

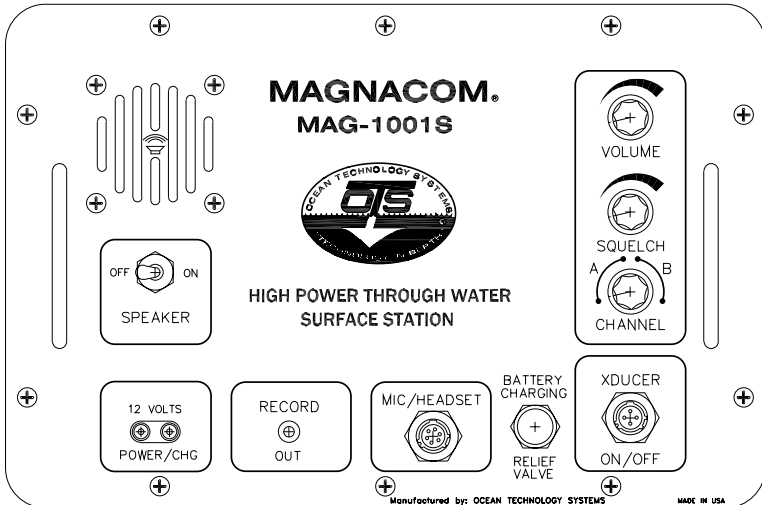


MAGNACOM[®]

MAG-1001S

**SINGLE-SIDEBAND
ACOUSTIC TRANSCIVER
(MILITARY)**

User's Guide



“Technology in Depth”

Undersea Systems International, Inc.
dba
Ocean Technology Systems

- IMPORTANT SAFETY NOTICE -
(Please read before using product)

It is absolutely essential that all divers be properly trained and equipped and fully understand this owner's manual before attempting to use the MAG-1001S.

While the MAG-1001S provides divers with good underwater communications, it does not change or eliminate the potential hazards of diving!

- NOTE -

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SECTION 1: INTRODUCTION

Congratulations! You have just purchased one of the finest, state-of-the-art underwater communication systems available. The Magnacom® MAG-1001S is a compact, ultrasonic, single sideband transceiver designed to allow surface-to-diver and/or diver-to-surface through-water communications. The MAG series employs *digital signal processing* techniques that ensure the highest performance possible.

The MAG-1001S offers many useful features to ensure user-friendly performance, such as: front-panel squelch control, a heavy-duty panel speaker, a record-out connector (female RCA), a multichannel selector, a heavy-duty waterproof housing, 12-volt external power accommodations, a headset with boom microphone output (headset optional), easy battery access, and much more. In all, the MAG-1001S Single Sideband Acoustic Transceiver is second to none!

1.1 GENERAL

This manual presents the MAG-1001S Single Sideband Acoustic Transceiver underwater communication system. Section 1 provides specifications and a general discussion of its functions. Please note that the MAG-1001S can be configured to specific frequencies, which may vary the product slightly.

1.2 DESCRIPTION

The MAG-1001S is equipped with two channels, which constitute either a high- or low-frequency pair (depending on which version you have purchased). The high-frequency pair is 28.5 kHz lower side band (LSB) and 32.768 kHz upper side band (USB). The low-frequency pair is 8.0875 kHz USB and 11 kHz LSB. However, custom frequency pairs are available and can be installed on special request. (Note: The frequencies must be within 3 kHz of each other and use opposite sidebands, e.g., 28.5 kHz USB and 32.786 kHz LSB.)

The MAG-1001S is designed for use with OTS' Magnacom® series of military transceivers, such as the MAG-1003D, MAG-1004HS, and MAG-1003-PS. The standard versions of these systems are compatible, provided the diver and surface units are operating on the same frequency. The standard SSB-1001B military-approved diver transceiver is compatible when operated at 25 kHz USB. Other compatible systems, when operated on the same frequency and within range, include the Buddy Phone (e.g., XT-100, MKII-BUD, MTS-BUD, SCU-BUD, OR-BUD, DSI-BUD, and RX-100), the SSB-2010, SSB-2001B-2, SP-100, STX-101, and STX-101M.

The MAG-1001S transceiver comes with rechargeable batteries and the RCS-13 multi-voltage (90V to 234V) smart battery charger. The MAG-1001S is rated at 70 watts and is equipped with a heavy-duty transducer assembly. The quality hand-held microphone ensures clear communications.

