

Frequency Components and Antennas
for
HVAC Equipment



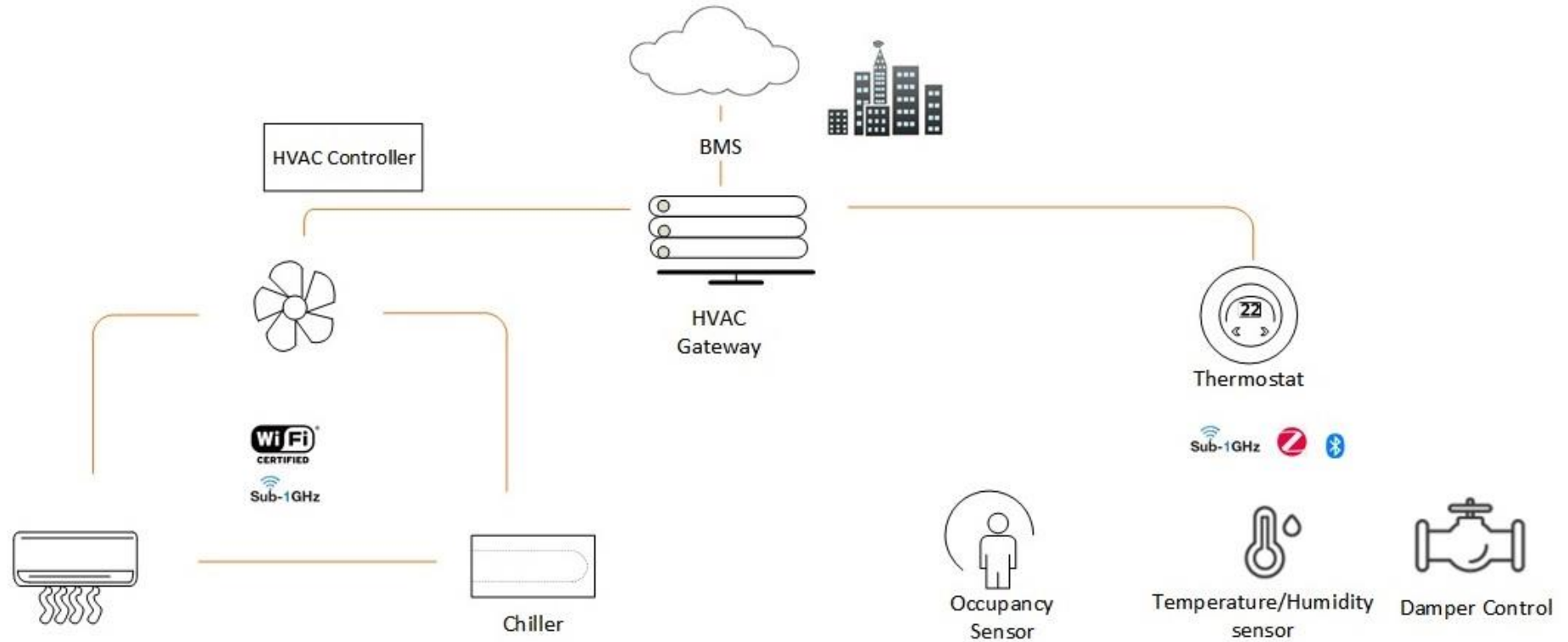
RALTRON

Introduction

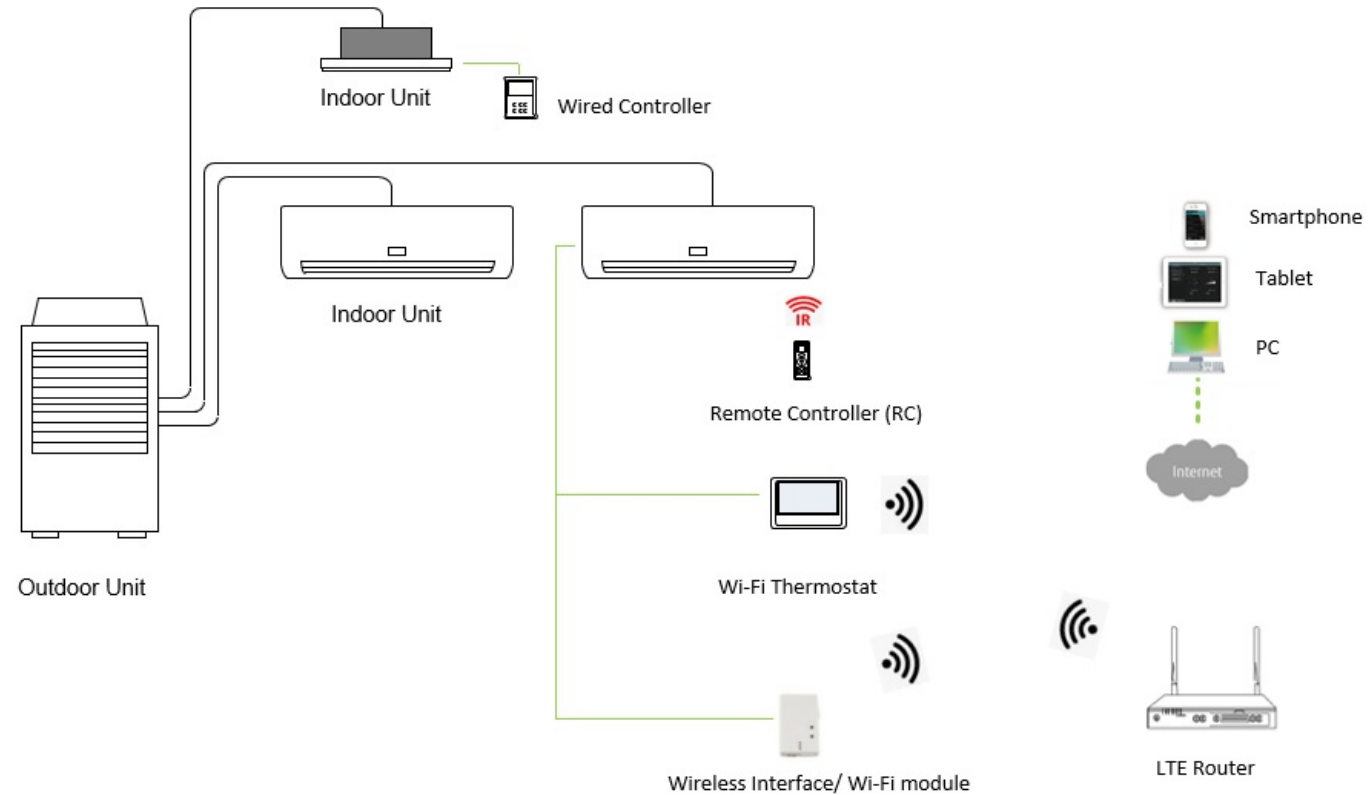


Raltron offers the most comprehensive line of frequency management components for HVAC Equipment, from simple tuning fork crystals to high stability, temperature compensated crystal oscillators and antennas. These products are designed to satisfy the ultra-low power, small footprint, and low-cost requirements of this growing market.

HVAC Control Systems Overview



Sample VRF System Control Systems Overview



