OWNER_____

VESSEL_____

RADIO CALL SIGN_____

# Technical Users Guide

## Float Free 406
## S-VDR Memory Capsule

Product No. 2515 Cat. 1

RLB-35MC

Y1-03-0202
Rev. D

FCC Type Accepted
Patent Pending

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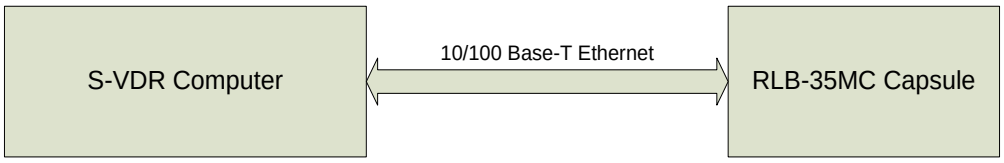
## 1. Introduction

The ACR Electronics RLB-35MC is an EPIRB containing a module with non-volatile memory (FLASH) intended to store ship parameters from an S-VDR in real time. The storage memory will continually store the last 12 hours or more of received data. The interface between the S-VDR (Simplified Voyage Data Recorder) and the memory capsule is with standard CAT-5 Ethernet cable. Protocol is the standard TCP over IP or TCP/IP.




Power for the capsule is provided over the same Ethernet cable using PoE (Power over Ethernet). This feature has the advantage in that a separate power cable is not required.

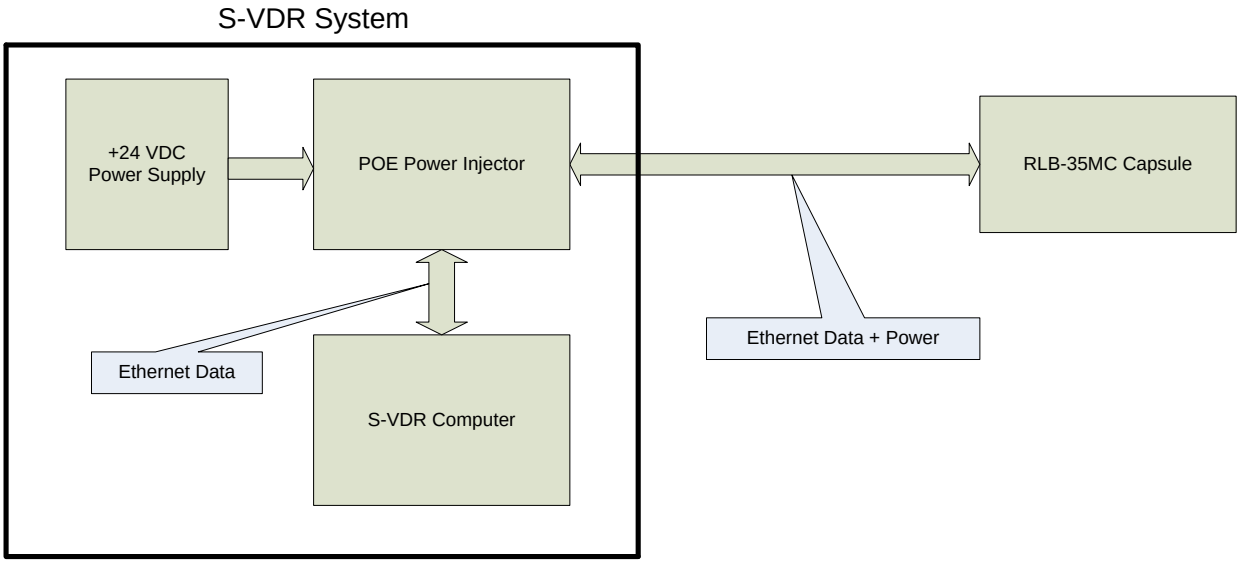
## 2. Specifications

| Memory Card | 4GB FLASH | 8GB FLASH |
|---|---|---|
| Main Memory Storage | 4,095 MBytes | 8,190 MBytes |
| Ship Configuration Storage | 1.0 MBytes | 1.0 MBytes |

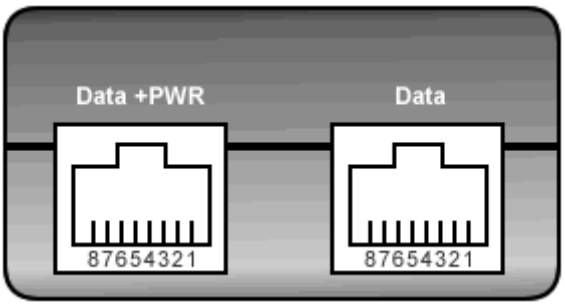
| | |
|---|---|
| IP Address | 192.168.2.100 (Factory Default) |
| Port Numbers used | 7000, 7100 and 7200 |
| PoE Voltage | 48 VDC |
| TCP/IP Data Rate | 100Mbps |
| Ethernet Interface | Full Duplex |
| Power Requirement | 8 Watts Max |
| Max CAT5 Cable Length | 50 meters |

## 3. Power-Over-Ethernet

PoE technology brings power, as well as data transfer, to the RLB-35MC via a standard twisted-pair Ethernet cable. In effect, PoE provides a new standards-based way for a computer to provide power to a wide variety of remote equipment in areas where it is physically or financially prohibitive to offer normal power. The cost savings and reliability improvements involved in not having to install and maintain power wiring in addition to Ethernet cabling is especially a key factor onboard ships during an S-VDR installation. The industry has standardized on the use of 48 VDC as the Injected PoE voltage. The use of this higher voltage reduces the current flowing through the CAT5 cable and therefore increases the load capability and increases the CAT5 cable length limitations.

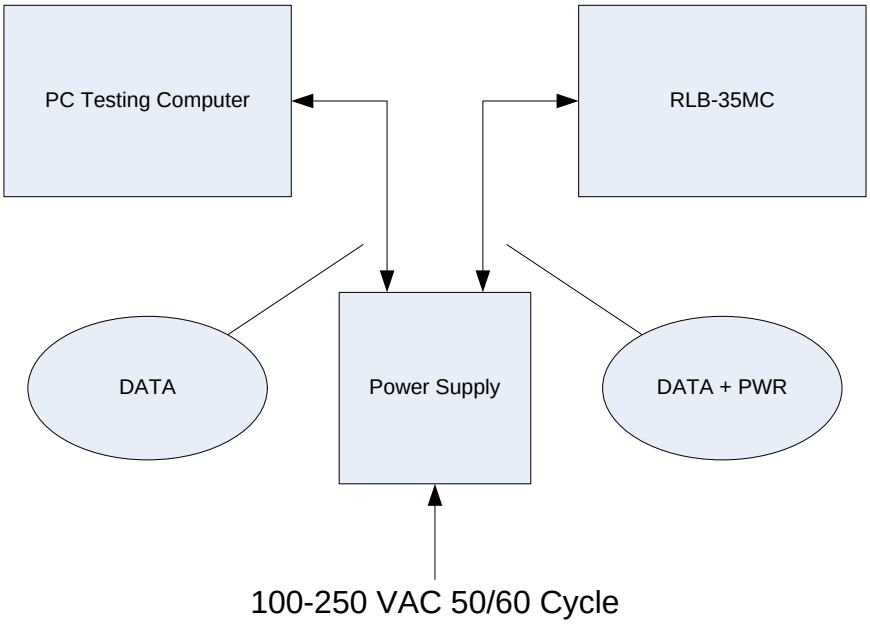



For evaluation and development, the RLB-35MC kit contains a power supply which operates from AC power mains 100 – 250 VAC 50/60 cycle. Also supplied are two CAT-5 cables for connecting between the power supply and the RLB-35MC proto assembly. The other RJ-45 cable will connect to the computer running the evaluation software.



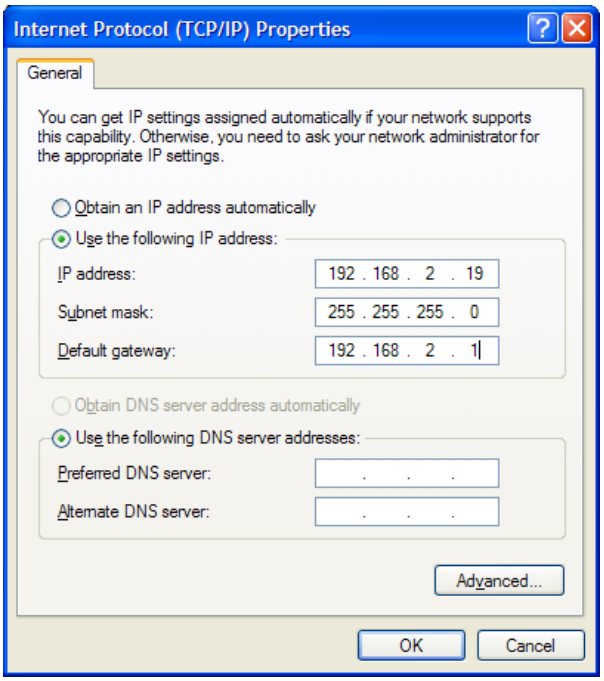
## 4. Connecting for Evaluation

Connect the RLB-35MC to a PC using the following illustration:




Either the cable between the PC and power supply or the RLB-35MC and power supply will need to be a CAT-5 "cross-over" cable. The supplied "green" cable included in the kit is a cross-over cable which can be used.

On the test PC, set the NIC TCP/IP address to 192.168.2.19.



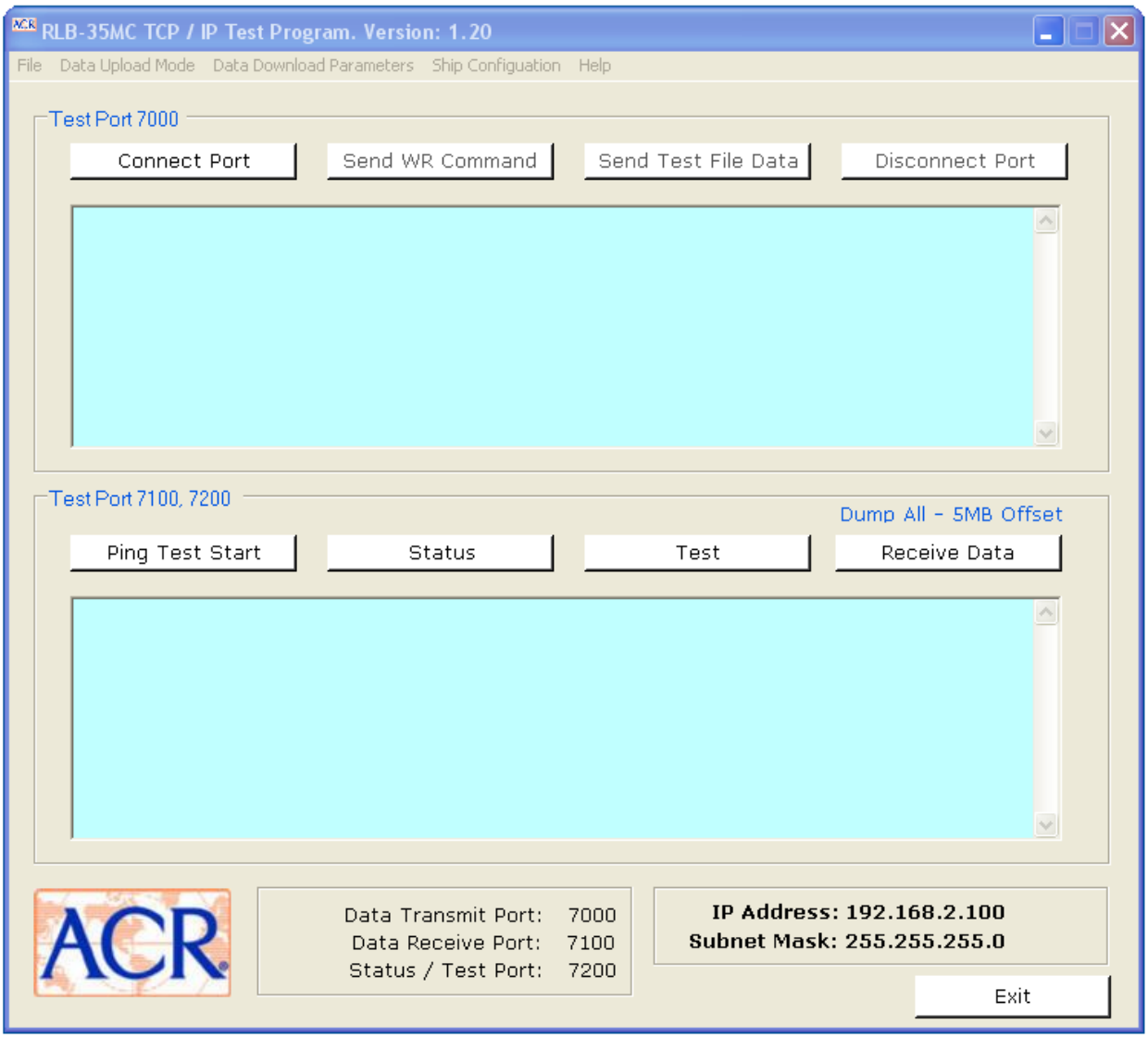
# 5. Evaluation Software Program

## 5.1. Purpose

The RLB-35MC demo software is for evaluating the RLB-35MC only and is not meant for use in actual VDR or S-VDR systems.

