TXB-B FAQ

14 May 2001

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Overview

In the new TXB-B there are some limitations and peculiarities that may generate some questions. This is a listing/discussion of some questions that might be frequently asked. This document applies to software revision 1.11.

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[1] `$Header: d:/ecr6171/RCS/faq.tex,v 1.21 2001-01-19 08:52:18-08 Hamilton Exp Hamilton $`

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Note

A change bar will be used where any changes have been made since the last "final" version of this FAQ was printed. The base-line version of this FAQ was the one dated "11 January 2001 — 14:21". The `.PDF` version was `FAQ14D.PDF`.

As is common, those pages with changed page numbers and references to those numbers, (this includes the Table of Contents and the Index) do not qualify for a change bar. Neither will there be a change bar on this page.

A summary of the changes will also be listed here.

Date	Notes
14MAY01	Changed the format of the questions so that they would appear in the Table of Contents.

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1 What should be Frequently Asked Questions, TXB-B

1.1 General

1.1.1 Q: In 25 words or less, what does the TXB-B do?

A: It is used to translate the Burle/Philips CCTV camera protocol (Bi-Phase or Manchester) for use with Pelco's Spectra and Esprit line of products.

1.1.2 Q: What does TXB-B stand for?

A: Translator Board for use with Burle type CCTV equipment. I have no idea where the "X" came from and have been told that Burle was bought out by Philips and that the equipment is identical (only the names were changed to protect the guilty).

1.1.3 Q: In the new TXB-B do you have any concerns?

A: Yes there are several and they are all in areas of hardware design that were inherited from the older TXB-AB. These are:

1. The input circuitry is questionable as it does not reliably work with the TXB-AB.

   The problem only shows up when using the TXB-AB with a Burle matrix. An investigation of the problem reveals that the input chip, U3 a MAX-485 type, is being operated outside its manufacturer specified range. Actually that is incorrect, it is required to operate in a specified manner when the inputs are not in a specified input range.

   The parts from Maxim usually appear to work, however those from Linear Technology sometimes work and sometime don't. (In a recent, August 2000, batch of 19 TXB-ABs, five didn't work. All used Linear Technology parts. But more of the Linear Technology parts worked than failed.)[3]

2. The input circuitry is not terminated as per the Philips application note.

3. On 27NOV00 there was a seminar on agency compliance issues that I attended. In it the presenter pointed out that equipment will have to pass more difficult testing starting with January 2001. I talked to John Pretzer during one of the breaks to see if the Spectra already met the new requirements and he said that it didn't. I then asked him if there were firm plans to upgrade the units and he did not give a firm and clear answer. Because the TXB-B may be the first item that "sees" an outside signal. It may be non-compliant starting early next year and I see no way to fix this as it is assumed that the Spectra will deliver a clean "signal" to the translator.

4. The output circuitry that drives the Spectra does not provide correct RS-422 level signals.

[2] `$Header: d:/ecr6171/RCS/faq.inc,v 1.54 2001-02-08 14:03:12-08 Hamilton Exp Hamilton $`

[3] Since this was originally written, some of the failed Linear Technology parts were installed in the new TXB-B units and they showed no sign of failure.

5. The input circuitry from the Spectra does not do any level changing of the input RS-422 signals.

6. There is no "brown out" circuitry for power up as outlined in MicroChip's Application Notes 522, 607 and 686.

   In the original TXB-AB a PIC type 16C57 CPU was specified. Since that time someone changed it to the similar 16C57C. The different revisions of the chip appear to be very similar, however the "Errata Sheet" (DS80042C dated 1999) for the 16C57C specifically mentions possible problems with how to handle `MCLR*` on power up. I don't know if this applies to the TXB-B or not.

1.1.4 Q: What are the requirements for the output of the input circuitry?

A: It must have a consistent output when the inputs are in an unspecified area of operation. Specifically:

1. If input A is less than 200 mv different from input B, the output **must** be predictable and consistent.

2. The duration of the output signal **must** be within $\pm.1\mu$s of the input signal's duration.

3. It would be nice if it works with/without the termination jumper installed, irreguardless of the presence of other units on the same line.

1.1.5 Q: When powered up with a TXB-B installed in my Spectra, the second line of the initial screen changed to "`TXB-B Rev N.NN AA`". What does this mean?

A: This indicates that the TXB-B has been successfully installed in the Spectra. (␣ is used to indicate a blank character on the display.) The various fields have the following meaning:

`TXB-B` This is the model of translator board installed.

`Rev` Indicates that following it is the revision level of the software. (There wasn't enough room to indicate the address field. Sorry.)

`N.NN` This is the revision level of the software on the TXB-B. I.e. "`1.00`" is used for the first released version of the software, etc. There are three special values that may be used here instead of a revision level:

`BETA`	Indicates Beta test software
`TEST`	Indicates "in house" test software
`DEBUG`	Indicates that the TXB-B is operating in special debug mode. In this mode the TXB-B sends out a debug stream of ASCII characters that indicate what the received data consisted of and what is output to the Spectra. This mode is enabled when bit 8 of the switch is turned on.

`AA` This is the value loaded into the block address switch. It is a hexadecimal value.

All this information will be cleared when the TXB-B receives its first valid command from the head end.

1.1.6 Q: On my fixed speed system, will proportional pan work?

A: On those units that support it yes. Proportional pan is done inside the Spectra.

1.1.7 Q: I have an old TXB-AB, and it seams to have two PIC chips on it. The TXB-B only has one. What gives?

A: Never send a boy to do a man's work.