1.3 SPECIFICATIONS

| | |
|------------------------------|--|
| Transmitter output power: | 70 watts (PEP) |
| Audio output to speaker: | 4 watts RMS |
| Modulation: | Single Sideband with suppressed carrier |
| Standard operating channels: | <i>Low-freq. pair:</i> Channel A, 8.0875 USB Channel B, 11 kHz LSB <i>High-freq. pair:</i> Channel A, 29.75 kHz LSB Channel B, 32.768 kHz USB |

Note: Custom frequencies may be ordered. Contact your local OTS representative or OTS direct for more information.

| | |
|---------------------------------|--|
| Power: | 2 rechargeable internal 6V gel cells w/ RCS-13 smart charger <i>or</i> 1 11V lithium battery w/ RCSLi lithium charger. |
| Battery Life: | 8 hrs. w/ gel cells, 16 hrs. w/ lithium cell (assuming a 20% duty cycle for each). |
| External Power: | 12 volts DC at a minimum of 10 amps. Access via front panel with use of an MS connector. |
| Transducer: | Piezoelectric type |
| Squelch: | User adjustable from the front panel |
| Volume: | User adjustable from the front panel |
| Microphone: | Hand-held, dynamic, 200 ohm impedance |
| Record output jack: | Panel-mounted female RCA connector (line level) |
| Activation (On/Off): | Upon connection of transducer cable to MAG-1001S |
| Headset/External speaker jack: | Panel-mounted MS connector (external speaker/headset) |
| Housing: | Heavy-duty U/K 603 case |
| Control Panel: | Stainless steel |
| Receiver sensitivity: | Greater than 100 dBv |
| Automatic Gain Control (AGC): | Greater than 100 dBv |
| Xmitter speech freq. bandwidth: | 300–3500 Hz |
| RB-6V rechargeable battery: | 6V DC, 5.0 A, spring terminal, sealed gel cell |
| Lithium rechargeable battery: | 11.1 V DC, 10.4 A, single Lithium cell |
| Housing Dimensions: | Height: 6.500 in. Width: 14.000 in. Depth: 10.600 in. |
| Weight: | 12 lbs. (with batteries) |

1.4 FUNCTIONS

Refer to Figure 1 by item number.

1. HANDLE: One of two front panel handles.
2. SPEAKER CONTROL: Toggle switch used to turn the front panel speaker *on* or *off*.
3. 12 VOLTS POWER/CHG: Used when an external 12-volt DC power source is desired. Ensure the source has a minimum of 10 amps. This receptacle is also used to charge rechargeable batteries.
4. RECORD OUT: This female RCA receptacle is used to connect to any type of recording system. It supplies “line-level” signal output.
5. MIC/HEADSET: This receptacle is used for a hand-held microphone (HSM-10, supplied) or headset with boom mic (THB-MAG, optional).
6. BATTERY-CHARGING RELIEF VALVE: This relief valve must be open when charging rechargeable batteries. It is also recommended to open the relief valve when transporting via aircraft. Ensure the valve is closed again before using the MAG-1001S.
7. XDUCER & ON/OFF: The unit will power up and cycles to the receive mode when the transducer cable is connected to the female receptacle (#7). If you are not using the system, disconnect the transducer cable to power down the system and conserve energy.
8. CHANNEL: The MAG-1001S comes with two channels (see 1.3 Specifications).
9. SQUELCH: The squelch control is designed to help suppress background noise created by sea creatures and/or man-made sound (i.e., snapping shrimp, croakers, motor boat or pool pump noise, etc.). When rotating the squelch completely counterclockwise, the squelch is deactivated and all noises within range will be heard. You will also obtain the maximum reception range. When you rotate the squelch clockwise, you begin to eliminate background noise. However, you also *decrease* your range.
10. VOLUME: The volume control will adjust the listening volume from the front panel speaker. Clockwise will give you higher volume; counterclockwise, less volume.
11. SCREW: One of ten (10) Phillips head, 8-32 stainless-steel screws. They all must be removed to gain access to the battery compartment and/or mother board. Be careful not to lose the screws.
12. SPEAKER: Heavy-duty front panel speaker (under grill).

