

ATMEL

SMART RF

RF WIRELESS

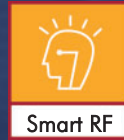
DATA/CONTROL SOLUTIONS

FOR INDUSTRIAL

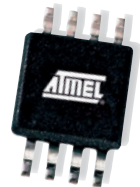
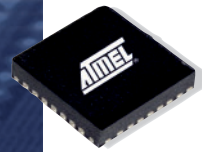
AND CONSUMER

APPLICATIONS

IN THE ISM BANDS



Smart RF



ATMEL[®]



ATMEL SMART RF

Atmel offers a broad range of integrated circuits for a variety of RF applications in the ISM bands. The product portfolio includes single-channel transmitter ICs, receiver and transceiver ICs, as well as multi-channel transceiver circuits and transmitters with an integrated MARC4 4-bit or AVR® microcontroller.

The frequency range spans from 250-450 MHz to 868-870 MHz, 902-928 MHz and 2.4 GHz, thus enabling all kinds of applications in the industrial and consumer area.

All Atmel ISM products provide a high integration level and enable easy implementation.

APPLICATIONS

Home Automation

- Door Opening Systems (Garage Doors)
- Weather Stations: Lights, Humidity, Wind, Radiation
- Heating/Air Conditioning Monitoring
- Blinds, Roller Shutters
- Wall Sockets
- TV, Hi-fi, Video Remote Controls
- Emergency Systems for Elderly People
- Computer Peripherals (Mouse, Keyboard, Joystick, etc.)
- Intercom

Automatic Meter Reading

- Gas, Water, Electricity

Advanced Toys and Gaming

- Toys (Remote-controlled Cars)
- Gaming (Wireless Game Controller)

Industrial

- Measurements: Lights, Humidity, Wind, Radiation
- Production Monitoring and Controlling
- Remote Control (e.g., Cranes)
- Logistics/Stock Management (Wireless Handheld Terminals, e.g. Bar Code Readers)
- Telematics

Headsets

Wireless Audio/Video

High-speed Data Communications

Wireless USB

Infotainment and Conference Systems

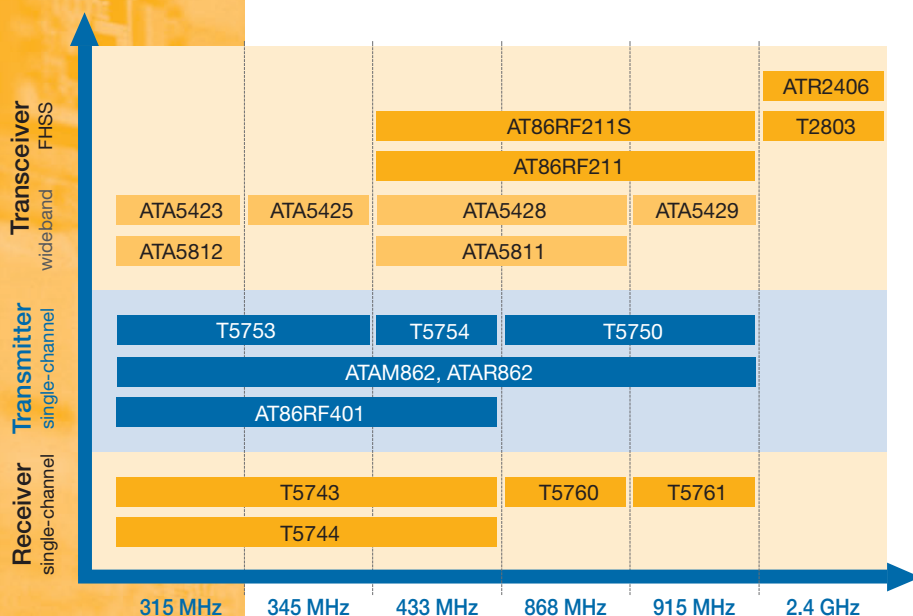
Wireless Communications

- Walkie-Talkie

Electronic Point of Sales Systems

Alarm and Security Systems

- Wireless Warning Systems (Tension, Temperature, Heart Problems etc.)
- Alarm Systems, Smoke and Presence Detectors



SYSTEM SOLUTIONS

An ISM system consists typically of at least two RF nodes. The most simple system has a transmitter on one side and a receiver on the other side. For many applications such as remote controls for lights, garage doors, air conditioning systems etc., this is sufficient.