## 5.2. Version Compatibility

TCP_REC demo software versions 1.20 and higher have an option to reset the capsule IP address and/or subnet mask; only RLB-35MC Memory Board Software Version B and higher have this ability. The demo software can still be used with the previous capsule software version, but the capsule IP address and subnet mask can not be reset.



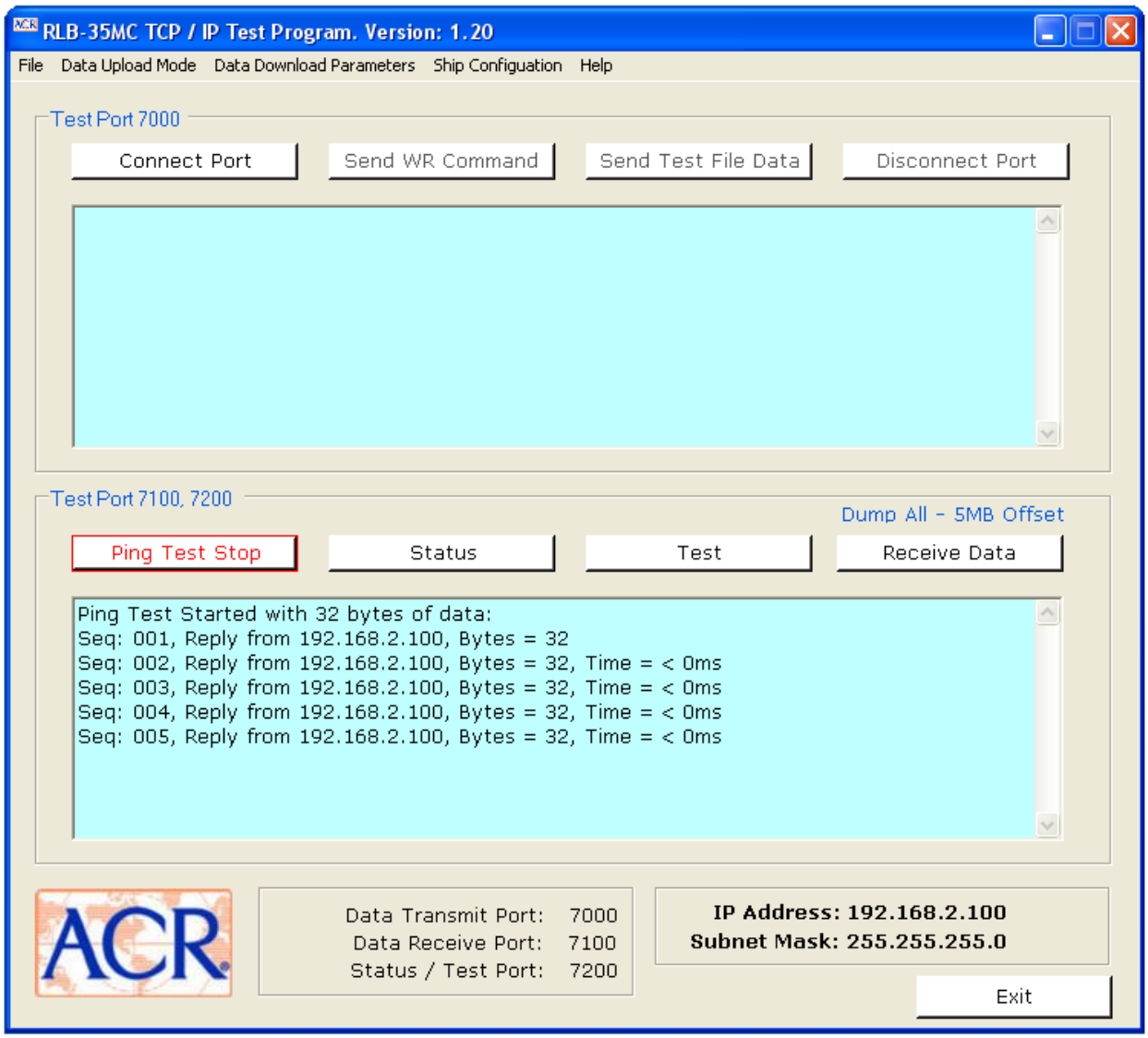

## 5.3. Setup

To load the RLB-35MC evaluation software on the testing PC, insert the software CD and follow the installation instructions. This software uses

the Microsoft .NET Framework so it may be necessary to download this software from the Microsoft website if the test PC does not already have the Framework software installed. Please note that our demo software has not been tested on Windows Vista.

### 5.4. Test

To begin, click the "Ping Test Start" button and confirm a successful ping test in the Logging window. If the ping results display a fail message, communications between the testing PC and the RLB-35MC has not been established.



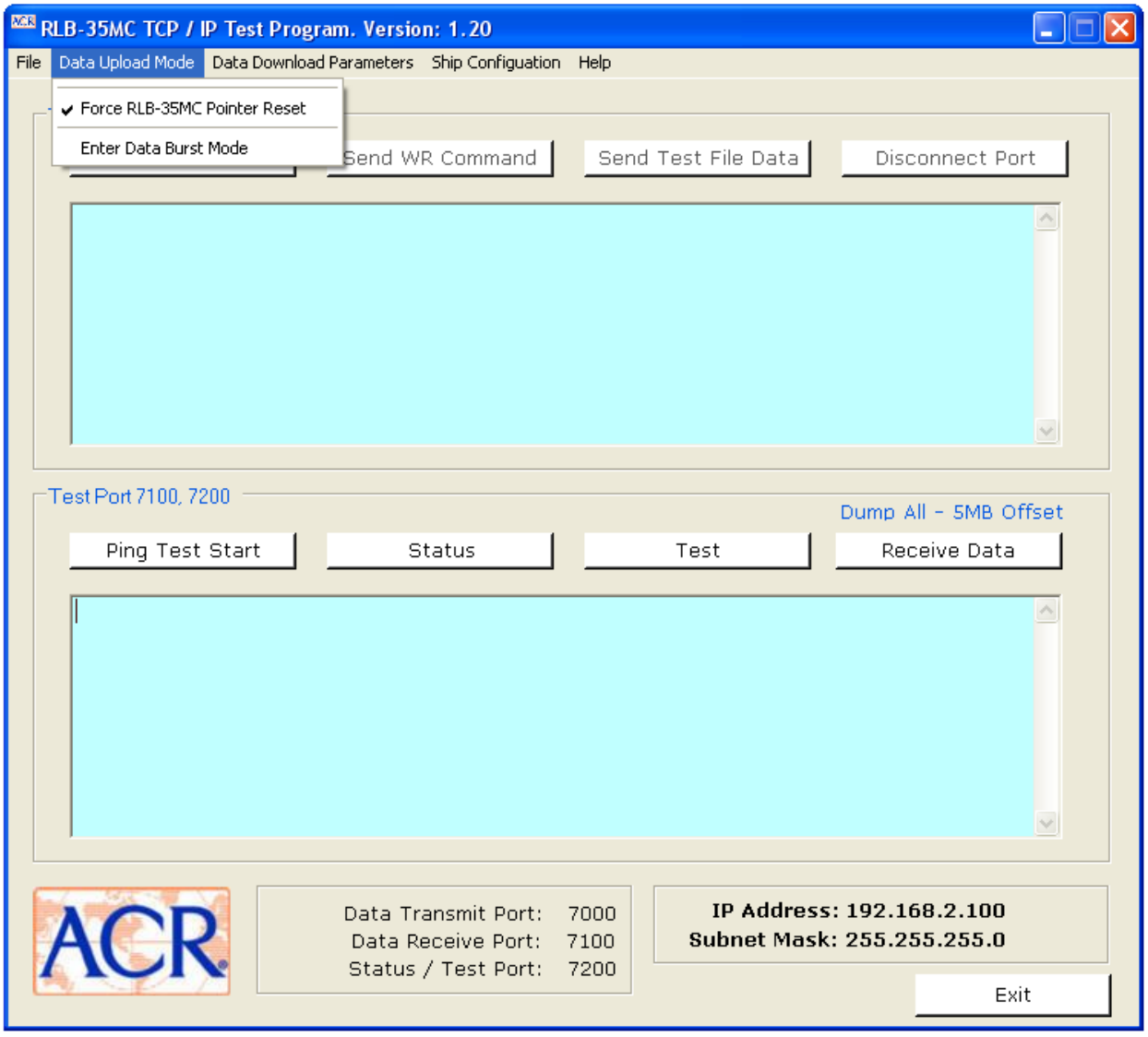

Once Ping is working correctly, click the Ping button again to stop the ping test.

Next continue with the 'Test' and the 'Status' buttons and note the results displayed in the logging text box where the ping results were listed.

### 5.5. Data Upload Mode

Two options are available on the demonstration software for writing to the Main Memory area. Select an upload option before connecting to the port and writing a file into memory.

Select menu item "Data Upload Mode" and note the two options. When selected a check mark appears to the left of the option.



**Force RLB-35MC Pointer Reset.**
This option will reset the current write location to the beginning of Main Memory.

Note: To read back the data just written, choose the 'Download from beginning of memory to current write location' option from the 'RLB-35MC Data Receive Setup' window, then click the 'Receive Data' button. See the Demo Data Download Mode Section below.

**Enter Data Burst Mode**
This mode writes a file to the Main Memory area starting at the current write location. Choose the 'Enter Data Burst Mode' from the 'Data Upload Mode' pull-down menu.

**Writing a File**
After the upload mode is selected, click the 'Send WR Command'. The 'Send Test File Data' can be selected repeatedly to write data to the Main Memory. Each time this option is selected the user will be prompted for the name of the file to write to memory. The current write pointer is advanced each time data is written.

**Disconnecting Port 7000**
Clicking the 'Disconnect Port' button will disconnect the port.

## 5.6. Data Download Mode

Four options are available on the demonstration software for reading data from the Main Memory area. Select the download mode before reading data from memory.