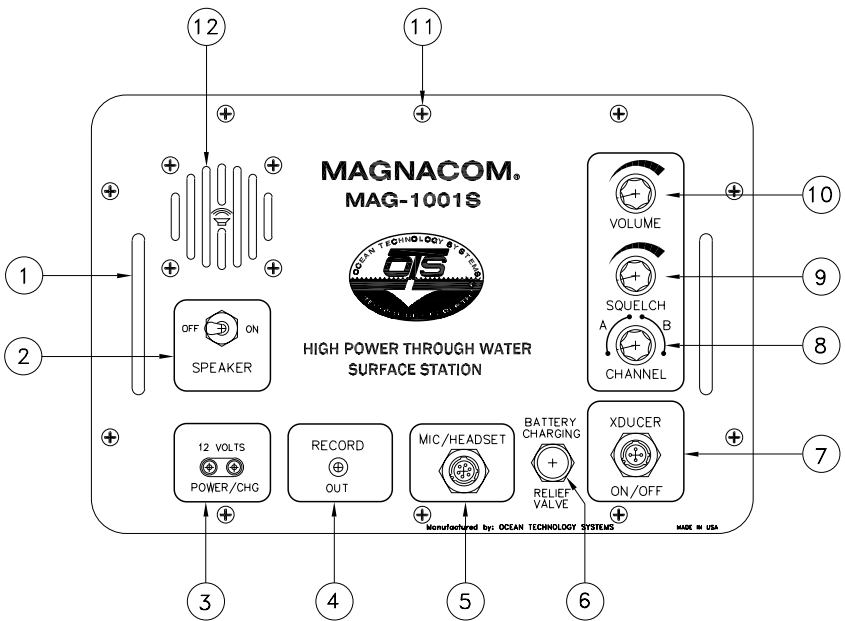


Figure 1. Layout of MAG-1001S Panel

SECTION 2: BATTERIES AND CHARGING

The MAG-1001S is powered by two RB-6V rechargeable, 6-volt, spring-type batteries, or optimal lithium batteries.

2.1 BATTERY INSTALLATION

Replacement rechargeable batteries are available from OTS or your local OTS dealer. In the event you must replace the batteries:

1. Locate and remove the ten screws found on the front panel (Fig. 1, #11). Do not remove the front-panel screws located around the front-panel speaker grill (Fig. 1, #12).
2. Carefully remove the front panel. Be careful not to stress the connecting wire harness while setting aside the front panel.
3. Remove and set aside the wing nuts (Fig. 2, #2).
4. Remove and set aside the battery-retaining bracket (Fig. 2, #5).
5. Insert battery w/ the battery springs facing toward the battery circuit board (Fig. 2, #4). Ensure they are firmly seated in the bottom of the battery bracket housing.
6. Replace the battery-retaining bracket, and tighten the wing nuts securely.
7. Ensure the wire harness (Fig. 3, #1) is plugged into connector J9 (Fig. 3, #2).

NOTE: It is important not to use alkaline lantern batteries. The high-power amplifier requires current levels that only rechargeable batteries can supply.

8. While the unit is open, you may want to verify that the four screws securing the feet and battery plate assembly are tight (Fig. 2, #6).
9. Replace the front panel, ensuring you have not pinched any wires. Do not overtighten the ten front panel screws (technical information: Tighten to 6 inch-pounds).

NOTE: The silver pads located on the battery circuit board (Fig. 2, #4) are spaced to accept the spring contacts found on a rechargeable lantern battery. The configuration ensures springs make contact at any axis along which the batteries are installed. The spring-contact circuit board is located on one end of the battery storage housing. The spring contacts of the batteries must be in contact with this board in order for the system to work. Installing the batteries in the wrong direction may cause damage to the unit (the batteries and/or the MAG-1001S will not operate).