For mobile or handheld end products, a highly integrated system allows the manufacturing of very small transmitters. This solution is based on one-way communication, but using a micro-transmitter on the transmitter side.

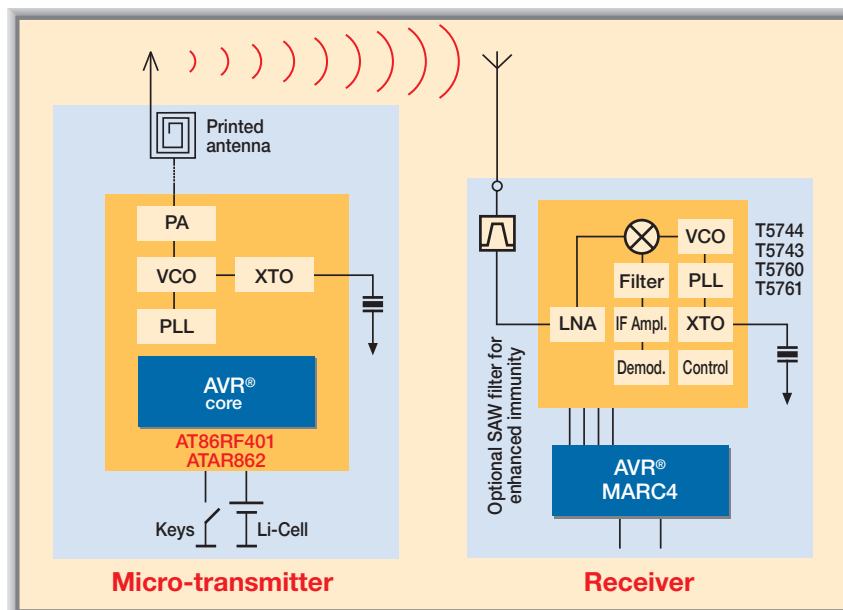
Two-way communication systems may have a very simple link with low data transmission rates, but high data rates of up to 1 Mbit/s as required for wire-

less data transfer, control or gaming are also possible.

The system diagram shows a typical one-way link application with an AVR® micro-transmitter. By replacing the transmitter and the receiver by a transceiver on each side, a two-way communication system can easily be designed.

ATMEL'S ISM SYSTEM BENEFITS

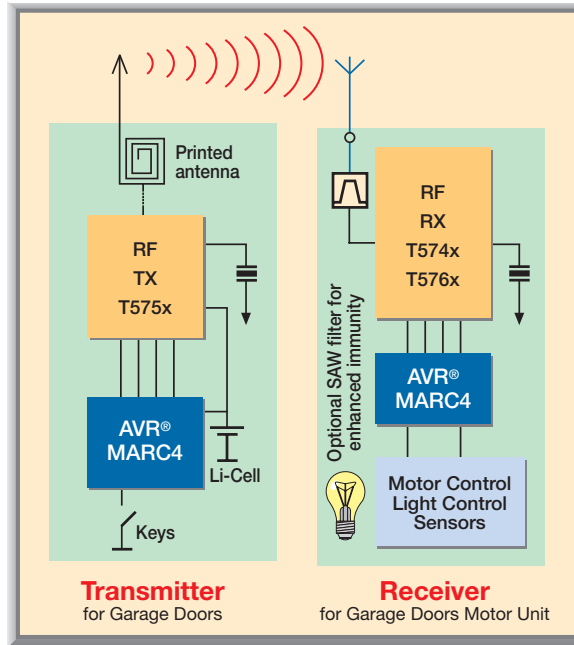
- Complete Radio Product Portfolio Covers All ISM Bands from 250 MHz to 2.4 GHz
- Compliant to FCC CFR 46, Part 15 (US) and EN300 328/400 (Europe)
- Low Cost and Low Power Consumption
- Fast Data Rates (1.152 Mbit/s Maximum)
- Using Atmel's SiGe PAs, the Maximum Output Power of 14 dBm Can Be Increased up to 35 dBm for Extended Link Ranges
- Atmel Provides All Further Devices Needed for a Complete ISM System Solution: MARC4 4-Bit and AVR Microcontrollers, SiGe PAs, EEPROM, Flash etc. as well as Application Support and Design Kits