1.1.8 Q: In this FAQ, you keep saying Burle. My system is marked Philips. Why can't you get the name right?

A: Philips bought out Burle and made almost no changes to the system. And Burle is a shorter word than Philips, so I used the shorter word.

1.1.9 Q: This is a great product. Do you walk on water?

[4]

A: Only on real cold days. (And I know where the rocks are!)

[4] "You're just a legend in your own mind" — James Martinez, September 2000

1.2 Features

1.2.1 Q: On the old TXB-AB there was a jumper that had to be setup correctly for the unit to work with a matrix or a keyboard. The only jumper on the TXB-B is the data line termination jumper. Why?

A: The TXB-B automatically recognizes the type of signal that comes into it and configures itself accordingly. The TXB-B has been tested with Burle TC-8501/TC-8550 and LTC-8801/-LTC-8553 matrices/keyboard combination. It has also been tested with LTC-5136 and LTC-5138 keyboards. All of these generated different data and the TXB-B knows how to translate their output.

1.2.2 Q: Why does the manual not mention where to connect the plus and minus sides of the Manchester data line?

A: The software inside the TXB-B automatically compensates for signals that are inverted and it wasn't thought to be important to make life any more difficult than necessary for an installer. So the polarity of connecting the data wires wasn't mentioned.

1.2.3 Q: If I have two or more sources of Burle formatted data, connected to the TXB-B simultaneously. Can one have "normal" polarity and the other "reversed" polarity?

A: Yes.

1.2.4 Q: Does this mean that, for example, an LTC-5136 Keyboard and an LTC-8801 Matrix can be simultaneously connected to a TXB-B/Spectra?

A: Yes. In fact any number of units may be simultaneously connected. The total number/-type/polarity is limited only by the capabilities of the Burle equipment.

1.2.5 Q: What is the signal that the Burle system sends that is translated by a TXB-B?

A: The signal output by the Burle equipment is called a bi-phase, or Manchester, encoded signal. This Manchester signal is sent as a "three state" (**not** tri-state) wavetrain which has a baud rate of 62.5 KHz and is in one of two formats (Format K and Format M). For more details see the wonderful document "Burle and AD Command Details". Which is available from me.

1.2.6 Q: I notice that the DIP switch and the crystal are identical to the ones on a Spectra. Is this accidental?

A: No.

1.3 Potential Problems

1.3.1 Q: When a "recalibrate" command is sent to the Spectra it does not display the TXB-B's configuration information. What is going on here, you can display it on power up, why not now?

A: The TXB-B has no way of knowing that the Spectra is going through a recalibrate sequence, thus it can not know when to send its configuration information to the Spectra. However you can send an "ON 66" command at any time to get the TXB-B's software revision level.

1.3.2 Q: Sometimes when using the joy stick to move around in a Spectra menu, it gets "stuck" and continues to move when I let go of the handle. What gives?

A: The TXB-B does extensive checks on every command that comes into it. This includes checking parity on each byte, checking the checksum on the whole message and verifying that the logical structure of the command is correct. Sometimes line errors cause commands to be "lost".

About 100 ms following any motion command the TXB-B sends a stop command. All motion commands, that result in movement of the Spectra, time out inside the actual Spectra, in about 15 seconds, to get around a possible "dropped command" problem. However there is no time out associated with cursor movement on a Spectra menu. The easiest way to get around this is to use the joy stick again and this time the cursor usually behaves.

1.3.3 Q: Sometimes when accessing control menus the Iris control has to be hit once and sometimes twice, Why?

A: See the previous question and answer.

1.3.4 Q: On some of my keyboards I have to use the upper end of the iris control to select a Spectra menu item and on others I have to use the lower end. What gives?

A: In the Burle protocol there are commands for reversing the sense of Iris, Focus and Zoom commands. None of these were implemented on the TXB-B. The logic behind this is that the TXB-B does not have any long term memory and will always return to "defaults" following a power up sequence. I thought that it would be a bad idea to let people make a change that was not "sticky". There are enough problems following a power failure and having to set up each Spectra in a special way didn't seem to be a good idea. Then of course different Burle keyboards have different characteristics.

1.3.5 Q: I can't seem to get motion going when in Spectra's menu. Why?

A: When in menu mode, the Spectra will only respond to a very limited set of commands. All of the commands relate to selecting, etc., menu items. No other commands are accepted and this includes recalibrate and scan commands.

1.3.6 Q: I used the Spectra's menu system and enabled some alarms. Now when an alarm goes off the Spectra points to the preset assigned to the alarm and keeps pointing at it following any inactivity. Why doesn't it respond to my joy stick commands as I expect it to?

A: The Spectra internally handles up to seven alarm inputs. When an alarm occurs the Spectra will automatically move to the preset for that alarm. (I.e. preset 4 for alarm 4 and so on.) If the alarm is not acknowledged **and** still active, then the Spectra will return to the alarm's preset location after about one minute of inactivity. The only way to stop this behavior is to "Acknowledge the alarm". To acknowledge the alarm it is necessary to send an appropriate OFF command. OFF commands for each alarm are in the range of $11 \rightarrow 17$ and correspond to alarms $1 \rightarrow 7$. I.e OFF 14 will acknowledge alarm 4, etc.

