IRSC - Open

ZN1CL – IRSC

Edition 1.0

Version 1.0

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1. OVERVIEW

IRSC Open is designed to allow control of consumer electronic devices, such as TVs, from a KNX system. It aims to emulate the Infra Red remote control that is used to command the consumer electronic device.

A typical usage scenario might be in a Sports bar where multiple TVs are installed. The IRSC Open device would allow all TVs to be switched on/off simultaneously, automatically, or with minimal user effort.

IRSC Open features:

- Emulation of up to 4 remote controls
- Emulation of up to 30 commands
- Up to 6 macros with 4 parts each

1.1. INTRODUCTION TO IR TRANSMISSION

The majority of consumer electronic devices, TVs, DVD players, Set Top Boxes etc. come with a remote control that allows the device to be controlled from a distance. Typically this remote control communicates with the device by means of Infra Red (IR). In order to understand the configuration of IRSC Open it is useful to understand a little about how this communication is achieved and some of the terminology involved.

- Remote

  Remote refers to the remote control that is supplied with the device to allow control of the device from a distance.
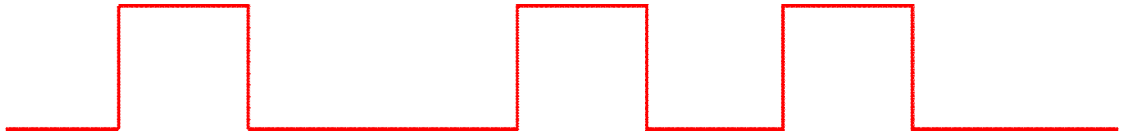
- Command

  A command is a message from the remote, to the device, which aims to achieve a certain goal, such as turn on the device, change channel, play etc. The command is transmitted from the remote to the device by means of a series of IR pulses.

- Carrier Frequency

  There are two methods to transmit an IR pulse. The simplest is to switch on the IR emitter, wait, and then switch it off. A number of pulses modulated in this

way are illustrated below:

This method is used by older products, and has been largely superseded by a method that modulates a carrier frequency, which is generally more robust to IR interference from other light sources. In this case the IR emitter is driven by a fixed carrier frequency, typically 30 – 56 kHz. A pulse is formed by switching this carrier frequency on and off as illustrated below:

IRSC Open only supports IR transmission **with** a carrier frequency.

🔵 <u>Frame</u>

In order for a command, sent by the remote, to be understood by the device, the train of IR pulses must follow a predictable pattern. For example:

The entirety of this pulse train is called a frame. Note here that the diagram omits the carrier frequency for clarity.

1.2.   INTRODUCTION TO IRSC OPEN CAPTURE

IRSC Open Capture (referred to from here on as IOC) is an application to aid in the configuration of IRSC Open. It uses the Z38i hardware.

IOC provides a simple GUI for the analysis of IR commands sent by consumer electronic Infra Red remote controls. The analysis results in two strings of hexadecimal characters that represent the IR protocol/frame format, and the data that it contains. For example:

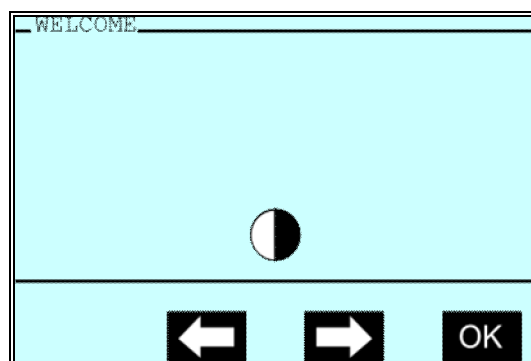|	
Frame String	*2F002020109F2710000C884502292231B06704700142898*
Data String	*E11EFF00*

The frame string, specifies all of the symbol and delay timing and the sequential order in which symbols, data and delays can be found. It also contains information regarding toggle bits and repetition behavior. This information remains constant for all of the IR commands emitted from a single remote control.

The data string represents any data sent when pressing a button. This information will vary with each unique button. i.e. On/Off, Change Channel.

