TREK

IONizer

USER GUIDE

July 2017

TABLE OF CONTENTS

PARAGRAPH PAGE

FIGURES

FIGURE PAGE

1 Welcome

The Telescience Resource Kit (TReK) is a suite of software applications and libraries that can be used to monitor and control assets in space or on the ground.

The TReK IONizer application provides the capability to start, stop, and monitor Interplanetary Overlay Network (ION) software.

1.1 Getting Started

Start with the Introduction which provides an application overview. Next, try the Quick Start Guides for "How Tos" for common functions. For help with details, reference the Details section. See the FAQ and Troubleshooting section for helpful hints and solutions to the common "gotchas".

2 Technical Support

If you are having trouble installing the TReK software or using any of the TReK software, please contact us for technical assistance:

TReK Help Desk E-Mail, Phone & Fax:

E-Mail: trek.help@nasa.gov
Telephone: 256-544-3521 (8:00 a.m. - 4:00 p.m. Central Time)
Fax: 256-544-9353

If you call the TReK Help Desk and you get a recording please leave a message and someone will return your call. E-mail is the preferred contact method for help. The e-mail message is automatically forwarded to the TReK developers and helps cut the response time. The HOSC Help Desk (256-544-5066) can provide assistance as needed and is available 24x7.

3 Introduction

The TReK IONizer application provides the capability to start, stop and monitor a single instance of the Interplanetary Overlay Network (ION) software.

If you are not familiar with Delay Tolerant Networking or the Interplanetary Overlay Network software, please see the TReK Delay Tolerant Networking Tutorial for an introduction to these topics.

4 Overview of the User Interface

4.1 Main Window

The main window (Monitor tab) is shown in Figure 1. The Monitor tab displays messages written to the ION log and messages about ION processes.

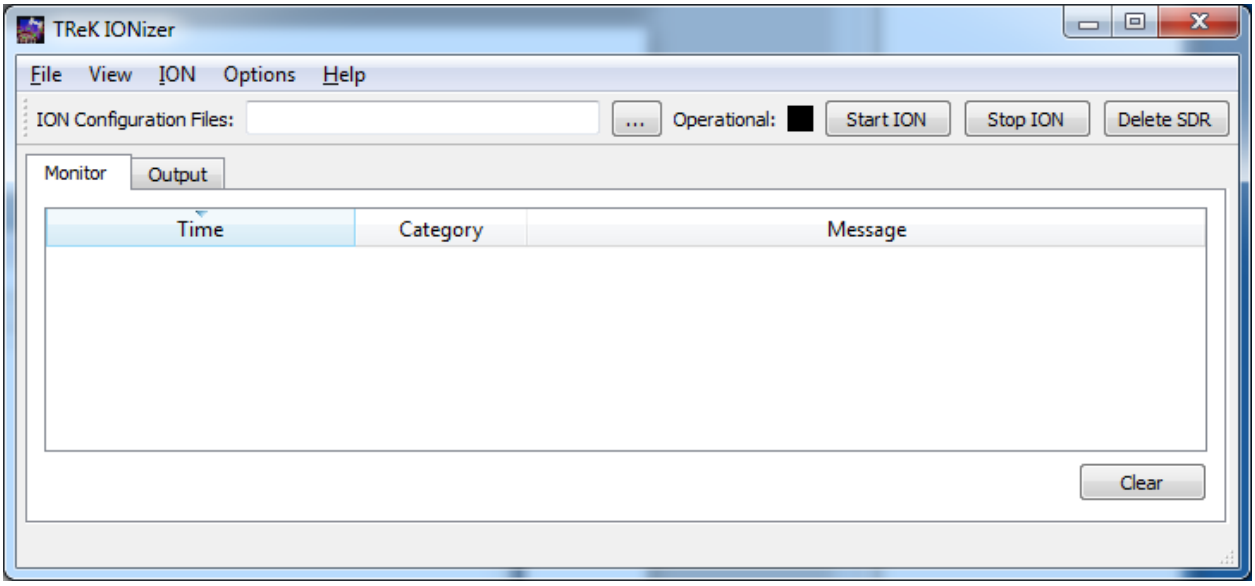


Figure 1 Main Window (Monitor Tab)

The main window (Output tab) is shown in Figure 2. The Output tab displays messages that ION writes to standard out (stdout). This includes ION watch characters.

