PHILIPS ADDS NEW DIMENSIONS TO INFORMATION MANAGEMENT

INFORMATION SHEET

CTCSS
CONTINUOUS TONE CONTROLLED SQUELCH SYSTEM

A proven method of achieving a number of signalling functions

Excludes other users’ calls on a shared channel
Ideal for community repeater applications
Dependable remote switching of facilities
Shared radio channel

What is CTCSS?
CTCSS is an internationally recognised signalling system, previously known as Tone Lock or Tone Squelch, and stands for Continuous Tone Controlled Squelch System (i.e. Continuous Tone Controlled Signalling System (MPT 1306)).

How is CTCSS achieved?
In CTCSS applications the RF carrier frequency is continuously modulated at the transmitter with a low audio frequency tone. When the signals are received by a suitably equipped receiver the tone is used to provide one of several switching facilities as described overleaf.

The CTCSS tone frequencies are defined by international standards and fall within the range 87 Hz to 2050 Hz. The tones are removed by filtering at the receiving station, thereby ensuring that monologos heard by the operator originate from the signalling tone.

Why is CTCSS used?
CTCSS can be used to achieve a number of signalling functions including simple selective calling.

CTCSS is a fail-safe system since the required facility is only activated when the designated continuous sub-audible tone is being received. The loss or failure of the tone will deactivate the selected facility.

Where is CTCSS used?
CTCSS is used in radio system applications where it provides a method of:

(i) remotely selecting a facility e.g. tightrope
(ii) minimizing co-channel interference
(iii) simple selective calling
(iv) gaining access to a common repeater station.

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Remote Controlled Talkthrough

In this application CTOSS is used for remote switching a fixed station to the talkthrough mode, i.e., turning it into a repeater station. As shown, the fixed station is fixed with a CTOSS decoder set for tone 16. It will listen only, accept the corresponding CTOSS tone frequency from any associated civil stations in order to switch the fixed station from send/receive to the talkthrough mode.

In some markets it is mandatory to use tone-controlled access to a repeater station.

Shared Radio Channel

The CTOSS facility permits a number of radiotelephone users who have their own radio system to share time on a common channel with maximum convenience to each other. The presence of a CTOSS tone during transmissions ensures that only users in a particular organisation using radio telephones are fitted with decoders set for the same tone will hear the message; other co-channel users' receivers remain muted.

The application of CTOSS is also suitable for co-channel users. With shared radio channel systems correct observance of radio procedure is important, e.g., listen-out to ensure the channel is free before transmitting.

Selective Calling of Fixed Stations

In single channel radio systems where a number of fixed stations are required to provide wide range of radio coverage, CTOSS is used for selectively calling a particular fixed station, thereby avoiding interior confusion at the central point due to multiple receive paths.

Each station is fitted with a CTOSS decoder and allocated a discrete tone frequency. The roaming station, e.g., a mobile, is fitted with an encoder which has a number of switch selectable CTOSS tones. Each encoder tone corresponds to individual fixed station decoder in that area. By selecting the appropriate CTOSS tone the mobile operator can select the fixed station which provides the best communication with control for any given operator within the area covered.
Portables

PFX

PFX is a frequency-synthesised VHF as UHF handheld portable designed to accommodate a wide range of accessories and signalling options.

Offering up to 99 channels, the PFX is compatible with CTCS signalling module type TC38.

Versions include:
- Fixed CTCS in all channels
- Switched CTCS on per channel basis
- CTCSS

Colours available: Enamel, scarf, enamel only and lockable.

TC38 can be combined with sequential signalling module type TC36.

For full details of PFX and accessories please refer to Publication Reference Numbers PT TIP994 and PT TIP995.

PPB5

PPB5 is a VHF handheld portable designed to accommodate a wide range of signalling options and accessories.

Versions include:
- Single channel, fixed CTCS
- Single channel, switched CTCS
- 3 channel, fixed CTCS

CTCS module type TC22(EN) is designed for bands within the standard limits of the PPB5 and offers a choice of encode only or encode/decode facilities.