It is important to note that the Z38i hardware is NOT capable of determining the carrier frequency of the IR transmission. It is also important to note that the IR receiver used by Z38i is only capable of detecting IR transmissions with a carrier frequency within a limited frequency range of 38 kHz (30, 33, 36, 37, 38, 40 and 56kHz tested). It may therefore not be possible to capture and analyze the IR commands from certain remote controls, for example, those with a carrier frequency upper than 56 kHz.
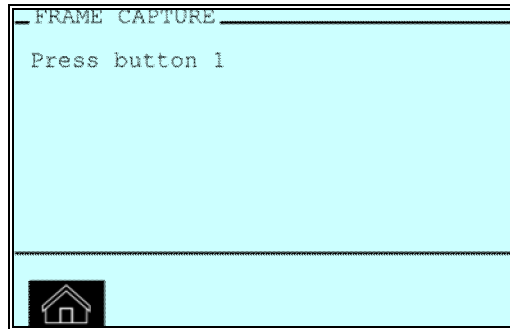
2. OBTAINING DATA WITH IRSC OPEN

After switching a Z38i loaded with the "IRSC Open Capture" application on you are greeted by the welcome screen:
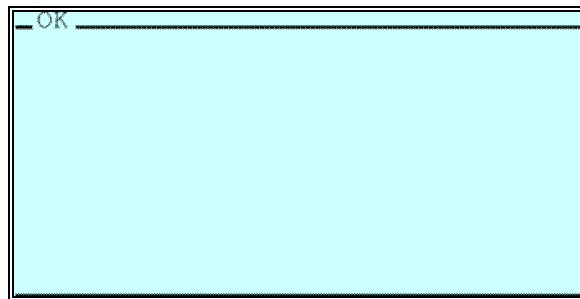

Note that pressing the ⌂ icon on any of the following screens will return you to this welcome screen. The two arrows allow you to modify the contrast of the display, either lighter
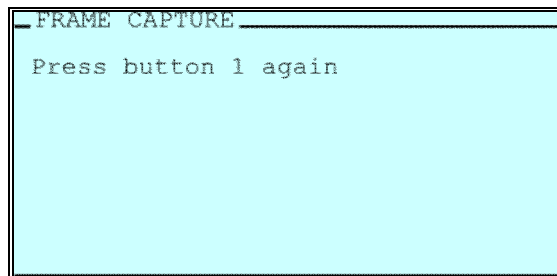
or darker. Pressing 'OK' leads to the frame capture screen, which will prompt you to press a button on the remote:

```
_FRAME CAPTURE_____

 Press button 1



_____

🏠
```
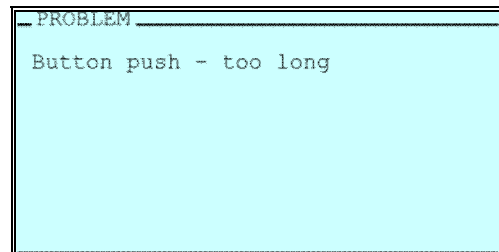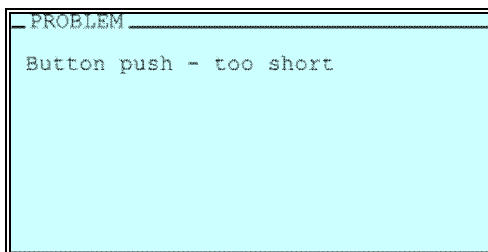
It is not important which button you press, but you must treat this button as button 1, and choose different buttons when prompted later for buttons 2 and 3. Aim the remote towards the Z38i and press the requested button. If everything is ok you will see the 'ok' screen, briefly:

```
_OK _____




```

You will then be prompted for the next button press:

```
_FRAME CAPTURE_____

 Press button 1 again



```

If your button press is either too short or too long you will be presented with one of the following 'problem' screens:

```
_PROBLEM_____

 Button push - too short


```

```
_PROBLEM_____

 Button push - too long


```

This signifies that your button press was either too short or too long. When the previous prompt for a button press is repeated, you must press the requested button again, but this time aim to hold the button down **slightly** longer or release **slightly** earlier.

