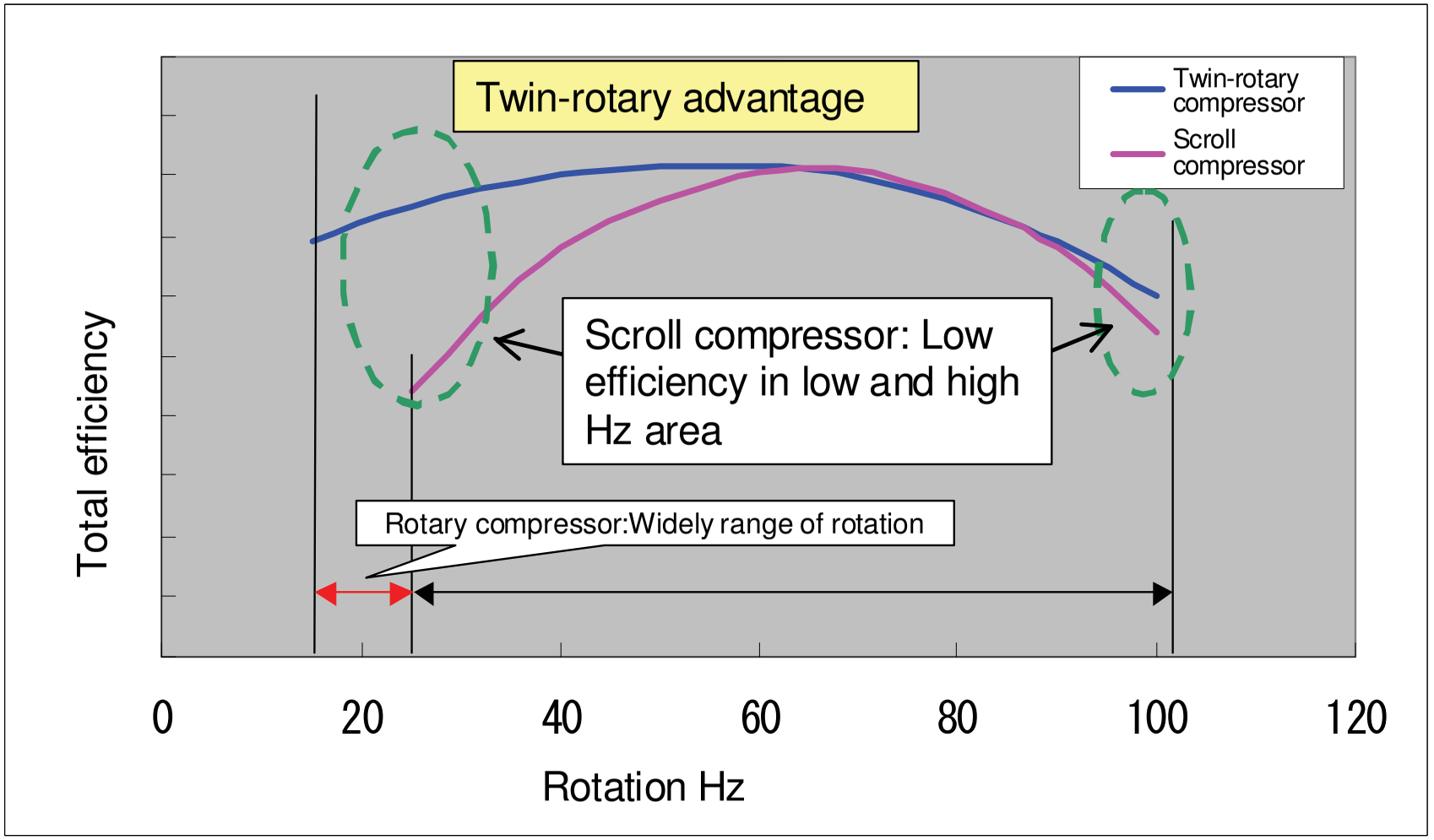
TOSHIBA
AIR CONDITIONING

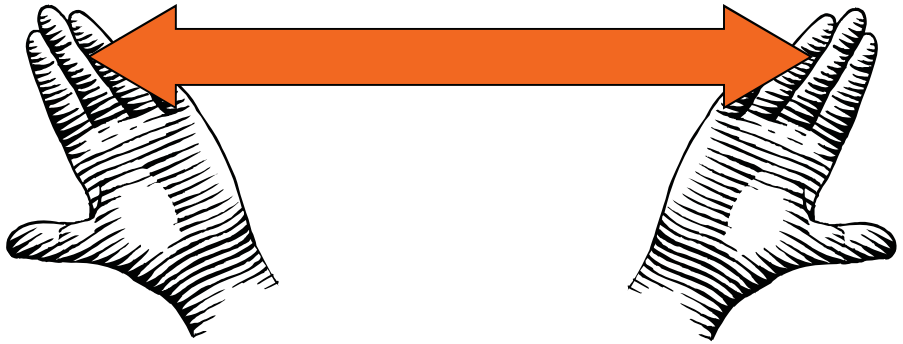
Compressor Performance Comparison

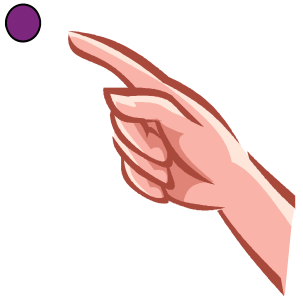


TOSHIBA
AIR CONDITIONING

Rotary vs. Scroll compressor

	Rotary	Scroll
Energy saving	Through all range	One point only

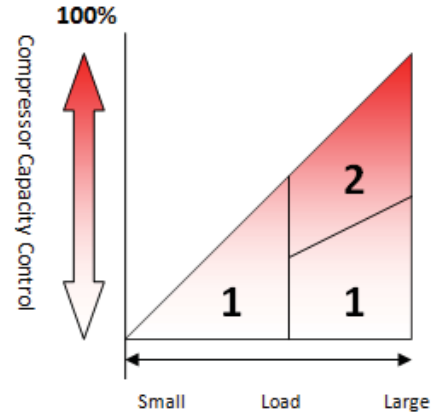


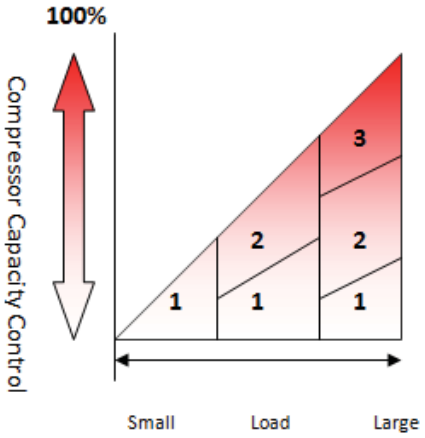


Rotary vs. Scroll Summary

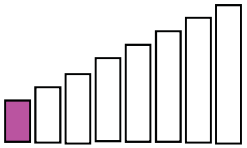
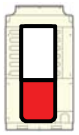
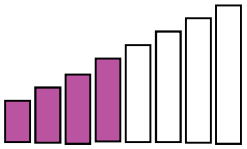
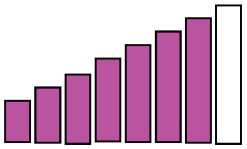
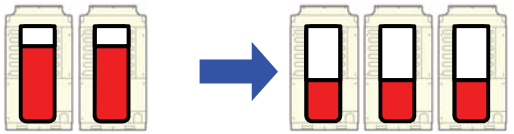
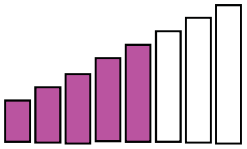
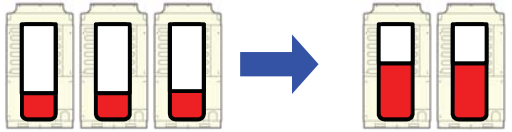
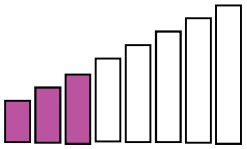
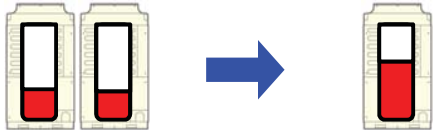
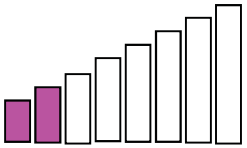
TOSHIBA
AIR CONDITIONING

SMMS-i Compressor Control image





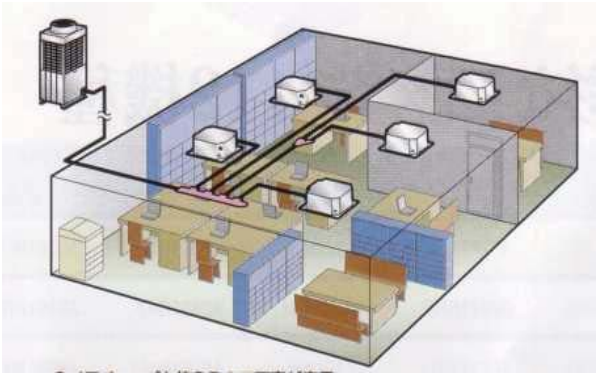
In part load condition, SMMS-i controls the inverter compressors in 30% to 80% of the compressor speed.

Load	Compressor state
	
	80 % 
	80 % 
	30 % 
	30 % 
	

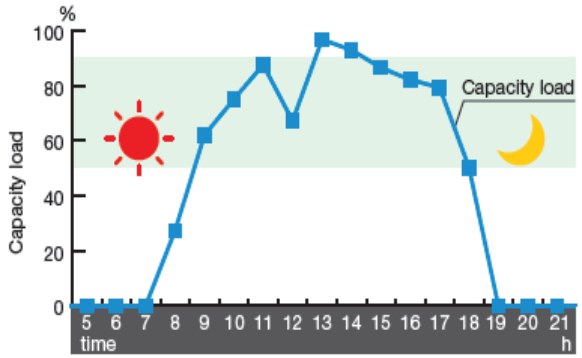
TOSHIBA
AIR CONDITIONING

Part load operation

In case of:
Partial indoor units operation.
Ex) office area is ON, meeting room is OFF.



In case of:
Outdoor unit temperature is lower than standard condition.
Ex) Night time operation



In case of:
Indoor load is decreasing after running certain time.
Ex) Office closed

Application:

Apartment

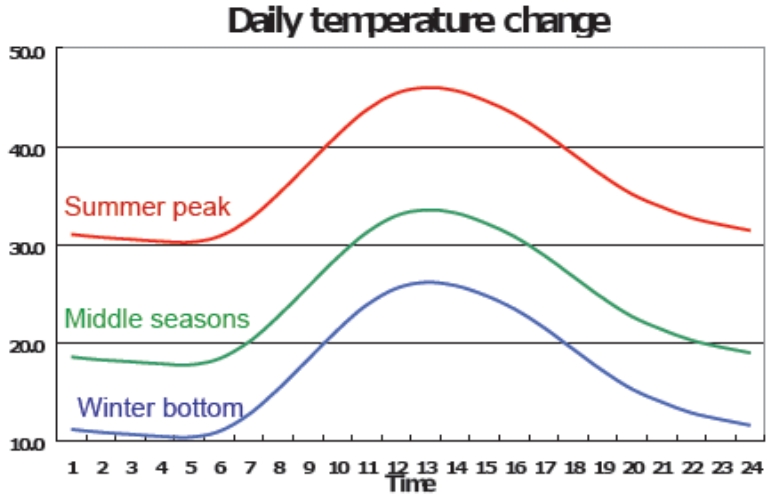
Office

TOSHIBA
AIR CONDITIONING

Reducing energy losses

- Air conditioning capacity is often specified for maximum load, however for the majority of time the system will only operate in part load conditions.

- It is essential therefore that any air conditioning system be able to modulate its capacity output to match the requirements of the cooling demand at any given time.