Key

1. RB-6V rechargeable batteries
2. Wing nuts, retaining battery bracket
3. Battery plate
4. Battery circuit board
5. Battery-retaining bracket
6. Battery-plate screws
7. MAG-1001S case
8. Battery wire harness

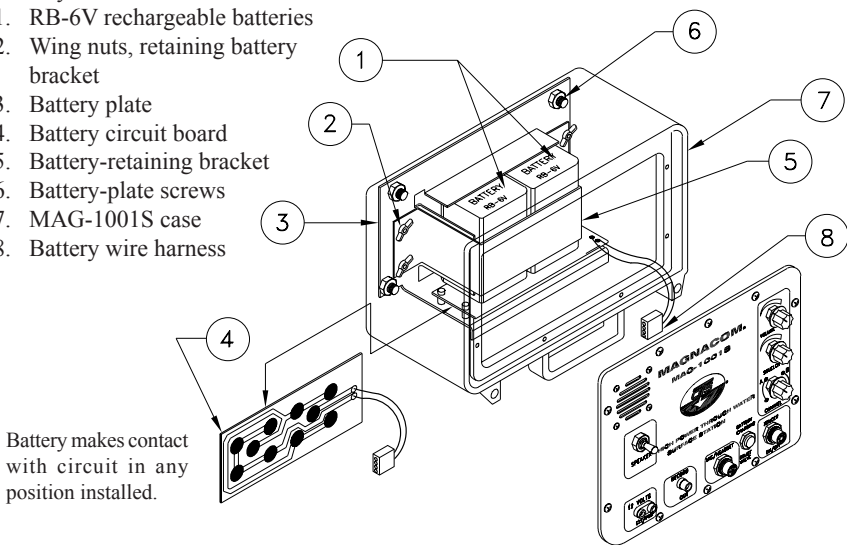


Figure 2. RB-6V Battery Installation

Note: RB-6V batteries shown

2.2 LOW-BATTERY ALERT

The MAG-1001S is equipped with a unique low-battery alert. When the batteries reach approximately 10 volts, you will hear a short beep every 2 minutes. At 9 volts, the beep tone starts to occur once a minute. When the battery voltage goes below 8 volts, you will hear the tone every 30 seconds. When battery voltage falls below 6 volts, the microcomputer switches the system power off, preventing battery damage.

2.3 RECHARGEABLE BATTERY

The MAG-1001S comes with either two RB-6V batteries or a lithium battery. When replacing the batteries per the instructions found in Section 2.1, ensure the power harness in the battery compartment (Fig. 2, #8) is connected to J9 (Fig. 3, #2) on the circuit board. This connection channels the battery charger's current to the batteries.

Note: The battery you receive may have upgraded specifications from what is stated in this manual. Due to advancing battery technologies, we continually upgrade our batteries and chargers. Contact OTS or your OTS dealer to find out the latest available battery and charger.

2.4 CHARGING THE BATTERIES

Once replacement RB-6V rechargeable batteries are installed, charging is simple

with the **RCS-13** smart battery charger. Power cords are available with the plugs required in regions throughout the world and can accept power input ranging from 90 to 240V AC. We recommend the connection first be made between the panel's 12-volt Power/CHG jack and the RCS-13 charger. Then plug the charger into your power source. Charging time for a depleted battery is 3–5 hours. For more information, refer to the operation instructions provided with the RCS-13 charger.

The same logic applies to the lithium battery and its corresponding charger, the RCSLi (i.e., variety of cords and power input range), with the only difference being the charge time is longer with the lithium battery (6-8 hours v. 3-5 hours for the RCS-13).

Anytime you charge the batteries, open the front panel's "Battery Charging Relief Valve." Leave it open and do not operate the MAG-1001S for approximately 15 minutes after charging, to give the system time to dissipate any gasses released from the batteries during charging. After charging is complete, close the "Battery Charging Relief Valve."

2.5 ALTERNATE POWER SOURCE

The external receptacle (Fig. 1, #3) provides an easy terminal for a marine or automotive 12-volt DC source. This terminal can also be used with any external power source providing 12 volts and a minimum of 10 amps capacity. This receptacle is also used for charging the internal chargeable batteries.

- IMPORTANT SAFETY NOTE -

Before charging the batteries, verify they are the correct rechargeable batteries, the vent is open (Fig. 1, #6), and the internal plug is connected to the proper connector (Fig. 3, #2). Do not charge alkaline or heavy-duty batteries—otherwise, damage to the MAG-1001S, an explosion, and/or injury may occur. Before powering up the MAG-1001S, always wait a minimum of 15 minutes for any gasses expelled from the charged batteries to dissipate.

