for a field installed filtered outside air intake.
3. Branch ducting shall be allowed from cabinet.
4. Four-way grille shall be fixed to bottom of cabinet allowing two, three or four-way blow.
5. The grille vane angles shall be individually adjustable from the wired remote controller to customize the airflow pattern for the conditioned space

C. Fan:

1. The indoor fan shall be an assembly with a turbo fan direct driven by a single motor.
2. The indoor fan shall be statically and dynamically balanced to run on a motor with permanently lubricated bearings.
3. The indoor fan shall consist of five (5) speed settings, Low, Mid1, Mid2, High and Auto.
4. The fan shall have a selectable Auto fan setting that will adjust the fan speed based on the difference between controller set-point and space temperature.
5. The indoor unit shall have an adjustable air outlet system offering 4-way airflow, 3-way airflow, or 2-way airflow.
6. The indoor unit shall have switches that can be set to provide optimum airflow based on ceiling height and number of outlets used.
7. The indoor unit vanes shall have 5 fixed positions and a swing feature that shall be capable of automatically swinging the vanes up and down for uniform air distribution.
8. The vanes shall have an Auto-Wave selectable option in the heating mode that shall randomly cycle the vanes up and down to evenly heat the space.
9. If specified, the grille shall have an optional i-see sensor that will measure room temperature variations and adjust the airflow accordingly to evenly condition the space.

D. Filter:

1. Return air shall be filtered by means of a long-life washable filter

E. Coil:

1. The indoor coil shall be of nonferrous construction with smooth plate fins on copper tubing.
2. The tubing shall have inner grooves for high efficiency heat exchange.
3. All tube joints shall be brazed with phos-copper or silver alloy.
4. The coils shall be pressure tested at the factory.
5. A condensate pan and drain shall be provided under the coil.

6. The unit shall be provided with an integral condensate lift mechanism that will be able to raise drain water 33 inches above the condensate pan.

7. Both refrigerant lines to the PLFY indoor units shall be insulated.

F. Electrical:

1. The unit electrical power shall be 208/230 volts, 1-phase, 60 hertz.

2. The system shall be capable of satisfactory operation within voltage limits of 187-228 volts (208V/60Hz) or 207-253 volts (230V/60Hz).

G. Controls:

1. This unit shall use controls provided by Mitsubishi Electric to perform functions necessary to operate the system.

2. Indoor unit shall compensate for the higher temperature sensed by the return air sensor compared to the temperature at level of the occupant when in HEAT mode. Disabling of compensation shall be possible for individual units to accommodate instances when compensation is not required.

3. Control board shall include contacts for control of external heat source. External heat may be energized as second stage with 1.8°F - 9.0°F adjustable deadband from set point.

4. Indoor unit shall include no less than four (4) digital inputs capable of being used for customizable control strategies.

5. Indoor unit shall include no less than three (3) digital outputs capable of being used for customizable control strategies.

6. Manufacturer to provide drain pan level sensor powered by a 20-year life lithium battery. Sensor shall require no external power for operation and shall have an audible indication of low battery condition.

7. The drain pan sensor shall provide protection against drain pan overflow by sensing a high condensate level in the drain pan. Should this occur the control shuts down the indoor unit before an overflow can occur. A thermistor error code will be produced

should the sensor activate indicating a fault which must be resolved before the unit re-starts.

Part 4 - Controls

4.01 Overview

A. General:

The Controls Network (CMCN) shall be capable of supporting remote controllers, centralized controllers, an integrated web based interface, graphical user workstation, and system integration to Building Management Systems via BACnet® and LonWorks®. Coordinate with COR.

4.02 Electrical Characteristics

A. General:

The CMCN shall operate at 24VDC. Controller power and communications shall be via a common non-polar communications bus.