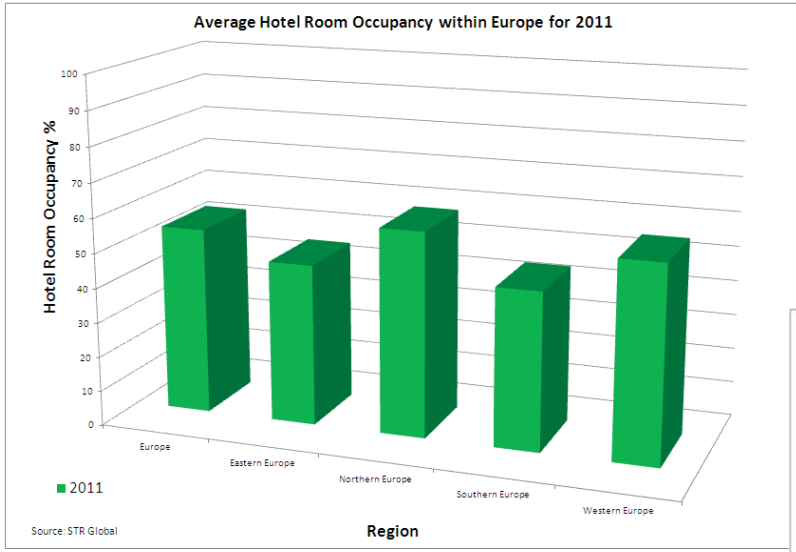
Toshiba Air Conditioning have spent the last 25 years designing and producing innovation after innovation to achieve the optimum in energy efficiency. Acuminating in our latest and most efficient product to date, the Toshiba SMMSi VRF systems.

TOSHIBA
AIR CONDITIONING

Toshiba VRF – Energy saving

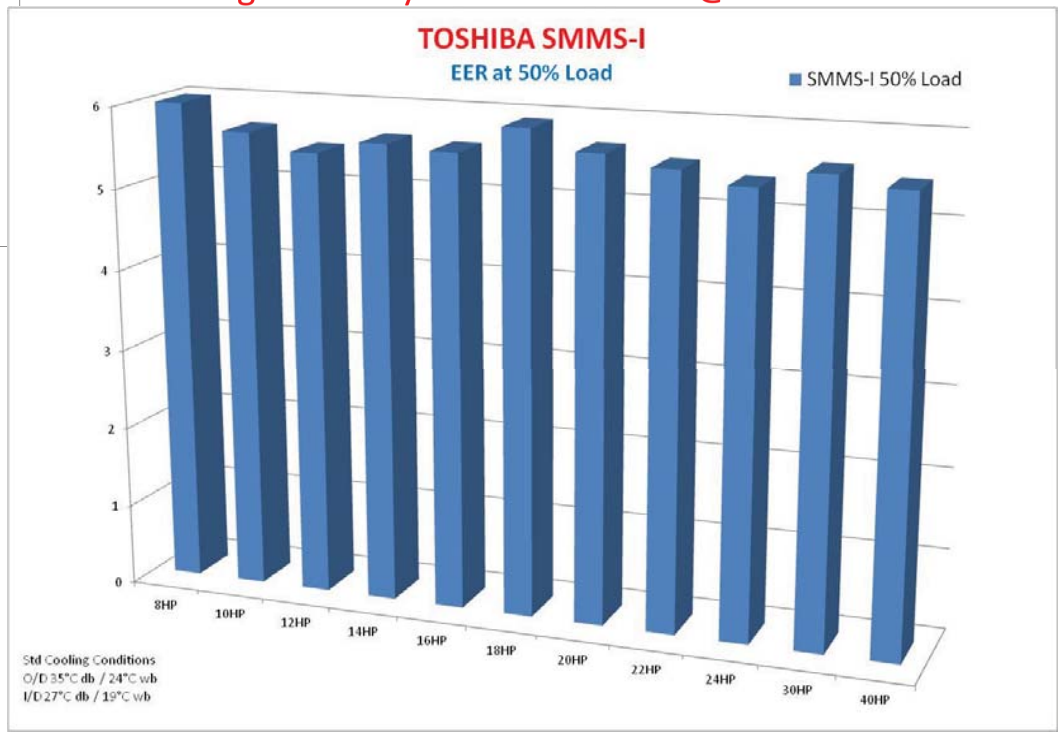
High performance and energy savings in part load conditions

Average Hotel Room occupancy rate in Europe



The average Hotel room occupancy rate within Europe averages between 50% & 60%. This is the Optimum load for the new Toshiba SMMS-I VRF.

Cooling Efficiency Toshiba SMMS-I @ 50% load



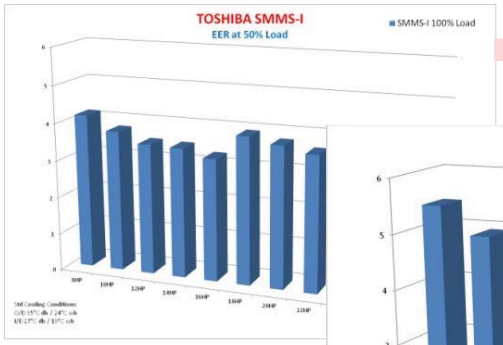
The Toshiba SMMS-I VRF system gives maximum performance and efficiency when needed most. In comparison with chiller derived systems, the Toshiba SMMS-i VRF is over 40% more efficient during part loads, giving increased cost saving throughout the entire life of the system.

TOSHIBA
AIR CONDITIONING

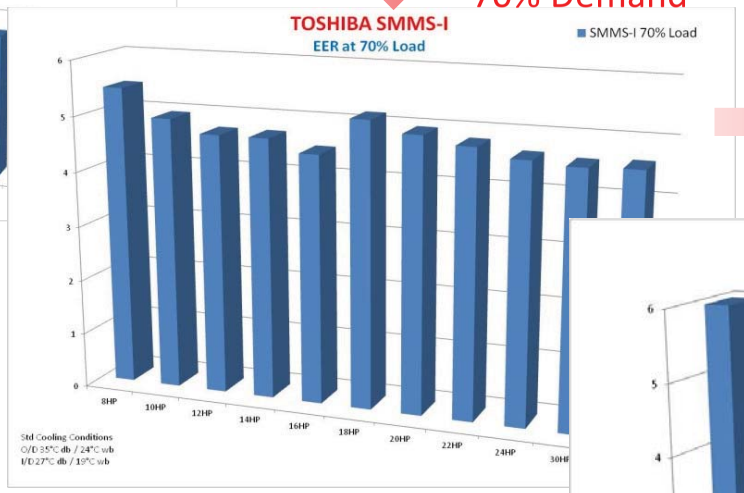
Toshiba VRF – Energy saving

› *High performance and energy savings in Cooling part load conditions*

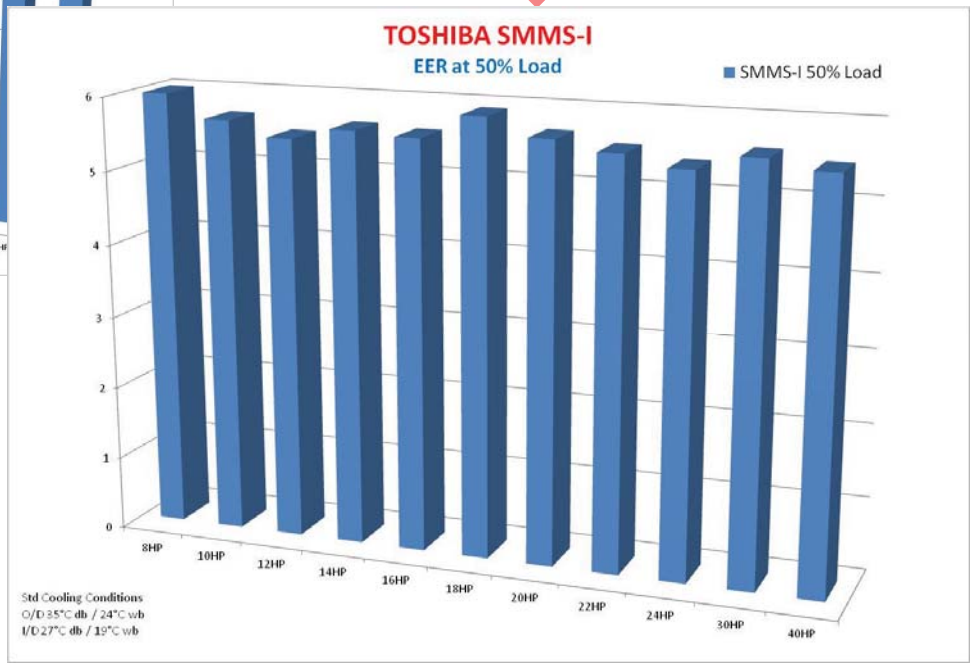
100% Demand



70% Demand



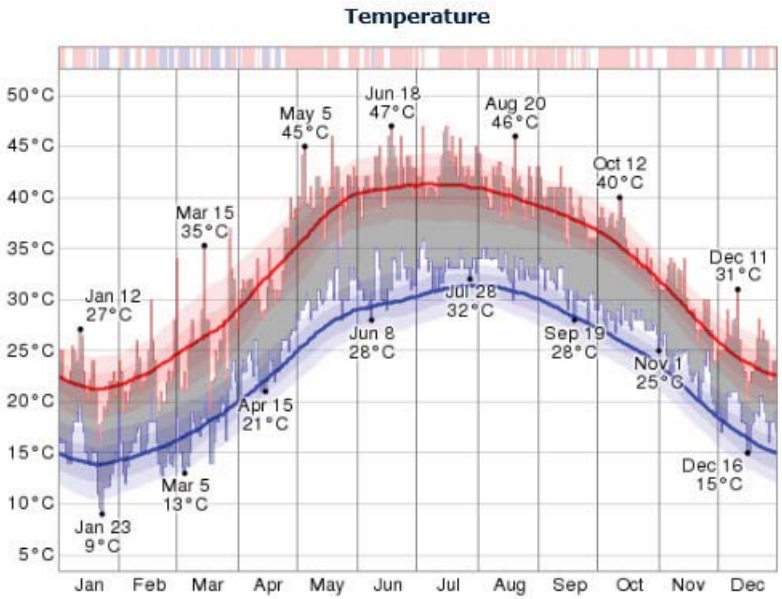
50% Demand

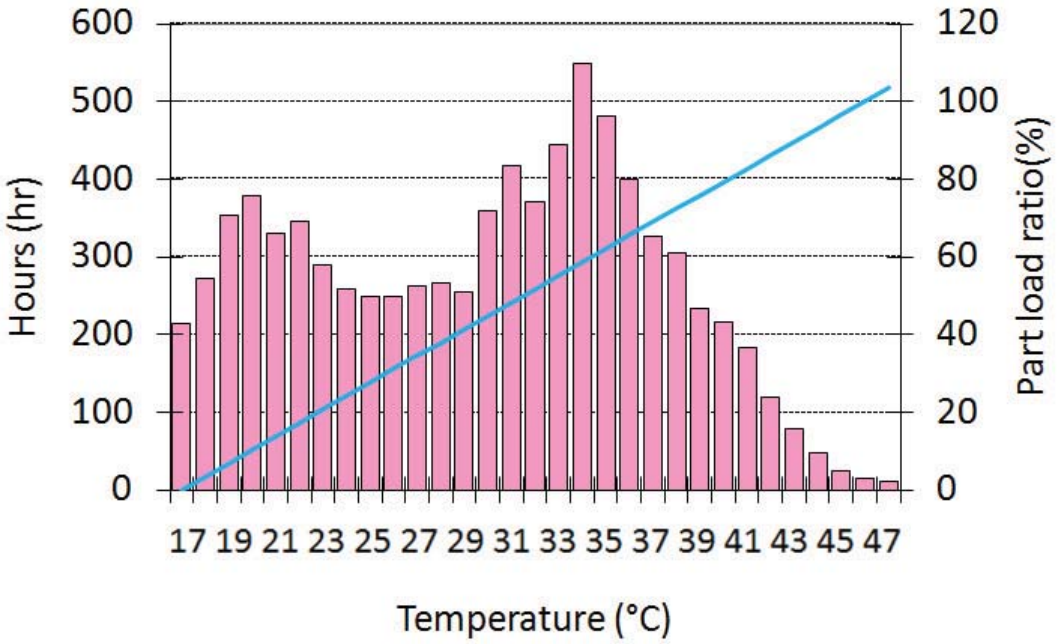


As the demand drops the Toshiba SMMS-i ALL inverter compressor Design produces SIGNIFICANT ENERGY SAVINGS when compared to the current established technologies, such as Chiller systems