You may see another 'problem' screen:

```
┌─ PROBLEM ────────────────────────┐
│                                  │
│  Please try again ...            │
│                                  │
│                                  │
│                                  │
│                                  │
│                                  │
│                                  │
└──────────────────────────────────┘
```
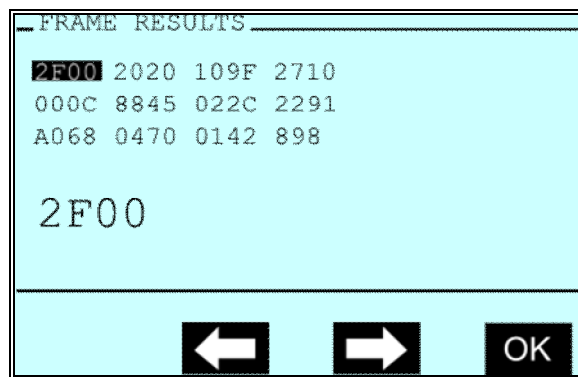
This signifies that there is something wrong. Perhaps the remote is not directed directly towards the Z38i, or another device is emitting IR which is interfering with the analysis. It is also possible that the remote being analyzed has a carrier frequency that the Z38i cannot detect.

After sufficient data has been captured the following frame results screen is presented:

```
┌─ FRAME RESULTS ──────────────────┐
│  2F00  2020 109F 2710            │
│  000C 8845 022C 2291             │
│  A068 0470 0142 898              │
│                                  │
│  2F00                            │
│                                  │
│ ─────────────────────────────    │
│           ←      →       OK      │
└──────────────────────────────────┘
```
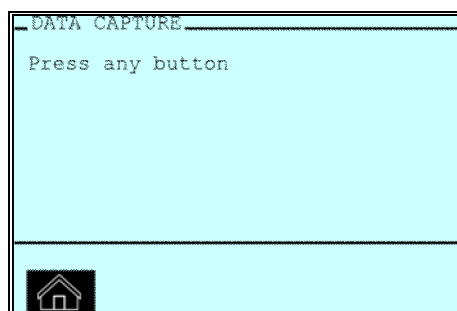
Here the frame string is displayed. The string is displayed in this way to help copying, however when entered into IRSC Open's frame configuration parameter, this string must be entered **without** spaces:
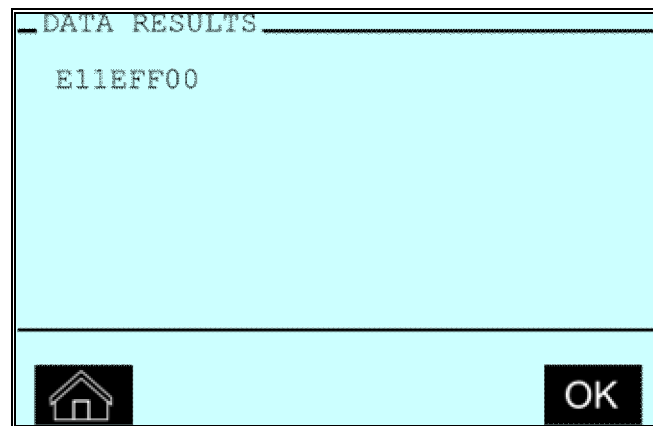
2F002020109F2710000C8845022C2291A06804700142898

Nota: A 'zoom' feature is provided to further aid copying the string. The left and right buttons may be used to highlight blocks of 4 characters which will be displayed in a larger font below.

Pressing 'OK' leads to the data capture screen:

```
┌─ DATA CAPTURE ───────────────────┐
│  Press any button                │
│                                  │
│                                  │
│                                  │
│                                  │
│ ─────────────────────────────    │
│  🏠                              │
└──────────────────────────────────┘
```
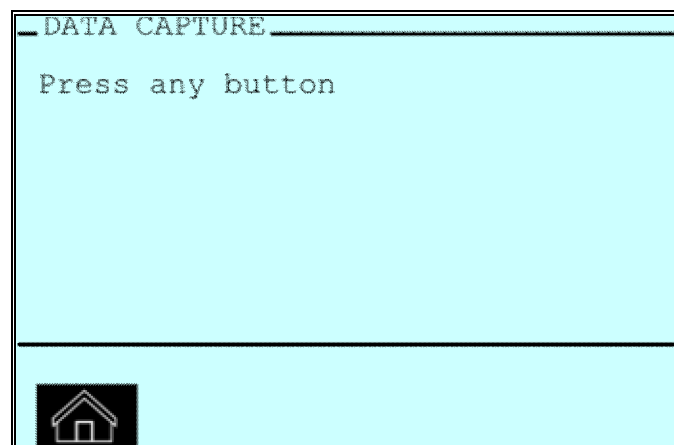
At this point press the button on the IR remote for which you wish to know the code (the length of the press is less important here). After a short while the following data results screen will be presented:

```
_DATA RESULTS_____

   E11EFF00




_____

[🏠]                          [OK]
```

There may be more than one line of data. If this is the case you must concatenate the data strings together when entering the string into IRSC Open's data configuration parameter.