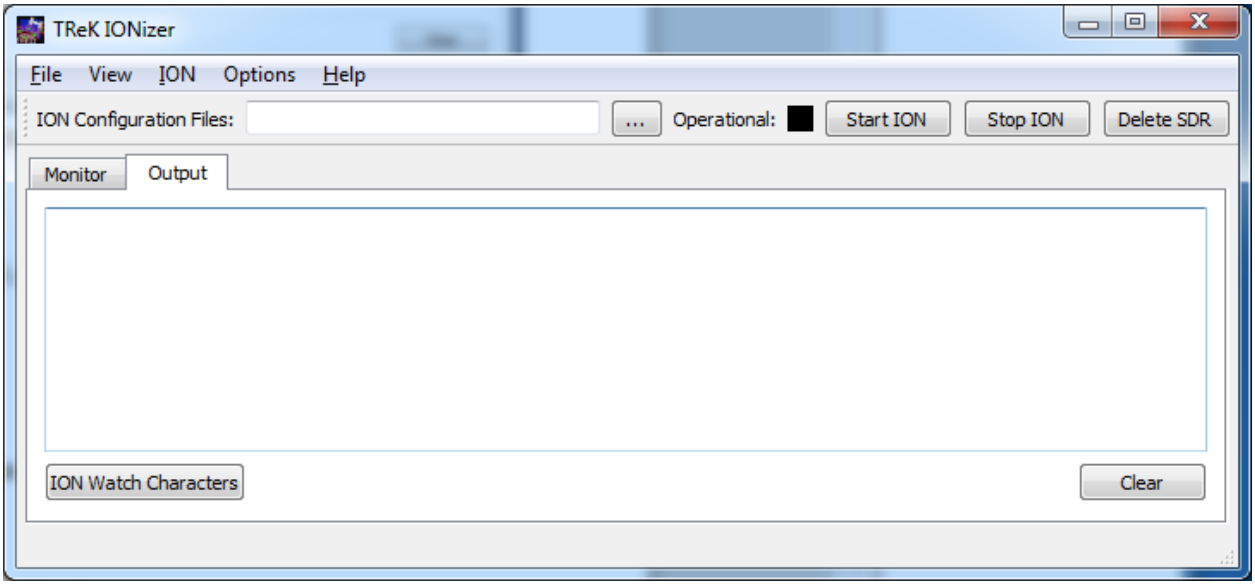


Figure 2 Main Window (Output Tab)

Figure 3 shows the IONizer console window. This window will only appear on Windows. It will be displayed when you start the IONizer application. You can safely iconify the console window to keep it out of your way. Please be sure not to close this window, or it will shut down the IONizer application. You will not see this window if you are running on Linux.

