

Application Note



Introduction to 3500 Lua Scripting

by Adam Pierson



With the addition of Lua, the Aeroflex 3500 Series test set has a full-featured scripting language capable of automated testing. The additions to the Lua syntax incorporated by Aeroflex allow for remote commands to be used in Lua scripts. This open scripting language allows 3500 users to create their own test scripts that perform many tasks including taking measurements, prompting the user, taking in user input, saving settings, and saving test results.



The 3500 Series test set is a hand-held radio tester capable of direct connect and over the air testing from 2-1000 MHz.

Lua is an open-source scripting language created in 1993 at the Pontifical Catholic University of Rio de Janeiro, Brazil. Because it is written in C, Lua has fast execution speeds, requires very little storage space, and easily meshes with other C and C++ code. The fact that Lua meshes so well with C and C++ makes it an excellent “glue” language to bind systems together. It is used by many different applications, primarily for scripting. Its fast execution speed, small storage requirements, and relative ease of development make it an excellent choice to use as the basis for the 3500 Series scripting language.

In order for Lua to be suited for the 3500 test set, the syntax first had to be modified to include the ability to issue Standard Commands for Programmable Instrumentation (SCPI) style commands. In a nutshell, the SCPI syntax consists of string tokens delimited by colons. To incorporate use of 3500 RCI commands, an additional statement was added to the Lua syntax. Statements are at the same level as functions and return values. Modifications were also made such that SCPI queries could be issued and used in simple assignment operations. This allows scripts to do things like query a meter and save the reading to a variable for use later.

3500 Scripting 101

One of the things most programmers do when first using a programming language is to write a short program that simply prompts the user and perhaps takes in input. A person wishing to do so with the 3500 Series version of Lua might write the following code to create a simple user prompt on the test set.

```
:scripting:dialog:create;

:scripting:screen:print X7_POS, Y4_POS, "Hello
World";

:scripting:softkey:label 1, "Exit";

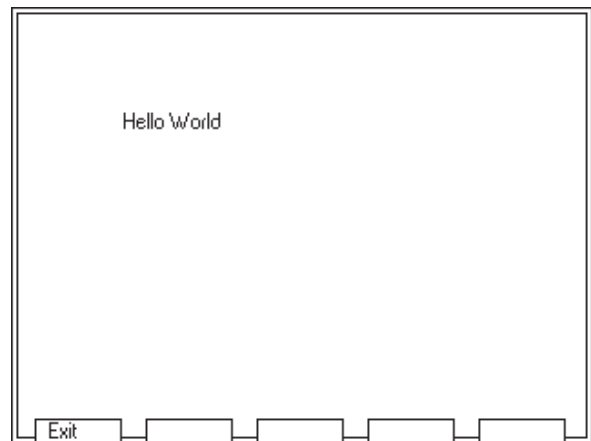
:scripting:event:enable 1, "--do nothing";

:scripting:event:idle;

:scripting:exit;
```

In this example, several commands have been added to facilitate the creation of user prompts and the acceptance of user input. First, a dialog screen is created. This dialog screen is a blank

canvas that can then have text or graphics placed on it. In this example, the text “Hello World” is written on the dialog screen. Next, an “Exit” softkey is created and its action is initialized to do nothing. Once the softkey is defined, a call is made to `:scripting:event:idle`. This command sits waiting for a valid key press. When that key press arrives, `:scripting:event:idle` performs the action corresponding to that key before closing the dialog screen. Finally, `:scripting:exit` signals that the script is finished. Using these basic commands, programmers can create a myriad of different user prompts and interact with the user in many ways.



One last thing to note on the topic of user interaction is the ability in 3500 Series Lua to create a dialog screen that can update itself while simultaneously watching for a user key press event. The addition of the command `:scripting:checkkey?` has made this possible. This command simply checks to see if a key has been pressed. It returns the key if a key press has occurred and -1 otherwise. This allows programmers to create fairly sophisticated user interfaces that can do things such as display a continuously updating power reading while simultaneously waiting on a user key press to exit the script.