Pressing 'OK' will once again return you to the data capture screen, allowing you to capture additional IR commands.

```
_DATA CAPTURE_____

 Press any button




_____

[🏠]
```

Note: We recommend writing down the results obtained together with a small description to later parameterize the IRSC-Open.

346B1483024121F5F273412140200046A4504446604819184898 – Frame String

F708FB04 -- On/off

FD02FB04 -- Vol +

FC03FB04 -- Vol –

FF00FB04 -- Channel +

FE01FB04 -- Channel –

BC43FB04 -- Menu
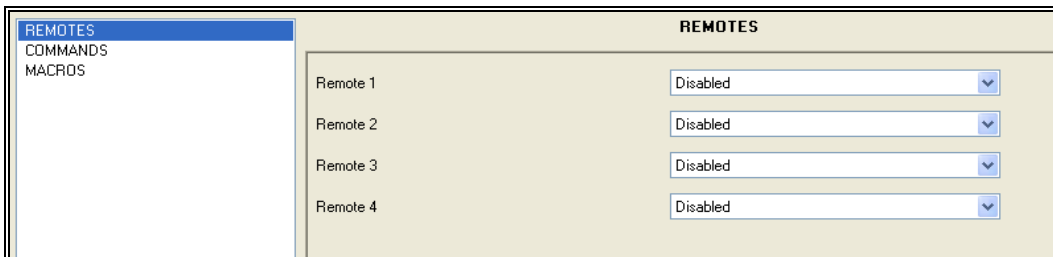
A45BFB04 -- Exit

EA15FB04 -- Channel 3

3. PARAMETERIZING IRSC-OPEN

Three different sections will be found when entering the parameterization enviroment of the IRSC-Open:
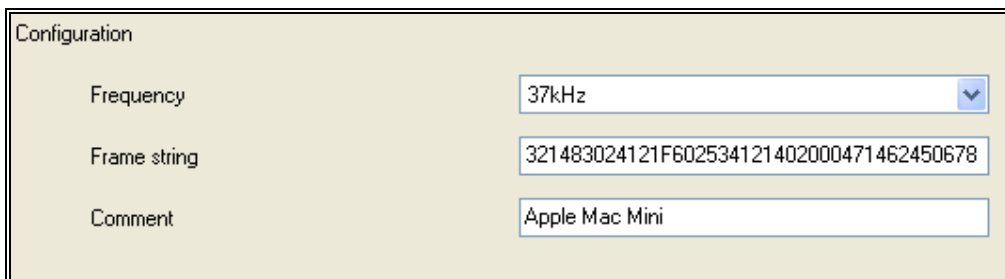
- **<<REMOTES>>**
- **<<COMMANDS>>**
- **<<MACROS>>**

3.1. REMOTES

IRSC Open can emulate four remotes, each of which can either be enabled or disabled.

REMOTES		REMOTES
COMMANDS		
MACROS	Remote 1	Disabled
	Remote 2	Disabled
	Remote 3	Disabled
	Remote 4	Disabled

There are only two parameters to configure:

Configuration	
Frequency	37kHz
Frame string	321483024121F602534121402000471462450678
Comment	Apple Mac Mini

FREQUENCY → To choose the Carrier Frequency in the range : 30kHz, 33kHz, 36kHz, 37kHz, 38kHz, 40kHz y 56kHz.

Nota: IRSC Open Capture cannot determine the carrier frequency. Therefore if the carrier frequency is not already known, it can only be determined by trial and error. This is best achieved by determining which frequency works reliably and gives the longest range.