TOSHIBA
AIR CONDITIONING

Temperature Condition in Doha





Temperature data in Doha
1st Jan -31st Dec, 2012

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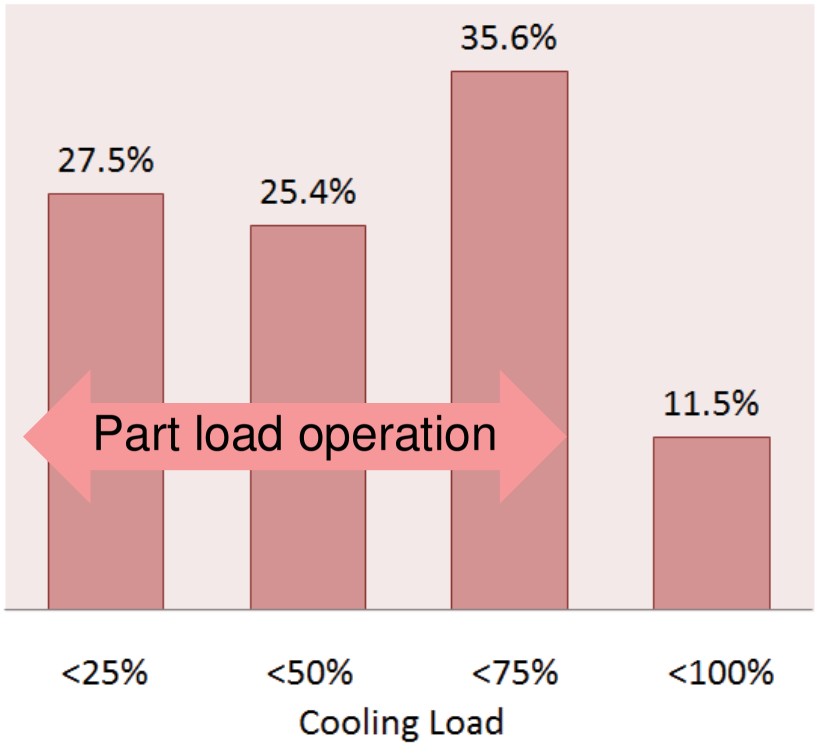
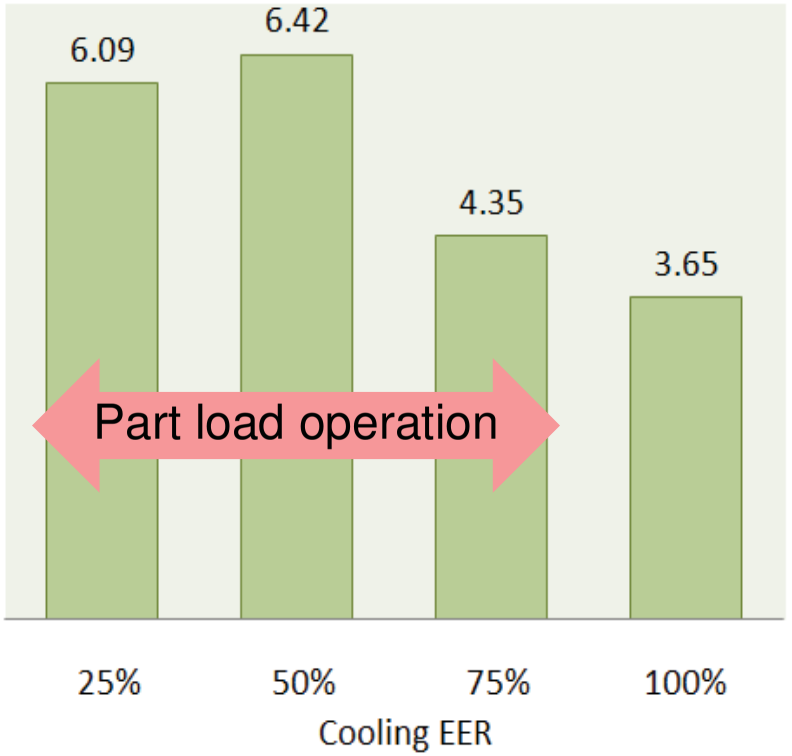
AIR CONDITIONING

Cooling Load analysis in Doha

Operation Hours of an air conditioner



Part Load Performance SMMSi



Condition: MMY-MP2014HT8 Estimated EER for 100% Cooling load @46C, 75% cooling load @38C, 50% cooling load @ 31C, 25% cooling load @ 24C
Indoor temp condition: DB 27C/ Wb 19C,

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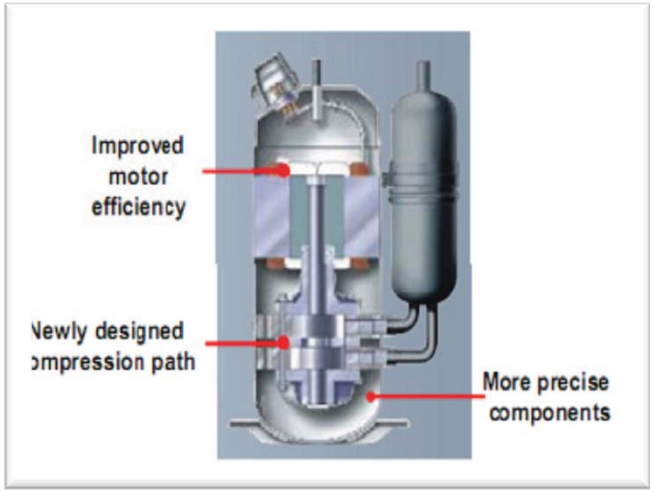
AIR CONDITIONING

SMMS-i Features & Benefits

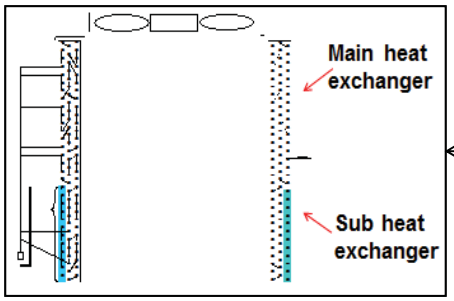
Features & benefits

- Outstanding performance under part load
- Twin rotor for balanced and efficient operation
- Less mechanical vibration and electrical losses
- Balance compressor operation hours
- High power factor
- Soft start operation with less starting current

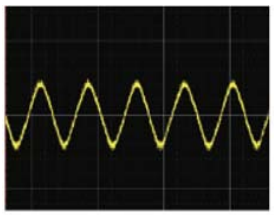


TOSHIBA
AIR CONDITIONING

SMMS-i Technologies



3. Sub cool
High efficiency Heat exchanger



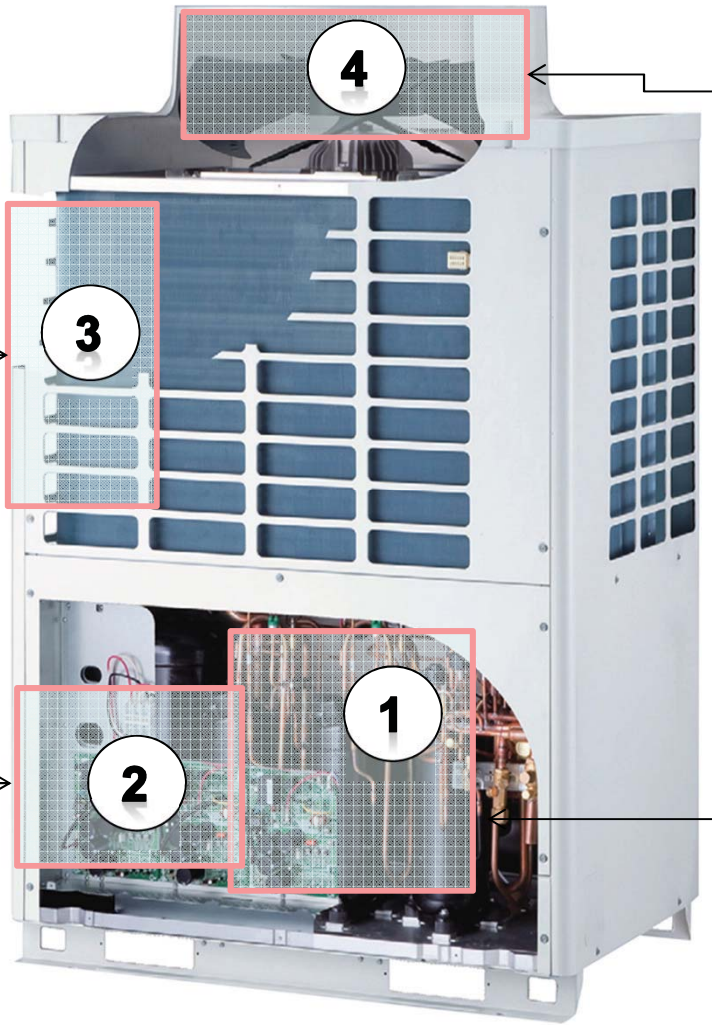
Smooth sine curve

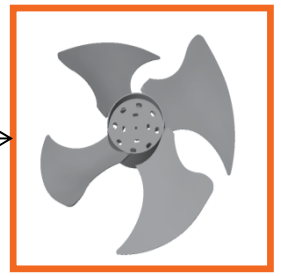
The fast-calculating vector-controlled inverter produces a smooth sine curve that improves operating efficiency.

Circuit board

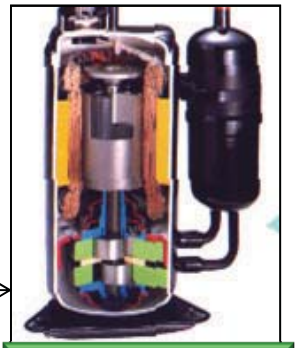
The vector-controlled inverter quickly converts current into a smooth sine curve to achieve smoother operation of the compressor's DC motor.

2. Fast-calculating vector-controlled inverter (0.1 Hz)





4. 64 steps DC condenser fan



1. All inverter Twin Rotary Multiple Compressor

TOSHIBA
AIR CONDITIONING

SMMS-i Technologies

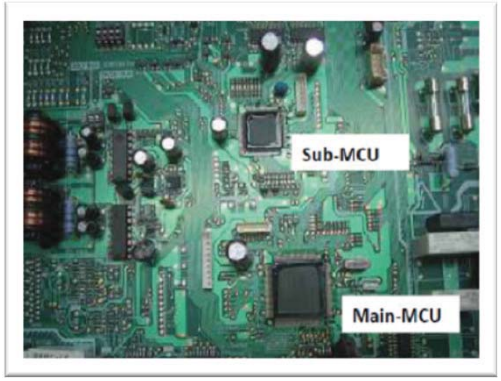
Advanced "I/F" Technology

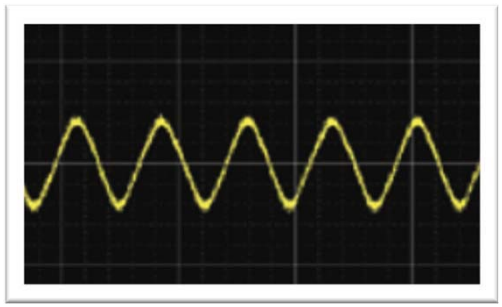
•Dual MCU system

•High-speed operation by parallel processing

•Fast handling of capacity requirements from each indoor unit

•Produces a smooth sine curve which Improves operating efficiency





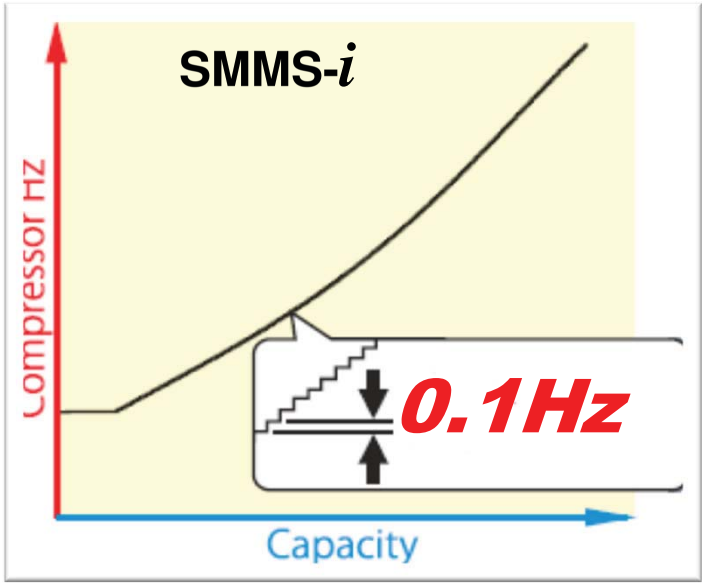
Ultra-precise 0.1 Hz Infinity Variable Control

•Adjusts compressor rotation speed in near-seamless 0.1 Hz steps results in **faster cooling**

•Precise response to the capacity needs

•Minimizes energy loss on changing frequencies

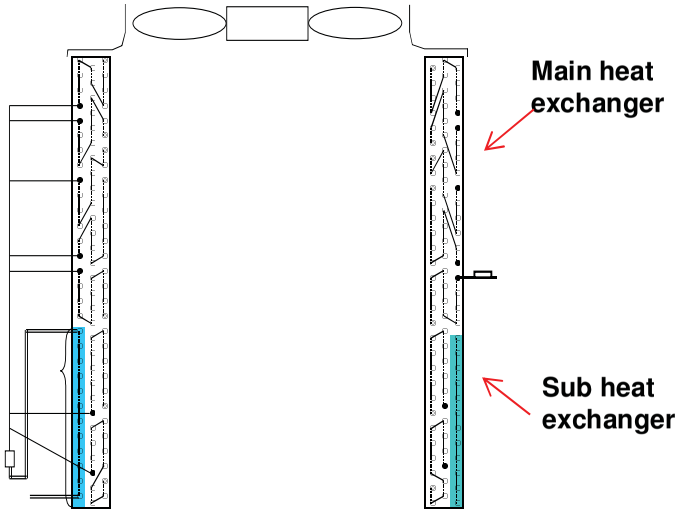
•Comfortable environment to minimal temperature variations.