TC22(EN) can be combined with sequential signalling module type TC38.

For full details of PPB5 and accessories please refer to Publication Reference Numbers PT TIP996 and PT TIP997.

PS001

PS001 is a VHF handheld portable designed to accommodate a wide range of accessories and signalling options.

There is a choice of single or up to 6 channels. Signalling options include CTCS module type TC2 which offers encoder/decoder functions or encode only.

For full details of the PS001 microphone, accessories and battery chargers please refer to the separate publication.
This facility allows radiotelephone users to share a common base station operating in the repeater mode. The system is ideal for organizations which require comparatively small amounts of 'air-time' for the passing of messages.

Organizations participating in the Community Repeater scheme share a common radio channel and are allocated discrete CTCSS tone frequencies. Once access is granted by a user (e.g. calling Group 1, tone 1), the other organizations within the scheme are locked out until the transmission is terminated. This allows a certain amount of privacy to users as the receivers of other organizations within the scheme are effectively excluded, their lipids being muffled and their transmitters silenced.

Fixed stations
F-490 Series

Fixed station radiotelephones of type F493 (VHF AM), type F494 (VHF FM) and type F495 (UHF FM) are remotely-controlled base stations derived from the MC90 series of mobile two-way radio equipment.

CTCSS signalling PCBs, types TE1 and TR03, are compatible with the F-490 series and application plans are described in separate publications. For additional information on the F-490 series, please refer to Publication Reference Number P1 TSP756.

TE1 is a plug-in PCB fitted within the F490 series fixed station, offering single tone frequency encode only facility.

TR03 is also fitted internally and is set for decode only function. For full encode/decode, TE1 and TR03 PCBs must be fitted. See Equipment Code Manual for ordering details.

Control of CTCSS-equipped fixed stations is achieved remotely using type MK3 series control equipment or locally using the optional, handheld, covert type CK300.

F-4000 Series

A full range of VHF AM, VHF FM and UHF FM transmitters and receivers designed for fixed station applications.

CTCSS printed circuit boards type TL1 is internally fitted within the transmitters and receivers, and set for encode only and decode only respectively.

For details of the F4000 Series, please refer to the separate publications.
The FM900 series is a range of remote mounted VHF or UHF FM frequency synthesiser radiotelephones with microcomputers. Control offering a channel capacity of up to 120 channels and a wide range of signalling options.

CTCSS is provided by fitting a small hardwired module to the synthesiser/controlled located in the main transceiver. Options, which are software controlled, include single fixed tone or different tones per channel. The pre-programmed tones may be altered via the integral keypad located on the remote control unit.

To change a tone, enter required tone code number and press 'Tone' key. To display a tone code press 'Tone' key. The CTCSS decoder is automatically 'deleted' when the microphone is removed from its mounting and is reset when returned.

For details of the FM900 series radiotelephones please refer to the separate publication.
Technical Data

CTCSS

Catalogue Section
Control/Signalling

General

Code Tones
Total of 38 sub-audio tones with C/A spacing in the range of 76.0 - 250.3 Hz

Encode Build-up Time
300 ms for 30% modulation at 60% modulation input

Decode Response Time
250 ms to 75% of pre-determined audio amplitude at receiver output

Deviation Levels

<table>
<thead>
<tr>
<th>Channel</th>
<th>Peak Audio Deviation</th>
<th>Lock Tone Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>FM 12.5 kHz</td>
<td>± 2.5 kHz</td>
<td>± 1.0 kHz</td>
</tr>
<tr>
<td>FM 25 kHz</td>
<td>± 5 kHz</td>
<td>± 2.0 kHz</td>
</tr>
</tbody>
</table>

AM 10% to 20%

Power Supply
Powered from associated radio/telephone

CTCSS Groups

CTCSS frequencies are divided into three groups, A, B and C. The selection of the tone frequencies must be taken from the same group.