1.3.7 Q: Does the TXB-B ever intentionally loose commands?

A: Yes. It takes about 29 ms to send a command to the Spectra. During this time no more commands are accepted. Thus if a second command comes in very quickly, it will be ignored. In early testing, the TXB-B does not loose commands that are 30.2 ms apart and does loose those that are 29 ms or less apart. The exact point as to where commands are lost is unknown.

1.3.8 Q: I have connected my Esprit (or Spectra) and nothing is working correctly. What is wrong?

A: Check that the DIP switch is not set to operate in American Dynamics mode. In American Dynamics mode, SHOTs are limited to 32, which makes is so that the full range of SHOTs required to setup and control an Esprit/Spectra are not being processed by the Esprit/Spectra[5]. With the Esprit the switch is `SW1-5` and with the Spectra it is switch `SW1-7`. In future revisions of the equipment, the switch positions may change. Be sure to use the manual that came with your unit.

1.3.9 Q: I installed a TXB-B into my Spectra and everything worked perfectly. I then moved it to an Esprit and it didn't work at all. What is wrong here?

A: The most likely problem here is that the Spectra can only receive D protocol commands at 2400 baud and the TXB-B can only send them at 2400 baud. While the Esprit can receive D protocol commands at several different baud rates. Be sure that the Esprit is set to 2400 baud (`SW1-1`, `SW1-2` and `SW1-3` all `OFF`.) In future revisions of the equipment, the switch positions may change. Be sure to use the manual that came with your unit.

1.3.10 Q: I am connected to a fixed speed system and I can not access Spectra configuration menus. What is wrong here?

A: The TXB-B repeats the special Spectra presets to ON and OFF commands in the $40 \rightarrow 59$

[5]There is no feed back from the Esprit/Spectra that would allow the TXB-B to know that the switch is incorrectly set. If it was possible to detect this problem, then it wouldn't be a problem.

range of commands. This is done as a convinence. See the full list of moved, redefined and repeated commands in Section 1.10, page 35.

1.3.11 Q: Why doesn't the TXB-B remember the fixed speed values that I send to it?

A: The TXB-B does not have any long term memory and following a power cycle will "forget" everything that has been changed in it.

1.3.12 Q: How is proportional pan enabled?

A: With the menu system of the Spectra on those units that support it. There are at least five different models of Spectra that the TXB-B (along with 12, or more, models of Esprit) may be used in. Some of them do not support proportional pan.

1.3.13 Q: I have my Spectra DIP switch set to camera #135 and my block address DIP switch set to block #1. Why is nothing working?

A: In trying to address a Spectra at address 135, you have gotten half the problem right and half wrong. The address block that you selected, #1, was correct. However the camera number must come from the Section 6, page 64 set of tables. (The camera # is **never** greater than 127.) In this case the Spectra must be set to address #7.

This is because the Burle protocol uses two seven bit address bytes and each one only goes up to 128. The least significant half is used when actually addressing the Spectra and the most significant half is used when addressing the TXB-B.

This correctly implies that the Spectra's, D protocol range of up to 256 is not reachable in one step, but is broken up into two steps of 128 each. (Of course you must consider that the Spectra can't be at address zero, so it's really two steps of 127 with two addresses of zero not being usable.)

<This question and its answer are so important that it is repeated in the Addressing *section.>*

1.3.14 Q: Burle has a "Poor Man's Prepositioning" capability. Why can't I get it to work?

A: This feature is not implemented.

1.3.15 Q: My fixed speed keyboard can not send SHOTs greater than 63. How can I access the Spectra control SHOTs that are in the range of 90 → 99?

A: The TXB-B "mirrors" these commands as "ON/OFF" commands in the range of 40 → 49 as a convineance for those that can't get past SHOT/ON 63.

1.3.16 Q: Burle has up to 1,024 SHOTs and auxes. Why can't I get more than 100 when using the TXB-B.

A: Pelco does not support that many. The limit of the TXB-B is 128 SHOTs or auxes.

The actual limits on the Spectra and Esprit are 64 SHOTs/SETs and 2 ONs/OFFs. Other SHOTs, SETs, ONs and OFFs are used for special control commands for the camera. In future revisions of the equipment, these values may change. Be sure to use the manual that came with your unit.

1.3.17 Q: How does the TXB-B process latching/indefinite action commands *vs.* other commands?

A: Identically, i.e. Pelco's D protocol does not constantly send commands as does the Burle protocol with its attempt to send commands at least 20 times a second. But rather it sends a command ant then nothing more until the operation is complete. (Unless the operation there is a "long" time, and then additional commands are resent.) At the completion of a command's motion a "stop" command is sent. Thus, in the land of Pelco all commands are what Burle calls "latching" or "indefinite action" commands.

1.3.18 Q: When programming a pattern, the Spectra never goes into turbo pan mode. Why?

A: There is programming characteristic of the Spectra which causes the Spectra to always throws away any turbo command when in pattern programming mode. To get around this problem, the TXB-B translates all turbo commands, when in pattern programming mode, into the highest speed non-turbo speed available.

1.3.19 Q: If I try to program 7 minuets of a 6 minute pattern (less with the shorter pattern lengths), all of a sudden the "PROGRAMMING PATTERN" message goes away. But the Spectra does not go into turbo speed mode. What is happening here?