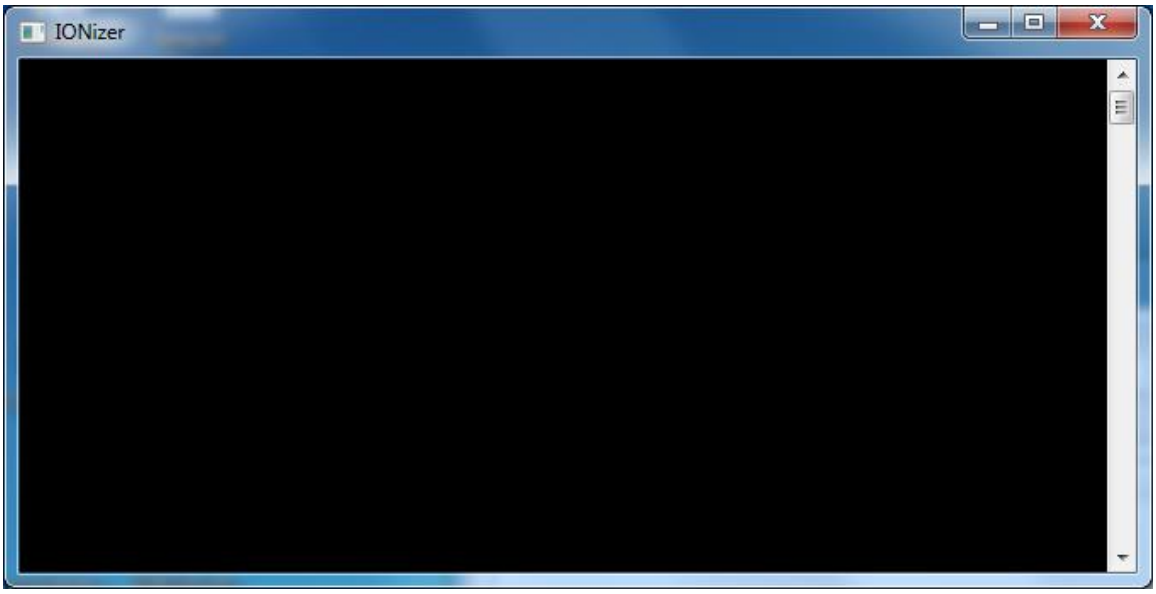


Figure 3 IONizer Console Window (Windows Only)

One of the ION configuration parameters provides the capability to run the Bundle Protocol (BP) Echo Service. If ION is configured to run the BP Echo Service, the console window shown in Figure 4 will be displayed when you start ION on Windows. You will not see this window on Linux, even if ION is configured to run the BP Echo Service. As noted in the window title, do not exit this window or it will shut down the BP Echo Service.

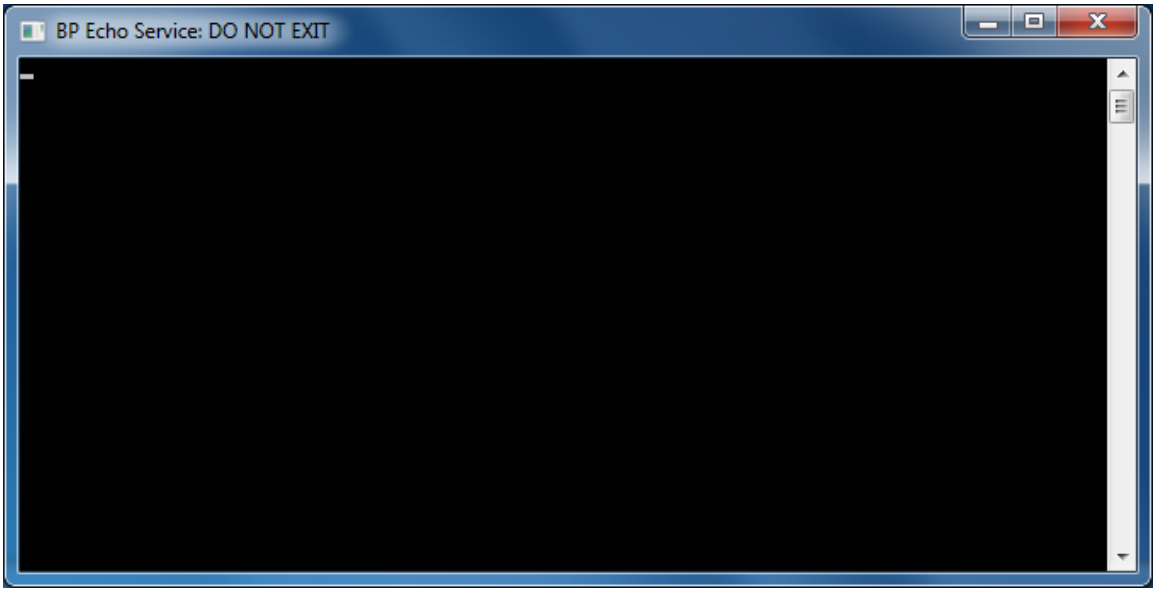


Figure 4 IONizer BP Echo Service Console Window (Windows Only)

When you stop ION on Windows, the BP Echo Service console window will close. When you exit the IONizer application on Windows, the IONizer main window and IONizer console window will both close.