CTCSS Tones (Hz)

<table>
<thead>
<tr>
<th>Group A</th>
<th>Group B</th>
<th>Group C</th>
</tr>
</thead>
<tbody>
<tr>
<td>770</td>
<td>719</td>
<td>*270</td>
</tr>
<tr>
<td>885</td>
<td>825</td>
<td>74.4</td>
</tr>
<tr>
<td>1030</td>
<td>94.8</td>
<td>79.7</td>
</tr>
<tr>
<td>1072</td>
<td>1005</td>
<td>85.4</td>
</tr>
<tr>
<td>1145</td>
<td>1103</td>
<td>91.5</td>
</tr>
<tr>
<td>1230</td>
<td>1186</td>
<td>97.4</td>
</tr>
<tr>
<td>1273</td>
<td>1273</td>
<td>104.5</td>
</tr>
<tr>
<td>1413</td>
<td>1395</td>
<td>113.2</td>
</tr>
<tr>
<td>1514</td>
<td>1462</td>
<td>125.7</td>
</tr>
<tr>
<td>1657</td>
<td>1657</td>
<td>137.3</td>
</tr>
<tr>
<td>1738</td>
<td>1679</td>
<td>151.5</td>
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<tr>
<td>1862</td>
<td>1799</td>
<td>1679</td>
</tr>
<tr>
<td>2035</td>
<td>1928</td>
<td>1862</td>
</tr>
<tr>
<td>2131</td>
<td>2019</td>
<td>2035</td>
</tr>
<tr>
<td>2257</td>
<td>2131</td>
<td>2131</td>
</tr>
<tr>
<td>2418</td>
<td>2257</td>
<td>2257</td>
</tr>
</tbody>
</table>

Apply to your local representative or Philips Sales Office for advice on which tone frequencies should be chosen for equipment operating on 50 Hz or 60 Hz mains supplies.

For a full CTCSS system or a channel in a new and existing radio audio tone frequencies should be chosen for equipment operating on 50 Hz or 60 Hz mains supplies.

In areas where CTCSS systems already exist, a careful check of frequencies in use must be made to ascertain which are free for use on the channel being switched.

Community Repeater
For community repeaters, tones from group B only are used, normally in the preferred order shown below.

<table>
<thead>
<tr>
<th>User Order</th>
<th>Group B Tones (Hz)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>118.8</td>
</tr>
<tr>
<td>2</td>
<td>127.3</td>
</tr>
<tr>
<td>3</td>
<td>136.5</td>
</tr>
<tr>
<td>4</td>
<td>145.2</td>
</tr>
<tr>
<td>5</td>
<td>154.7</td>
</tr>
<tr>
<td>6</td>
<td>163.9</td>
</tr>
<tr>
<td>7</td>
<td>173.9</td>
</tr>
<tr>
<td>8</td>
<td>183.8</td>
</tr>
<tr>
<td>9</td>
<td>193.7</td>
</tr>
<tr>
<td>10</td>
<td>203.5</td>
</tr>
<tr>
<td>11</td>
<td>213.1</td>
</tr>
<tr>
<td>12</td>
<td>223.7</td>
</tr>
<tr>
<td>13</td>
<td>241.8</td>
</tr>
</tbody>
</table>

Glossary

Indicator
Body... Signifies that an RF carrier is present without a CTCSS tone, or with a tone of unknown frequency.

Undetected conditions: the indicators "filters" or remain on steadily, depending on installed equipment.

Controls
Defeat/Reset A push-button for resetting the one-toner function of the CTCSS decoder

Memory A push-button for combining the CTCSS and Squelch functions.

Encoder/Decoder An optional push-button, usually available for enabling or disabling the CTCSS Encoder/Decoder.

Optional Facilities
Transmit A locally which prevents the operation of the micro-switch during "Busy" periods

Receiver A locally controlling the operation of "Defeat" or "Monitor" mode

Lockout This facility combines the "Transmit inhibit" and Receiver Lockout facilities

Typical figures based on normal operating conditions.

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