A: When the TXB-B detects that the Spectra is starting to record a pattern, it starts a timer. If the user attempts to program too long a pattern, then the Spectra will internally time out and **not** tell the TXB-B that it is no longer entering data into pattern memory. However the TXB-B still has its "pattern programming" status bit set, which causes it to never let a turbo command go to the Spectra. To get around this problem, if the TXB-B times out on its pattern programming timer, it automatically reenables turbo speeds. If however the Spectra fills up its pattern memory and the user does not send an end of pattern command, then the TXB-B will remain in pattern mode and not send turbo commands, until the timer times off. However the pattern recording process is terminated, by command or Spectra time out, the TXB-B will reenable turbo speeds. The TXB-B's pattern timeout is about 9 seconds long. It is not possible to accurately give an exact value as the timeout is based on counting $256 * 256 * 7$ or 458,752 (or so) passes through the "main" program loop. Whenever a command comes into the TXB-B, and has to be processed, the TXB-B's "main" loop will take a different time to complete than it did when there was nothing to do. The result of this is that the TXB-B has a timeout of between 8 and about 14 minuets for a pattern to get finished in. The exact upper limit depends on how much the TXB-B is doing other that look for something to do.

1.4 Zone and Shot (Preset) labels

1.4.1 Q: On my Burle domes there are 16 zones. I can only find commands for 8 zones with the Spectra. What gives?

A: The Spectra has 8 variable width zones instead of 16 fixed width zones. To enable a Spectra zone, its left and right limits must be set using ON and OFF commands in the range of 21 → 28. I.e. ON 21 starts zone 21 and OFF 21 ends it, etc.

To clear a zone you must set the start and end the zone definition at the same location. The best way to do this is to set the start and then the end without moving the Spectra.

If two, or more, zones "overlap" then the highest numbered zone has "priority", is active and has its label displayed.

1.4.2 Q: Why can't I edit labels?

A: This is caused by a fundamental difference between the way that Pelco and Burle handel labels (both zone and shot). WithPelco all label editing is done in the head end and then down loaded into the Spectra. With the Burle system all editing is done inside the dome. The overall result is that the Spectra has no way to transmit the contents of its internal message buffer out to be edited, and thus the messages may not edited. (Since Burle does everything inside their dome, all information is available for editing.)

1.4.3 Q: Why can't I move on screen labels around on the Spectra screen?

A: Spectras do not have this capability so the TXB-B can't force it.

1.4.4 Q: Where do the labels appear on the Spectra?

A: The words "`Zone x`" and "`Shot xx`" are left justified on their 20 character wide line on the screen.

All Spectra shot labels are always on the second line of the display. All Spectra zone labels are on the first line.

Because of the internal design of the Spectra character generator the first of these two lines is about $\frac{1}{10}$th the way down from the top of the screen.

1.4.5 Q: When I define a zone, the state of the "display enable" changes. When done it is always on. Why?

A: The only way that a Spectra can accept zone labels, is to have its character display disabled. Thus in order to load a label, I first have to disable character displays, then the user defines the limits of a zone, and I reenable the character/label display. The assumption here is that no-one would want the character display disabled if they just entered something into it. If the character display is not desired, send a OFF 60 command and it will go away.

1.4.6 Q: Exactly what happens when I define the start and end points of a zone?

A: There are several thing that happen here: (using zone 5 as an example.)

1. Select OFF 60, this disables the on screen display.
2. Move the camera to where you want to start the zone from.
3. Send the label to the Spectra.
4. Send a zone 5 start command of ON 25.
5. Move the camera to the end of where you want zone 5 to be.
6. Send a zone 5 end command of OFF 25.
7. Then an enable label command of ON 60 is sent to enable viewing labels.

While doing this you should remember that "no matter how you define the zone, what counts is the clockwise direction of travel from start to finish". Clockwise refers to looking down from above on the Spectra/Esprit. If an Esprit is mounted "upside down" then everything gets reversed, because up is now down, left is right, etc., etc.

Sending the OFF 60 at the start and the ON 60 at then end, are automatically done by the TXB-B. (Which is why zone labels are always enabled after defining a zone.)

1.4.7 Q: When I try to go to a "SHOT" that I haven't set, my Burle system says "`Shot xx not set`". Why doesn't the Spectra do this?

A: This feature wasn't designed into the Spectra thus the TXB-B can't force them. The same applies to at least all of the following Burle AutoDome messages:

- "`Shot xx set`"
- "`Display ON`"
- "`Display OFF`"

1.4.8 Q: My Burle system automatically clears on screen messages after one or two seconds. When does the Spectra clear its messages?

A: With the exception of zone labels, all on screen messages are cleared when the Spectra receives another command.

1.5 Addressing

1.5.1 Q: You said that the block address shown in initial display is in hexadecimal. Isn't that hard to understand?

A: Hexadecimal and decimal numbers are identical up to 9. With a block address of 9 entered into the switch, it is possible to address over 1,200 cameras. This should suffice for most users. If more are needed, the TXB-B can address over 16,000 cameras and it is probably time to learn hexadecimal.

1.5.2 Q: What's all this junk about "Address Blocks"?

A: The Burle communications protocol may address up to 16,384 devices. This is done by having two seven bit address bytes in the protocol. Pelco uses the least significant half of this as the Spectra address and the most significant half as a "block address". The block address is setup on the DIP switch which is mounted on the TXB-B.

When selecting an address for a Spectra, the tables shown in Section 6, page 64 must be used. For example:

- To put a Spectra at address 123, requires that the block address be put at 0 and the Spectra be put at 123.
- To put a Spectra at address 635, requires that the block address be put at 4 and the Spectra be put at 123. $(635 = 512 + 123)$

1.5.3 Q: The address block table only goes up to 40 blocks. Why doesn't it go further?

A: It is unlikely that any site will require more than this number of Spectra addresses. However the formulas to calculate the Spectra Address and its Block Address are:

- The Block Address is the quotient of dividing the Camera Address by 128.
- The Spectra address is the remainder of dividing the Camera Address by 128.