Solutions for Bluetooth & BLE Protocol

Bluetooth Low Energy uses the same 2.4 GHz radio frequencies as classic Bluetooth
Some Typical Crystal or TCXO frequencies for **Bluetooth & BLE** HVAC Equipment ICs:

Infineon - PSoC 6 MCU: CY8C63x6, CY8C63x7 - 16 MHz/32 MHz Crystal Oscillator
16 to 35 MHz, 32.768 kHz On-chip Crystal Oscillators
- 2.4 GHz Chip Antenna

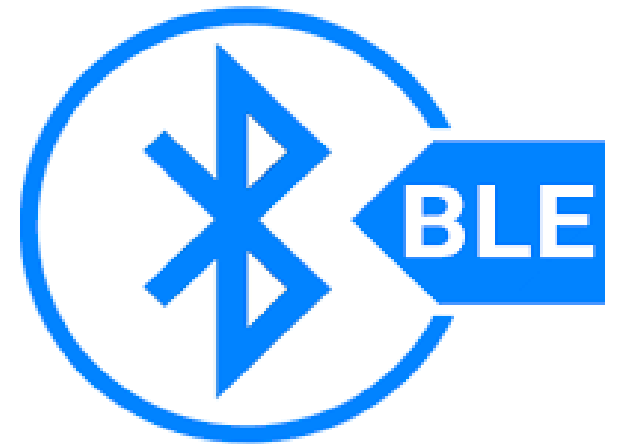
Nordic Semiconductor - nRF52810 - 64 MHz Crystal Oscillator, 32 MHz Crystal
32.768 kHz Crystal Oscillator, 32.768 kHz Crystal
1 MHz/16 MHz/32 MHz Peripheral Clock
- 2.4 GHz Antenna