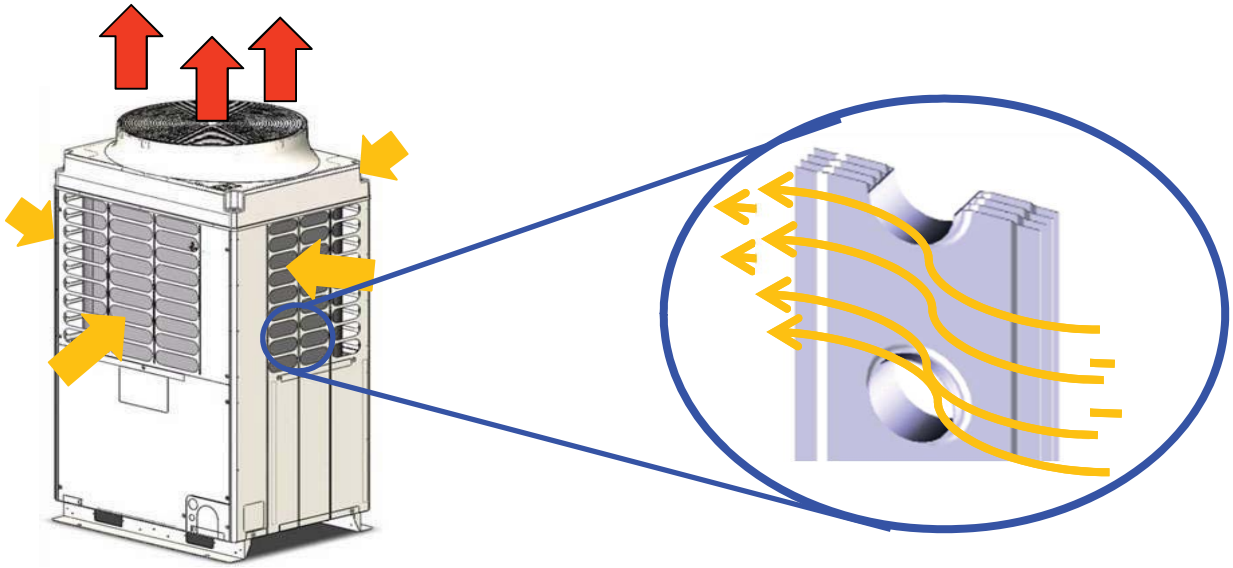


SMMS-i Technologies

Improved 4 way Heat exchanger

- Main and sub heat exchanger- improving efficiency
- Optimized fin size and distance
- Stabilize the refrigerant pressure and temperature on part load operation
- Low speed airflow - decrease pressure loss by 10 % and also reduce noise level





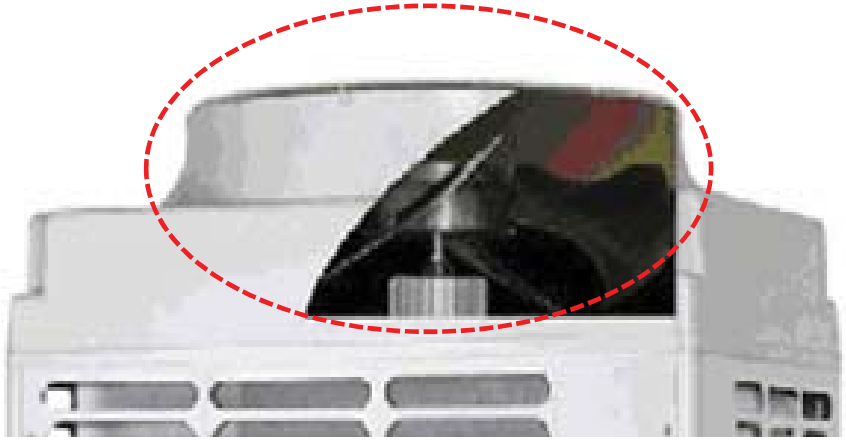
SMMS-i Technologies

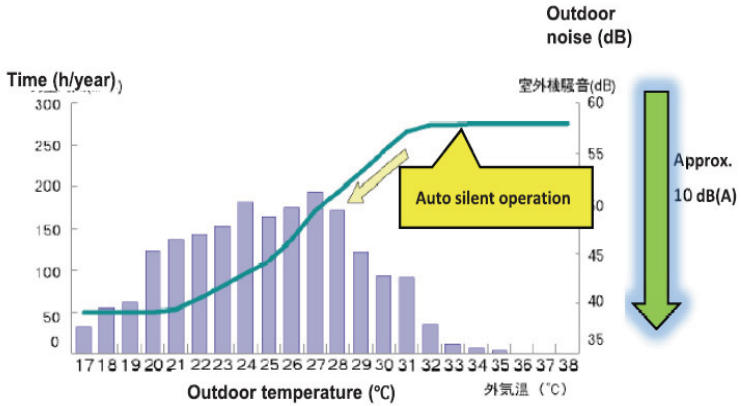
BLDC inverter fan

- Fan inverter control: 64 steps
- BLDC Fan motor
- Low noise level
- Auto silent operation for balcony application

Fan use BLDC motor (output:1000W)

4 wings large-diameter propeller fan





TOSHIBA
AIR CONDITIONING

SMMS-i Outdoor Unit Line Up

50Hz model

8 HP, 10 HP, 12 HP

14 HP

Range : 8 HP to 48 HP

TOSHIBA
AIR CONDITIONING

SMMS-i Indoor Unit Line Up

Indoor Unit Type	Appearance	007 2.2 kW 0.8 HP	009 2.8 kW 1.0 HP	012 3.6 kW 1.25 HP	015 4.5 kW 1.7 HP	018 5.6 kW 2.0 HP	024 7.1 kW 2.5 HP	027 8.0 kW 3.0 HP	030 9.0 kW 3.2 HP	036 11.2 kW 4.0 HP	048 14.0 kW 5.0 HP	056 16.0 kW 6.0 HP	072 22.4 kW 8.0 HP	096 28.0 kW 10.0 HP
High Wall		●	●	●	●	●	●							
Underceiling					●	●	●	●		●	●			
Floor-standing		●	●	●	●	●	●							
Floor-standing cabinet		●	●	●	●	●	●							
Bi-flow console		●	●	●	●	●								
Free Standing					●	●	●	●		●	●	●		
4-way cassette			●	●	●	●	●	●	●	●	●	●		
Compact 4-way cassette		●	●	●	●	●	●							
2-way cassette		●	●	●	●	●	●	●	●	●	●	●		
1-way cassette		●	●	●	●	●	●							
Slim duct		●	●	●	●	●	●	●						
Std Static duct		●	●	●	●	●	●	●	●	●	●	●		
High static duct						●	●	●		●	●		●	●

TOSHIBA
AIR CONDITIONING

Super Digital Inverter
High Ambient Markets
Made in Japan

Smart Air Conditioning

TOSHIBA
AIR CONDITIONING

Super Digital Inverter Features

* 14kW, 16 kW

Features

- Higher Efficiency
- Eco driving Twin Rotary Compressor
- Greater pipe runs (75m* with 30 m elevation)
- Quite operation (maximum 53 dB of 16 kW)
- Compatible with R-22 & R407c replacement
- 7 Sizes available-
- 3.6kW, 4.5kW, 5.6kW, 7.1kW, 11.2kW, 14kW, 16kW
- 3 Phase available – 11.2kW, 14kW, 16kW
- Charge less pipe length 20/30 m

TOSHIBA
AIR CONDITIONING

Super Digital Inverter Technologies

1 Heat Exchanger

- Dual-sized tube

2 Propeller Fan

- Larger Diameter
- DC Fan motor

* 14kW, 16 kW

3 vector controlled, Intelligent Power Drive Unit

- Produces a power supply whose frequency and voltage provide superb control and energy efficiency.
- Performance is further improved by the high-speed converter circuit

4 DC Twin Rotary Compressor

- Magnetic-action control
- Thrust Lubricated condition
- High power motor
- The optimization of discharge port positioning

TOSHIBA
AIR CONDITIONING

SDI Indoor Unit Line UP

Indoor Unit Type	Appearance	3.6 kW	4.5 kW	5.6 kW	8 kW	11.2 kW	14 kW	16 kW
High-wall				●	●			
Underceiling				●	●	●	●	
4-way cassette				●	●	●	●	●
Compact 4-way cassette		●	●	●				
Slim duct		●	●	●				
Std Static duct		●	●	●	●	●	●	●