Thus given a Camera Address of 2,345. Its Block Address is 18 $(18 = 2345/128)$ and its Spectra Address is 41 $(2345 = (18 \times 128) + 41)$. This will work up to the maximum Camera Address that Burle can access (16,384).

1.5.4 Q: Burle reserves address zero as a broadcast address. The TXB-B does not appear to support it. Why?

A: This is one of the areas where Pelco and Burle have fundamental differences in philosophy. Pelco does not have a broadcast address and there was no practical way to implement one. So it isn't supported.

1.5.5 Q: I tried to use your formula and it doesn't work if the Camera Address is exactly divisible by 128. What is wrong with your math?

A: Camera addresses that are exactly divisible by 128 present a special case. This is because the Spectra does not have a Camera Address of zero (0). Its lowest camera address is one (1), thus any camera address that is an exact multiple of 128 is unusable[6]. The first few of these are listed below:

128	1,024	2,048	3,072	4,096	5,120	6,144	7,168
256	1,280	2,304	3,328	4,352	5,376	6,400	7,424
384	1,408	2,432	3,456	4,480	5,504	6,528	7,552
512	1,536	2,560	3,584	4,608	5,632	6,656	7,680
640	1,664	2,688	3,712	4,736	5,760	6,784	7,808
768	1,792	2,816	3,840	4,864	5,888	6,912	7,936
896	1,920	2,944	3,968	4,992	6,016	7,040	8,064

1.5.6 Q: I notice that 0 is not it the above list. What gives?

A: Well I guess that when 0 is divided by 128 the remainder is 0, so you are correct. It's just that I forgot to put it in the table. However address 0 is not in the full address table on Section 6, page 64.

1.5.7 Q: How are the bits assigned on the block address switch?

A: Exactly the same as they are on the Spectra. I.e. to select address block 5, set the switches exactly as they would be for a Spectra camera #5 (`ON OFF ON OFF OFF OFF OFF OFF`). Use the tables in Section 6, page 64 as a guide to the correct address block #s to use.

1.5.8 Q: In the Spectra manual there is no entry for camera 0. How do I enter a block address of zero (0) into the TXB-B switch?

A: `OFF OFF OFF OFF OFF OFF OFF OFF`!

1.5.9 Q: I have my Spectra DIP switch set to camera #135 and my block address DIP switch set to block #1. Why is nothing working?

A: In trying to address a Spectra at address 135, you have gotten half the problem right and half wrong. The address block that you selected, #1, was correct. However the camera number must come from the Section 6, page 64 set of tables. (The camera # is **never** greater than 127.) In this case the Spectra must be set to address #7.

This is because the Burle protocol uses two seven bit address bytes and each one only goes up to 128. The least significant half is used when actually addressing the Spectra and the most significant half is used when addressing the TXB-B.

[6] You will also note that these addresses are not in the address table (Section 6, page 64).

This correctly implies that the Spectra's, D protocol range of up to 256 is not reachable in one step, but is broken up into two steps of 128 each. (Of course you must consider that the Spectra can't be at address zero, so it's really two steps of 127 with two addresses of zero not being usable.)

<This question and its answer are so important that it is repeated in the Potential Problems *section.>*

1.6 Virtual Keyboard LTC-5138

1.6.1 Q: When using my "Virtual Keyboard" (LTC-5138) to control the Spectra, The Spectra does not stop moving when I let go of the simulated joy stick. What is happening?

A: When you "double click" on the simulated joy stick it remembers what has happened and allows the command to run continuously. (Burle has several types of motion commands, the LTC-5138 Virtual Keyboard uses what are called "indefinite activation" type of motion commands. With this type of command, motion is started with one command and stopped with another command. With Burle's other type of motion command they resend the motion command continuously until motion should stop.) If this happens then the joy stick/Spectra moves until it receives a "normal click", at which point it stops moving because the LTC-5138 then sends a "stop motion" command.

1.6.2 Q: When using my "Virtual Keyboard" (LTC-5138) to control the Spectra, it does not go into turbo speed when panning right, but does when panning left. What is wrong with the Spectra?

A: This is a known problem with Virtual Keyboard rev 1.01. The maximum value given out for pan left is different than the maximum value given out for pan right. This results in being able to get into turbo speed only when going left, never when going right.

1.7 Dome Speeds

1.7.1 Q: I saw a Spectra at a show and was impressed with its smooth motion. With a TXB-B installed in mine, the motion is not as smooth. Why?

A: The Burle system has 16 different speeds for pan and tilt. Pelco has up to 64. This results in Pelco systems having very smooth pan and tilt capabilities. The TXB-B only translates what it is given and there is no practical way to generate the "in between" speed values.

There are two situations here. One involves pan speeds and the other involves tilt speeds. Although the methods of determining the actual speeds are similar, the actual calculations are different.

For variable speed keyboards, the TXB-B takes the Burle speed, multiplies it by a constant and adds another constant to get the value sent to the Spectra. This was done because the Spectra moves at the same rate for several low speeds and then starts to move faster as each higher speed command comes in. The transfer function between input speed indexes is not linear. As long as the slowest speed from the Burle equipment is zero (0), these formulas start out at "dead slow" for the Spectra/Esprit and give evenly spaced speed steps until the Burle equipment sends a speed high enough to cause "turbo" operation.