Standard ISM System Using a Micro-transmitter

ONE-WAY RF TRANSMITTER

(e.g. Remote Control for Garage Door Openers)

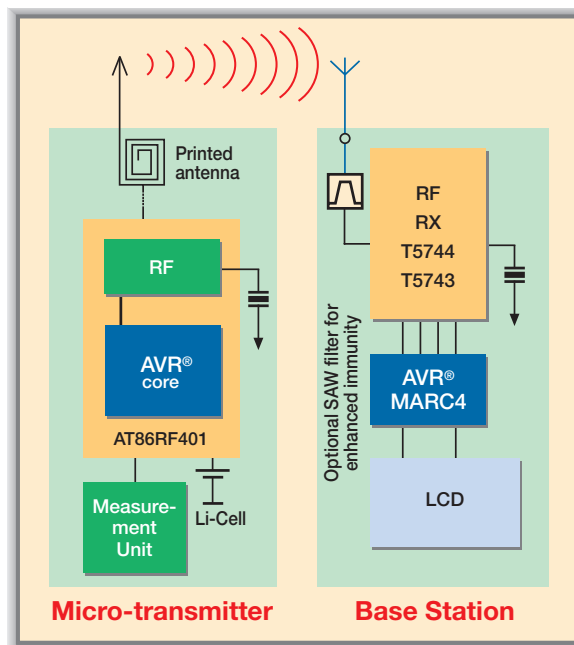


Key Benefits

- Tiny Transmitter Package
- Intelligent Receivers with Automatic Decoding
- Frequency Range 315 to 928 MHz
- Crystal Sharing with MARC4 Device Saves BOM
- Printed PCB Antenna Allows Small Housings
- MARC4 Enables Long Battery Lifetime

AVR-MICRO-TRANSMITTER SYSTEM

(Next Integration Level of One-way RF Transmitter Systems, e.g., Outside-temperature Data Transmission)



Key Benefits

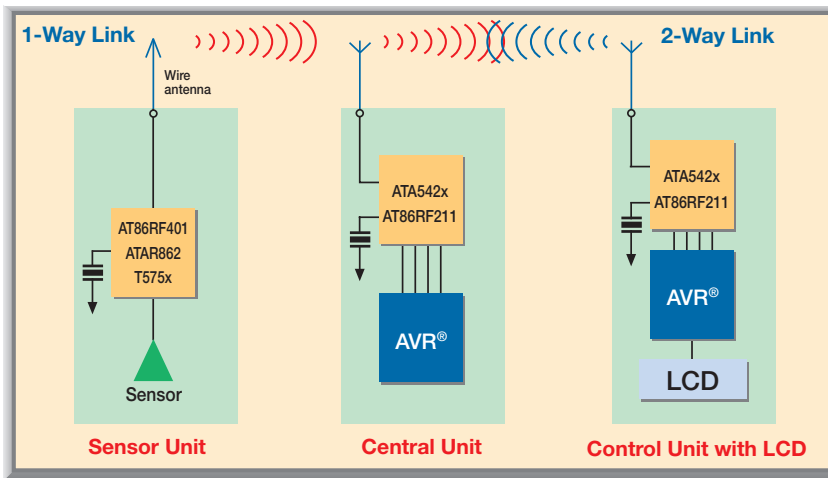
- Tiny Micro-transmitter Package
- Only One IC in the Sensor Unit
- AVR Core with 2-kbyte Flash Memory
- AVR on Receiver Side with Integrated LCD Driver
- AVR Tools Can Be Used
- Suitable for Different ISM Bands