B. Wiring:

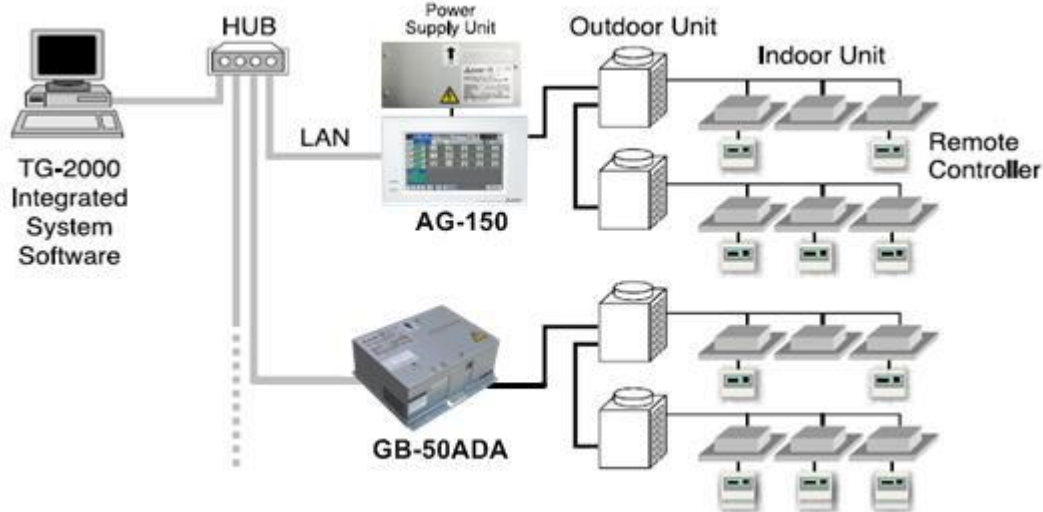
1. Control wiring shall be installed in a daisy chain configuration from indoor unit to ME remote controller to indoor unit, to the BC controller (main and subs, if applicable) and to the outdoor unit. Control wiring to remote controllers shall be run from the indoor unit terminal block to the controller associated with that unit.
2. Control wiring for centralized controllers shall be installed in a daisy chain configuration from outdoor unit to outdoor unit, to the system controllers (centralized controllers and/or integrated web based interface), to the power supply.
3. Control wiring for the Backlit MA, Deluxe MA, Simple MA, and Wireless MA remote controllers shall be from the remote controller to the first associated indoor unit (TB-15) then to the remaining associated indoor units (TB-15) in a daisy chain configuration.
4. The AG-150, GB-50ADA, GB-24 centralized controller shall be capable of being networked with other AG-150, GB-50ADA and GB-24 centralized controllers for centralized control.

C. Wiring type:

1. Wiring shall be 2-conductor (16 AWG), twisted, stranded, shielded wire as defined by the Diamond System Builder output.
2. Network wiring shall be CAT-5e with RJ-45 connection.

4.03 Controls Network

The Controls Network (CMCN) consists of remote controllers, centralized controllers, and/or integrated web based interface communicating over a high-speed communication bus. The Controls Network shall support operation monitoring, scheduling, error email distribution, personal web browsers, tenant billing, online maintenance support, and integration with Building Management Systems (BMS) using either LonWorks® or BACnet® interfaces. The below figure illustrates a sample CMCN System Configuration.



CMCN System Configuration or equivalent

4.04 CMCN: Remote Controllers

A. Backlit MA Remote Controller (PAR-30MAA)

The Backlit MA Remote Controller (PAR-30MAAU) shall be capable of controlling up to 16 indoor units (defined as 1 group). The Backlit MA Remote Controller shall be approximately 5" x 5" in size and white in color with an auto-timeout backlit LCD display. The Backlit MA Remote Controller shall support a selection from multiple languages (English, Spanish or French) for display

information. The Backlit MA supports temperature display selection of Fahrenheit or Celsius. The Backlit MA Remote Controller shall control the following grouped operations: On/Off, Operation Mode (cool, heat, auto (Simultaneous Heating and Cooling only), dry, and fan), temperature set point, fan speed setting, and airflow direction setting. The Backlit MA Remote Controller shall support timer settings of on/off/temperature up to 8 times in a day in 1-minute increments. The Backlit MA Remote Controller shall support an Auto Off timer. The Backlit MA Remote Controller shall be able to limit the set temperature range from the Backlit MA. The room temperature shall be sensed at either the Backlit MA Remote Controller or the Indoor Unit dependent on the indoor unit dipswitch setting. The Backlit MA Remote Controller shall display a four-digit error code in the event of system abnormality or error. The Backlit MA Remote Controller shall be used as the only controller in a group.