The actual formulas used are:

- Pan speed: $PanSpeed_{spectra} = (S_{burle} * 4) + 7$
- Tilt speed: $TiltSpeed_{spectra} = (S_{burle} * 4) + 3$

For fixed speed keyboards, the TXB-B uses a hard coded default value that gives 20 °/sec. If the user wishes to, the speed may be changed using the ON 1x series of commands.

1.7.2 Q: On my variable speed system, when I hold the joy stick all the way to the right or left, the camera goes real fast. Why?

A: The TXB-B automatically issues a "turbo speed" command when the joy stick is at maximum left or right. Turbo speed is greater than 100 degrees per second.

1.7.3 Q: Can you compare the various pan speeds that are available in the TXB-AB, TXB-AD and TXB-B?

A: Grudgingly yes.

This is a table that compares the speed commands sent to a Spectra/Esprit from several sources. Note that fixed speed commands do not have a speed field and use a value that is stored inside the translator (be it TXB-AB/TXB-AD or TXB-B). With the TXB-B these values may be changed with the ON 1X series of commands.

The Burle/Philips speeds were obtained from an AutoDome with various input pan values, and the lens at maximum wide angle, in a horizontal position, with a "`Dome G3:  SW Ver 1.10`"[7] type of AutoDome. The AutoDome is model LTC-0829/20.

[7] This is the software version readout generated with an ON 66 command.

Burle Speed Table Notes

1. ^{o}**/Sec** This is the measured speed of rotation in degrees per second.
2. **Input Speed** This is the Burle/Philips protocol speed field value. This is a 4 bit wide field which varies from $0 \rightarrow 15$.

On a fixed speed system the camera rotates at 20^o/sec.

Burle AutoDome rotational speeds							
Input Speed	^{o}/Sec	Input Speed	^{o}/Sec	Input Speed	^{o}/Sec	Input Speed	^{o}/Sec
0	7.2	4	18	8	40	12	74
1	8.8	5	22.5	9	48	13	90
2	11.25	6	28	10	55	14	105
3	14.4	7	33	11	66	15	120

Pelco Speed Table Notes

- The following table is ordered by the hexadecimal value sent to the Spectra/Esprit.
- Although the Spectra/Esprit listing indicates a given speed for a given input, there are some speeds that are intentionally blocked to reduce potential problems with resonance caused mechanical noise. These blocked speed values are dependent on the actual zoom factor in use and vary in different revisions of the Spectra/Esprit software. This results in a table that is should be considered a "rough guide" to the actual speeds that a Spectra/Esprit will rotate/tilt at.
- Spectra and Esprit pan and tilt speeds come from the source code for Spectra software revision 3.29 and Esprit software revision 1.01. These values are given in ^{o}/sec, with the lens at maximum wide angle and ignoring any "skipped" speeds. This table is specific to each revision/model of the Spectra/Esprit and may change at any time.
- In the past Pelco has done considerable research into the ergonomics of using a joy stick to control camera motion. The results of this research resulted in the following tables of camera motion *vs.* value reported out from Pelco's joy sticks. It should be noted that the table is not linear and has different values in pan and tilt (and NTSC and PAL tilt (and Esprit *vs.* Spectra)). Since pan has a total travel (360^o) which is four times that of tilt (90^o), which makes for some of the differences. Many values were empericaly derived from studies with various test subjects using Pelco keyboard/joy stick combinations. With the Burle variable speed keyboards the transfer characteristic of joy stick motion is different from that generated by a Pelco joy stick. Additionally Burle utilizes only 4 bits (which gives 16 different speeds) in their variable speed to designate speeds, while Pelco utilizes 6 (giving 64 different potential speeds). In an attempt to provide the best low speed control (i.e. small joy stick deflections) from a Burle *vs.* Pelco dome.

- Note that the hexadecimal values in the pan column are not what might be expected as these are the actual values that are used on the communications line from the Burle equipment. In the Burle protocol, the bit positions of the pan speed cross over a nibble boundary and are thus a pain to read. (Works just fine with the software and hardware, but is difficult for the human-ware. And of course tilt is nicely aligned on a nibble boundary.)
- In the following table, most entries are not used by the TXB-B. I have marked those that are used in **bold** type. The last column (marked "Fixed Speed ON 1X Cmnd") indicates the command used with fixed speed keyboards to select a given set of pan/-tilt speeds. The default speed is given by ON 15 which marked in **bold**.