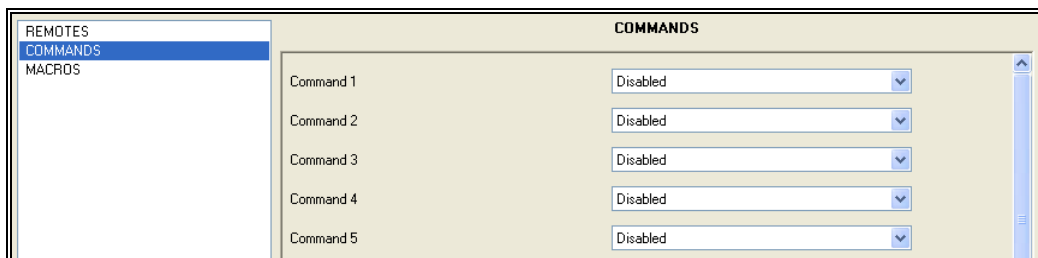One possible trial and error procedure is as follows:

- Configure IRSC Open's parameters and choose a frequency. A commonly used frequency is 38kHz.
- Point IRSC Open's IR LED towards the device to be controlled, preferably directly towards the device's IR detector at a distance of 50cm or similar.
- Try sending a command to see if it works. It is best to use a command that acts instantaneously such as volume up, or volume down. Power on/off is not a good choice, due to most devices having a large turn on/off time. It is assumed here, that the device is already powered on.
- If the command works correctly, increase the distance between the IR LED and the device a step at a time, checking each time to see if the command continues to work.
- If everything works correctly, remove the protection of the adhesive and stick the IR emitter in the IR receptor of the appropriate device. Once this step is done, check again if everything works properly.

  In any case, most remote controls use a frequency between 36kHz and 38kHz.

  FRAME STRING → Enter the frame configuration string previously captured using the IRSC Open Capture.

  COMMENT→ This field may be optionally used to enter a description or comment related to this remote, such as a device name, etc.

3.2. COMMANDS

IRSC Open can send 30 commands, each of which can either be enabled or disabled.

There is a single page of configuration for each command:

REMOTE → We must use this field to specify which remote the command is associated with

TRIGGER OBJECT → Sets which is the object that will cause the execution of the order in the KNX BUS.

TRIGGER VALUE → Value the object must have in order for the command to be sent

Note: By default the "Trigger Object" is set to "None" which signifies that the command is not associated with any object and therefore cannot be triggered.

DATA STRING → This field refers to a specific command sent by any of the IR remote buttons and requires a string captured using IRSC Open.

Note: It is not possible to check the validity of this hexadecimal string when configuring the command parameters. Instead the validity is checked by IRSC Open when the command is to be sent. If the string contains invalid (non-hexadecimal characters) the command will not be sent.

Note II: The application is not case sensitive, i.e. the lowercase and uppercase letters A to F are treated equally.

COMMENT → This field may be optionally used to enter a description of the command.

If two or more commands share the same trigger object and trigger value, then each command is sent in numerical order. This configuration may be useful for sending the same command to multiple devices whose remotes differ, for example an 'On' command to both a TV and a DVD player.
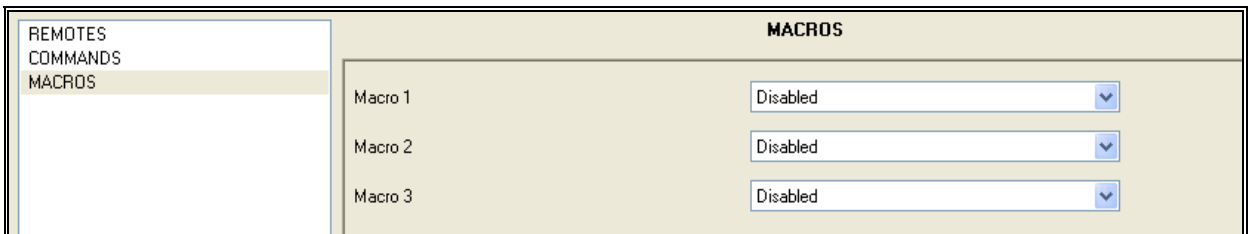
Note however, that in this case it is not possible to configure a delay between the commands being sent.

For example, if we wish to switch a TV on and tune to channel 1 using the commands 'On' an 'Channel 1' tied to the same object, it is very unlikely to work, as the TV would probably miss the 'Channel 1' command whilst it was turning on. Therefore this method of configuration is generally not recommended without first confirming that the devices respond correctly to commands sent in this manner.