Toolbars

The toolbar provides the capability to specify ION configuration files, start ION, stop ION, and delete the ION SDR.

4.2 Menus

The application menus are: File, View, ION, Options, and Help. Each of these menus is described in more detail below.

File Menu

The File menu provides the capability to exit the application.

View Menu

The View menu provides the capability to clear the main window message area and show and hide the main window message area.

ION Menu

The ION menu provides the capability to specify ION configuration files, start ION, stop ION, and delete the ION SDR.

Options Menu

The Options menu provides access to the Messages dialog. The Messages dialog displays application messages.

Help Menu
The Help menu provides access to on-line help and application version information.

5 Quick Start Guides

This section provides "How Tos" for common functions.

5.1 How to Start ION

The following steps explain how to start ION.

1. Identify the location of the ION configuration files using the field provided in the toolbar. You can use the TReK IONconfig application to create a set of ION configuration files.
2. Use the Start ION button in the toolbar to start ION (see Note 3 below for important information for ISS users). As the ION processes start, you will see status messages in the main window.

Note: If one or more of the required ION processes fail to start this will be reflected in the status messages. If this occurs, you will need to stop ION and review the ION log to determine what has gone wrong. The ION log is located in the same directory as the ION configuration files and shown in the Monitor tab. If you need to ensure ION is completely cleaned up you can go to a command prompt window and type 'killm'. This will clean up all instances of any ION processes on the computer. Use caution when using killm.

Note 2: The ION configuration files must be located on a local drive. If you attempt to use ION configuration files located on a shared drive, this can cause the IONizer application to crash.

Note 3: When connecting to the HOSC DTN ground gateway for ISS, a dialog box with three options will appear. Each option is explained below:

- Auto reconfiguration – This is the recommended option. It will automatically reconfigure ION to match the information provided by the HOSC DTN ground gateway using a series of scripts and the ION configuration files.
- ION as configured – This option will run with the ION configuration files as is. This allows users to configure ION completely as needed, but may require periodic changes to the ION configuration files.
- TReK DTN proxy – This option uses the original TReK DTN proxy. The information provided by the HOSC ground gateway is used to configure a TReK provided application that will bridge the local ION instance with the HOSC DTN ground gateway.

5.2 How to Stop ION

The following steps explain how to stop ION.

1. Use the Stop ION button in the toolbar to stop ION. As the ION processes stop, you will see status messages in the main window.

5.3 How to Delete the ION SDR

The following steps explain how to delete the ION SDR.

1. Use the Delete ION SDR button in the toolbar to delete the SDR. ION will be stopped and the SDR will be deleted.

Note: Be aware that deleting the SDR will delete all data ION was storing in preparation for transmitting as well as partially received data.

5.4 How to Clear ION Log and Process Status Messages

The following steps explain how to clear ION log and process status messages.

1. Use the Clear button located on the Monitor tab. Once the messages are cleared, there is no way to recover them.

5.5 How to Clear ION Output Messages

The following steps explain how to clear ION output messages.