TOSHIBA
AIR CONDITIONING

Toshiba Control Line Up


Wireless


RBC-AS21E2
Wired


RBC-AMT32E
Wired


RBC-AMS41E
7-day Timer


RBC-AMS51E
ECO Vision

Local Remote Controls


TCB-EXS21TLE
Schedule Timer


TCB-CC163TLE
16-way On/OFF


TCB-SC642TLE
64 way Central
Controller


BMS-CM1280TLE
Standard Compliant Manager
Up to 128 Indoor Unit

Central Controls


TCB-PCIN4E
Operation status


TCB-PCMO4E
External On/OFF


TCB-IFCB5-PE
Windows Switch

Application Control Board


CN32-
Ventilation
Control


CN60 Operation
Status Output


CN61 On/OFF
Control

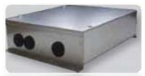

CN80 Force
OFF

Connectors


BMS-SM1280HTLE
BMS-SM1280ETLE
Smart Manager
Up to 128 Indoor Unit


Touch Screen Controller
Up to 512 Indoor Unit

Advance Central Controls


TCB-IFLN642TLE
Lonworks Interface


Modbus Interface
TCB-IFMB640TLE


BMS-LSV6E
BACnet Server

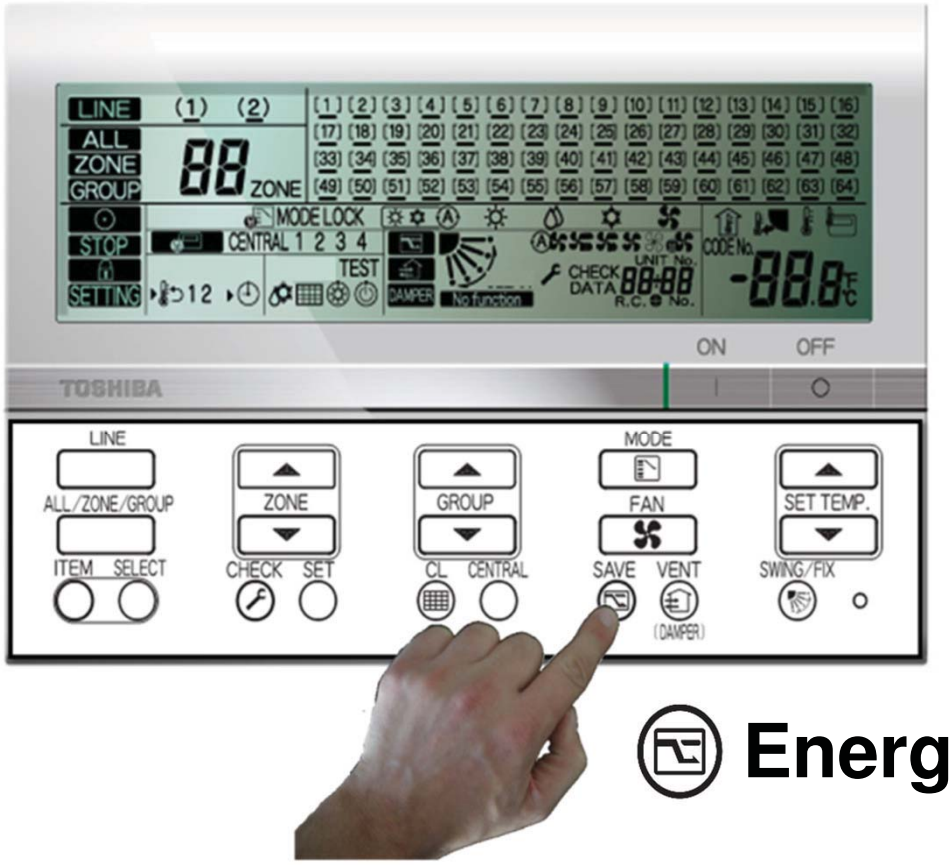

TCB-IFCB640TLE
Analogue Interface

BMS Interface


Smart Manager with Data Analyzer

TOSHIBA
AIR CONDITIONING

Energy Saving Function



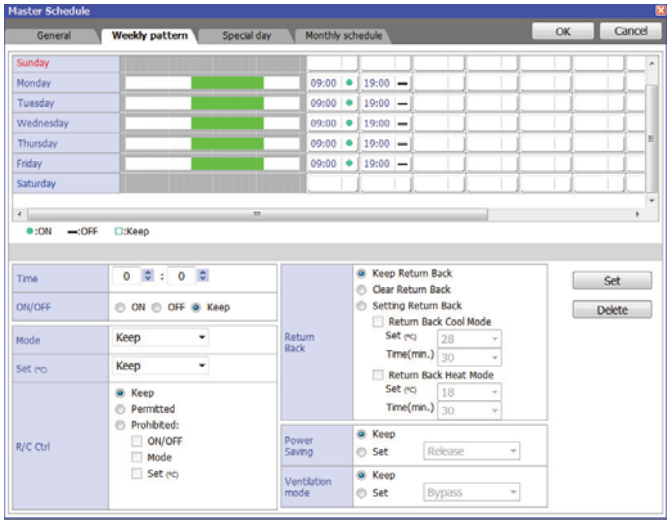
Energy SAVE

Activate Energy SAVE Operation for selected Indoor Unit.

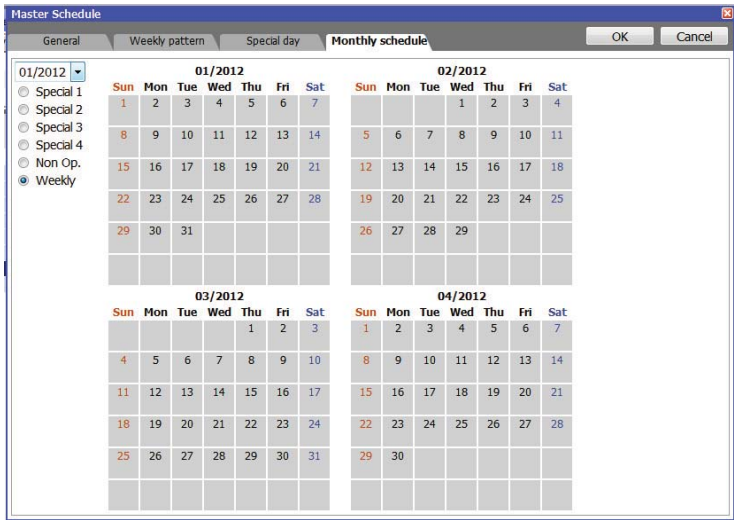
By using remote controller, We can configure Energy saving ratio within the range from 50% to 100% by 1 %. The lower the value is set, the higher the power saving effect becomes.

TOSHIBA
AIR CONDITIONING

Scheduling Function



Schedule setup



Monthly Pattern setup

Operations of air conditioners can be scheduled.
- The following can be set for scheduled operation.
  - On/Off, Operation mode, Temperature setup, Operation of remote control prohibited/allowed, Return Back, and Ventilation mode.
- Up to 10 operations can be set per day for scheduled operation.
- Up to 32 master schedules can be set.

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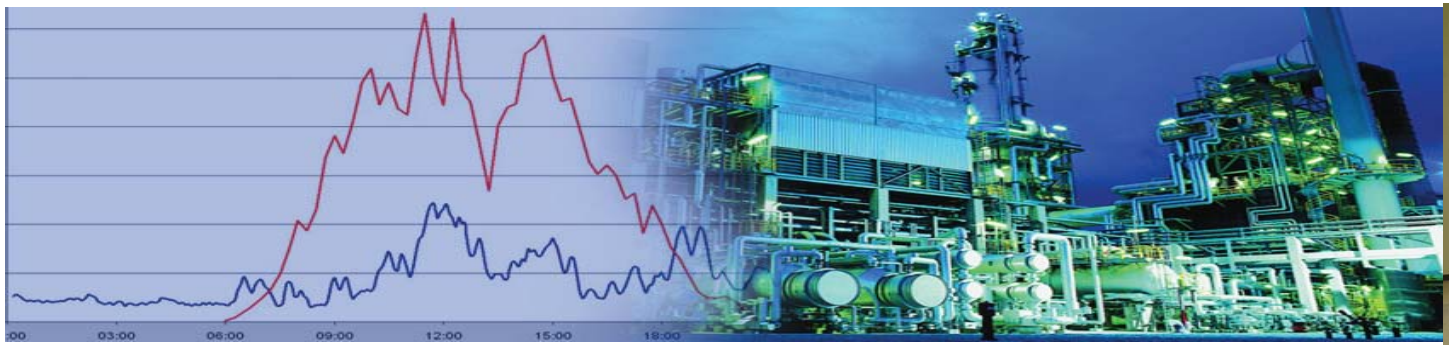
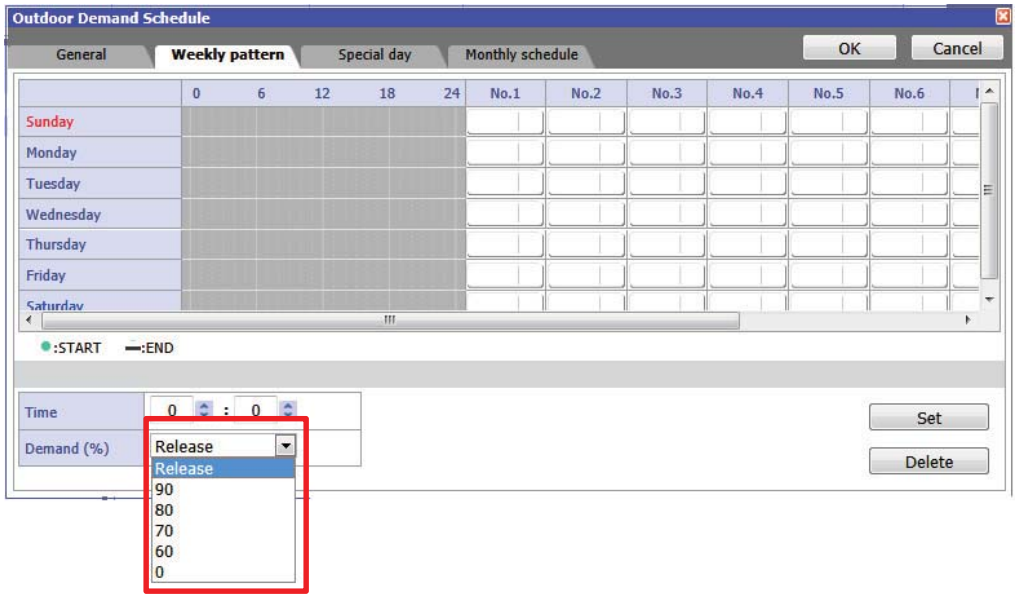
AIR CONDITIONING

Power Peak Control





No Additional Hardware require

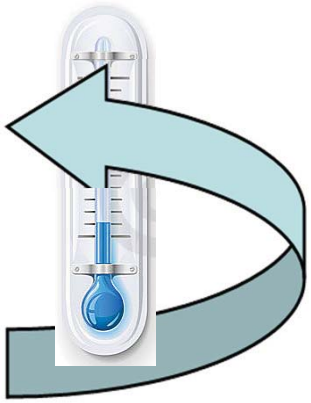
The upper limit capacity of the outdoor unit is restricted based on the demand schedule program.

TOSHIBA
AIR CONDITIONING

Return back Function

What is return-back temperature Set point ?

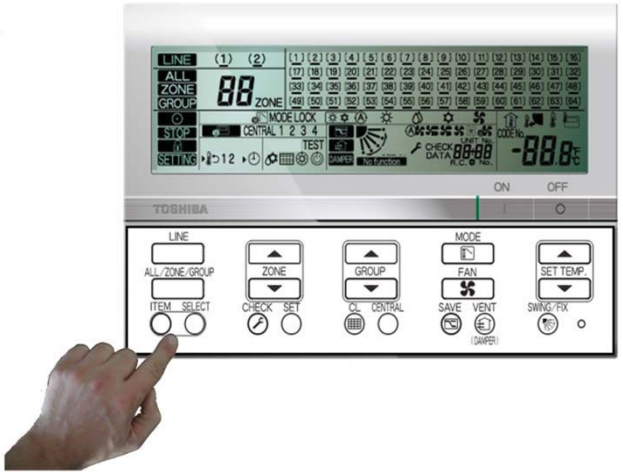
When the return-back function is activated, the temperature setting exceeding the return-back temperature will automatically be adjusted to the return-back temperature after a certain period of time to prevent extremely high / low temperature setting.



CODE No.	Item	Data	
		Factory setting	Setting range
01	Activate / deactivate the return-back function	001 (Enabled)	000 (Disabled), 001 (Enabled)
02	Time setting of Return-back 1, for heating	030 (30 minutes)	1 to 60 minutes (in units of 1 minute)
03	Time setting of Return-back 1, for cooling	030 (30 minutes)	1 to 60 minutes (in units of 1 minute)
04	Temperature setting of Return-back 1, for heating	018 (18°C)	18 to 29°C (in units of 1°C)
05	Temperature setting of Return-back 1, for cooling	028 (28°C)	18 to 29°C (in units of 1°C)
06	Time setting of Return-back 2, for heating	030 (30 minutes)	1 to 60 minutes (in units of 1 minute)
07	Time setting of Return-back 2, for cooling	030 (30 minutes)	1 to 60 minutes (in units of 1 minute)
08	Temperature setting of Return-back 2, for heating	018 (18°C)	18 to 29°C (in units of 1°C)
09	Temperature setting of Return-back 2, for cooling	028 (28°C)	18 to 29°C (in units of 1°C)

Two sets of return-back settings, Return-back 1 and 2, can be stored. Select Return-back 1 or 2 using 

buttons when activating the return-back function.