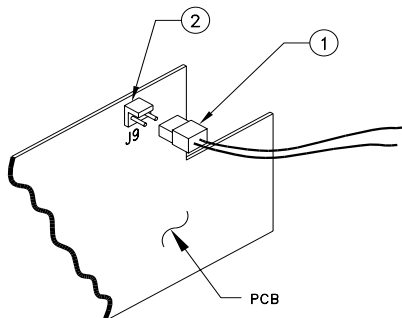


Figure 3. Battery Wire Harness Connection

SECTION 3: OPERATION

The MAG-1001S was designed to be portable and easy to operate. After proper installation of the batteries, your surface station can be set up for use.

The MAG-1001S is an ultrasonic through-water communication system. It must be operated using water as the transmitting medium. You will be able to talk to all other divers and/or surface stations on the same frequency and within range. When you speak, your voice is sent out in an omnidirectional pattern via the transducer to all other transceivers within range. The transducer is the antenna that both sends and receives signals.

The MAG-1001S produces a short tone burst each time one presses either the microphone or the push-to-talk (PTT) switch on a headset with boom microphone. This tone is transmitted through the water and is heard by all other communication systems—both diver units and surface stations. The tone burst alerts the diver or surface station operator that there is a transmission to follow. This tone may be used alone (without transmitting voice) for recall or Morse code messages.

Note: To avoid damage, do not transmit with the transducer out of the water.

The following is the recommended operating procedure:

1. Ensure all batteries are properly installed and charged and that the front panel is installed with no wires pinched.
2. Place the MAG-1001S on a surface secure from boat action and in a place where the transducer cable will not trip anyone.
3. Open the cover of the MAG-1001S, and connect the transducer cable to the front panel (Fig. 1, #7). Connecting the transducer cable powers up the MAG-1001S. When not using the MAG-1001S, disconnect the transducer cable to conserve battery power.
4. Lower the transducer into the water. If using a boat, lower the transducer so it clears the hull. If the base station is set up on a beach, the transducer should be suspended from a float. Under no circumstances should the transducer lie on the bottom, or else most of the transmitting and receiving signals will be greatly reduced: The result will be reduced range and weak or no communications.

If a current is running and you must have a weight on the transducer to keep it from flagging, tie the weight to a separate line and marry the transducer cable to the separate line. Lower the line with the weight and transducer into the water and tie it off. (CAUTION: Ensure the transducer is not free to float around and hit the weight, thus interfering with communications.)

5. Adjust the volume to a comfortable listening level.
6. Adjust the squelch. The squelch will help suppress background noise, which is typically due to marine biological (e.g., snapping shrimp) or man-made (propellers, engines, equipment, etc.) causes. Note that the squelch adjustment will affect the range. The more squelch you apply, the less range you will achieve.
7. Select a channel that all other divers and/or surface stations will be using.
8. Connect the hand-held microphone or a headset to the microphone receptacle (Fig. 1, #5).
9. If you would like to record, connect a male RCA plug into the RECORD OUT receptacle of the MAG-1001S. Connect the other end of the record patch cable to the recorder's RECORD IN. Ensure the tape recorder is recording when the MAG-1001S is operated. *Note: The record output is a "line level" signal.*
10. If you use a 12-volt boat power source or another alternate power source, ensure the source is capable of generating 12 volts DC at 10 amps minimum.

Upon completion of the above steps, the MAG-1001S is ready for use. The unit will already be in the receive mode and will be listening for incoming signals. To talk to a diver and/or another surface station, hold the hand-held microphone within a 1/4 inch of your lips, depress the PTT switch (located on the side of the hand-held microphone), and speak slowly. When you release the PTT button, the MAG-1001S will automatically go into the receive mode.

You must remember that all divers are already hearing plenty of sound underwater (e.g., bubbles and biological or man-made sounds). Try to get the attention of the diver you want to talk to; then give him the message slowly. An example is "Alpha Diver, Alpha Diver, this is Topside, come in Alpha Diver." Alpha Diver, hearing his name, will get ready for the message and reply, "This is Alpha Diver, go ahead Topside."

We have found that when talking to divers, short sentences are more effective than long sentences. The use of short sentences gives the diver a chance to take a breath and still receive a clear message.

SECTION 4: MAINTENANCE

Although the Magnacom® MAG-1001S has a rugged design, it should be treated carefully like any quality electronic instrument. Avoid transportation modes that would expose the unit to constant vibrations and disturbance. Ship the unit well packaged.