TRANSCEIVER SYSTEM

(Uni- and Bi-directional RF Link for Alarm Systems)

Key Benefits

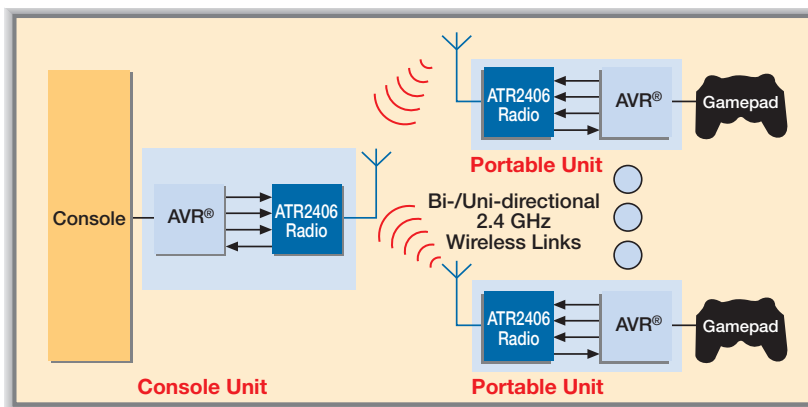
- Bi-directional Circuits for Central and Control Units
- Uni-directional Circuits for Sensors
- Very Robust by Design
- Low Current Consumption Enables Extended Battery Life
- Long Distances Due to High Output Power
- Suitable for Several ISM Bands
- Small Housing Since the RF Transmitter Integrates the AVR Microcontroller



WIRELESS GAME CONTROLLER SYSTEM

Key Benefits

- 2.4-GHz Transceiver for World-wide Usage
- Frequency Hopping Spread Spectrum (FHSS) Supported to Minimize Interferences with Other 2.4-GHz Systems such as Bluetooth® or WLAN
- Well Suited for Multi-user Support (Point-to-multipoint)
- Data Rates up to 1.152 Mbit/s
- Low Average Power Consumption Due to Burst Mode Operation



Transmitter ICs

| Part No. | Frequency Range [MHz] | Modulation ASK/FSK | Data Rate ¹⁾ [kHz] | V _S [V] | I _{sleep} Max. [µA] | I _{active} Typ. [mA] | I _{transmit} Typ. [mA] | P [dBm] | Package |
|----------|-----------------------|--------------------|-------------------------------|--------------------|------------------------------|-------------------------------|---------------------------------|---------|---------|
| U2741B | 300-450 | X X | 20 | 2.0-5.5 | 0.35 | 4.7 | 10 | 3 | SSO16 |
| U2745B | 310-440 | X | 20 | 2.2-4.0 | 2 | 4.7 | 10 | 3 | SSO16 |
| T5750 | 868-928 | X X | 32 | 2.0-4.0 | 0.35 | 3.6 | 8.5 | 5.5 | TSSOP8 |
| T5753 | 310-350 | X X | 32 | 2.0-4.0 | 0.35 | 3.7 | 9 | 8 | TSSOP8 |
| T5754 | 429-439 | X X | 32 | 2.0-4.0 | 0.35 | 3.7 | 9 | 7.5 | TSSOP8 |

¹⁾ 32 kHz means 32 kBit/s Manchester coding or 64 kBit/s NRZ coding

Micro-transmitter ICs

| Part No. | Frequency Range [MHz] | µC Core | Modulation ASK/FSK | Data Rate ¹⁾ [kHz] | V _S [V] | I _{sleep} Max. [µA] | I _{active} Typ. [mA] | I _{transmit} Typ. [mA] | P [dBm] | Package |
|---------------------------|-----------------------|---------|--------------------|-------------------------------|--------------------|------------------------------|-------------------------------|---------------------------------|---------|---------|
| AT86RF401 | 250-450 | AVR | X | 10 | 2.0-3.5 | 0.5 | 13 | 18 | 6 | TSSOP20 |
| ATAx862 ²⁾ -R3 | 310-330 | MARC4 | X X | 32 | 2.0-4.0 | 0.35 | 3.7 | 9.5 | 8 | SSO24 |
| ATAx862 ²⁾ -R4 | 429-439 | MARC4 | X X | 32 | 2.0-4.0 | 0.35 | 3.7 | 9.5 | 7.5 | SSO24 |
| ATAx862 ²⁾ -R8 | 868-928 | MARC4 | X X | 32 | 2.0-4.0 | 0.35 | 3.6 | 9 | 5.5 | SSO24 |