Texas Instruments - CC2640R2F - 32.8 kHz/48 MHz RC Oscillator, 24 MHz Crystal Oscillator
32.768 kHz Crystal Oscillator
- 2.4 GHz Antenna

NXP Semiconductors - MKW39/38/37 - 26 MHz/32 MHz Crystal, 32.768 kHz Crystal Oscillator
- 2.4 GHz Antenna

Dialog Semiconductor - DA1469x - 32 MHz Crystal, 32.768 kHz Crystal Oscillator
- 2.4 GHz Antenna

STMicroelectronics - BlueNRG-LPS - 32 MHz Crystal, 32.768 kHz Crystal
- 2.4 GHz Antenna



[See All Crystal Products](#)

[See Antenna Products for Bluetooth](#)

Solutions for Wi-Fi Protocol

The Wi-Fi/IEEE 802.11 has three frequency bands, 2.4/5/6 GHz.

Some Typical Crystal or TCXO frequencies for **Wi-Fi** HVAC Equipment ICs:

Infineon - CYW43012 - 37.4 MHz, 32.768 kHz
CY8C62xA - 16 to 35 MHz , 32.768 kHz

Silicon Labs - WF200 - 38.4 MHz, 32.768 kHz
RS9116 - 40 MHz, 32.768 kHz

Microchip - ATWINC3400A-MU - 26 MHz, 32.768 kHz



The Wi-Fi 6/IEEE 802.11ax has two frequency bands, 2.4/5 GHz.

The Crystals for lower frequencies of **Wi-Fi 6** such as 38.4 and 48 MHz, and for higher are 76.8 and 96 MHz

Some Typical Crystals or TCXO frequencies for Wi-Fi 6 HVAC Equipment ICs:

SparkLan - WNFB-266AXI(BT) - 37.4 MHz, 32.768 kHz
AP6281 - 59.97 MHz, 32.768 kHz

[See All Crystal Products](#)

[See Antenna Products for Wi-Fi](#)

Solutions for ZigBee Protocol

The ZigBee/IEEE 802.15.4 has three frequency bands, allowing operation in all regions of the world: 2.4 GHz for worldwide applications, 868 MHz for Europe and 915 MHz for the American.

Some Typical Crystal or TCXO frequencies for **ZigBee** HVAC Equipment ICs :

Texas Instruments - CC2652RSIP - 48 MHz Crystal
48 MHz Crystal Oscillator
32.768 kHz Crystal Oscillator
- 2.4 GHz Inverted F Antenna

Nordic Semiconductor - nRF52832 - 64 MHz Crystal Oscillator
32 MHz Crystal, 32.768 kHz Crystal Oscillator
1 MHz/16 MHz/32 MHz Peripheral Clock
- 2.4 GHz Chip Antenna

NXP Semiconductors - JN5189 - 32 MHz Crystal Oscillator
32.768 kHz Crystal Oscillator
- 2.4 GHz Antenna



[See All Crystal Products](#)

[See Antenna Products for Zigbee](#)

Raltron Solutions - MHz Crystals

Available Crystal Packages


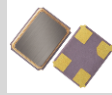

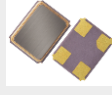

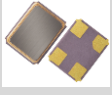

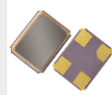
Part #	Size(mm)
R1612-32.000-9-F-1010-TR	1.60 x 1.25 x 0.32
R2016-48.000-8-F-1030-EXT-TR	2.00 x 1.60 x 0.50
R2520-26.000-18-F-1010-EXT-TR	2.50 x 2.00 x 0.65
RH100-38.400-10-F-1010-TR	3.20 x 2.50 x 0.70

[See All Crystal Products](#)

Typical Frequencies:

16 MHz, 26 MHz, 32 MHz, 37.4 MHz, 38.4 MHz, 48 MHz,
59.97 MHz , 64 MHz

Stock at our Distributors

Product Series	Datasheet	Image	Contact Us / Buy Now
R1612 View products in stock			Buy Now
R2016 View products in stock			Buy Now
R2520 View products in stock			Buy Now
RH100 View products in stock			Buy Now