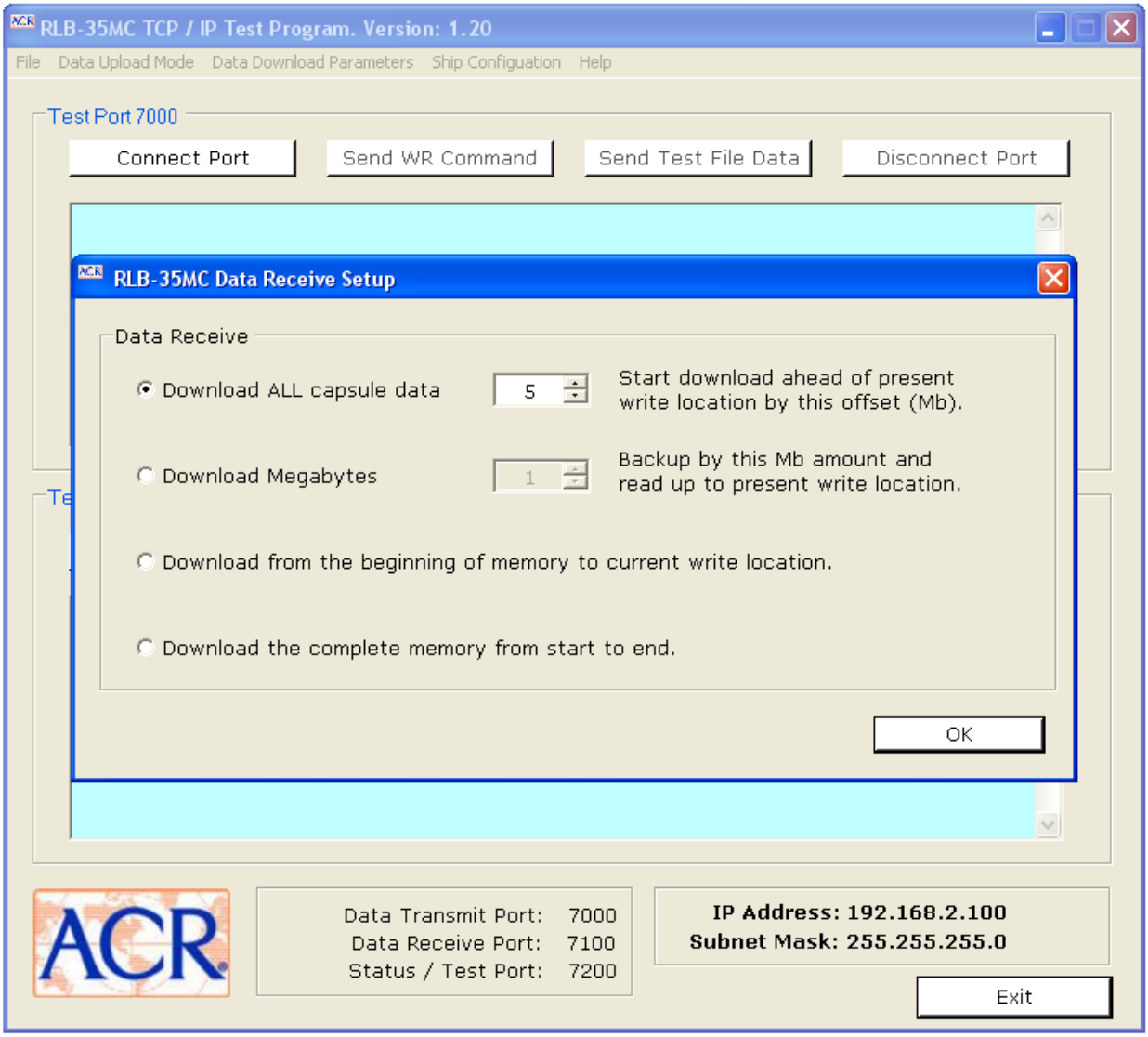
Select menu item "Data Download Parameters" and note the four options. When selected a dot appears in the circle to the left of the option.

**Download ALL capsule data**
This option will read all of the Main Memory area starting at an address that is the specified number megabytes ahead of the current write location. Enter the desired number of megabytes for the offset.

**Download Megabytes**
This option will read a specified number of megabytes of Main Memory. Enter the number of megabytes to read. The current write address will be the last address to be read.

**Download from the beginning of memory to current write location**
This option reads the Main Memory area starting at the first address in the partition and ending at the current write location. This can be used to read back a compete file when used in conjunction with the data upload option 'Force RLB-35MC Pointer Reset'.

**Download the complete memory from start to end**
This option also reads all of the Main Memory area but starts at the first address in the partition and ends at the last address.

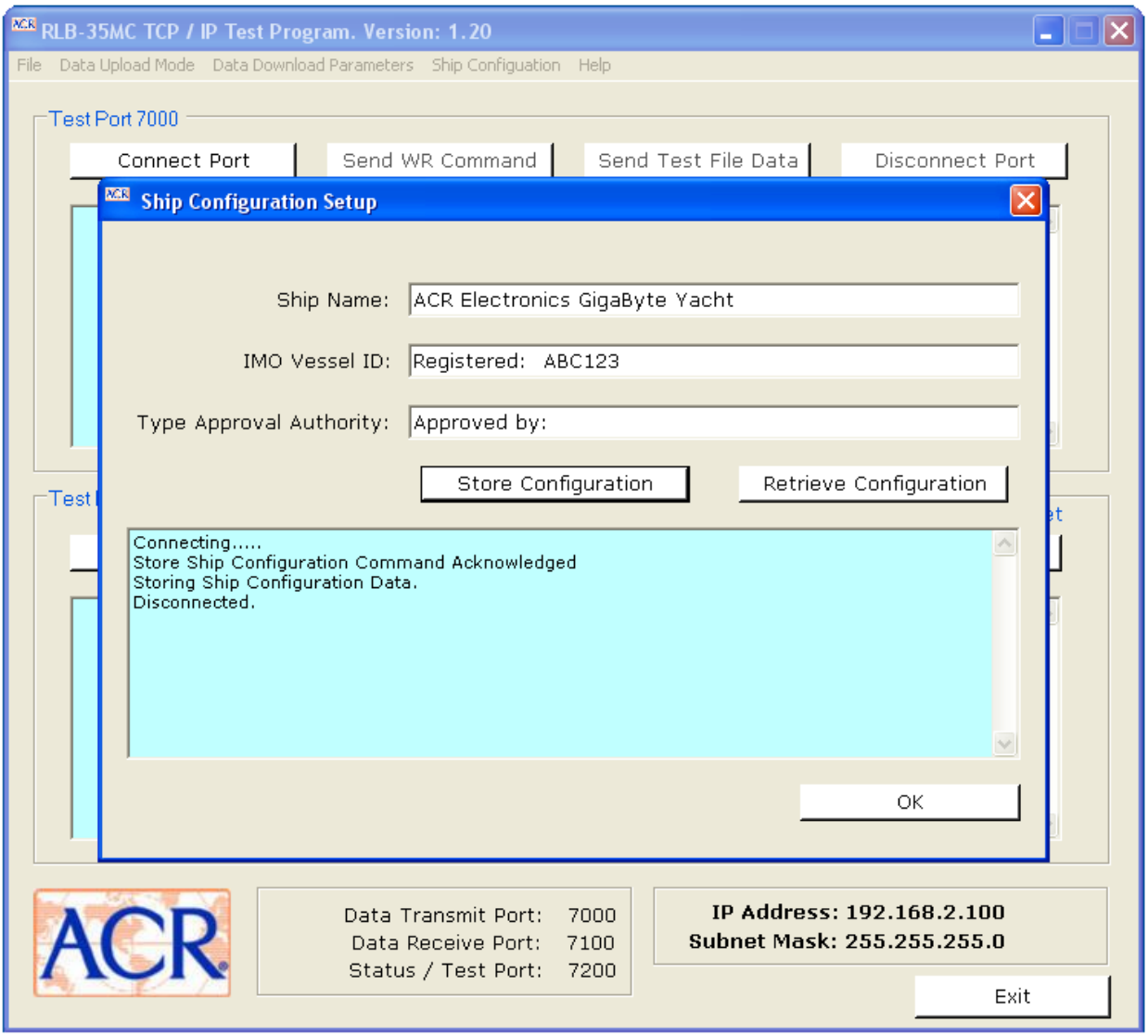



**Reading a File**
After the download mode is selected, click the 'Receive Data' button. Each time this option is selected the user will be prompted for the name of a file to save the data to.

**Disconnecting Port 7100**
The port is automatically closed by the RLB-35MC after a read.

## 5.7. Ship Configuration

For evaluation, only a small amount of data is stored in the Configuration Memory area. To access this area, click menu item 'Ship Configuration' to open the following dialog window. To store the three items, click on the 'Store Configuration' button. The data in the windows can be modified if desired.

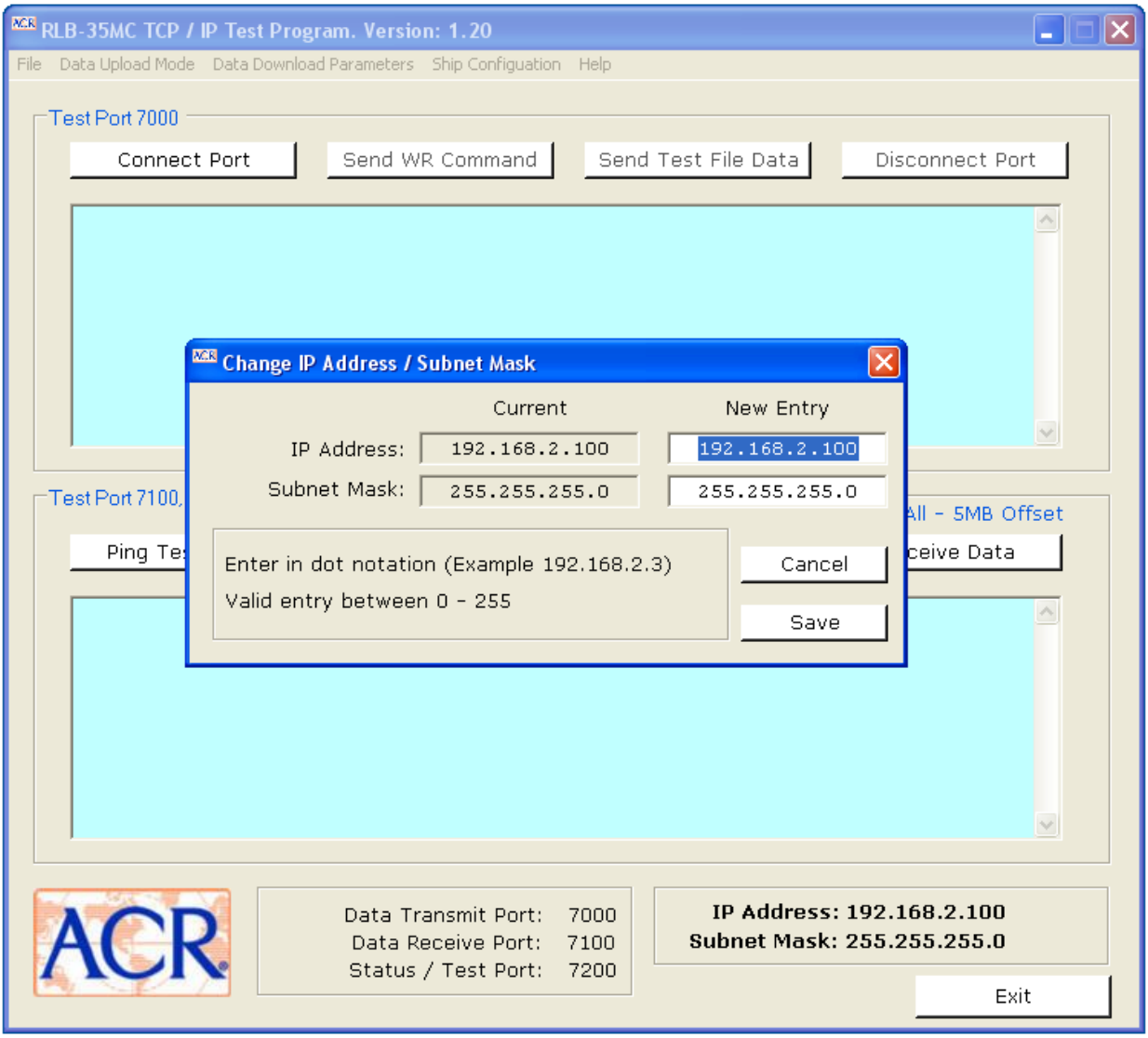



Click the 'Retrieve Configuration' button to read back what was written.

## 5.8. IP Address and Subnet Mask

### Setting a New IP Address and Subnet Mask

To change the IP address or subnet mask, click menu item 'File' then click 'Configure Capsule IP Address and Subnet Mask' to open the following dialog window.




Change the IP address and/or subnet mask and click the 'Save' button. The IP address and subnet mask displayed in the lower right corner of the demo software screen will display the new values. Cycle the power to the RLB-35MC Memory Board for the new values to take effect.

**Forcing the IP Address and Subnet Mask Back to the Default Values**

To force the RLB-35MC Memory Board back to its default state with no user set values in effect and with the default IP address of 192.168.2.100 and subnet mask of 255.255.255.0 reinstated, do the following:

1. Remove power from the Memory Board.
2. Remove the CFC from its holder.
3. Apply power to the Memory Board with the CFC still removed.
4. Wait 10 seconds.
5. Remove power from the Memory Board.
6. Re-engage the CFC in its holder.
7. Re-apply power to the Memory Board. The default values are now in effect.
8. On the PC edit the IP Address and IP Subnet Mask in the RLB-35MC TCP_REC registry back to the default values. To get to the registry editor select 'Run' on the windows startup menu, then type in regedit and click ok. Next select the RLB-35MC TCP_REC program from the list on the left-hand side of the Registry Editor window; the list of RLB-35MC TCP_REC registers available will come up on the right-hand side of the Registry Editor window.

