# Programming Example: Retrieve data from an XE series Oscilloscope using Kotlin

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The SDS series of oscilloscopes all feature remote programming and data collection capabilities. They can be integrated easily into many automated test environments to ease the setup and data acquisition during testing.

One of our helpful customers developed a nice programming example designed to set up and retrieve data from a SIGLENT SDS1202X-E Oscilloscope using Kotlin, a free open source coding environment (more on Kotlin here).

The code utilizes a LAN connection and open sockets.

Thanks to Chris Welty for the code!

Here is a text file of the example:

SDSDataRetrievalKotlinExample

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```
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*
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*/

package scope

import java.io.BufferedWriter
import java.io.OutputStreamWriter
import java.io.Serializable
import java.net.Socket

/**
* Contains a single waveform downloaded from a Siglent 1202X-E
*/
class Waveform(val vDiv: Double, val vOffset: Double, val tDiv: Double, val tOffset: Double, val data:
ByteArray) : Serializable {

val xs: DoubleArray
get() = DoubleArray(data.size, { i -> i * tDiv * 14 / data.size + tOffset – tDiv * 7 })

val ys: DoubleArray
get() = DoubleArray(data.size, { i -> data[i] * vDiv / 25 – vOffset })

companion object {
/**
* Download the waveform displayed on the scope’s screen
*/
fun download(): Waveform {
Socket(“192.168.1.222”, 5025).use { socket ->

println(“connected to ” + socket.inetAddress)
val output = BufferedWriter(OutputStreamWriter(socket.getOutputStream(), Charsets.US_ASCII))

// since the socket can return binary data, we can’t use an InputStreamReader to
// translate the bytes to characters. We’ll have to do it ourselves.
// SCPI generally uses US ASCII, shouldn’t be too hard.
val input = socket.getInputStream()

/**
* Read from the scope until \n is encountered.
* The bytes are translated to characters numerically (so US_ASCII).
*/
fun readLine(): String {
val sb = StringBuilder()
while (true) {
val c = input.read()
when (c) {
```

```
-1, '\n'.toInt() -> return sb.toString()
else -> sb.append(c.toChar())
}
}
}

/**
* Read a number of bytes from the scope.
*
* The bytes are not translated into characters.
*/
fun readBytes(n: Int): ByteArray {
val result = ByteArray(n)
var i = 0
while (i < n) {
i += input.read(result, i, n – i)
}
return result
}

fun writeLine(string: String) {
output.write(string)
output.write("\n")
output.flush()
}

/**
* Read a numerical response from the scope.
*
* The scope returns responses like "C1:VDIV 1.00E+00V".
* This function extracts the "1.00E+00", converts it to a double, and returns it.
*/
fun readNumber() = readLine().split(" ")[1].dropLast(1).toDouble()

writeLine("*IDN?")
println(readLine())

// reset the scope response format to its default so readNumber() works
writeLine("CHDR SHORT")

writeLine("C1:VDIV?")
val vDiv = readNumber()

writeLine("C1:OFST?")
val vOffset = readNumber()

writeLine("TDIV?")
val tDiv = readNumber()
```

```
writeLine("TRDL?")
val tOffset = readNumber()

// request all points for the waveform
writeLine("WFSU SP,0,NP,0,F,0")
writeLine("C1:WF? DAT2")

// parse waveform response
val header = String(readBytes(21))
println("header is $header")
val length = header.substring(13, 21).toInt()
println("length is $length")
val data = readBytes(length)
readBytes(2) // 2 garbage bytes at end

println("V/div = $vDiv; offset = $vOffset; t/div = $tDiv; tOffset = $tOffset")

return Waveform(vDiv, vOffset, tDiv, tOffset, data)
}
}
}
}
```

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