Raltron Solutions - Tuning Fork 32.768 kHz

Available Tuning Fork Crystal Packages

Part #	Size(mm)
RT1210-32.768-9-TR	1.2 x 1.0
RT1610-32.768-12.5-TR	1.6 x 1.0
RT2012-32.768-7-20-EXT-TR	2.0 x 1.2
RT3215-32.768-12.5-TR	3.2 x 1.5
RSE-32.768-12.5-H14-TR	6.9 x 1.4
RSM200S-32.768-12.5-TR	8.0 x 3.8













[See All Crystal Products](#)

Load capacitance values: 6 pF, 7 pF, 9 pF and 12.5 pF

Frequency Tolerances: ± 20 ppm and ± 10 ppm



Stock at our Distributors

Product Series	Datasheet	Image	Contact Us / Buy Now
RT1210 View products in stock			Buy Now
RT1610 View products in stock			Buy Now
RT2012 View products in stock			Buy Now
RT3215 View products in stock			Buy Now
RSE H14			Buy Now
RSM200S View products in stock			Buy Now

Typical example of IC for HVAC Equipment using a 32.768 kHz crystal as frequency reference:

Texas Instruments - CC1352P7

Using 32.768 kHz crystal

CL: 6, 7 or 12 pF

ESR: 90 k Ω max

Raltron Solutions - TCXOs and VCTCXOs







Raltron TCXOs IC Solutions

Part #	Size(mm)
RTX-1612BD32-S-52.000-TR	1.6 x 1.2
RTX-2016AD333-S-26.000-TR	2.0 x 1.6
RTX-2520AD31-S-26.000-TR	2.5 x 2.0
RTX-2520AF32-S-48.000-TR	2.5 x 2.0

[See All TCXOs Products](#)

- Tighter Stability: ± 0.5 ppm ~ ± 2.5 ppm, $-40 \sim +85^{\circ}\text{C}$
- Improved Frequency Tuning Characteristic
- Superior Phase Noise Performance (-130 dBc/Hz on the floor)
- Range Supply Voltage: 1.8 V ~ 3.3 V
- Typical Frequencies: 10.0 MHz, 16.0 MHz, 19.2 MHz, 20.0 MHz, 26.0 MHz, 32.0 MHz, 38.4MHz, 48.0 MHz, 50.0 MHz, 52.0 MHz

Stock at our Distributors

Product Series	Datasheet	Image	Contact Us / Buy Now
RTX /RTV-1612			Buy Now
RTX /RTV-2016 View products in stock			Buy Now
RTX /RTV-2520 View products in stock			Buy Now



Raltron Solutions – Antennas

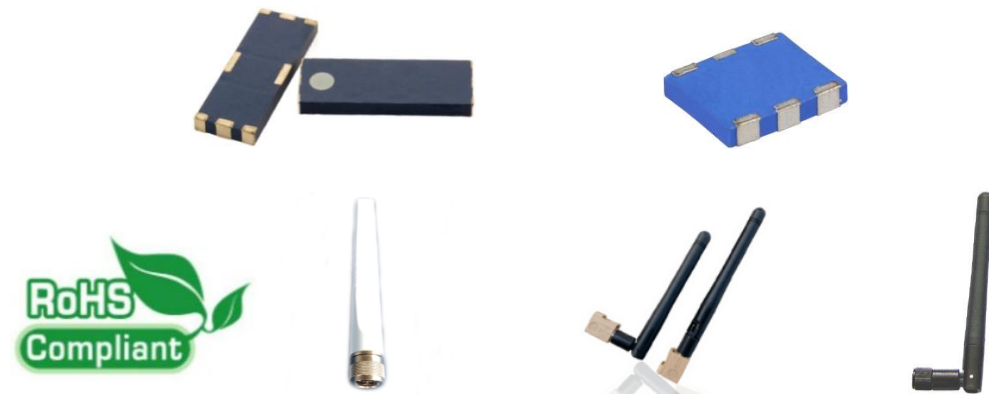
Raltron Stub Antennas Solutions

Part #	Frequency(MHz)
RST-W2-P-195-RPSMA-G	2400 ~ 2500
RST-W2A1-20022-17M-TE-001	2400 ~ 2500
RST-W7-30-A-G	2400 ~ 2500