# 6. Communications Command Structure

## 6.1. Byte Definitions

The RLB-35MC is configured as an iterative server with the PC as a client. The RLB-35MC server will be looking for a command string defining the requested operation as received from the client. The command string is sixteen (16) bytes in length with fixed byte positions defining various functions as seen below:

| Fixed Command Header | | | | Operation Command | Operation Subcommand | Reset Write Pointer | CFC Size MSB | CFC Size LSB | CFC Size Magnitude | Read Offset MSB | Read Offset LSB | Status Flags MSB | Status Flags LSB | Software Version | Termination | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AC | 53 | CA | 35 | | | | | | | | | | | | 00 | ← value |
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | ← byte |

← command

Bytes 0 – 6, 10, and 11 are part of the command string sent by the user to the RLB-35MC Memory Board. Bytes 7 – 9 and 12 – 14 are returned by the RLB-35MC Memory Board with the echoed command string in response to a 'Test' command ('E' command and '0' subcommand); only bytes 12 and 13 are returned with the command string in response to a 'Status' command ('S' command).

### 6.2. Header

The first four (4) bytes are a fixed value header with hexadecimal values of AC, 53, CA, 35.

### 6.3. Operation Command

Byte 4 is the Operation Command and is in ACSII format:

| ASCII Character | Hex Value | Command |
|---|---|---|
| R | 0x52 | If main memory, read the read offset specified number MB of data, else read & return all the data from the specified memory partition. |
| W | 0x57 | Write into the specified memory partition |
| D | 0x44 | Read all of main memory starting at the specified read offset from the current write address and ending at the address just before the stating address |
| P | 0x50 | Read main memory from the partition's beginning address to the current write address |
| F | 0x46 | Read all of main memory starting at the partition's beginning address to the ending address |
| S | 0x53 | Request the memory board status |
| E | 0x45 | Request the memory board status, CFC size, & software version |

### 6.4. Operation Subcommand

Byte 5 is the Operation Subcommand, and is in ASCII format. It defines which partition of memory each read or write command will operate on.

| ASCII Character | Hex Value | Definition |
|---|---|---|
| 0 | 0x30 | Test status request |
| 1 | 0x31 | Main memory partition |
| 2 | 0x32 | Configuration memory partition |
| 3 | 0x33 | Status memory partition |

### 6.5. Reset Write Pointer

| Decimal Number | Hex Value | Definition |
|---|---|---|
| 0 | 0x00 | Do not reset the current write address pointer of the specified memory partition. |
| 1 | 0x01 | Reset the current write address pointer of the specified memory partition to the first address in the partition. |

### 6.6. CFC Size

Bytes 7 and 8 indicate the CFC size in gigabytes or megabytes as a decimal number.

### 6.7. CFC Magnitude

Byte 9 is in ASCII format and indicates either gigabytes or megabytes:

| ASCII Character | Hex Value | Definition |
|---|---|---|
| G | 0x47 | Gigabytes |
| M | 0x4D | Megabytes |

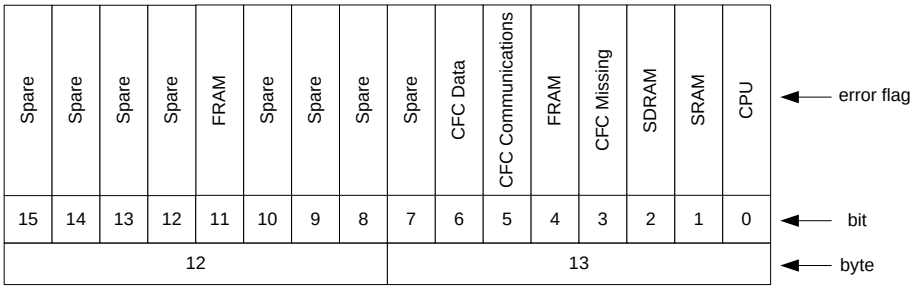
### 6.8. Read Offset

Bytes 10 and 11 are the read offset in number of megabytes as a decimal number; the read offset is defined for the following command/subcommand combinations:

| Command | Subcommand | Read Offset Definition |
|---|---|---|
| 'R' | '1' | The read offset gives the number of MB behind the current write address to start reading. |
| 'D' | '1' | The read offset gives the number MB ahead of the current write address to start reading. |

### 6.9. Error Flags

Bytes 12 and 13 are the error flags, the bits are defined below:




Note that all the Error Flags are 0 = PASS and 1 = FAIL except for bit 3, the CFC Missing flag, where 0 = card present and 1 = card missing.

### 6.10. Software Version

Byte 14 is in ASCII format and indicates the RLB-35MC Memory Board's software version.

## 7. Valid Commands

The possible valid combinations during normal VDR operations are as follows:

### 7.1. Write Port 7000:

| Operation Command | Operation Subcommand | Reset Write Pointer | CFC Size MSB | CFC Size LSB | CFC Size Magnitude | Read Offset MSB | Read Offset LSB | Status Flags MSB | Status Flags LSB | Software Version | Definition |
|---|---|---|---|---|---|---|---|---|---|---|---|
| W | 1 | xx[2] | 00[1] | 00[1] | 00[1] | 00[1] | 00[1] | 00[1] | 00[1] | 00[1] | Write received data into main memory starting at the current write address |
| W | 2 | 00[1] | 00[1] | 00[1] | 00[1] | 00[1] | 00[1] | 00[1] | 00[1] | 00[1] | Write received data into configuration memory starting at the current write address |

1) Don't Cares

2) 0x00 = leave the current write address as is; 0x01 = reset the current write address to the first address in the memory partition

RLB-35MC Write Commands

### 7.2. Read Port 7100:

| Operation Command | Operation Subcommand | Reset Write Pointer | CFC Size MSB | CFC Size LSB | CFC Size Magnitude | Read Offset MSB | Read Offset LSB | Status Flags MSB | Status Flags LSB | Software Version | Definition |
|---|---|---|---|---|---|---|---|---|---|---|---|
| R | 1 | 00[1] | 00[1] | 00[1] | 00[1] | xx[2] | xx[2] | 00[1] | 00[1] | 00[1] | Read main memory starting at the address that is the number of offset MBs behind the current write address and ending at the last address written at the time the command was received. |
| R | 2 | 00[1] | 00[1] | 00[1] | 00[1] | 00[1] | 00[1] | 00[1] | 00[1] | 00[1] | Read configuration memory starting at the first address and ending at the last address written at the time the command was received. |
| R | 3 | 00[1] | 00[1] | 00[1] | 00[1] | 00[1] | 00[1] | 00[1] | 00[1] | 00[1] | Read status memory starting at the first address and ending at the last address written at the time the command was received. |
| D | 1 | 00[1] | 00[1] | 00[1] | 00[1] | xx[3] | xx[3] | 00[1] | 00[1] | 00[1] | Read all of main memory starting at the address the number of offset MBs ahead of the current write address and ending at the address one less than the read starting address. |
| P | 1 | 00[1] | 00[1] | 00[1] | 00[1] | 00[1] | 00[1] | 00[1] | 00[1] | 00[1] | Read all of main memory starting at the first address in the partition and ending at the last address written at the time the command was received. |
| F | 1 | 00[1] | 00[1] | 00[1] | 00[1] | 00[1] | 00[1] | 00[1] | 00[1] | 00[1] | Read all of main memory starting at the first address in the partition and ending at the last valid address in the partition. |

1) Don't Cares

2) Number of MBs of main memory to read behind the current write position

3) Number of MBs offset ahead of the current write position to start reading all of main memory

RLB-35MC Read Commands

When reading (dumping) all of Main Memory data out of the RLB-35MC two commands are available. The 'D' command with a 16-bit offset value represents the number of megabytes ahead of the current writing position to start reading. For example, if the read offset is 7 MB and the current write address is 0x2110, the data dump would begin at 0x2117. All of Main Memory's data would be read ending with the last read at address 0x2116. If the 'F' command is used the data will be read back from the first address in the Main Memory partition to the last address in the partition.

| Command | Sub-Command | Offset Megabytes |
|---|---|---|
| "D" | "1" | 0007 |

RLB-35MC Dump with OFFSET

When reading Main Memory data out of the RLB-35MC, an offset value is made available so that only a portion of the data can be retrieved. The offset value in this case is the number of megabytes to read. The read starts at a location the specified number of megabytes behind the current write position and ends at the write location at the time the command was received. For example, a download of data that was stored 14 megabytes ago would be:

| Command | Sub-Command | Offset Megabytes |
|---|---|---|
| "R" | "1" | 000E |

RLB-35MC Read with OFFSET

A read command to the Configuration Memory reads back the entire Configuration Memory that was written. A read command to the Status Memory reads back the data stored in the Status Memory area.

### 7.3. Status Port 7200:

| Operation Command | Operation Subcommand | Reset Write Pointer | CFC Size MSB | CFC Size LSB | CFC Size Magnitude | Read Offset MSB | Read Offset LSB | Status Flags MSB | Status Flags LSB | Software Version | Definition |
|---|---|---|---|---|---|---|---|---|---|---|---|
| S | 00[1] | 00[1] | 00[1] | 00[1] | 00[1] | 00[1] | 00[1] | 00[1] | 00[1] | 00[1] | Request the memory board status |
| E | 30[2] | 00[1] | 00[1] | 00[1] | 00[1] | 00[1] | 00[1] | 00[1] | 00[1] | 00[1] | Request the memory board status, CFC size, and software version |

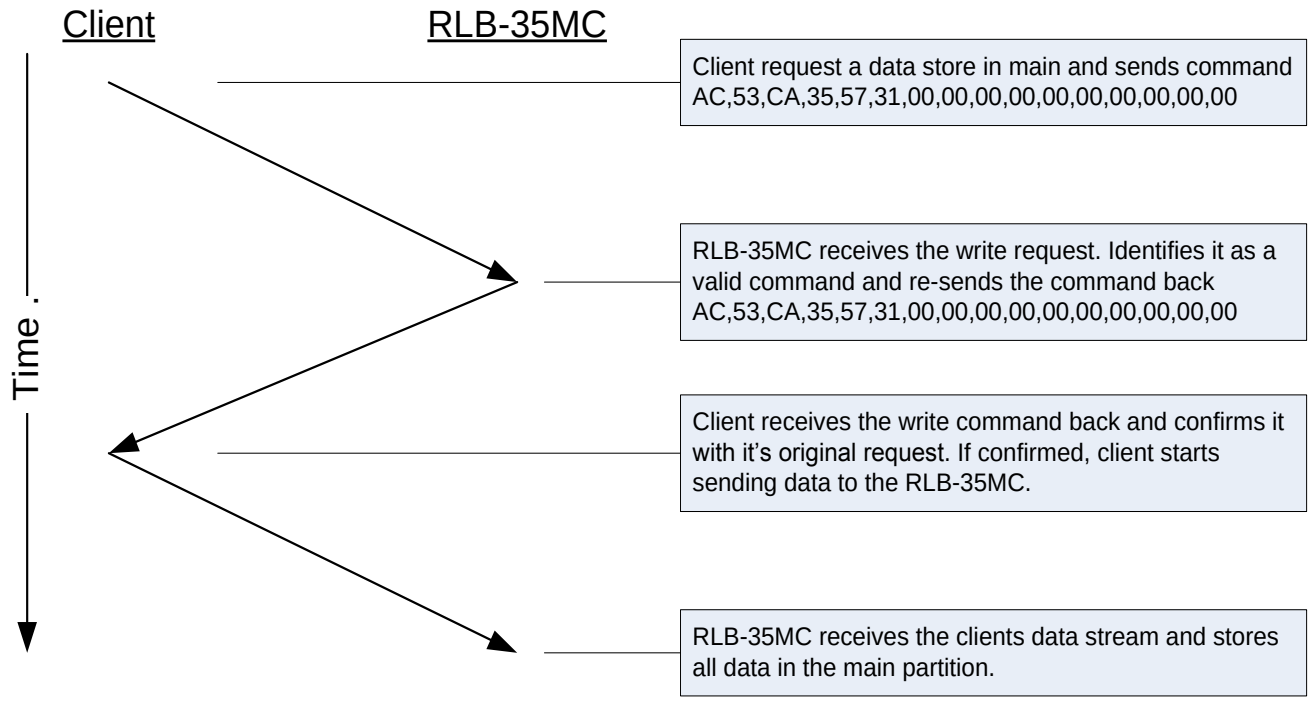
1) Don't Cares
2) Must be ASCII zero, 0x30