File IO

As in nearly every modern scripting language, Lua has built in file input/output capabilities. This may seem like a fairly insignificant piece of functionality, yet it can be amazingly helpful in many application scenarios. Test results from a script can be saved to a text file for analysis later. The setup values of a user-configurable script can be saved and recalled at a later time. Instruction dialog screens can be saved in text files and a simple function can be created to render them to a dialog screen, allowing for quick creation and editing of dialogs. These are just a few ways file IO can be used in scripting on the 3500 Series test set.

With the addition of Lua to the 3500 Series test set, areas in flash memory have been provided specifically for storing results and data. Files saved to `/var/Results` can be accessed by using a PC either through an FTP connection or via the built-in web server on the 3500. The location `/var/Scripts` is also available, and is intended to be used as the location where the .lua scripting files are stored.

Repeatability Through Scripting

Probably the most significant benefit of the Lua scripting language in the 3500 is the ability to manipulate hardware settings and take readings in a highly repeatable fashion. Instead of relying on the user to properly configure the test set based on a manual instruction or test procedure, using scripting guarantees that the 3500 will be set up in precisely the same fashion every time. Additionally, by using dialog screens, scripts can issue commands to users, implementing step-by-step test procedures such as where to stand or how to set up the unit under test. This can eliminate or reduce the need for test procedure paper documents. With this, the odds of errors due to lost documents or out of date documents goes down dramatically.

Available Libraries

In an effort to facilitate script creation for the 3500 Series test set, many library files have been created by Aeroflex to aid in the setup and shut down of 3500 hardware. These libraries should be sufficient to power on and off the RF generator, RF receiver and audio system, set up and query meters, and normalize the RSSI meter. Aeroflex offers Lua training as well.

The addition of a scripting language to the 3500 Series test set has opened up the possibility to use the 3500 for highly repeatable, user friendly tests. This language has many useful tools available and is highly conducive to easy development of custom scripts. It is the hope of Aeroflex that in providing a powerful scripting language, we will enable customers to generate their own custom scripts and fully utilize the capabilities of the 3500 Series test set.

Selected Reference Information

The following items are provided as an aid to the reader for further information about 3500 Series products and the Lua language.

- 3500A Aeroflex webpage – General information on the 3500 Series test set
www.aeroflex.com/3500A
- 3500A operation manual link – 3500 RCI command list
http://www.aeroflex.com/ats/products/prodfiles/opsmanuals/3500_3500A_Operation_manual_issue2.pdf
- Lua.org – Online documentation and reference guide
<http://www.lua.org>
- Lua book – Complete guide to Lua
<http://www.amazon.com/exec/obidos/ASIN/8590379825/lua-home-20>

Any further questions can be directed to info@aeroflex.com.

CHINA Beijing

Tel: [+86] (10) 6539 1166
Fax: [+86] (10) 6539 1778

CHINA Shanghai

Tel: [+86] (21) 5109 5128
Fax: [+86] (21) 5150 6112

CHINA Shenzhen

Tel: [+86] (755) 3301 9358
Tel: [+86] (755) 3301 9356

FINLAND

Tel: [+358] (9) 2709 5541
Fax: [+358] (9) 804 2441

FRANCE

Tel: [+33] 1 60 79 96 00
Fax: [+33] 1 60 77 69 22

GERMANY

Tel: [+49] 8131 2926-0
Fax: [+49] 8131 2926-130

HONG KONG

Tel: [+852] 2832 7988
Fax: [+852] 2834 5364

INDIA

Tel: [+91] 80 [4] 115 4501
Fax: [+91] 80 [4] 115 4502

JAPAN

Tel: [+81] (3) 3500 5591
Fax: [+81] (3) 3500 5592

KOREA

Tel: [+82] (2) 3424 2719
Fax: [+82] (2) 3424 8620

SCANDINAVIA

Tel: [+45] 9614 0045
Fax: [+45] 9614 0047

SINGAPORE

Tel: [+65] 6873 0991
Fax: [+65] 6873 0992

UK Stevenage

Tel: [+44] (0) 1438 742200
Fax: [+44] (0) 1438 727601
Freephone: 0800 282388

USA

Tel: [+1] (316) 522 4981
Fax: [+1] (316) 522 1360
Toll Free: 800 835 2352

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www.aeroflex.com
info-test@aeroflex.com



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