[See Antenna Products for Wi-Fi](#)
[See Antenna Products for Bluetooth](#)
[See Antenna Products for Zigbee](#)

Raltron Chip Antennas Solutions

Part #	Frequency(MHz)
RCA-868-P-1204-A37-G	868

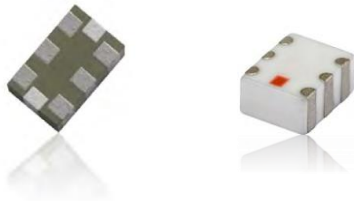


Raltron Products – LTCC Filters, Baluns and Diplexers

Raltron LTCC Filters Solutions

Part #	Size(mm)
RCF-5500.000-700000-1005-W-001	1.00 x 0.50
RCF-829.000-262000-1608-W-TR	1.60 x 0.80
RCF-2450.000-100000-1411-W-TR-001	1.40 x 1.10

[See All LTCC Filters, Baluns and Diplexers Products](#)



Raltron Diplexer Solutions

Part #	Size(mm)
RCDI-24-49-1608-W-TR	1.60 x 0.80 x 0.60
RCDI-W2A1-W5A17-1608-W-TR	1.60 x 0.80 x 0.60

Raltron Balun Transformers Solutions

Part #	Size(mm)
RBL-2430.000-1005-EV-001	1.00 x 0.50 x 0.40
RBL-1608-A3-TR	1.60 x 0.85 x 0.70
RBL-2012-G9D4-TR	2.00 x 1.25 x 0.90

Raltron Solutions – SAW Filters

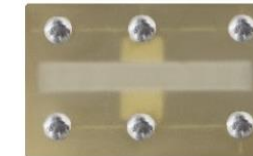
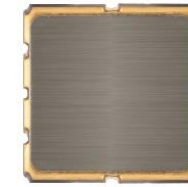
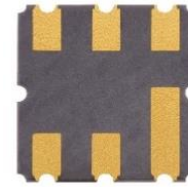
Raltron SAW Filter IC Solution

Part #	Size(mm)
RSF-916.500-5200-1411-TR-NS3	1.40 x 1.10 x 0.60
RSF-868.300-7000-3030-TR	3.00 x 3.00 x 1.28
RSF-915.000-926000-2016-TR	2.00 x 1.60 x 0.73

Raltron SAW filters designed for center frequencies between 315 MHz and 2.45 GHz with wideband and narrowband characteristics.

Main Features:

- Center frequency range between 315 MHz and 2.45 GHz
- Wideband filter with a center frequency of 315.00 MHz, 433.92 MHz, 460.00 MHz, 868.30 MHz, 869.00 MHz, 915.00 MHz, 942.50 MHz and 2.45 GHz
- Narrowband filters with a center frequency of 433.92 MHz and 868.30 MHz
- Low insertion loss between 1.4 dB and 3.3 dB



[See All SAW Filters Products](#)

Raltron Solutions RF Connectors and RF Cable Assemblies

Raltron RF connectors with low insertion loss and excellent voltage standing wave ratio support the high-level performance demanded by Smart City Applications.



SMA CONNECTORS - [RCN-1M-21419-K-001](#)

BNC CONNECTORS - [RCN-3F-3108-K-001](#)

MCX CONNECTORS - [RCN-4F-28012-K-001](#)

MMCX CONNECTORS - [RCN-5F-33106-K-001](#)

TNC CONNECTORS - [RCN-9M-16205-K-001](#)

N CONNECTORS - [RCN-17M-12816-K-001](#)

Raltron cable assemblies range from simple jumpers to power and high-speed data cables.

SMA TO IPEX CABLE - [RCB-16-F-95-11-SD](#)

MCX TO MCX CABLE - [RCB-21-174-150-DO-001](#)

MCX TO SMA CABLE - [RCB-14-H-100-12-SD](#)

MMCX TO SMA CABLE - [RCB-15-A-100-12-SD](#)

TNC TO SMA CABLE - [RCB-13-J-600-13-SD](#)



[CABLE ASSEMBLIES SHORT FORM CATALOG](#)

Contact



<http://www.raltron.com>

Raltron Electronics

10400 N.W. 33rd Street

Miami, FL 33172, U.S.A.

Phone: 305 593 6033

Fax: 305 594 3973