RLB-35MC Status Requests

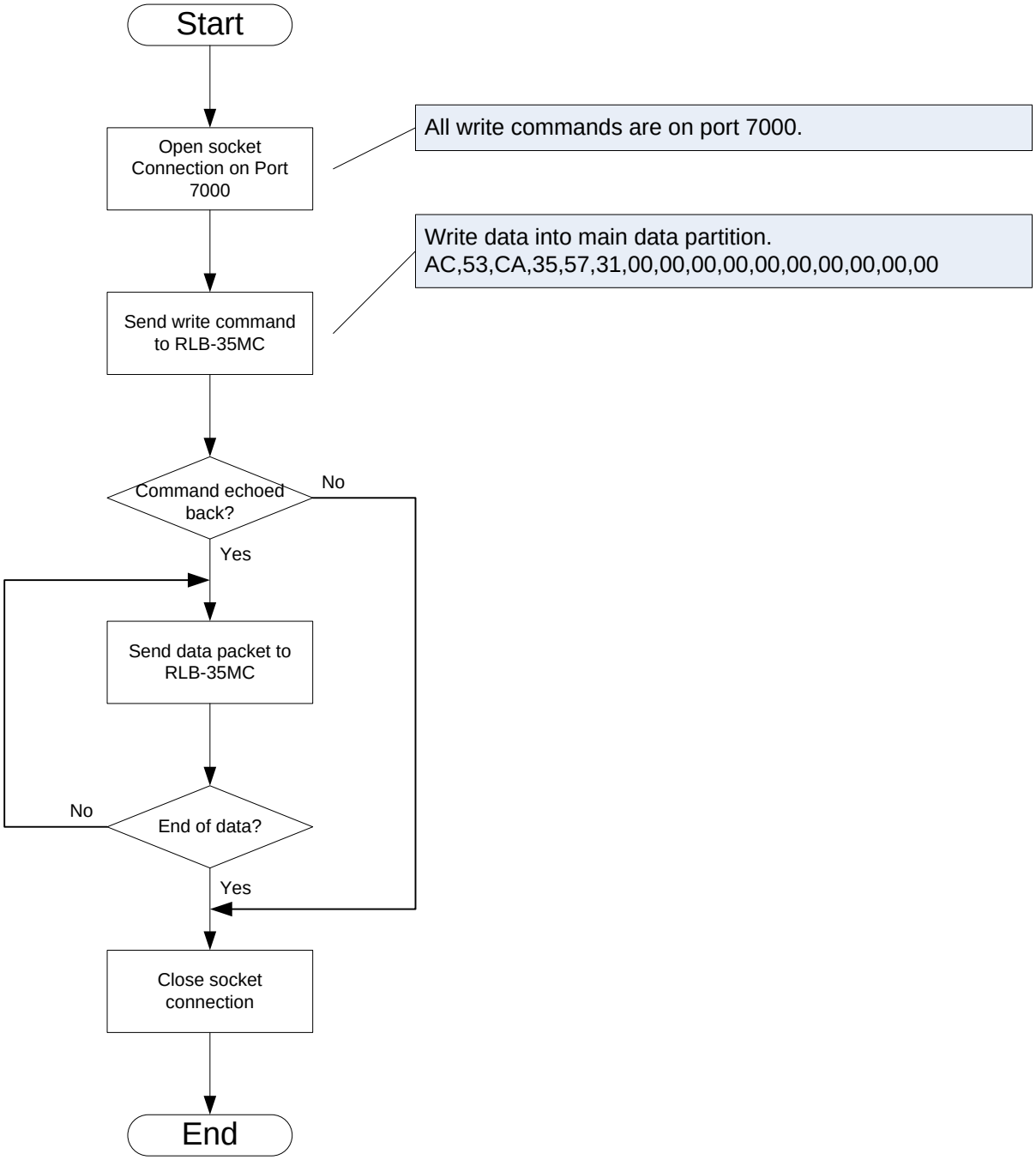
When requesting the RLB-35MC Memory Board status, two commands are available; both the 'S' and 'E''0' command return the command with the error flags set as necessary, additionally the 'E''0' command returns the CFC size and software version.

## 8. TCP/IP Communications Data Flow

Once the command is sent to the RLB-35MC, confirmation will be returned back to the client as an "echo" of the initial 16 byte command. This will insure that both the server and the client are in agreement as to what the command is and the correct follow-through of that command. For example, if we send a command to write data into the main data partition:



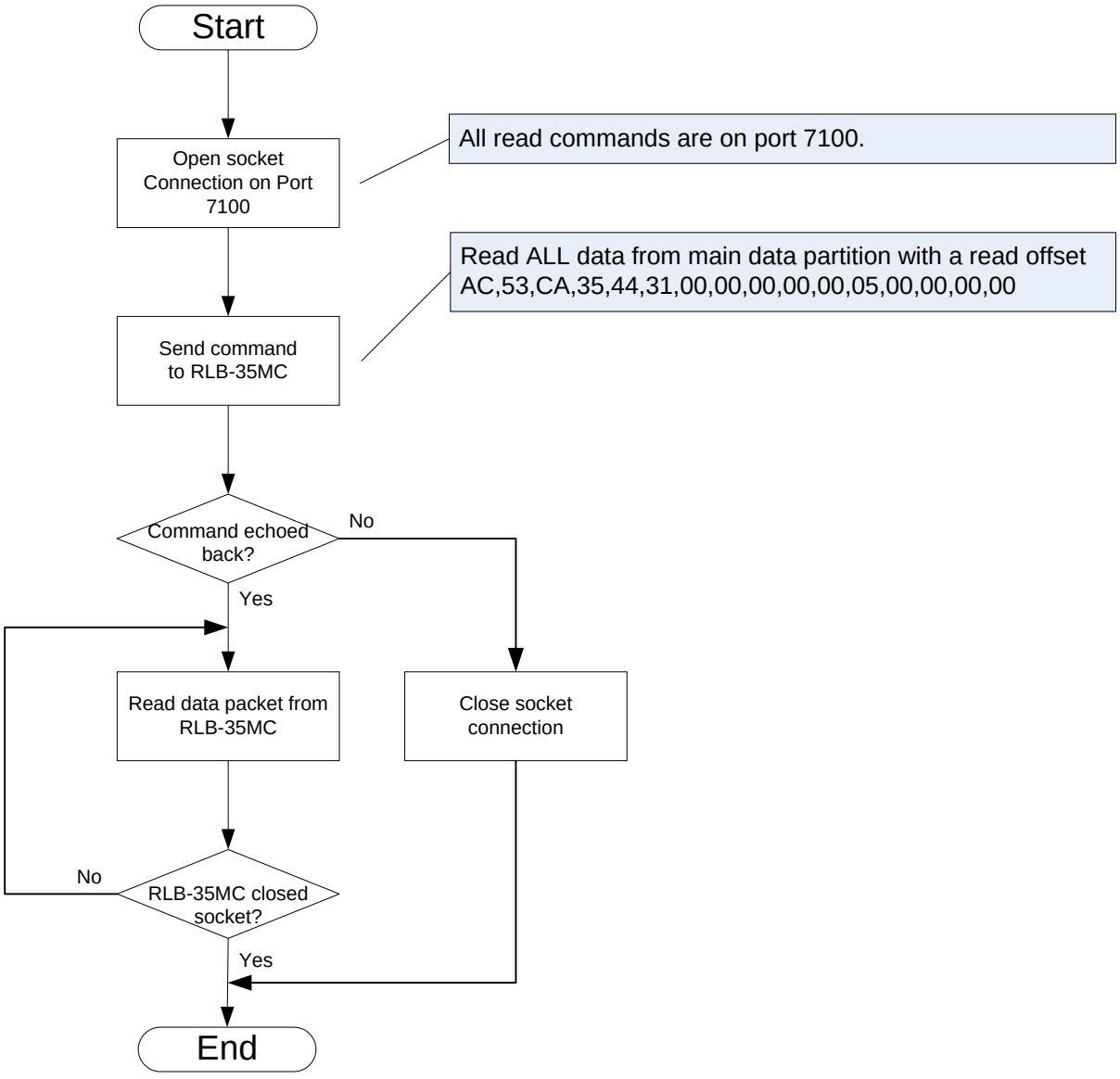
## 9. TCP/IP Communications Data Write Example




See section 5.3 for how to execute this sequence using our demo software.

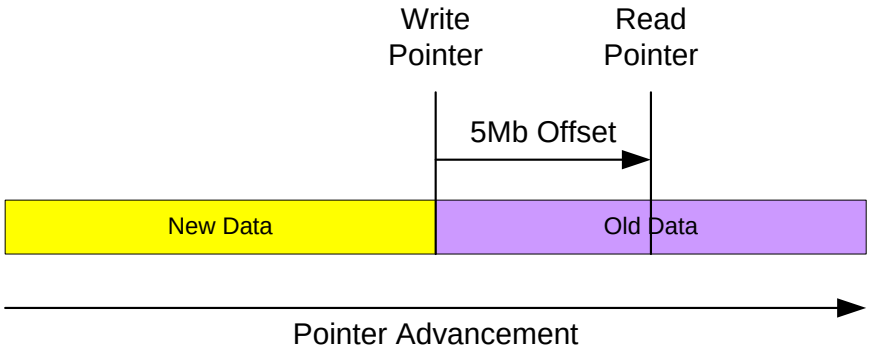
# 10. TCP/IP Communications Data Read Examples

## 10.1. Data Read All with Read Offset Example

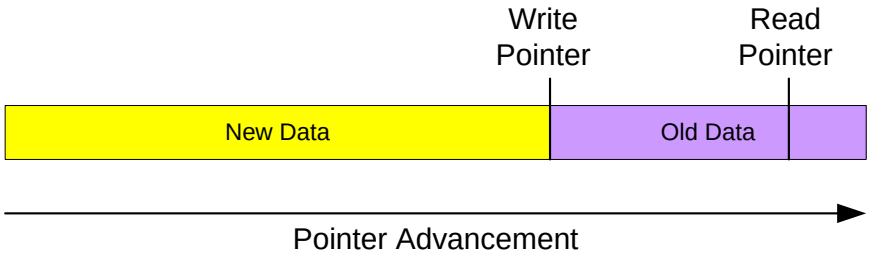



Note that this is the 'Download ALL capsule data' option in the 'RLB-35MC Data Receive Setup' window, with 5 MB entered as the read offset.

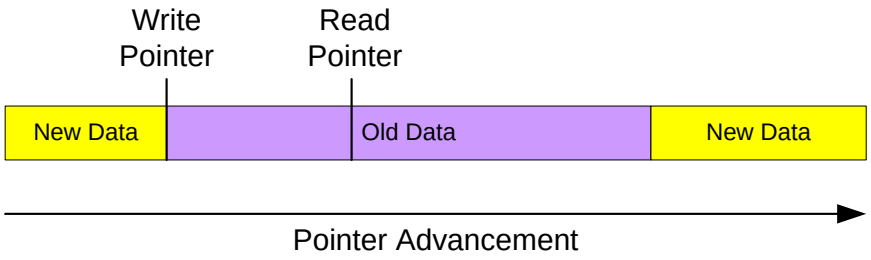
**Data read all download with offset example (continued)**



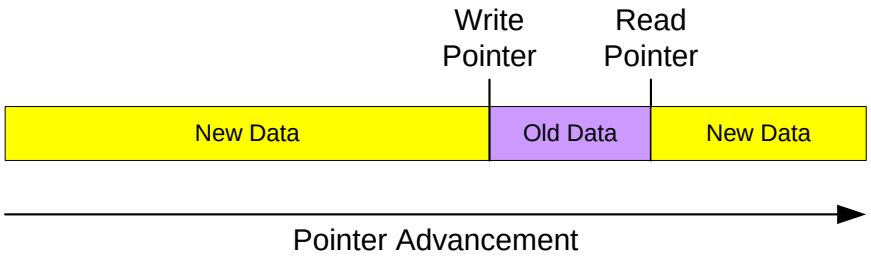

Snapshot of the Read Pointer Address is captured.




Pointers advanced during a read and write condition.