¹⁾ 32 kHz means 32 kBit/s Manchester coding or 64 kBit/s NRZ coding

²⁾ ATAR862 = ROM version, ATAM862 = Flash/MTP, replaces T48C862

Receiver ICs

| Part No. | Frequency Range [MHz] | Modulation ASK/FSK | Data Rate ¹⁾ [kHz] | V _S [V] | I _{off} [µA] | I _{active} [mA] | Sensitivity [dBm] ASK | Sensitivity [dBm] FSK | Package |
|----------|-----------------------|--------------------|-------------------------------|--------------------|-----------------------|--------------------------|-----------------------|-----------------------|---------------|
| U3741BM | 300-450 | X X | 10/3.2 | 4.5-5.5 | 190 | 7 | -110 | -98.5 | SO20 |
| U3742BM | 300-450 | X X | 10/3.2 | 4.5-5.5 | 190 | 7 | -110 | -98.5 | SO20 |
| U3745BM | 310-440 | X | 10/— | 4.5-5.5 | 190 | 7 | -110 | — | SO20 |
| T5743 | 300-450 | X X | 10/10 | 4.5-5.5 | 170 | 7.5 | -110 | -104 | SO20 |
| T5744 | 300-450 | X | 10/— | 4.5-5.5 | 190 | 7 | -110 | — | SO20 SSO20 |
| T5760 | 868-870 | X X | 10/10 | 4.5-5.5 | 170 | 7.6 | -112 | -106 | SO20 |
| T5761 | 902-928 | X X | 10/10 | 4.5-5.5 | 170 | 7.6 | -112 | -106 | SO20 |

¹⁾ 32 kHz means 32 kBit/s Manchester coding or 64 kBit/s NRZ coding

Wideband Transceiver ICs

| Part No. | Frequency Range [MHz] | Modulation ASK/FSK | Data Rate ¹⁾ [kHz] | V _S [V] | I _{off} [mA] | I _{active} [mA] at 10 dBm | Sensitivity [dBm] ASK | Sensitivity [dBm] FSK | P [dBm] | Package |
|----------------------------------|-----------------------|--------------------|-------------------------------|--------------------|-----------------------|------------------------------------|-----------------------|-----------------------|---------|---------|
| ATA5811 | 433-435 868-870 | X X | 10/20 | 2.4-3.6 | 0.01 | 15.8 17.3 | -116.5 -114 | -109.5 -107 | 10 | QFN48 |
| ATA5812 ATA5423 ³⁾ | 314-316 | X X | 10/20 | 2.4-3.6 | 0.01 | 15.7 | -117.5 | -110.5 | 10 | QFN48 |
| ATA5425 ³⁾ | 345 | X X | 10/20 | 2.4-3.6 | 0.01 | 15.7 | -117.5 | -110.5 | 10 | QFN48 |
| ATA5428 ³⁾ | 433-435 868-870 | X X | 10/20 | 2.4-3.6 | 0.01 | 15.8 17.3 | -116.5 -114 | -109.5 -107 | 10 | QFN48 |
| ATA5429 ³⁾ | 915 | X X | 10/20 | 2.4-3.6 | 0.01 | 17.3 | -114 | -107 | 10 | QFN48 |

