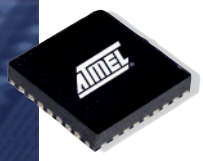
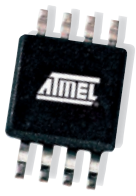
ATMEL SMART RF

RF Wireless Data/Control Solutions for Industrial and Consumer Applications in the ISM Bands

Smart RF





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

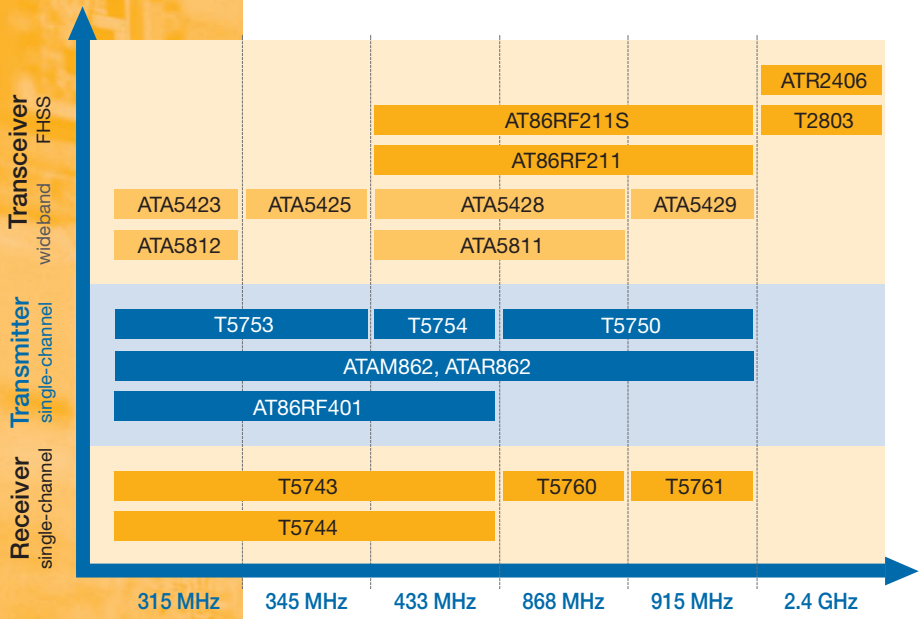
Wireless USB

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.

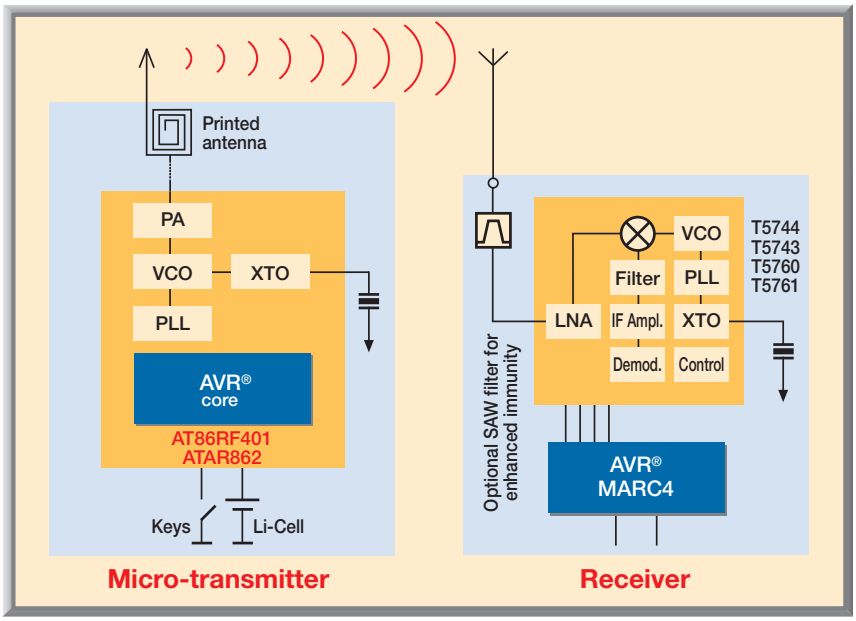
For mobile or handheld end products, a highly integrated system allows the manufacturing of very small transmitters. This solution is based on one-way communication, but using a micro-transmitter on the transmitter side.