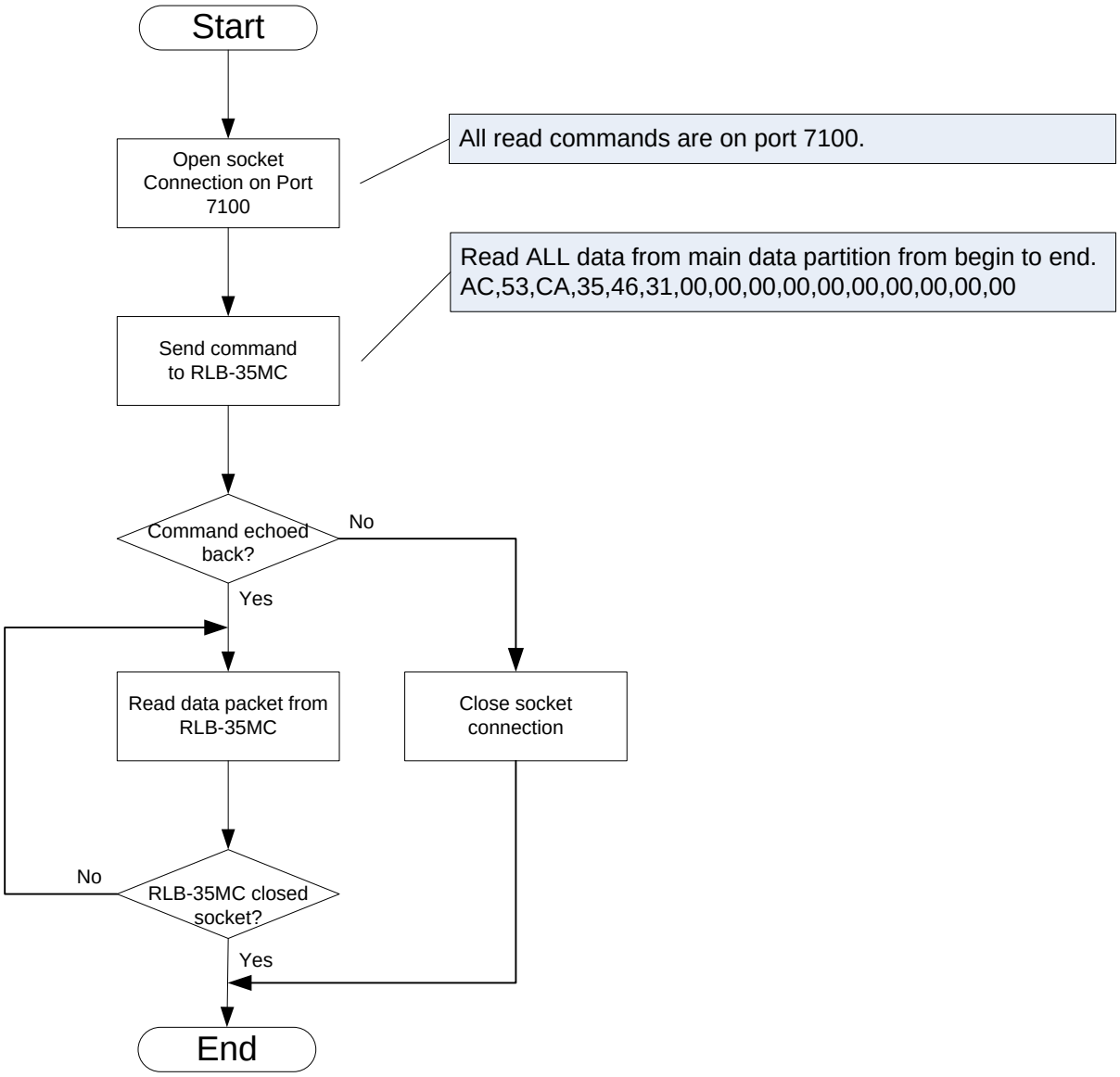



Pointers “wrap around” when reaching top of memory..



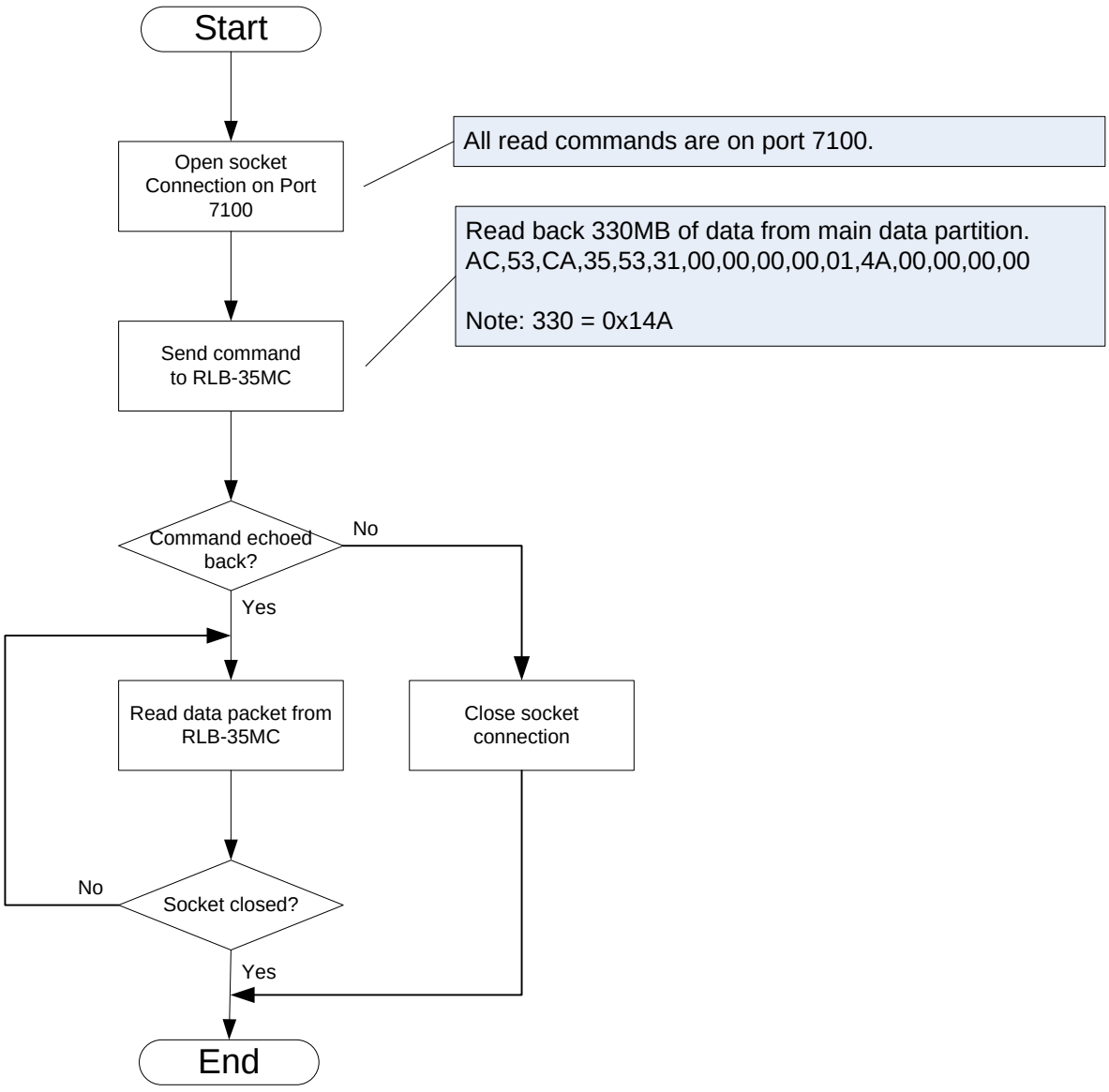

Read pointer is equal to the snapshot address at the begin of read. Read exits and disconnects the port.

### 10.2. Data Read All without Read Offset Example



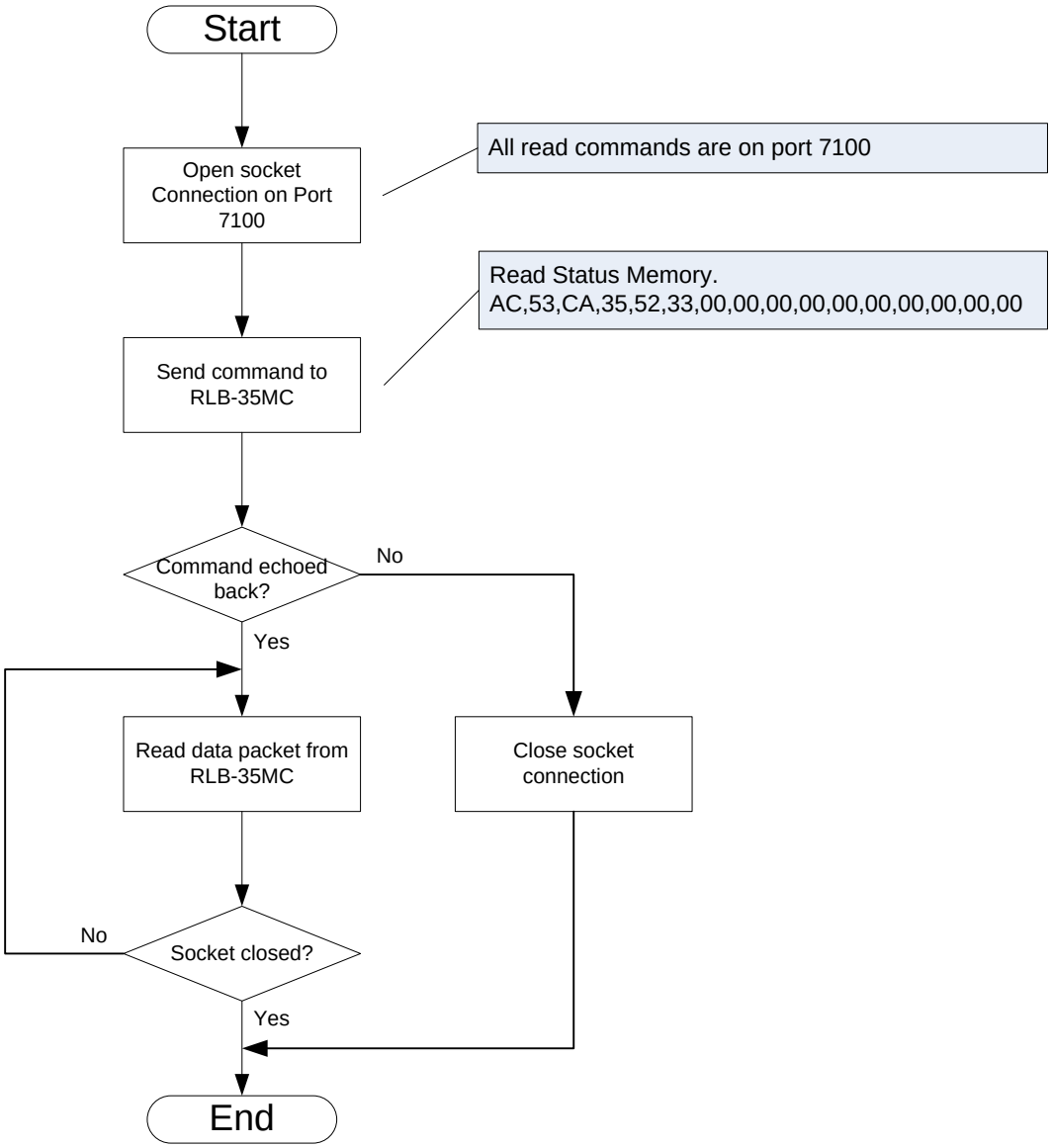

Note that this is the 'Download the complete memory from start to end' option in the 'RLB-35MC Data Receive Setup' window.

### 10.3. Data Read Example




Note that this is the 'Download Megabytes' option in the RLB-35MC Data Receive Setup window, with 330 MB entered as the number of megabytes to read.

## 10.4. Read Status Memory Example




Note that our demo software does not demonstrate this option.

# 11. Ship Configuration

## 11.1. Data

An area of data defining the configuration of the S-VDR and the sensors is written into the final recording medium during commissioning of the S-VDR. This configuration data is permanently retained in the final recording and protected from modification other than by a duly authorized person. Changes to the configuration data block does not affect the normal recording of the mandatory items.