¹⁾ 32 kHz means 32 kBit/s Manchester coding or 64 kBit/s NRZ coding

³⁾ Available end of 2004

Multi-channel Transceiver ICs

| Part No. | Frequency Range [MHz] | Modulation | Data Rate [kbit/s] | Output Power [dBm] | Rx Sensitivity [dBm] | V _S [V] | IIP3 [dBm] | Package |
|------------|-----------------------|------------|--------------------|--------------------|----------------------|--------------------|------------|---------|
| AT86RF211 | 433, 868, 915 | FSK | 64 | 14 | -99 | 2.4-3.75 | -15 | TQFP48 |
| AT86RF211S | 433, 868, 915 | FSK | 100 | 16 | -99 | 2.4-3.75 | -15 | TQFP48 |
| ATR2406 | 2,400-2,483 | GFSK | 0-1,152 | 3 | -93 | 3.0-4.6 | -15 | QFN32 |
| T2803 | 2,400-2,483 | GFSK | 0-1,152 | 3 | -78 | 3.0-4.6 | -7 | QFN48 |

Development Kits with Software

| Part No. | Application | Ordering No. | Remarks |
|-----------------------------------|---|----------------------------------|-------------------------------------|
| AT86RF211/ AT86RF211S | AVR mother boards for RF evaluation/development | AT86RF211-DK | RF modules ordered separately |
| AT86RF401 | RF evaluation kit AVR transmitter | AT86RF401E-EK1 AT86RF401U-EK1 | 433.92 MHz 315 MHz |
| AT86RF401, T5744 | RF development kit AVR transmitter + RX | ATAK4015744E ATAK4015744U | 433.92 MHz/no SAW 315 MHz/no SAW |
| ATR2406 | AVR-based development kit | ATR2406-DEV-KIT | 2 RF modules included |
| T5750/T5760/ MARC4/AVR | RF development kit 868.3 MHz | ATAK5750-60-N ATAK5750-60-S | No SAW SAW |
| T5750/T5761/ MARC4/AVR | RF development kit 915 MHz | ATAK5750-61-N | No SAW |
| T5753/T5743/ MARC4/AVR | RF development kit 315 MHz 300 kHz IF-BW | ATAK5753-43P3-S | SAW |
| T5753/T5743/ MARC4/AVR | RF development kit 315 MHz 600 kHz IF-BW | ATAK5753-43P6-S | SAW |
| T5754/T5743/ MARC4/AVR | RF development kit 433.92 MHz 300 kHz IF-BW | ATAK5754-43P3-S | SAW |
| T5754/T5743/ MARC4/AVR | RF development kit 433.92 MHz 600 kHz IF-BW | ATAK5754-43P6-S | SAW |

Development Boards

| Part No. | Application | Ordering No. | Remarks |
|----------------------------------|--|--|---|
| ATA5811 | RF transceiver board 433 MHz 868 MHz | ATAB5811-4L ATAB5811-8L | P = + 5 dBm |
| | RF transceiver board 433 MHz 868 MHz | ATAB5811-4H ATAB5811-8H | P = + 10 dBm |
| ATA5812 | RF transceiver board 315 MHz | ATAB5812-3L ATAB5812-3H | P = + 5 dBm P = + 10 dBm |
| AT86RF211/ AT86RF211S | UHF FSK transceiver board 868 and 915 MHz | AT86RF211DB-BIBAND | Same hardware for 868 and 915 MHz, printed antenna |
| AT86RF211/ AT86RF211S | UHF FSK transceiver board 433, 868 and 915 MHz | AT86RF211DB-433TRI | Only a few passives changed to swap frequencies |
| AT86RF211/ AT86RF211S | UHF FSK transceiver board 868 or 915 MHz | AT86RF211DB-868LNA or AT86RF211DB-915LNA | LNA, SAW filter printed antenna and inductors |
| AT86RF211/ AT86RF211S | UHF FSK transceiver board 433, 868 or 915 MHz | AT86RF211DB-433107 or AT86RF211DB-868107 or AT86RF211DB-915107 | SAW and IF filters used, all devices are SMD components |
| AT86RF211/ AT86RF211S | UHF FSK transceiver board 433, 868 or 915 MHz | AT86RF211DB-433LT or AT86RF211DB-868LT or AT86RF211DB-915LT | SAW and IF filters used, low-cost lead-through components |
| ATR2406 | ISM transceiver board 2.4 GHz, 1.152 Mb/s | ATR2406-DEV-BOARD | Low-cost reference design |
| T5744 | UHF ASK receiver board 300-450 MHz | ATAB5744-N4 ATAB5744-S4 | 433.92 MHz/no SAW 433.92 MHz/SAW |
| | | ATAB5744-N3 ATAB5744-S3 | 315 MHz/no SAW 315 MHz/SAW |
| T5743P3 | UHF ASK/FSK receiver board 300-450 MHz, IF bandwidth 300 kHz | ATAB5743P3-S4 ATAB5743P3-S3 | 433.92 MHz/SAW 315 MHz/SAW |
| T5743P6 | UHF ASK/FSK receiver board 300-450 MHz, IF bandwidth 600 kHz | ATAB5743P6-S4 ATAB5743P6-S3 | 433.92 MHz/SAW 315 MHz/SAW |
| T5750 | UHF ASK/FSK transmitter board 868.3/915 MHz | ATAB5750-8 ATAB5750-9 | 868.3 MHz 915 MHz |
| T5753 | UHF ASK/FSK transmitter board 315 MHz | ATAB5753 | |
| T5754 | UHF ASK/FSK transmitter board 433.92 MHz | ATAB5754 | |
| T5760 | UHF ASK/FSK receiver board 868.3 MHz | ATAB5760-N ATAB5760-S | No SAW SAW |
| T5761 | UHF ASK/FSK receiver board 915 MHz | ATAB5761-N | No SAW |