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 wireless 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

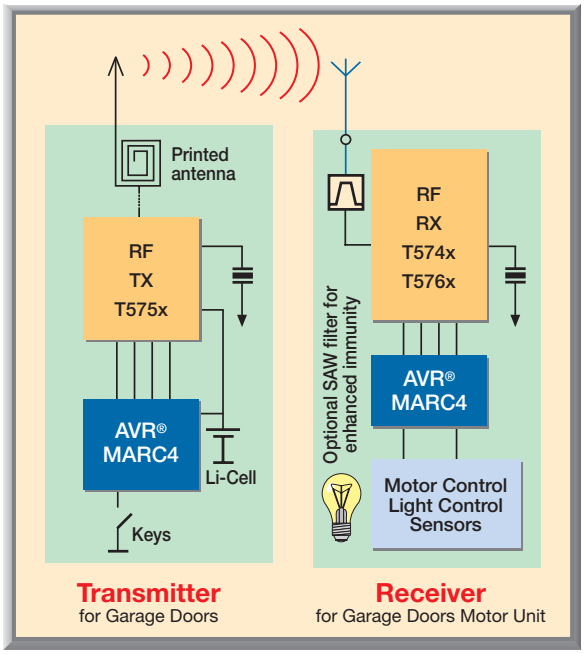
- Complete Radio Product Portfolio Covers All ISM Bands from 250 MHz to 2.4 GHz
- Compliant to FCC CFR 46, Part 15 (US) and EN300 328/400 (Europe)
- Low Cost and Low Power Consumption
- Fast Data Rates (1.152 Mbit/s Maximum)
- Using Atmel's SiGe PAs, the Maximum Output Power of 14 dBm Can Be Increased 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)

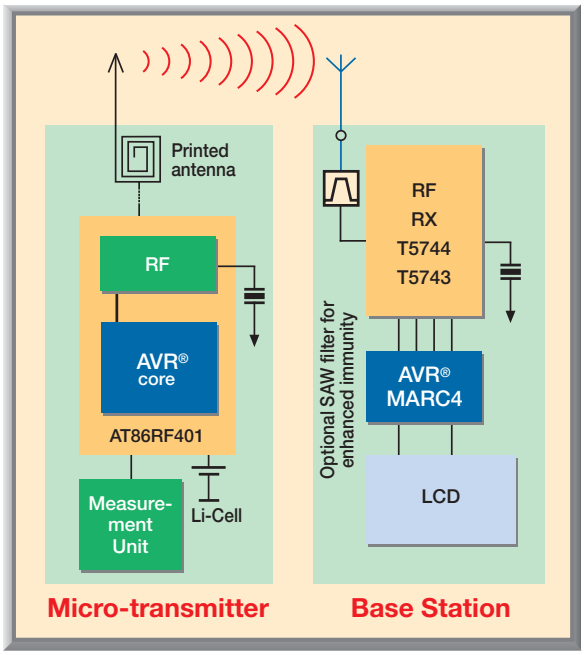


Key Benefits

- 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

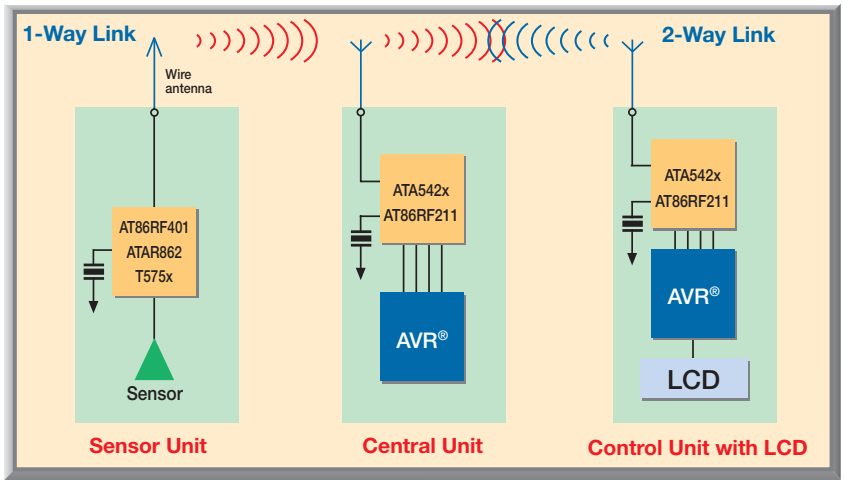
- Tiny Micro-transmitter Package
- Only One IC in the Sensor Unit
- AVR Core with 2-kbyte Flash Memory
- AVR on Receiver Side with Integrated LCD Driver
- AVR Tools Can Be Used
- Suitable for Different ISM Bands