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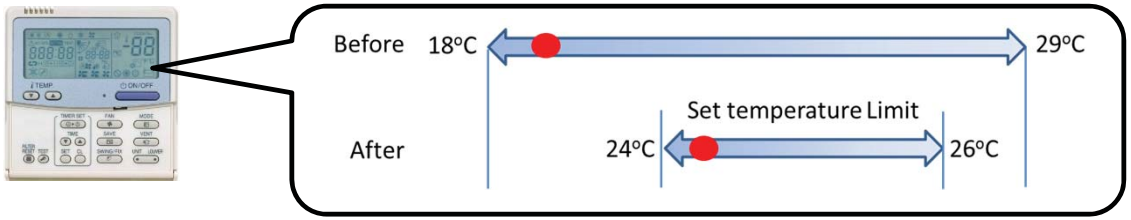
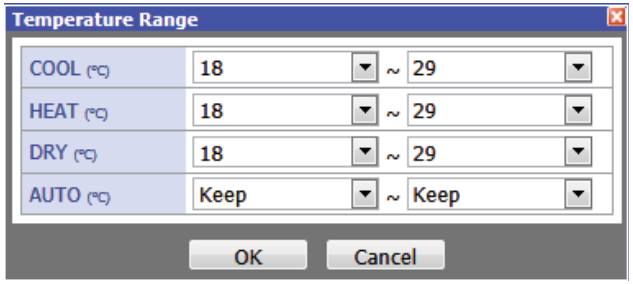
AIR CONDITIONING

Set Temperature Limit



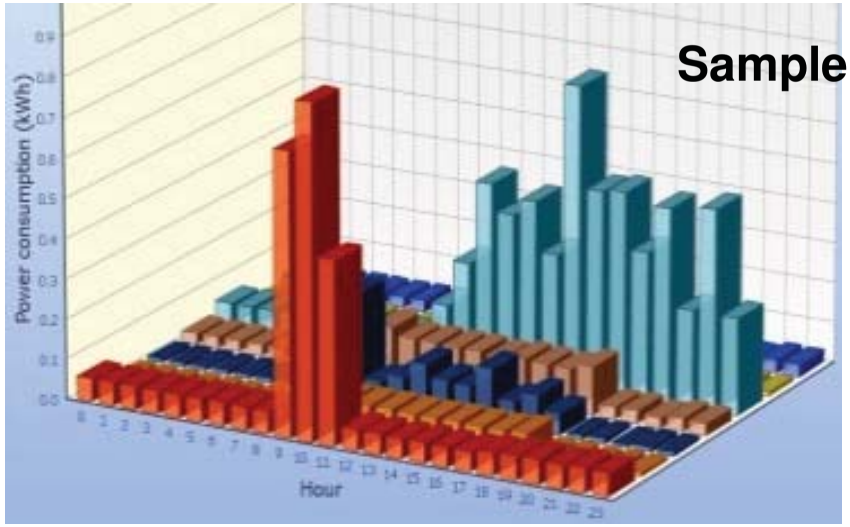


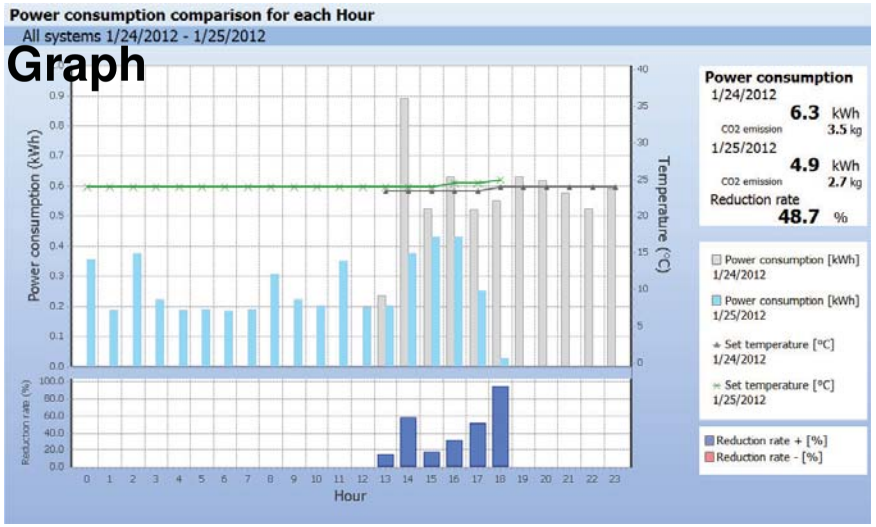
It is possible to set the upper and lower limit of temperature set points.

TOSHIBA
AIR CONDITIONING

Convenient Energy saving functions using Data Analyzer

Sample Graph



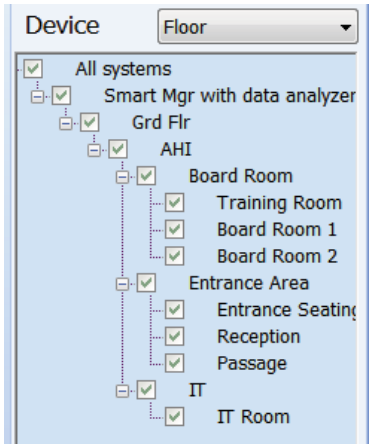


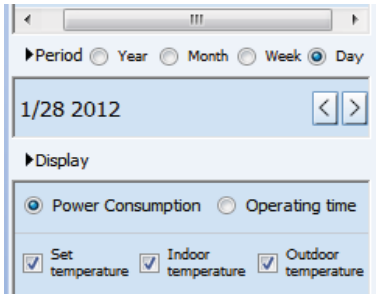
Data Analyzer

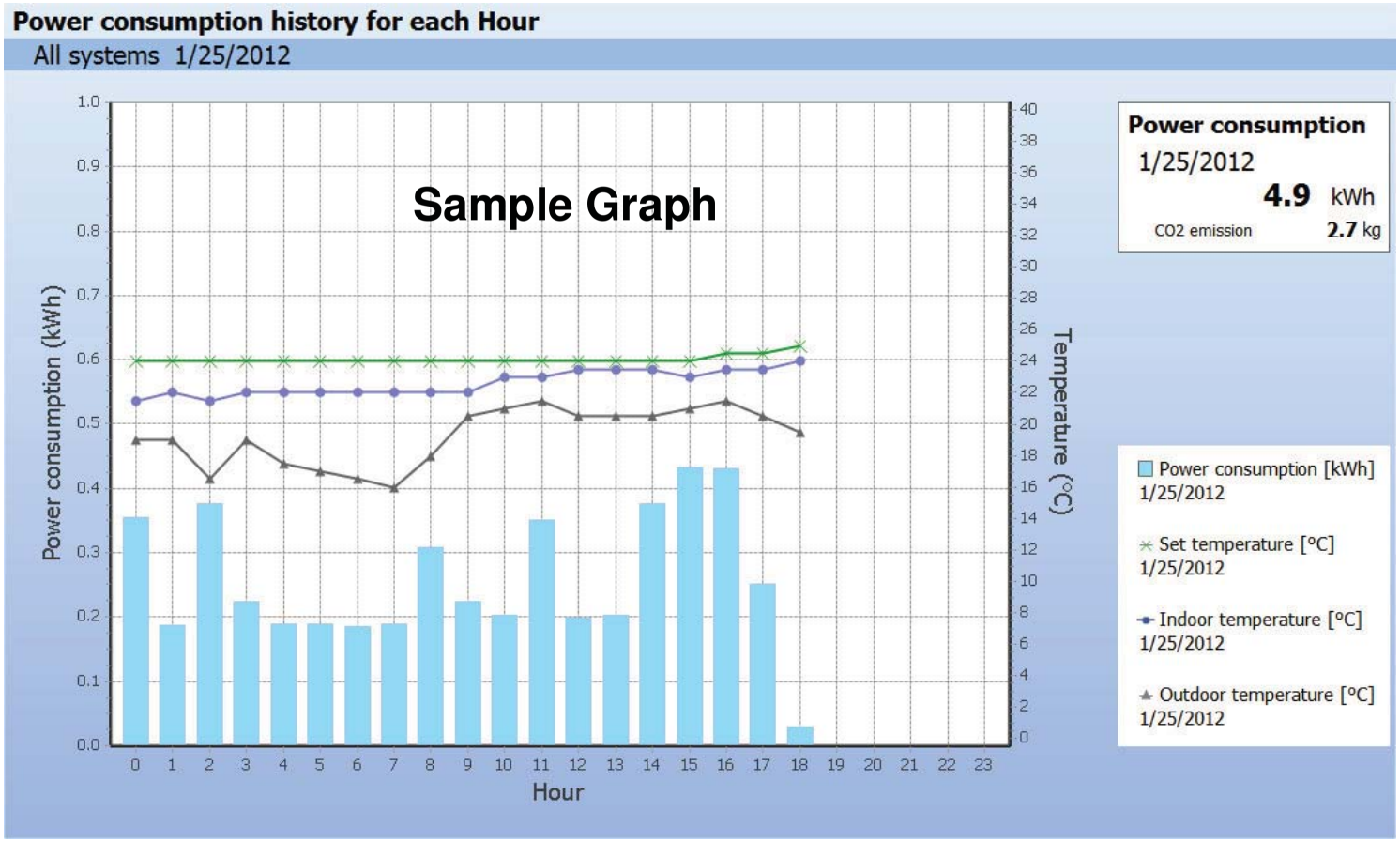
Data Analyzer provides graphical power consumption trends to help customer to save energy in operation.

TOSHIBA
AIR CONDITIONING

Smart Manager with Data Analyzer





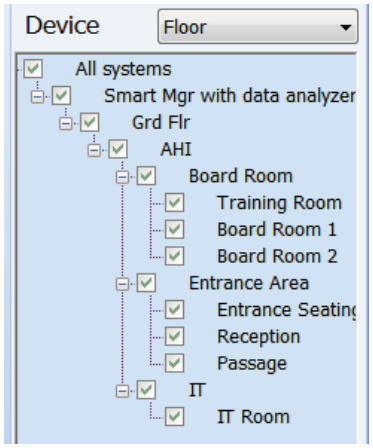


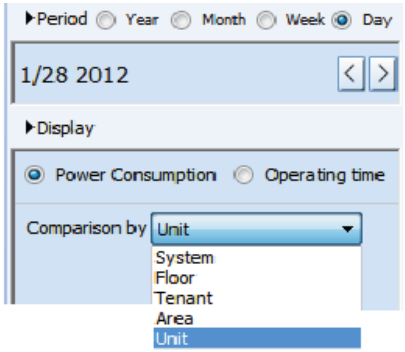
Application:

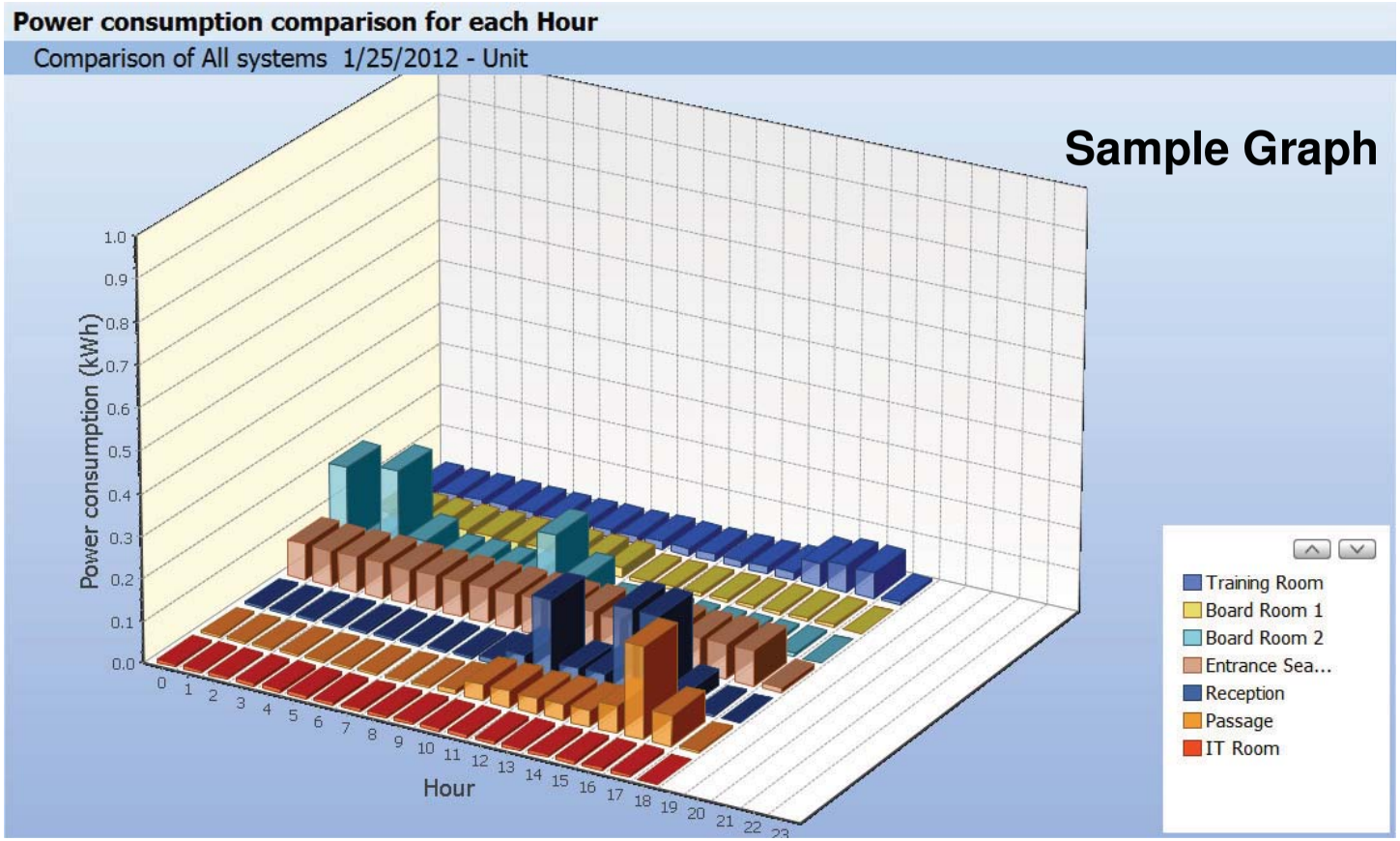
- Time period & Power consumption analysis
- Efficiency & ambient temperature analysis