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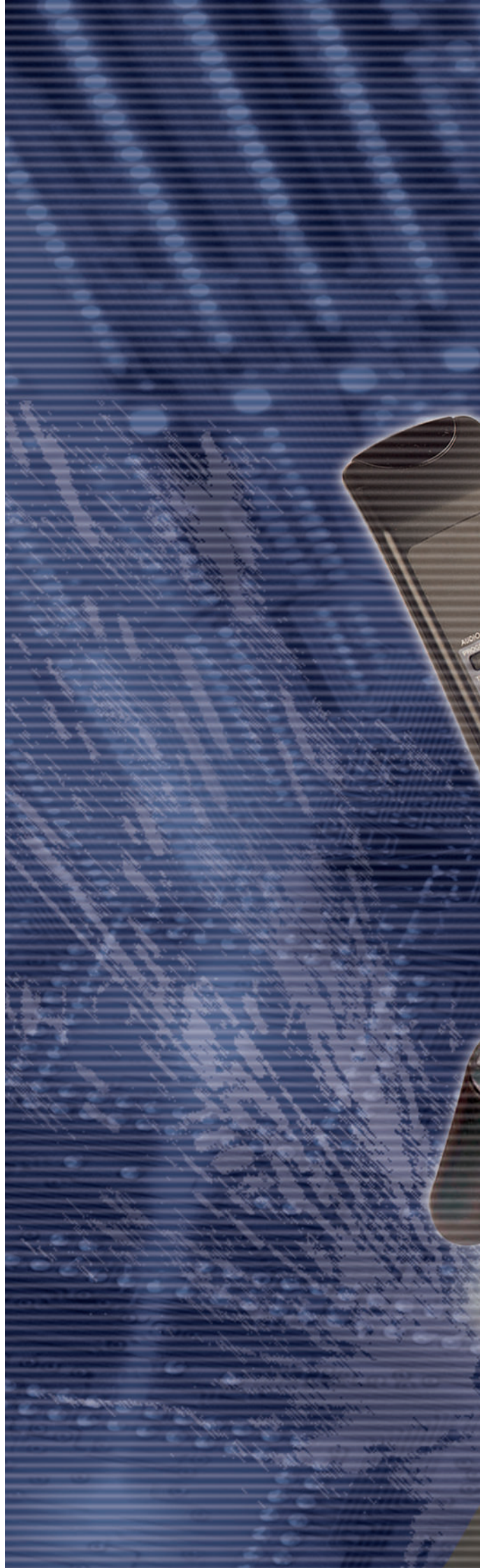
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