Transceiver System

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

Key Benefits

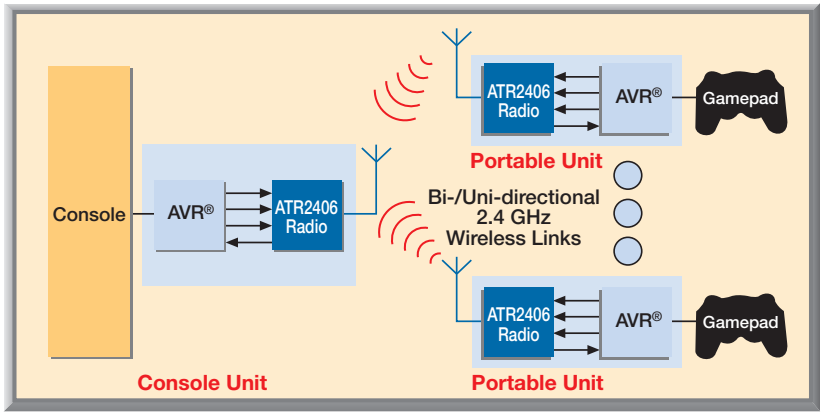
- Bi-directional Circuits for Central and Control Units
- Uni-directional Circuits for Sensors
- Very Robust by Design
- Low Current Consumption Enables Extended Battery Life
- Long Distances Due to High Output Power
- Suitable for Several ISM Bands
- Small Housing Since the RF Transmitter Integrates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



ATMEL PRODUCT OVERVIEW

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] ASK/FSK	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] ASK/FSK	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 ATAB5744-N3 ATAB5744-S3	433.92 MHz/no SAW 433.92 MHz/SAW 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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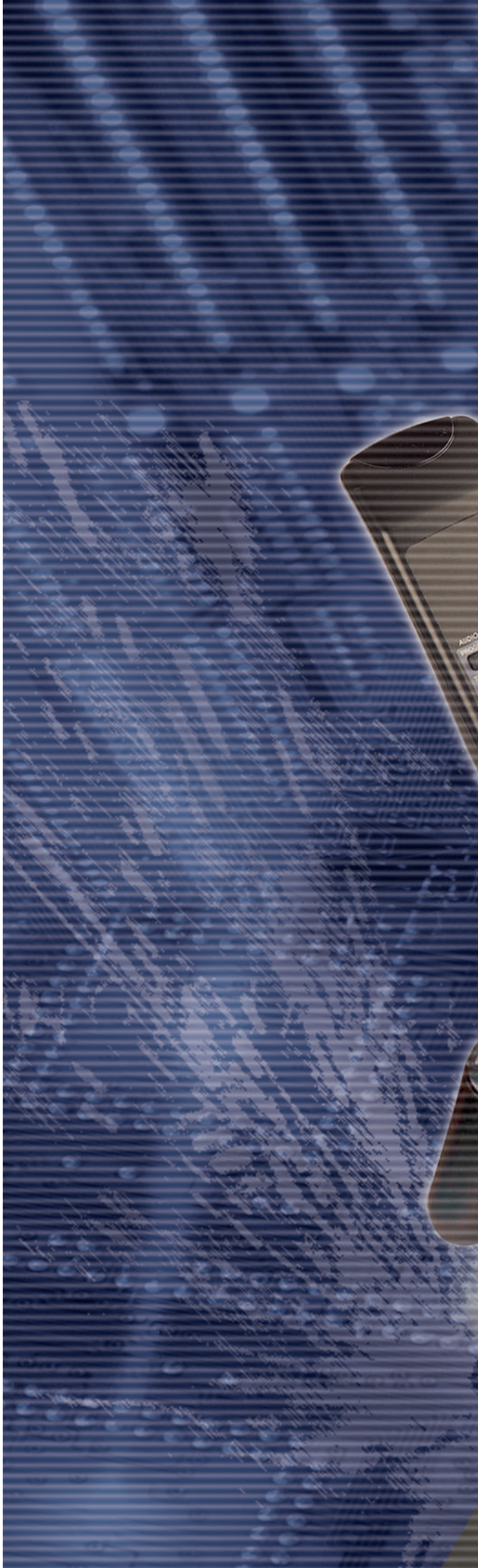

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