1. Use the Clear button located on the Output tab. Once the output is cleared, there is no way to recover it.

6 Details

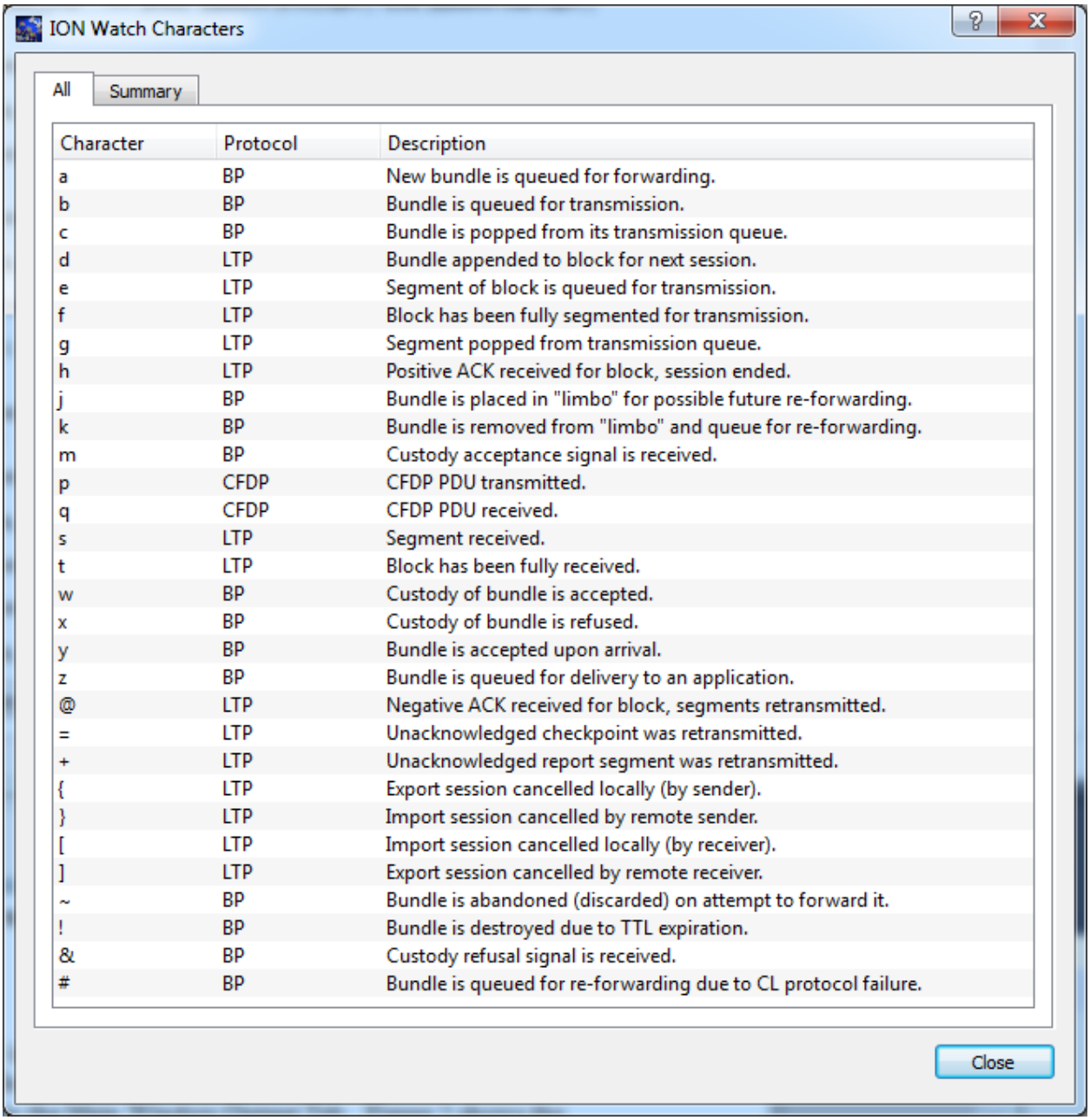
This section covers various application details.

6.1 ION Watch Characters

The ION Watch Characters dialog contains two tabs: All and Summary.

6.1.1 All Tab

The All tab is shown in Figure 5. The All tab provides a list of all the ION watch characters, the protocol associated with the watch character, and a short description.