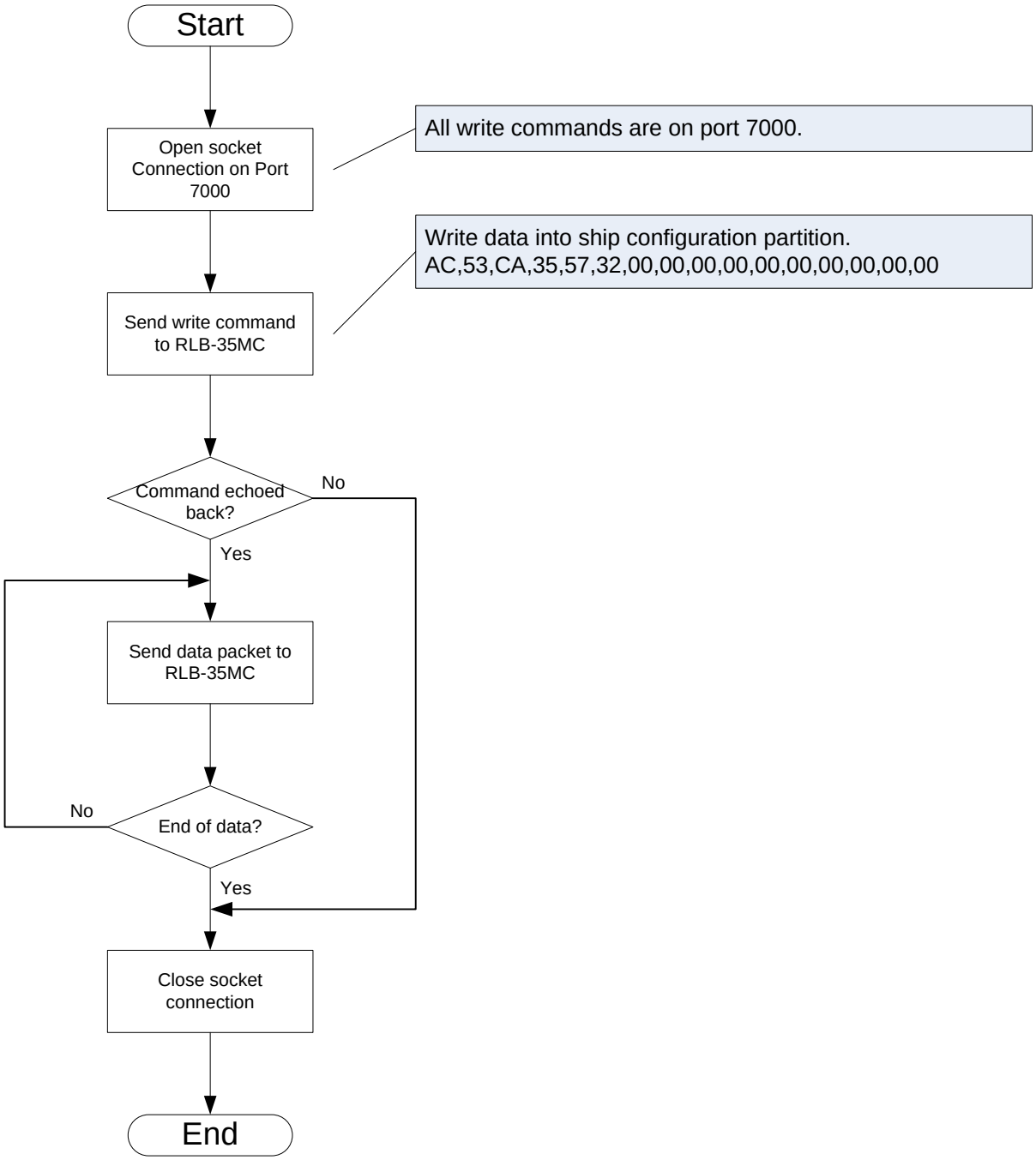
IEC-61996-2 defines the following system configuration information and data source which shall be included in this data block:

a) Type approval authority and reference.
b) IMO vessel identification number.
c) Software version(s) used.
d) Microphone locations and recording port allocation.
e) VHF communications – which VHF channel(s) are being recorded.
f) Date and time – from which source obtained.
g) Ship's position – from which EPFS obtained and position on the vessel.
h) Other data inputs – Identifying other inputs.
i) Automatic insertion of date and time of last amendment.

## 11.2. Partition Size

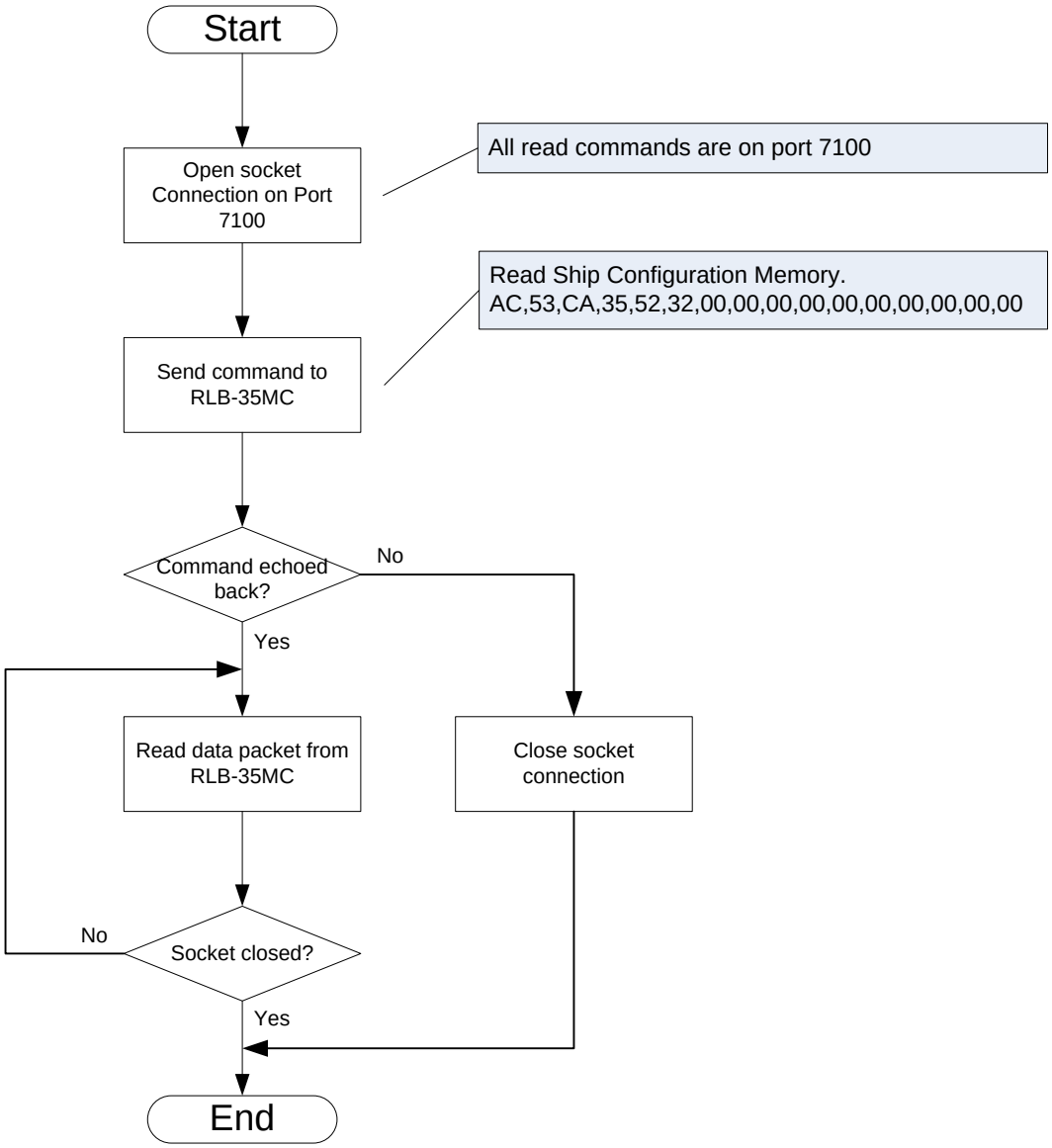
The RLB-35MC reserves 1MB of protected memory for storing the ship configuration.

### 11.3. Write Ship Configuration Example




Note that this is the 'Store Configuration' option on our demo software's 'Ship Configuration Setup' menu.

### 11.4. Read Ship Configuration Example



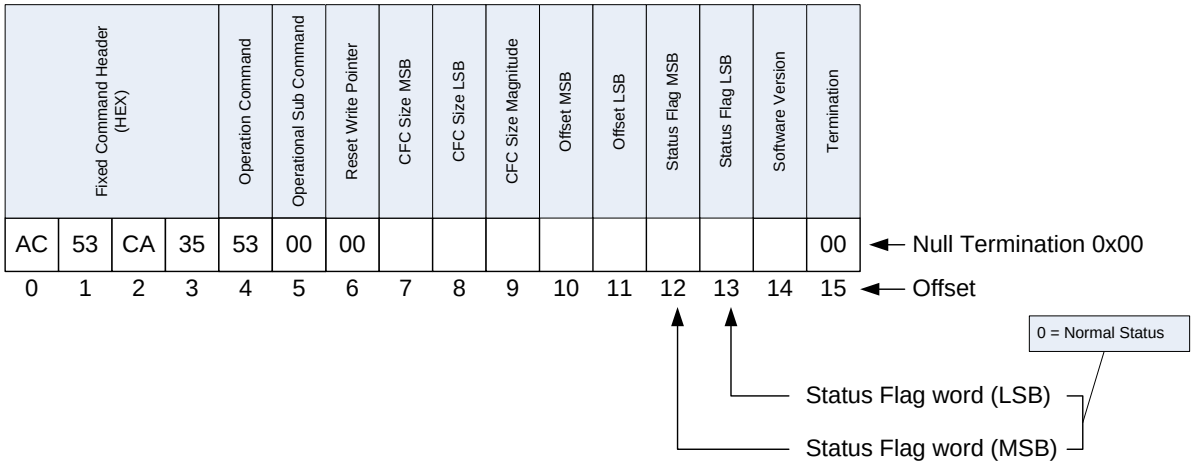

Note that this is the 'Retrieve Configuration' option on our demo software's 'Ship Configuration Setup' menu.

# 12. Data Integrity Flags

## 12.1. Bit Definitions

Bytes within the command string at offset location 12 and 13 make up a 16 bit status flag. This 16 bit word can be monitored to determine if there are any failures or data integrity problems within the RLB-35MC capsule. If the flag word is at 0x0000, no fail reports have been detected. A non-zero flag word would mean a failure has been detected.

RLB-35MC Command Structure

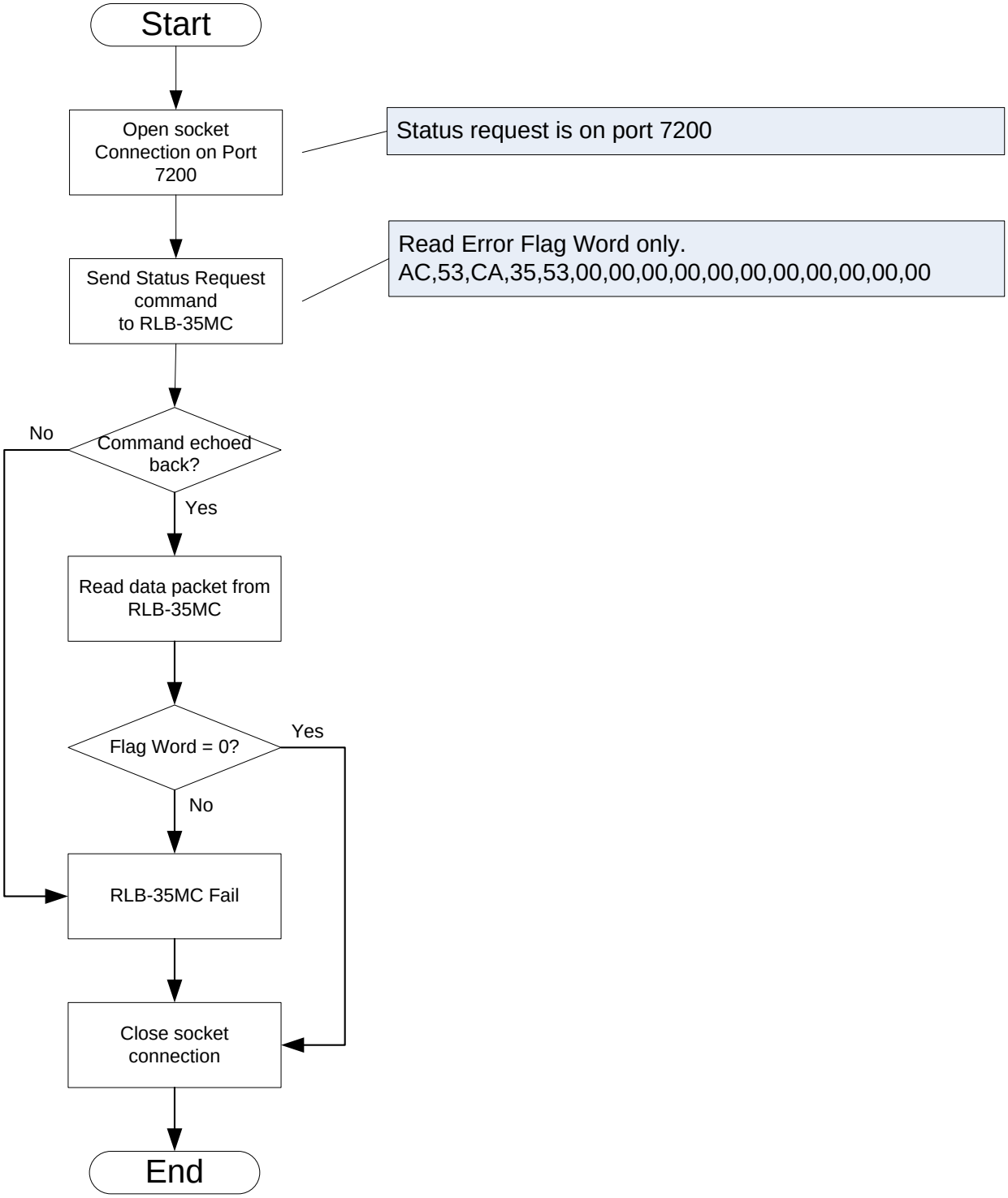



During normal operation port 7200 can be opened to request the beacon's error status at any time. When the command word is echoed back, check for a non-zero flag word to detect any errors.