The Backlit MA Remote Controller shall require no addressing. The Backlit MA Remote Controller shall connect using two-wire, stranded, non-polar control wire to the TB15 connection terminal on the indoor unit. The PAR-30MAAU shall require cross-over wiring for grouping across indoor units.

PAR-30MAAU (Backlit MA Remote Controller)			
Item	Description	Operation	Display
ON/OFF	Run and stop operation for a single group	Each Group	Each Group
Operation Mode	Switches between Cool/Dry/Auto/Fan/Heat/Setback. Operation modes vary depending on the air conditioner unit. Auto mode is in the R2/WR2-Series only.	Each Group	Each Group

PAR-30MAAU (Backlit MA Remote Controller)			
Item	Description	Operation	Display
Temperature Setting	Sets the temperature from 53°F - 87°F depending on operation mode and indoor unit.	Each Group	Each Group
Fan Speed Setting	Hi/Mid-2/Mid-1/Low/Auto Available fan speed settings depending on indoor unit.	Each Group	Each Group
Air Flow Direction Setting	Air flow direction angles (4 or 5 angle Swing) Auto Louver ON/OFF Air flow direction settings vary depending on the indoor unit model.	Each Group	Each Group
Weekly Timer	ON/OFF/Temperature setting can be done up to 8 times one day in the week. The time can be set by the 1-minute interval.	Each Group	Each Group
Permit / Prohibit Local Operation	Individually prohibit operation of each local remote control function (Start/Stop, Change operation mode, Set temperature, Reset filter). *1: Centrally Controlled is displayed on the remote controller for prohibited functions.	N/A	Each Group *1

PAR-30MAAU (Backlit MA Remote Controller)			
Item	Description	Operation	Display
Prohibition / Permission of Specified Mode	Setting via the System Controller, the operation for the following modes is prohibited: Cooling Prohibited: Cool, Dry, Auto Heating Prohibited: Heat, Auto Cooling-Heating Prohibited: Cool, Heat, Dry, Auto	N/A	Each Group
Display Indoor Unit Intake Temp	Measures and displays the intake temperature of the indoor unit when the indoor unit is operating.	N/A	Each Group
Error	When an error is currently occurring on an air conditioner unit, the afflicted unit and the error code are displayed	N/A	Each Unit
Test Run	Operates air conditioner units in test run mode.	Each Group	Each Group
Ventilation Equipment	Up to 16 indoor units can be connected to an interlocked system that has one LOSSNAY unit. LOSSNAY items that can be set are "Hi", "Low", and "Stop". Ventilation mode switching is not available.	Each Group	Each Group
Set Temperature Range Limit	Set temperature range limit for cooling, heating, or auto mode.	Each Group	Each Group

PAR-30MAAU (Backlit MA Remote Controller)			
Item	Description	Operation	Display
Operation Lock Out Function	Locking of ON/OFF, Mode, Set Temp, Vane, Hold buttons.	Each Group	Each Group
Hold	Hold Prohibits the scheduled operation from being executed <ul style="list-style-type: none"> a. ON/OFF timer b. Auto-OFF timer c. Weekly timer d. Automatic return to the preset temperature * While an operation is prohibited by Hold function, the operation icon lights up.	Each Group	Each Group

4.05 Input/Output (I/O) Boards

A. Digital Input Digital Output (DIDO) Board

The DIDO board shall be capable of providing On/Off control for equipment via the AG-150/GB-50ADA/GB-24 Centralized Controller's licensed web browser functions if required, the touch screen of the AG-150 and TC-24 Centralized Controller, the interlock function of the AG-150/GB-50ADA and the TG-2000 software. Each DIDO board shall have two digital inputs and two digital outputs. Each digital output shall be capable of supporting an independent schedule via the AG-150/GB-50ADA/GB-24 Centralized Controller's licensed web browser functions and the TG-2000 software. Status indication of the On/Off state of the non-Mitsubishi equipment shall be either via the On/Off status of the digital output or by receipt of a digital input to the DIDO board.

The DIDO board shall be capable of receiving a digital input for interlock settings with the indoor units or digital outputs on the DIDO board. Based on the digital input status the DIDO board shall be capable of setting the following parameter on the indoor unit On/Off, Mode, and Set Temperature to predefined settings. The DIDO board shall also be capable of interlocking the On/Off state of a digital output on the DIDO board based on an onboard channel digital input status or a free contact input status from system indoor units.