Character	Protocol	Description
a	BP	New bundle is queued for forwarding.
b	BP	Bundle is queued for transmission.
c	BP	Bundle is popped from its transmission queue.
d	LTP	Bundle appended to block for next session.
e	LTP	Segment of block is queued for transmission.
f	LTP	Block has been fully segmented for transmission.
g	LTP	Segment popped from transmission queue.
h	LTP	Positive ACK received for block, session ended.
j	BP	Bundle is placed in "limbo" for possible future re-forwarding.
k	BP	Bundle is removed from "limbo" and queue for re-forwarding.
m	BP	Custody acceptance signal is received.
p	CFDP	CFDP PDU transmitted.
q	CFDP	CFDP PDU received.
s	LTP	Segment received.
t	LTP	Block has been fully received.
w	BP	Custody of bundle is accepted.
x	BP	Custody of bundle is refused.
y	BP	Bundle is accepted upon arrival.
z	BP	Bundle is queued for delivery to an application.
@	LTP	Negative ACK received for block, segments retransmitted.
=	LTP	Unacknowledged checkpoint was retransmitted.
+	LTP	Unacknowledged report segment was retransmitted.
{	LTP	Export session cancelled locally (by sender).
}	LTP	Import session cancelled by remote sender.
[	LTP	Import session cancelled locally (by receiver).
]	LTP	Export session cancelled by remote receiver.
~	BP	Bundle is abandoned (discarded) on attempt to forward it.
!	BP	Bundle is destroyed due to TTL expiration.
&	BP	Custody refusal signal is received.
#	BP	Bundle is queued for re-forwarding due to CL protocol failure.

Figure 5 ION Watch Characters Dialog (All Tab)

6.1.2 Summary Tab

The Summary Tab shows summary information about the ION watch characters selected in the Main Window Output tab. The Summary Tab will be empty if you have not selected any ION watch characters in the Main Window Output Tab. Figure 6 shows the Main Window Output tab with some ION watch characters selected.