Table Index		Pan			Tilt				Fixed Speed ON 1x Cmnd
			Spectra	Esprit		Spectra		Esprit	
		Burle Index	°/sec	°/sec	Burle Index	NTSC °/sec	PAL °/sec	°/sec	
0x00	0_{10}		0.5	0.2		0.5	0.5	0.5	
0x01	1_{10}		0.5	0.2		0.5	0.5	0.5	
0x02	2_{10}		0.5	0.3		0.5	0.5	0.5	
0x03	3_{10}		0.5	0.3	0x00 0	**0.5**	**0.5**	**0.5**	
0x04	4_{10}		0.5	0.4		0.5	0.5	0.5	
0x05	5_{10}		0.5	0.5		0.5	0.5	0.5	
0x06	6_{10}		0.5	0.7		0.5	0.5	0.5	
0x07	7_{10}	0x00 0	**0.5**	**0.9**	0x01 1	**0.9**	**0.9**	**0.7**	
0x08	8_{10}		0.5	1.2		1.3	1.3	0.9	
0x09	9_{10}		0.5	1.5		1.6	1.6	1.1	
0x0A	10_{10}		0.6	1.8		2.0	2.0	1.3	
0x0B	11_{10}	0x08 1	**0.7**	**2.1**	0x02 2	**2.3**	**2.3**	**1.4**	
0x0C	12_{10}		0.7	2.5		2.7	2.7	1.6	
0x0D	13_{10}		0.8	2.9		3.0	3.0	1.8	
0x0E	14_{10}		0.9	3.3		3.4	3.4	2.0	
0x0F	15_{10}	0x10 2	**1.0**	**3.7**	0x03 3	**3.7**	**3.7**	**2.2**	
0x10	16_{10}		1.0	4.1		4.1	4.1	2.3	
0x11	17_{10}		1.1	4.5		4.5	4.5	2.5	
0x12	18_{10}		1.3	4.8		4.8	4.8	2.7	
0x13	19_{10}	0x18 3	**1.4**	**5.2**	0x04 4	**5.2**	**5.2**	**2.9**	
0x14	20_{10}		1.5	5.6		5.6	5.6	3.1	
0x15	21_{10}		1.7	5.9		5.9	5.9	3.3	
0x16	22_{10}		1.8	6.3		6.3	6.3	3.5	

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Table Index		Pan Burle Index		Pan Spectra °/sec	Pan Esprit °/sec	Tilt Burle Index		Tilt Spectra NTSC °/sec	Tilt Spectra PAL °/sec	Tilt Esprit °/sec	Fixed Speed ON 1x Cmnd
0x17	23_{10}	0x20	4	**2.0**	**6.7**	0x05	5	**6.7**	**6.7**	**3.6**	
0x18	24_{10}			2.2	7.1			7.1	7.1	3.8	
0x19	25_{10}			2.4	7.5			7.5	7.5	4.0	
0x1A	26_{10}			2.6	7.8			7.8	7.8	4.2	
0x1B	27_{10}	0x28	5	**2.9**	**8.2**	0x06	6	**8.2**	**8.2**	**4.4**	
0x1C	28_{10}			3.2	8.6			8.6	8.6	4.6	
0x1D	29_{10}			3.5	9.0			9.0	9.0	4.9	
0x1E	30_{10}			**3.8**	**9.4**			**9.4**	**9.4**	**5.1**	11
0x1F	31_{10}	0x30	6	**4.2**	**9.9**	0x07	7	**9.9**	**9.9**	**5.3**	
0x20	32_{10}			4.6	10.3			10.3	10.3	5.5	
0x21	33_{10}			5.0	10.7			10.7	10.6	5.7	
0x22	34_{10}			5.5	11.1			11.1	10.7	6.0	
0x23	35_{10}	0x38	7	**6.0**	**11.6**	0x08	8	**11.6**	**11.8**	**6.2**	12
0x24	36_{10}			6.6	12.1			12.1	12.1	6.4	
0x25	37_{10}			7.3	12.5			12.5	12.5	6.7	
0x26	38_{10}			8.0	13.0			12.8	13.0	6.9	
0x27	39_{10}	0x40	8	**8.7**	**13.5**	0x09	9	**13.1**	**13.5**	**7.2**	
0x28	40_{10}			9.6	14.1			**13.9**	**14.1**	**7.5**	13
0x29	41_{10}			10.5	14.6			14.6	14.6	7.8	
0x2A	42_{10}			11.5	15.2			15.2	15.2	8.1	
0x2B	43_{10}	0x48	9	**12.6**	**15.7**	0x0A	10	**15.7**	**15.7**	**8.4**	
0x2C	44_{10}			13.9	16.4			16.4	16.4	8.7	
0x2D	45_{10}			**15.2**	**17.0**			**17.0**	**17.0**	**9.0**	14
0x2E	46_{10}			16.7	17.7			17.7	17.7	9.4	
0x2F	47_{10}	0x50	10	**18.3**	**18.4**	0x0B	11	**18.4**	**18.4**	**9.7**	
0x30	48_{10}			**20.0**	**19.1**			**19.1**	**19.1**	**10.1**	**15**
0x31	49_{10}			22.0	19.9			19.9	19.9	10.5	
0x32	50_{10}			24.1	20.8			20.8	20.4	11.0	
0x33	51_{10}	0x58	11	**26.4**	**21.7**	0x0C	12	**21.7**	**20.6**	**11.4**	
0x34	52_{10}			**29.0**	**22.7**			**22.7**	**24.9**	**11.9**	16
0x35	53_{10}			31.8	23.7			23.7	25.2	12.4	
0x36	54_{10}			34.9	24.8			24.8	25.3	13.0	
0x37	55_{10}	0x60	12	**38.2**	**26.0**	0x0D	13	**25.3**	**25.5**	**13.5**	

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Table Index	Pan Burle Index	Pan Spectra °/sec	Pan Esprit °/sec	Tilt Burle Index	Tilt Spectra NTSC °/sec	Tilt Spectra PAL °/sec	Tilt Esprit °/sec	Fixed Speed ON 1x Cmnd
0x38 56_{10}		41.9	27.3		29.0	26.0	14.2	
0x39 57_{10}		**46.0**	**28.7**		**30.0**	**26.5**	**14.8**	17
0x3A 58_{10}		50.4	30.2		31.0	27.0	15.5	
0x3B 59_{10}	0x68 13	**55.3**	**31.8**	0x0E 14	**32.0**	**38.0**	**16.3**	18
0x3C 60_{10}		60.7	33.6		33.6	29.0	17.1	
0x3D 61_{10}		66.5	35.6		35.6	37.6	18.0	
0x3E 62_{10}		72.9	37.7		37.0	40.0	19.0	
0x3F 63_{10}	0x70 14	**80.0**	**40.0**	0x0F 15	**44.0**	**44.0**	**20.0**	

1.7.4 Q: Wow! Looking over that table it seems that the AutoDome moves faster than the Spectra does until you get to turbo speed. Are you sure that your numbers are correct?