B. Analog Input (AI) Board

The AI board shall be capable of monitoring temperature or humidity via the AG-150/GB-50ADA/GB-24 Centralized Controller's licensed web browser functions and the TG-2000 software. Each AI board shall have two analog inputs. Each input shall be capable of receiving a 4/20mA, 0/10 VDC, or 1/5 VDC signal for monitoring temperature or humidity. The AI board shall be capable of monitoring the temperature or humidity input and shall be capable of displaying graphical trending of the temperature or humidity values via the AG-150/GB-50ADA/GB-24 Centralized Controller's licensed web browser functions and the TG-2000 software. Notification of user adjustable high and low level alarms shall be capable of being emailed to distribution list or outputted via a digital output.

The AI board shall be capable of setting the following parameters on the indoor unit On/Off, Mode, and Set Temperature to predefined settings based on the input value of the temperature or humidity. The AI board shall also be capable of interlocking the On/Off state of a digital output on the input value of the temperature or humidity.

4.06 Centralized Controller (Web-enabled)

A. Centralized Controller

Centralized Controller shall be capable of controlling a maximum of 24 indoor units across multiple outdoor units. The controller shall be approximately 5 1/8"x10" in size and shall be powered from a PAC-SC51KUA power supply to the M-NET transmission line. The Centralized Controller shall support system configuration, daily/weekly scheduling, monitoring of operation status, and malfunction monitoring. The Centralized Controller shall have five basic operation controls which can be applied to an individual indoor unit, a group of indoor units (up to 50 indoor units), or all indoor units (collective batch operation). This basic set of operation controls for the Centralized Controller shall include on/off, operation mode selection (cool, heat, auto only), dry, fan and setback), temperature setting, fan speed setting, and airflow direction setting. To provide centralized control it shall be able to enable or disable operation of local remote controllers. In terms of scheduling, the Centralized Controller shall allow the user to define both daily and weekly schedules with operations consisting of ON/OFF, mode selection, temperature setting, air flow (vane) direction, fan speed, and permit/prohibit of remote controllers.

Setback mode shall be available to enable the indoor unit to be controlled within a temperature range. The Hold function shall be available to prohibit scheduled events and local control when enabled as a priority function.

(Centralized Controller)			
Item	Description	Operati on	Display
ON/OFF	Run and stop operation.	Each Block, Group or Collect ive	Each Group or Collect ive

(Centralized Controller)			
Item	Description	Operation	Display
Operation Mode	<p>Switches between Cool/Dry/Auto/Fan/Heat/Setback</p> <p>(Group of Lossnay unit: automatic ventilation/vent-heat/interchange/normal ventilation)</p> <p>Operation modes vary depending on the air conditioner unit.</p> <p>Auto mode is in the CITY MULTI R2/WR2-Series only.</p>	Each Block, Group or Collective	Each Group
Temperature Setting	Sets the temperature from 57°F - 87°F depending on operation mode and indoor unit.	Each Block, Group or Collective	Each Group
Set Temperature Range Limit	<p>The range of room temperature setting can be limited by the initial setting.</p> <p>The lowest limit temperature can be made higher than the usual (67°F) in cool/dry mode, while the upper limit temperature lower than the usual (83°F) in heat mode.</p>	Each Group	Each Group

(Centralized Controller)			
Item	Description	Operation	Display
Air Flow Direction Setting	<p>Air flow direction angles, 4-angle or 5-angle Swing, Auto</p> <p>*1: Louver cannot be set.</p> <p>*Air flow direction settings vary depending on the indoor unit model.</p>	<p>*1 Each Block, Group</p> <p>or</p> <p>Collective</p>	Each Group
Schedule Operation	<p>Annual/weekly/today schedule can be set for each group of air conditioning units.</p> <p>*2. The system follows either the current day, annual schedule, or weekly, which are in the descending order of overriding priority.</p> <p>Twelve events can scheduled per day, including ON/OFF, Mode, Temperature Setting, Operation Prohibition. Vane Direction and Fan Speed.</p>	<p>*2 Each Block, Group</p> <p>or</p> <p>Collective</p>	Each Group
Hold	Prohibits the scheduled operation from being executed	<p>Each Block, Group</p> <p>or</p> <p>Collective</p>	Each Group