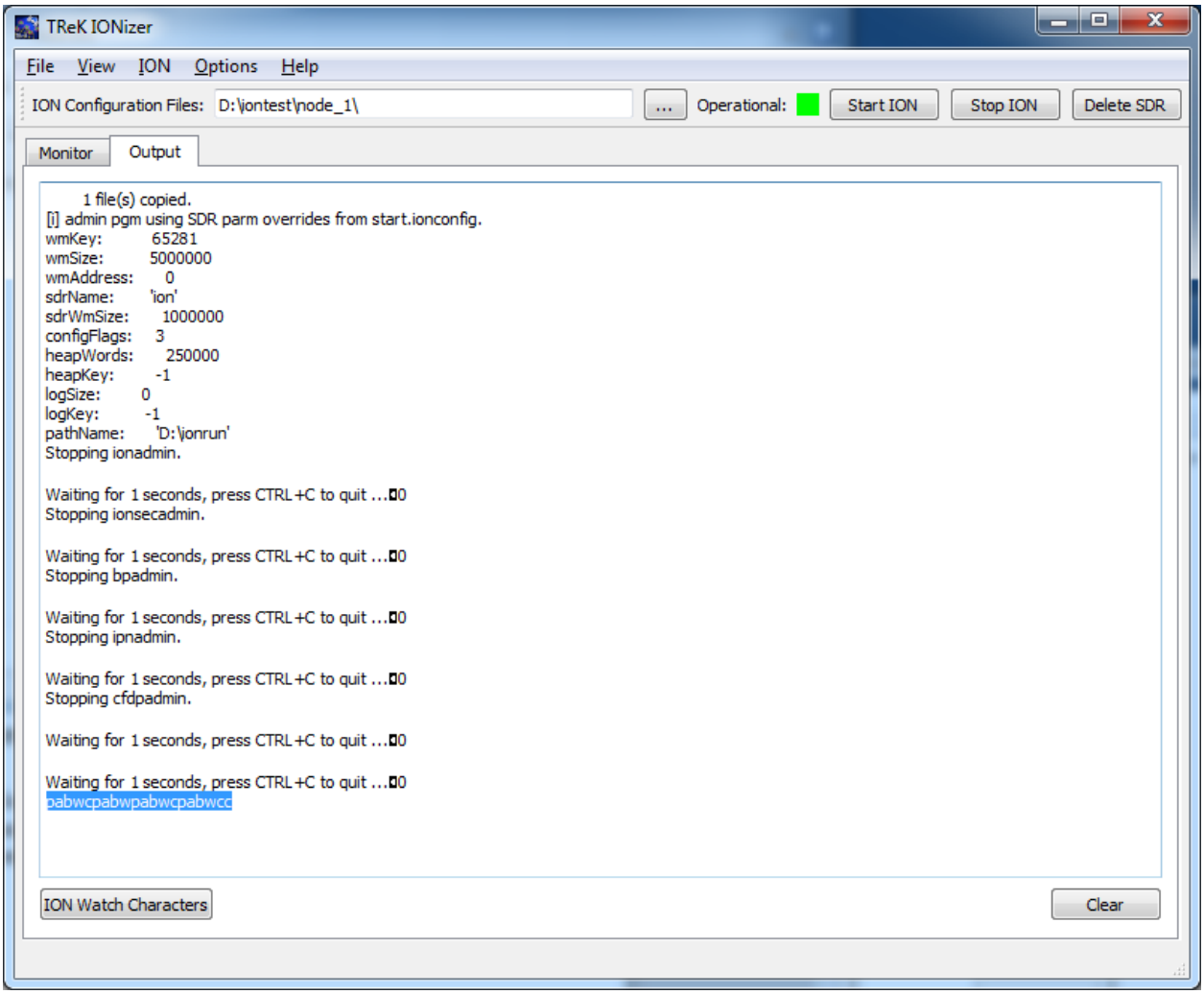


Figure 6 Selected ION Watch Characters

Figure 7 shows what the Summary tab will look like when it is populated after you select ION watch characters in the Main Window Output Tab and push the ION Watch Characters button. This information can be helpful when debugging.