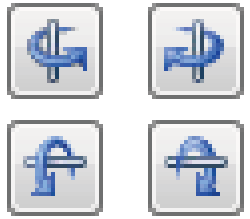
TOSHIBA
AIR CONDITIONING

Smart Manager with Data Analyzer









Application:

- 3D dimension graph for Analysis

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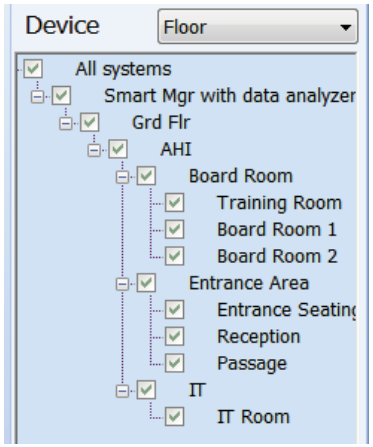
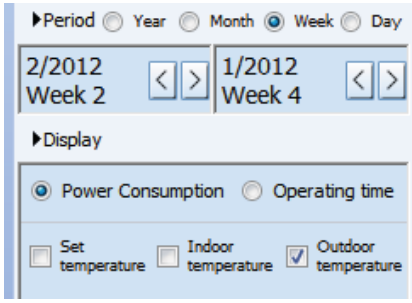
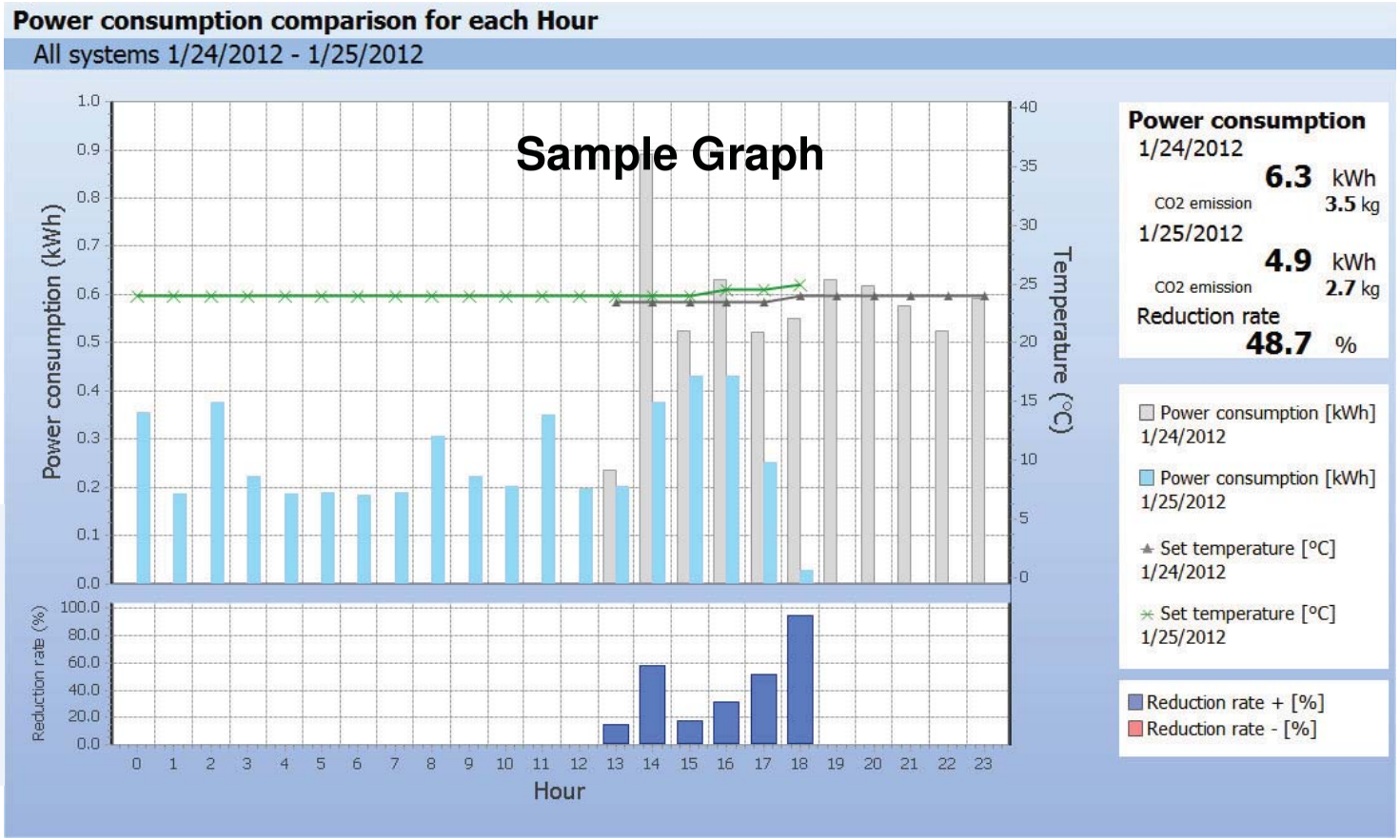
AIR CONDITIONING

Smart Manager with Data Analyzer







Application:

- Power consumption analysis over the periods with Reduction chart

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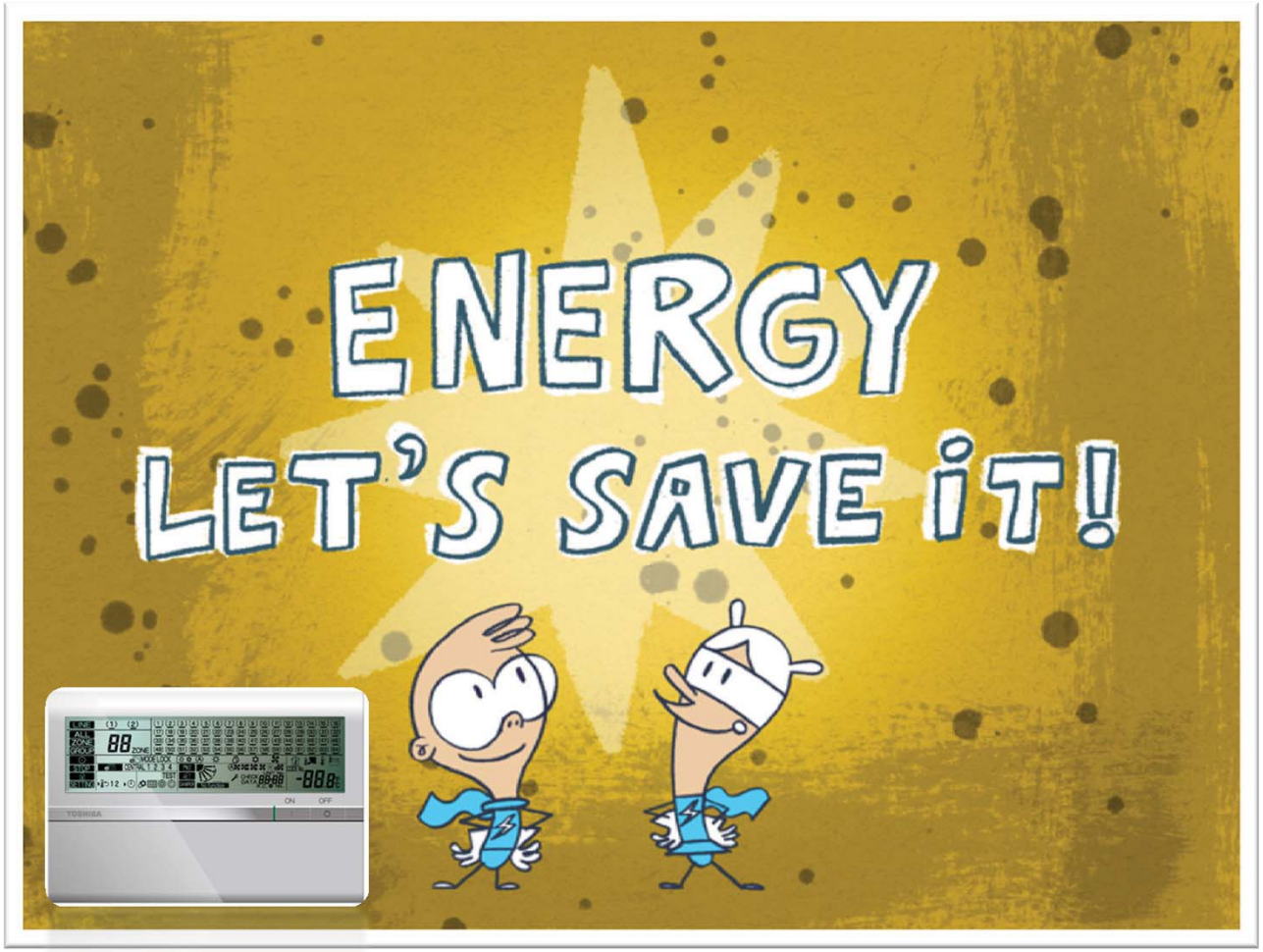
AIR CONDITIONING



Save Energy & Prove using Smart Manager with Data Analyzer

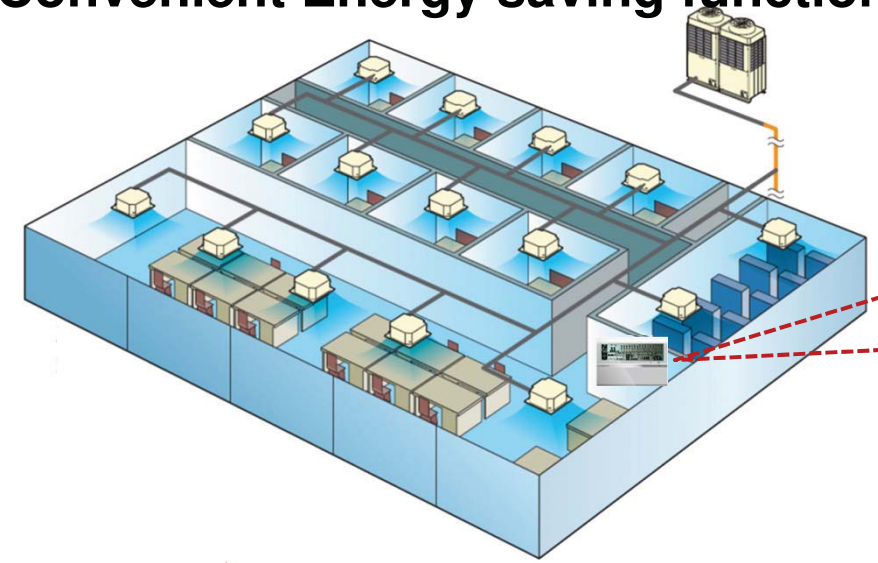
Convenient Energy saving functions using Schedule Operation

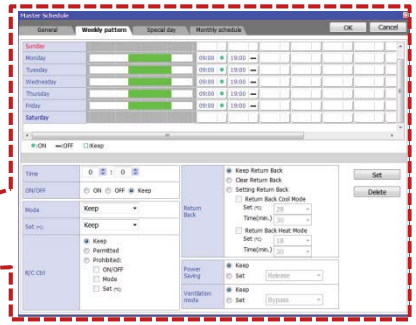
I forgot to turn off the Air conditioners in my office!!