(Centralized Controller)			
Item	Description	Operation	Display
Permit / Prohibit Local Operation	<p>Individually prohibit operation of each local remote control function (Start/Stop, Change operation mode, Set temperature, Reset filter).</p> <p>*3: Centrally Controlled is displayed on the remote controller for prohibited functions.</p>	Each Block, Group or Collective	*3 Each Group
Indoor Unit Intake Temp	Measures the intake temperature of the indoor unit when the indoor unit is operating.	N/A	Each Group
Error	<p>When an error is currently occurring on an air conditioner unit, the afflicted unit and the error code are displayed</p> <p>*1. When an error occurs, the LED flashes. The operation monitor screen shows the abnormal unit by flashing it. The error monitor screen shows the abnormal unit address, error code and source of detection. The error log monitor screen shows the time and date, the abnormal unit address, error code and source of detection</p>	N/A	*4 Each Unit or Collective

(Centralized Controller)			
Item	Description	Operation	Display
Ventilation Equipment	<p>This interlocked system settings can be performed by the master system controller.</p> <p>When setting the interlocked system, use the ventilation switch the free plan LOSSNAY settings between "Hi", "Low" and "Stop".</p> <p>When setting a group of only free plan LOSSNAY units, you can switch between "Normal ventilation", "Interchange ventilation" and "Automatic ventilation".</p>	Each Group	Each Group
Interlock	<p>Operation of indoor groups or general equipment can be interlocked by the change of state</p> <p>(ON/OFF, mode, error of indoor groups/general equipment). (GB-24 will execute interlocking control depending on the interlocked setting.)</p>	N/A	N/A
Multiple Language	<p>Other than English, the following language can be chosen. Spanish, French, Japanese, Dutch,</p> <p>Italian, Russian, Chinese, and Portuguese are available.</p>	N/A	N/A

(Centralized Controller)			
Item	Description	Operation	Display
External Input / Output	<p>By using accessory cables you can set and monitor the following.</p> <p>Input</p> <p>By level: "Batch start/stop", "Batch emergency stop"</p> <p>By pulse: "batch start/stop", "Enable/disable remote controller"</p> <p>Output: "start/stop", "error/Normal"</p> <p>5: Requires the external I/O cables (PAC-YG11HA) sold separately.</p>	*5 Collective	*5 Collective

All Centralized Controllers shall be equipped with one RJ-45 Ethernet port to support interconnection with a network PC via a closed/direct Local Area Network (LAN). The Centralized Controller shall be capable of performing initial settings via a PC using the Centralized Controller's initial setting browser.

Standard software functions shall be available so that the building manager can securely log into each centralized controllers via the PC's web browser to support operation monitoring, scheduling, error email, and online maintenance diagnostics.

4.07 CMCN: System Integration

The CMCN shall be capable of supporting integration with Building Management Systems (BMS).

A. BAC-HD150: BACnet® Interface

The Mitsubishi Electric Cooling & Heating BACnet® interface, BAC-HD150, shall be compliant with BACnet® Protocol (ANSI/ASHRAE 135-2004) and be Certified by the (BTL) BACnet® Testing Laboratories. The BACnet® interface shall support BACnet Broadcast Management (BBMD). The BACnet® interface shall support a maximum of 50 indoor units. Operation and monitoring points include, but are not limited to, on/off, operation mode, fan speed, prohibit remote controller, filter sign reset, alarm state, error code, and error address.

B. LMAP03U: LonWorks® Interface

The Mitsubishi Electric Cooling & Heating LonWorks® interface, LMAP03U, shall support up to fifty indoor units with a variety of network variables on a per indoor unit basis. Input variables include, but are not limited to, on/off, operation mode, fan speed, prohibit remote controller, and filter sign reset. Output variables include, but are not limited to, model size, alarm state, error code, and error address.

4.10 Power Supply (PAC-SC51KUA)

The power supply shall supply 24VDC (TB 3) for the AG-150 centralized controller and 24VDC (TB 2) voltage for the central control transmission.

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