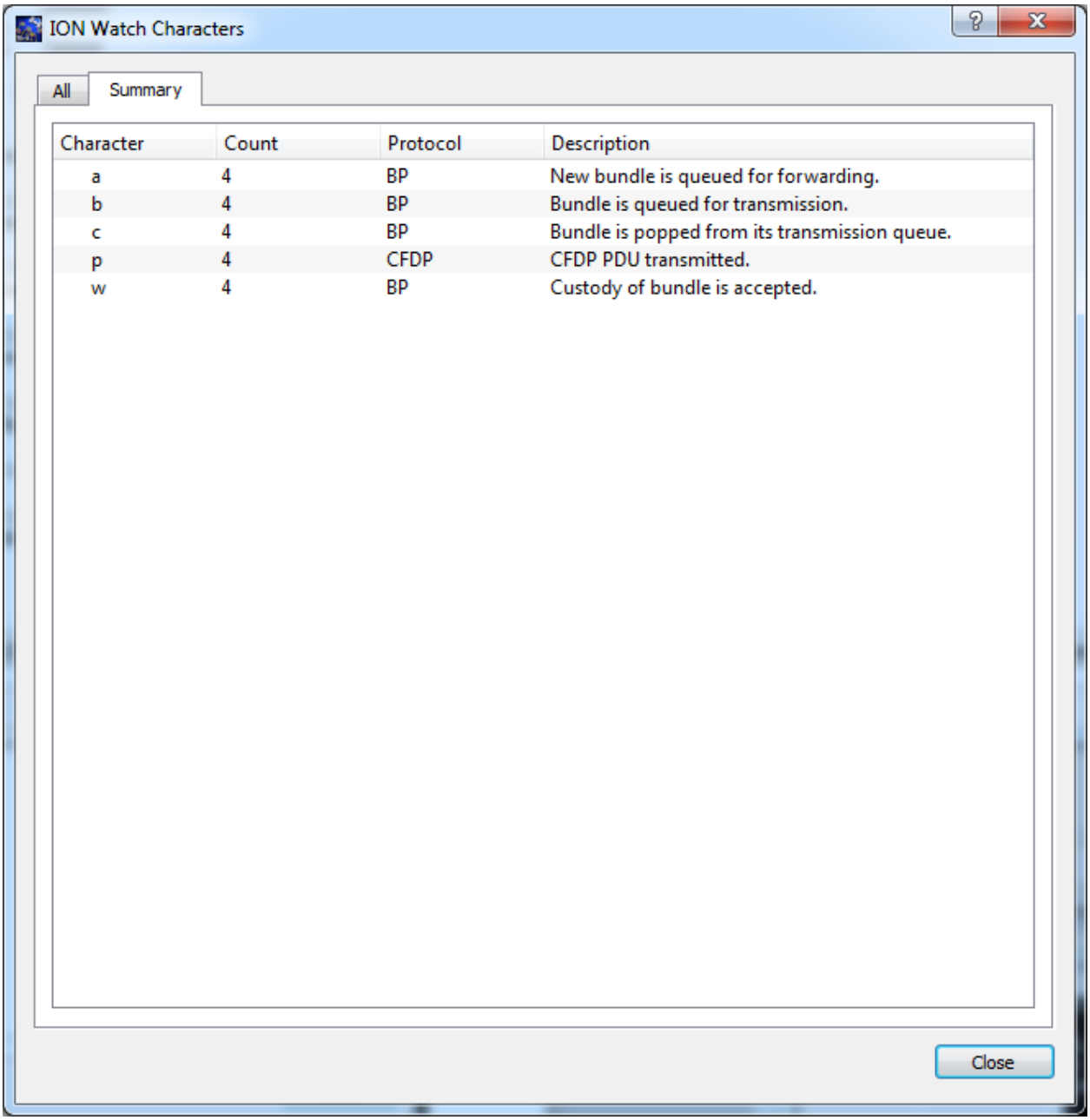


Figure 7 ION Watch Characters Dialog (Summary Tab)

6.2 Application Settings

The IONizer application saves some settings as application settings each time you exit the application. The next time you run the application, the application will initialize with the previous application settings. The following application settings are saved:

- Application Window Size

- ION Configuration Files Directory

7 FAQ and Troubleshooting

This section addresses Frequently Asked Questions and provides tips for troubleshooting common gotchas.

7.1 What is ION?

The following text is from the Interplanetary Overlay Network (ION) documentation:

"The Interplanetary Overlay Network (ION) software distribution is an implementation of Delay-Tolerant Networking (DTN) architecture as described in Internet RFC 4838. It is designed to enable inexpensive insertion of DTN functionality into embedded systems such as robotic spacecraft. The intent of ION deployment in space flight mission systems is to reduce cost and risk in mission communications by simplifying the construction and operation of automated digital data communication networks spanning space links, planetary surface links, and terrestrial links.

A comprehensive overview of DTN is beyond the scope of this document. Very briefly, though, DTN is a digital communication networking technology that enables data to be conveyed between two communicating entities automatically and reliably even if one or more of the network links in the end-to-end path between those entities is subject to very long signal propagation latency and/or prolonged intervals of unavailability."

7.2 What should I do if there are errors when I start ION?

Review the messages in the IONizer main window and the ION log file. The ION log file will be located in the directory with the ION configuration files. Some common problems that can occur:

a. The local IP Address has changed. If you started ION using an existing SDR file that contained an old IP address this can cause problems. If this occurs you will need to decide whether to modify the SDR via ION provided administrative programs to update the IP address or to delete the SDR (losing any data stored in the SDR).

b. The ION configuration files contain information that is incorrect (such as an IP address) or missing information.

Note: When using the TReK IONconfig application to create ION configuration files it is important to ensure the entire diagram (all nodes and ducts) contain valid information or at least no conflicting information. For example, if you use the same local IP address and port 4556 for all nodes in the diagram this will cause an error when you try to start ION. The nodes either need to use different IP addresses or different ports. Even though you

may only be using the configuration files for one of the nodes, the ION configuration files contain many interrelated parameters that are derived from information across the entire diagram.