The error flags are returned in response to both the 'S' command and the 'E' command with a '0' subcommand. The CFC size and software version are also returned for the 'E' command with a '0' subcommand.

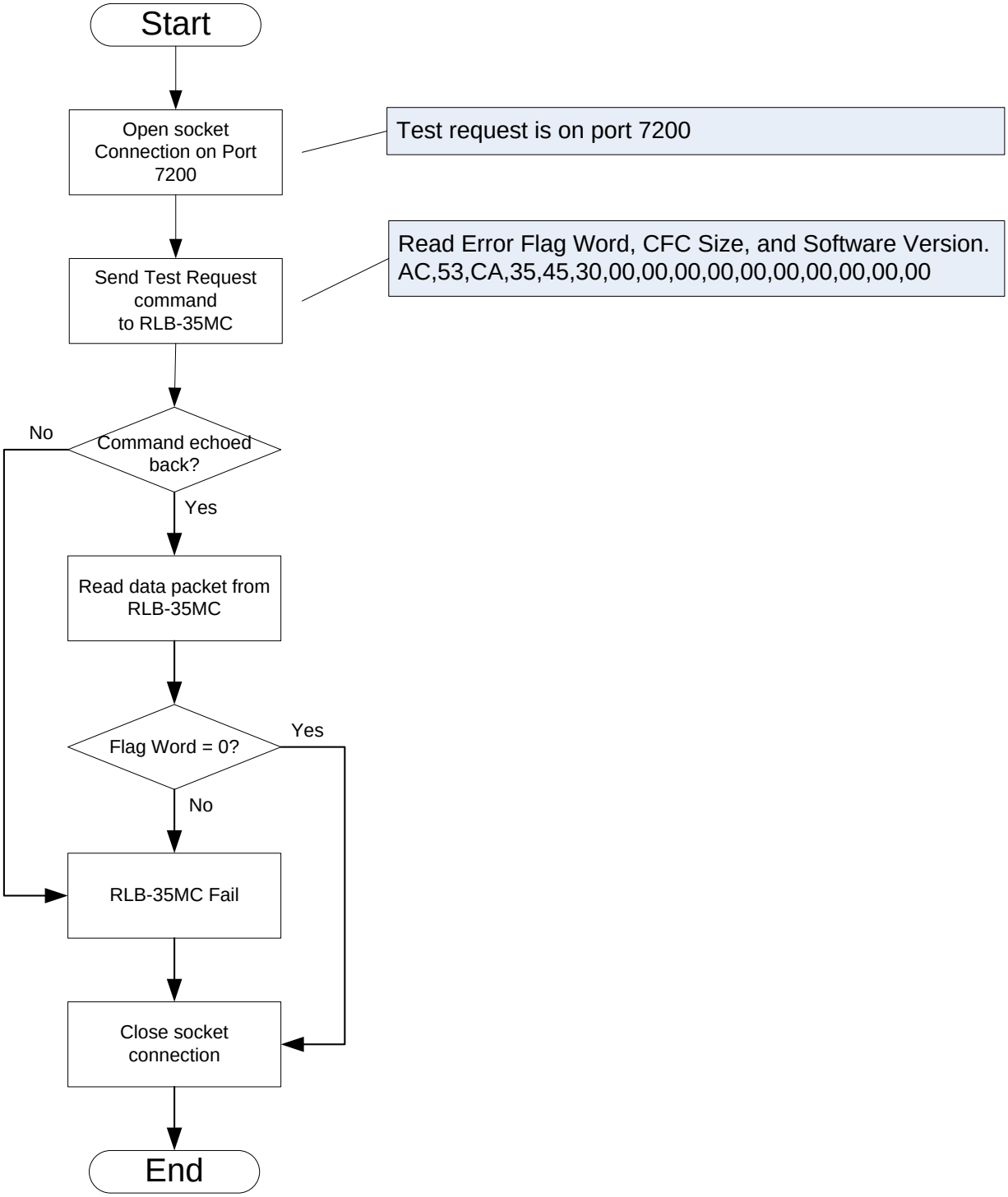
| Bit Position | Error Flag Definition Bytes 12 & 13 |
|---|---|
| 0 | CPU Test |
| 1 | Internal Static RAM |
| 2 | External Dynamic RAM |
| 3 | Compact Flash Card Missing |
| 4 | Ferrite RAM (NVRAM) |
| 5 | Compact Flash Card Communications |
| 6 | Compact Flash Card Data Bad |
| 7 - 15 | Not Assigned |

### 12.2. Status Request for Error Flag Word Example




Note that the 'Status' button of the demo software demonstrates this command. The error flags are returned in response to this command.

### 12.3. Test Request for Error Flags, CFC Size, and Software Version Example




Note that the 'Test' button of the demo software demonstrates this command. The error flags, CFC size, and software version are returned in response to this command.

## 13. Change IP Address and Subnet Mask Command Structure

The RLB-35MC's IP address and subnet mask can be changed from the factory set default values of 192.168.2.100 and 255.255.255.0, respectively, in RLB-35MC Memory Board Software Version B and higher. The command string is sixteen (16) bytes in length and has the same fixed command header as the communications command string. The bytes are defined as seen below:

RLB-35MC Command Structure

| Fixed Command Header (HEX) | | | | Operation Command | Operational Sub Command | New IP Address MSB | New IP Address 3rd Byte | New IP Address 2nd Byte | New IP Address LSB | Subnet Mask MSB | Subnet Mask 3rd Byte | Subnet Mask 2nd Byte | Subnet Mask LSB | Null | Termination | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AC | 53 | CA | 35 | 49 | 50 | xx[1] | xx[1] | xx[1] | xx[1] | yy[2] | yy[2] | yy[2] | yy[2] | 00 | 00 | ← Null Termination 0x00 |
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | ← Byte |

1) The new IP address with the MSB of the 4-byte address in byte 6 and the LSB in byte 9

2) The new subnet mask with the MSB of the 4-byte mask in byte 10 and the LSB in byte 13

### 13.1. Header

The first four (4) bytes are a fixed value header with hexadecimal values of AC, 53, CA, 35.

### 13.2. Operation Command

Byte 4 is the Operation Command of 'I' in ACSII format.

### 13.3. Operation Subcommand

Byte 5 is the Operation Subcommand of 'P' in ASCII format.

### 13.4. New IP Address

Bytes 6 – 9 are the new IP address arranged so the MSB of the 4-byte IP address is in byte 6 and the LSB is in byte 9. Below is an example of a new IP address of 192.168.2.75:

| Byte Position | Decimal Notation | Hex Notation |
|---|---|---|
| 6 | 192 | 0xC0 |
| 7 | 168 | 0xA8 |
| 8 | 2 | 0x02 |
| 9 | 75 | 0x4B |

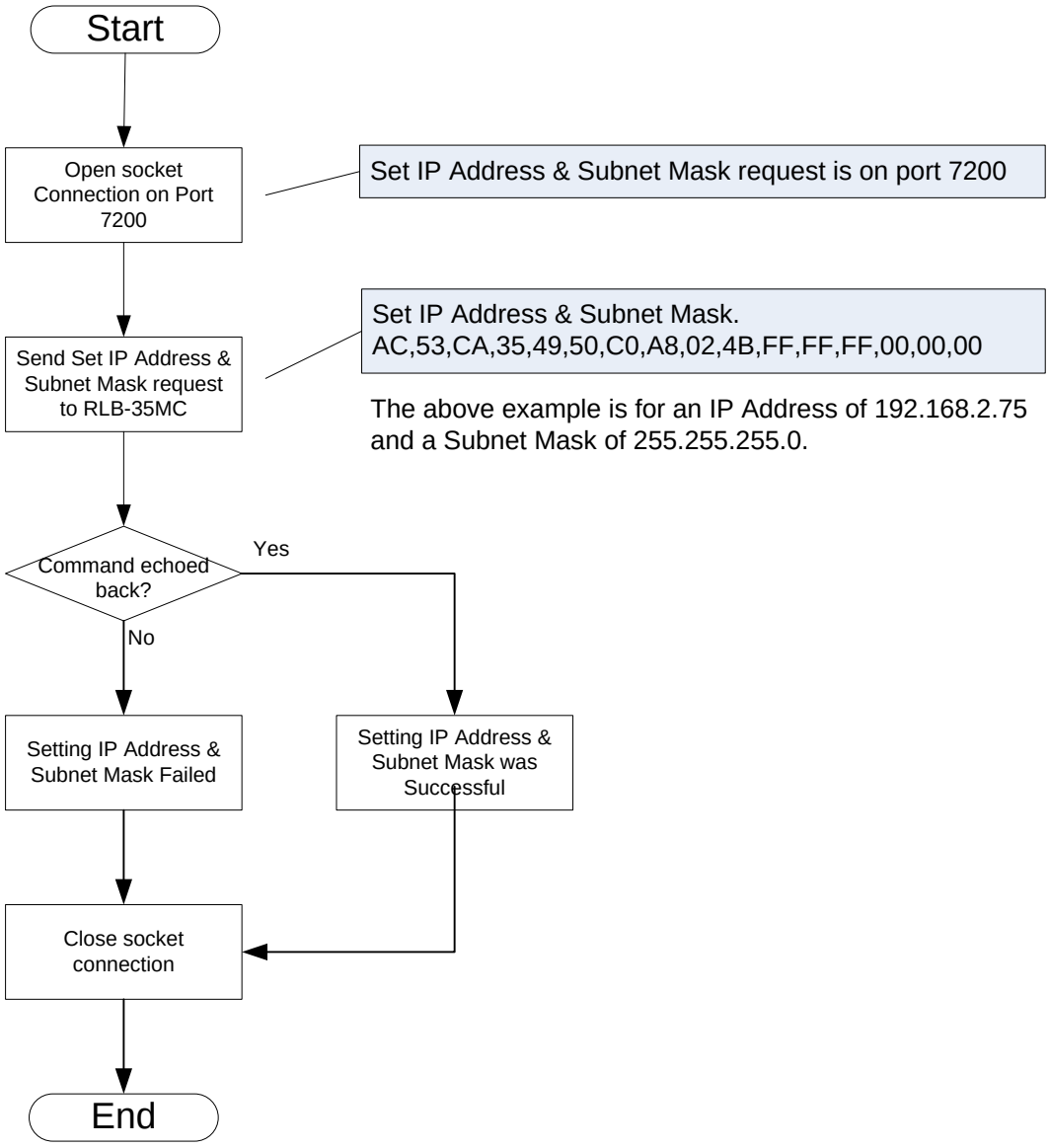
### 13.5. New Subnet Mask

Bytes 10 – 13 are the new subnet mask arranged so the MSB of the 4-byte subnet mask is in byte 10 and the LSB is in byte 13. Below is an example of a new subnet mask of 255.255.255.252:

| Byte Position | Decimal Notation | Hex Notation |
|---|---|---|
| 10 | 255 | 0xFF |
| 11 | 255 | 0xFF |
| 12 | 255 | 0xFF |
| 13 | 252 | 0xFC |

Note that the subnet mask should be sent with the IP address even if only the IP address is being changed.

### 13.6. Setting a New IP Address and Subnet Mask Example




Note that this is the 'Configure Capsule IP Address and Subnet Mask' option in our demo software. To make the new settings take effect, cycle power to the RLB-35MC capsule.