We can avoid unwanted AC operation using schedule program

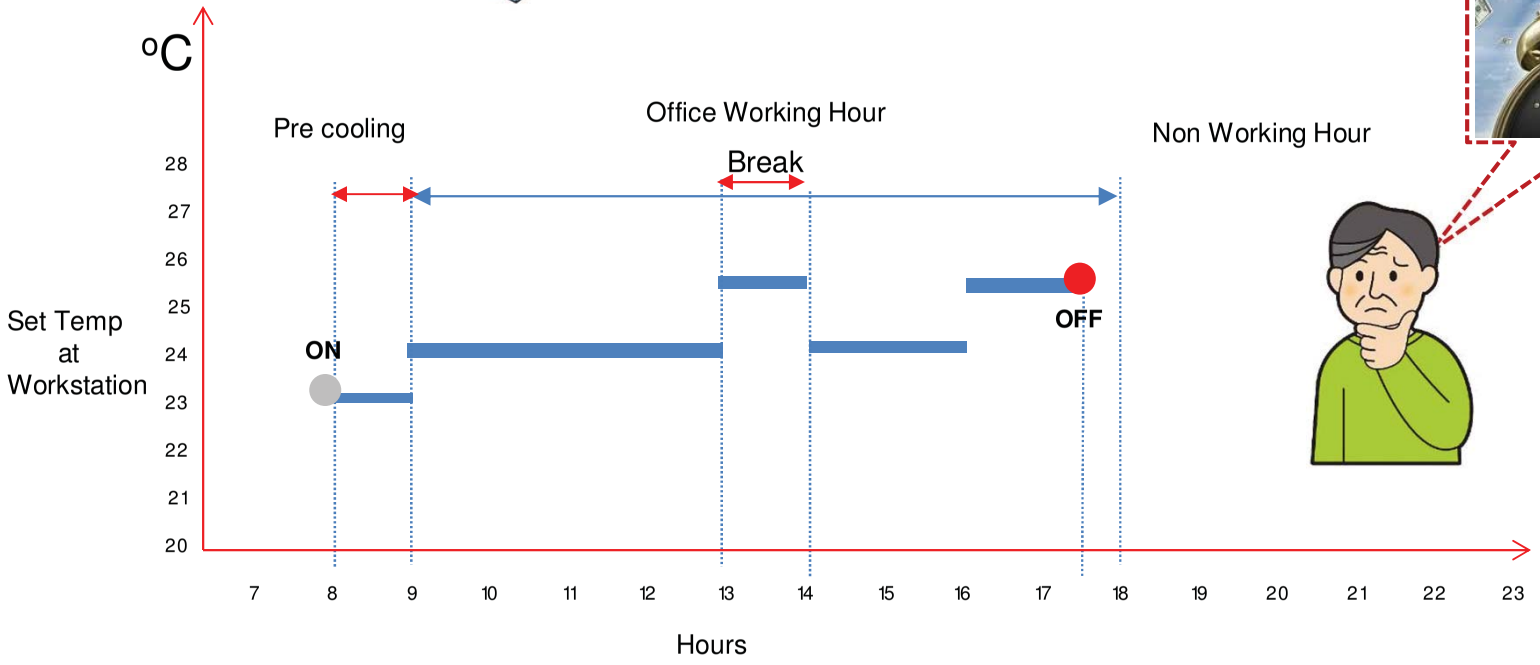
Schedule Program ON + OFF

Convenient Energy saving functions using Schedule Operation





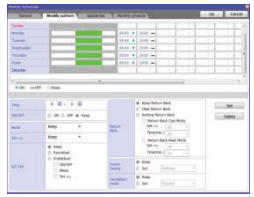
Schedule Program
ON+OFF+MODE+ Set Point



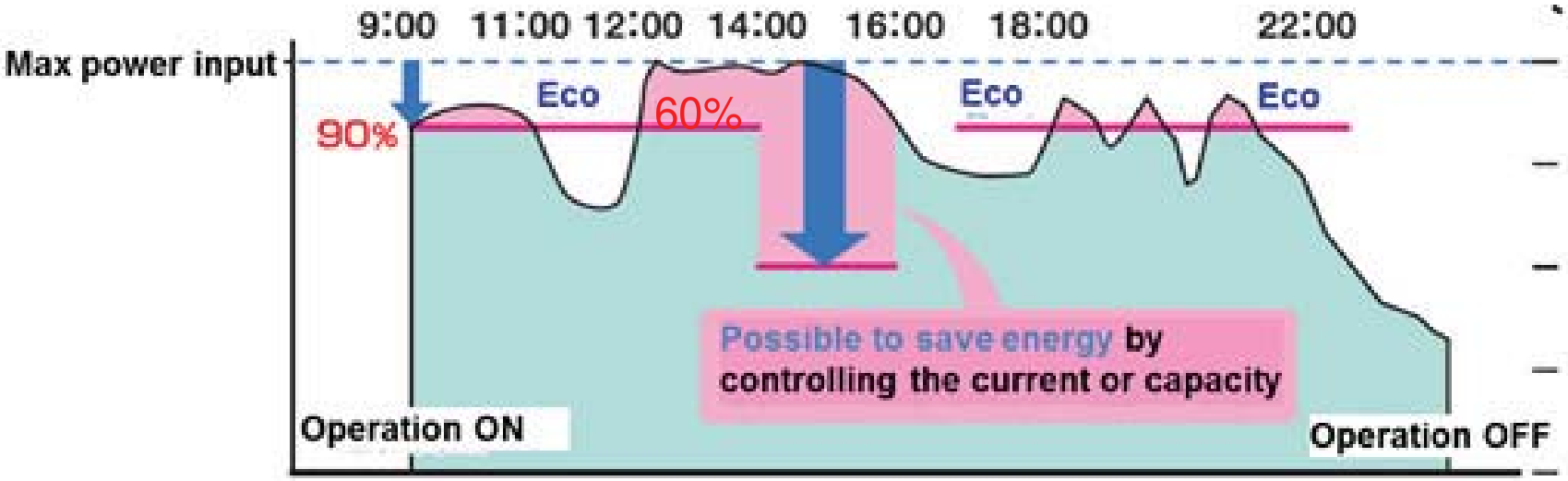
Convenient Energy saving functions using Schedule Operation

Control the peak power by Demand Control Scheduling.

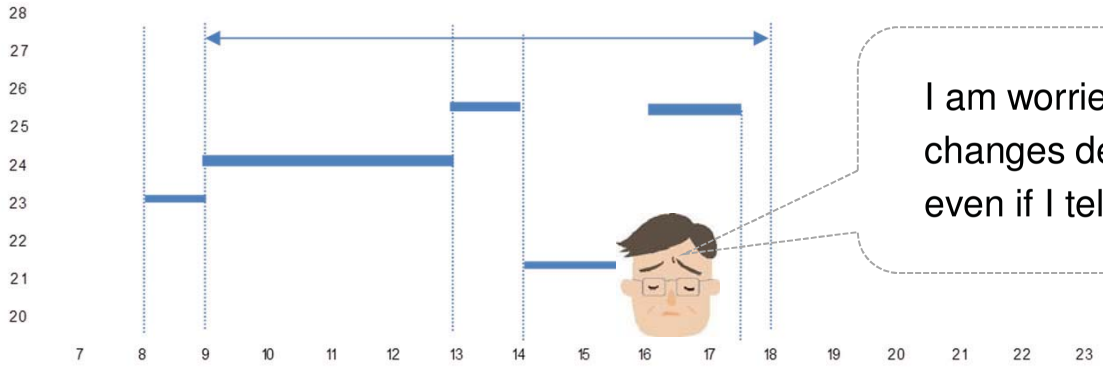
Demand control available with schedule function. Configurable setting 90, 80, 70, 60, 0 %.



Schedule Program With "SAVE "



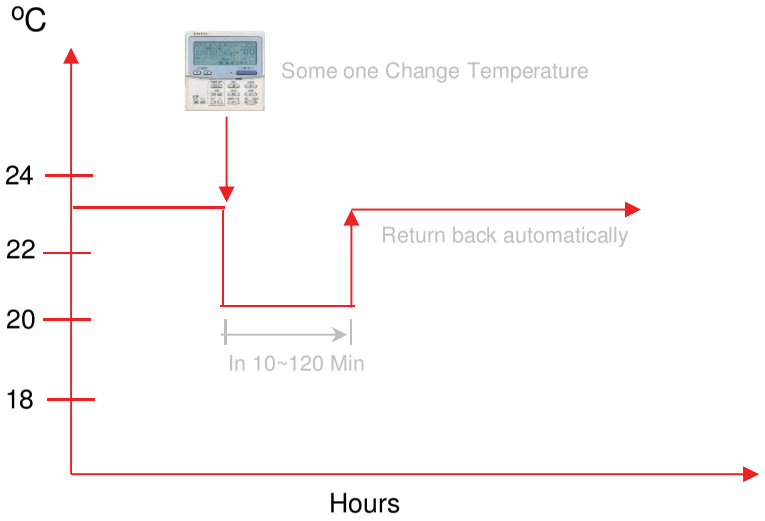
Convenient Energy saving functions using Schedule Operation

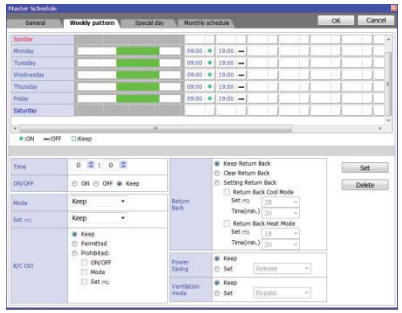


I am worried because someone changes deliberately set point even if I tell not to change that.

Return back

it can return back to the set temp. which you desire even if someone changes the set temp.





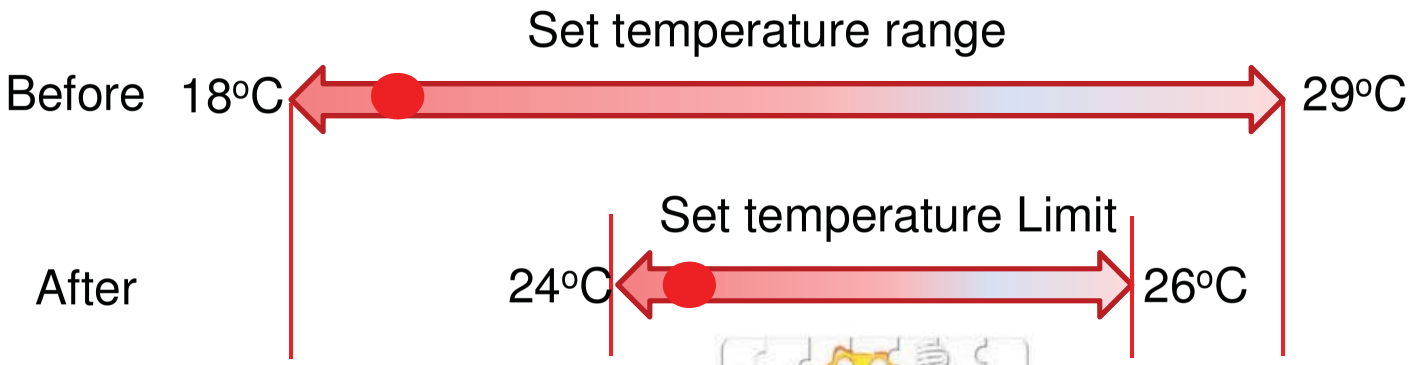
Schedule Program

Convenient Energy saving functions using Set Temp range Limit

Set temp. range limit

it can prevent heating and cooling too much because the set temp. range can be limited.

Example in Cooling



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AIR CONDITIONING

Excellent Energy Saving System with Toshiba

TOSHIBA
Carrier

Thank you!