After use, wipe the unit free of dirt, debris, and water. Use a clean, soft cloth. Warm water with a small amount of nonabrasive soap is the recommended cleaning solution.

The transducer should be kept clean and free of oils. The transducer itself can be cleaned with denatured alcohol. If wet after a dive, the transducer assembly should be stored in a separate container.

Store the hand-held microphone and optional headset in a dry area. The microphones are barely water resistant, not waterproof. Keep them free of water and water spray. The preferred cleaning method is to use a mild soap solution followed by wiping the microphone dry.

Inspect batteries periodically to ensure they are in good condition and not leaking.

When the MAG-1001S is not being used, it is a good idea to keep the cover securely fastened.

Remember, when the transducer assembly is connected to the MAG-1001S, the power is *on*. To conserve energy when securing or cleaning the MAG-1001S, disconnect the transducer connector from the front panel.

SECTION 5: HELPFUL HINTS AND TIPS

The following hints and tips should help you obtain the best possible use of the MAG-1001S:

5.1 TRANSDUCER

-It is important that the transducer be protected, because it is designed using a material that can break if sharply hit or impacted.

-Do not hang the transducer in a position that is blocked or lying on the bottom.

-Do not transmit without first submerging the transducer.

-All divers should inform everyone if they go below a thermocline. If possible, lower the transducer to the same depth as the divers in the thermocline.

-It is extremely important to remember to pull the transducer up when moving a vessel. Many transducers have been lost when cut off by a propeller.

5.2 HAND-HELD MICROPHONE OR HEADSET/BOOM MIC

-Most hand-held microphones and headsets are not waterproof. Keep them as dry as possible.

5.3 PLACEMENT OF THE MAG-1001S

-The MAG-1001S should be placed where it can be easily heard. If working out of a boat, locate a place you can secure the unit where boat action will not cause it to fall. Also, remember to dress the transducer cable in such a way that divers and/or topside personnel will not trip over it.

5.4 TALKING & LISTENING

-When talking to divers, keep in mind they have many things going on while underwater. It is best to get the diver's attention before giving him a message. Example: "*Mark, Mark, this is Topside, come in Mark.*" Mark answers and then listens for your message. Example: "*Topside, this is Mark, go ahead.*" Remember, you hear a short tone burst each time the MAG-1001S transmitter is keyed.

-Also remember to talk slowly and in one continuous sentence. Try not to make long sentences. It is always a good idea to have the divers repeat the message back to ensure they understood what you said.

-Listening to divers is usually easier than divers' listening to the topside tender. Again, repeat what you heard the divers say to ensure everyone is communicating accurately.

Talking and listening while diving require practice and will improve every time

a team works together. The U.S. Navy has found that there is a learning curve associated with mastering wireless communications. About three days of diving per Navy diver were required to get proficient with the equipment. Therefore, do not be discouraged when first using wireless communications.

5.5 IN THE BEGINNING . . .

If this is the first time that you or anyone else on your team is using underwater communications, it is recommended that the team first get together to talk about the system. Practice alternative communications in the event something is not working. Plan to use a second channel to which everyone knows to switch in the event someone leaves the working channel. A session in a swimming pool or another place where the team can practice in a controlled environment is recommended. (Note: Some pools contain filters that produce small bubbles, which can reduce or stop ultrasonic transmissions. Therefore, if you see these small bubbles, move to a different pool for your practice sessions.)

You will find you need about three full dives before you will be talking and listening like the “pros”. Have fun, and we hope to see you on a communication dive in the future!

- LIMITED WARRANTY-

MAGNACOM® MAG-1001S is warranted against defects in materials and/or workmanship for a period of one (1) year from the time of purchase. Items not manufactured by OTS are covered by their manufacturers' warranties. Our obligation under this warranty is limited to the replacement of any parts that prove to our satisfaction to have been defective and that have not been misused or carelessly handled. The complete unit and/or part must be returned to our factory, transportation charges prepaid. We will ship all components back via UPS Ground Service in the U.S.A. and via the most appropriate service internationally. We reserve the right to decline responsibility where repairs have been made or attempted by other than an OTS factory-trained personnel or approved OTS service center. In no event shall OTS be liable for consequential damages.

You can now register your product online at the OTS Web site. Just visit <http://www.otscmm.com/register1.html>.

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