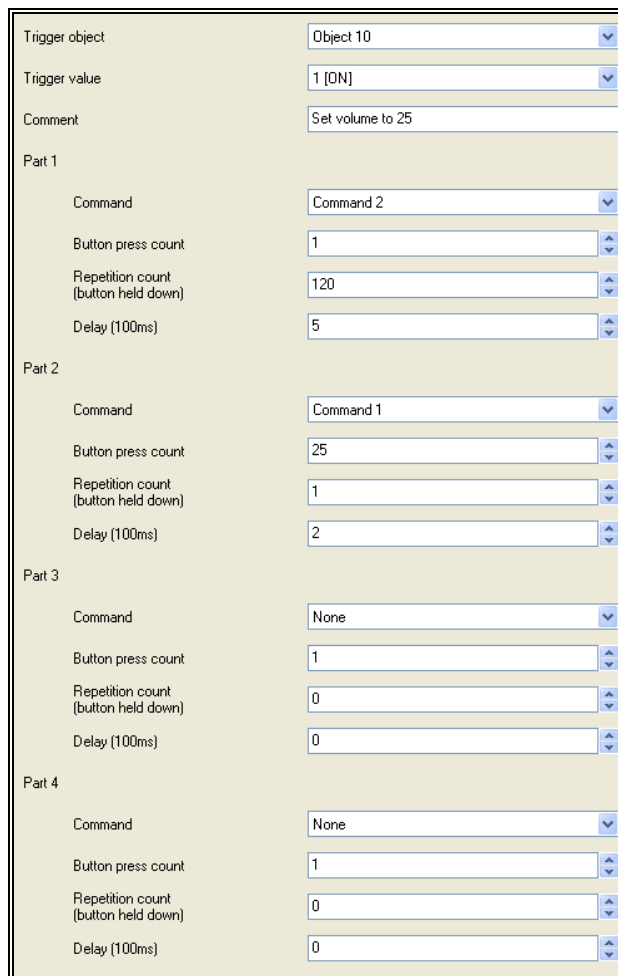**To chain multiple commands together it is recommended to use MACROS.**

3.3.MACROS

Commands may be chained together to form macros. IRSC Open supports 6 macros, each of which can be enabled or disabled.

There is a single page of configuration for each macro:

Figure 1

Each macro has a trigger object and a trigger value and may consist of up to 4 parts. When the macro is invoked, the commands are sent in order.

TRIGGER OBJECT → Sets the object which will cause the macro execution when sending it to the BUS.

TRIGGER VALUE → Value the object must have in order for the macro to be sent

COMMENT → This field may be optionally used to enter a description of the Macro

PART X → Correspond with the different parts of the macro

- Command: This parameter corresponds with section <<COMMANDS>> detailed in point 3.2 COMMANDS, and allows us to associate every part in the Macro with one of the previously parameterized commands.

- Button press count: IRSC-Open allows us to emulate the same button being pressed multiple times. This field specifies how many times the emulated button is pressed and then released.

    Example : If 'button press count' is set to 2 IRSC Open sends the following

    Note how the specified delay follows each individual emulated button press.

- Repetition count: When a button in the remote is held down continuously, the remote control will repeat the IR command periodically until the button is released. The IRSC Open can be made to emulate this behaviour by configuring this field.

    Example : If in additon to setting 'button press count' to 2, we also set 'repetition count' = 2, IRSC Open sends the following:

    Note how the button is held down for longer and also that the specified delay follows each individual emulated button press. The configuration of this parameter will require experimentation.

- Delay: To set a sending delay in case we have set more than one button press count in the corresponding field.

Note: If two or more macros share the same trigger object and trigger value, then each macro is processed in numerical order. Therefore up to 24 commands can be chained together.

The Macro in the macro configuration illustrated in Figure 1 turns the TV ON and sets the volume to 25:

- <u>Part 1 -> Command 1</u>: Turn the TV ON

- <u>Part 2 -> Command 3</u>: With a very long press of the volume down button, we ensure that we arrive at zero (to get a reference to later turn the volume up to 25).

- <u>Part 3 -> Command 2</u>: 500 ms later.....25 individual button presses to get the desired volume level.

ANEX I. COMMUNICATION OBJECTS

The Application has 30 binary objects to be used as "commands" or "macros" Trigger objects.

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