A: I'm sure and Burle does not have the Spectra's low speeds. (Unless we have a "high speed" model and others have a "low speed" model.)

1.7.5 Q: How do I change the pan/tilt speeds that are available to me on a fixed speed system?

A: Use the following "ON" commands to get the indicated speeds. (In an Esprit the speeds will differ and in future versions of the Spectra they may also differ. In future revisions of the equipment, the speed available with the TXB-B may change. Be sure to use the manual that came with your unit.)

20°/Sec (ON 15) is the default value.

Command	Speed °/Sec	Command	Speed °/Sec
ON 11	3.8	ON **15**	**20**
ON 12	6	ON 16	29
ON 13	9.6	ON 17	46
ON 14	15.2	ON 18	60.1

1.7.6 Q: With my Burle cameras the zoom speed changes depending on how hard I twist the joy stick. The Spectra does not do this, it seems to only have one speed for zoom. What is wrong?

A: None of Pelco's products have a dynamicly variable zoom speed feature, so it wasn't implemented.

1.7.7 Q: I notice that when I am using a fixed speed keyboard to pan a camera, and I zoom the lens at the same time. That the panning rate changes. I thought that panning speed stayed the same in a fixed speed system. What gives?

A: You probably have proportional pan enabled. As you pan and zoom simultaneously, you are able to watch the effects that proportional pan has on the pan rate of the Spectra.

1.7.8 Q: I notice that the pan and tilt speeds of a Spectra change depending on the keyboard type being used. For example: when a Spectra is being controlled by an LTC-5136 keyboard *vs.* the speeds available from an LTC-8553 keyboard/-matrix. I notice that the same speeds are not available. What is happening here?

A: In carefully checking the pan and tilt speeds, generated by the two keyboard types that I have available for testing, I have noticed that the codes at the start and end are not the same. I have attempted to indicate this in the following table.

When reading this table it should be remembered that the Burle keyboards generate a four bit value for both pan and tilt speeds. Thus the range for these values varies from zero (`0`) to fifteen (`15`).

LTC-5136 Keyboard	LTC-8553/LTC-8801 Keyboard/Matrix	LTC-5136 Keyboard	LTC-8553/LTC-8801 Keyboard/Matrix
None	0	8	8
1	1	9	9
2	2	10	10
3	3	11	11
4	4	12	12
5	5	13	13
6	6	14	None
7	7	15	15

Note

In the above table "None" indicates that no code is generated.

The LTC-8553 keyboard is missing one output near the high end of the scale.

The LTC-5136 keyboard is missing one output on the low end of the scale.

It is unclear if these differences are designed into the keyboards, or if they are just out of calibration. (I haven't made an attempt to get the two keyboards checked by Burle/Philips!)

1.8 Burle protocol commands

Burle protocol commands and their implementation status:

Command Type	Status
Auxiliary	Maximum value that is decoded is 128, not the Burle protocol limit of 1,024.
Prepositioning	Maximum value that is decoded is 128, not the Burle protocol limit of 1,024.
Auxiliary/Prepositioning implemented sub-options implemented:	Cancel Latching Aux: Not Implemented Aux Off: Implemented Aux On: Implemented Aux Toggle: Not Implemented Pre-Position Set: Implemented Pre-Position Show: Implemented Latching Aux Off: Implemented Latching Aux On: Implemented All Other Codes: Not Implemented
Fixed speed Pan/Tilt/Zoom	Fully implemented.
Indefinite Activation, Variable Speed, Pan/Tilt/Lens	Fully implemented, except for lack of dynamicly variable speed zoom.
Indefinite Activation	Fully implemented.
Lens Control	Fully implemented.
Poor Man's Preposition	Not implemented.
Variable Speed, Pan/Tilt/-Lens	Except for lack of dynamicly variable speed zoom, this is fully implemented.

1.9 Differences

Note

I was unable to find any way to "clear" a preset, once it is set. There is no button on the keyboard that is marked to indicate that it is possible. Thus this feature is totally untested/unimplemented. It might be that Burle doesn't support it.

How closely does the Spectra match the capabilities of my Burle domes? The Spectra dome does not have some of the capabilities/concepts of the Burle equipment, and it has some capabilities/-concepts that the Burle equipment does not have. (The most obvious of these it that Pelco does not implement "Tour"s.)

Still other capabilities/characteristics are implemented differently. (Here the most obvious difference is that Pelco makes extensive use of "menus" that are generated by the Spectra unit. While Burle makes extensive use of presets, both SET and CALL, and auxes, both ON and OFF. Both techniques have similar capabilities.)

The TXB-B attempts to "hide" as many of the differences as possible. However Burle and Pelco developed, and are actively maintaining and enhancing, their domes independently. Some differences are inevitable. The following items attempt to list the known differences, non-compatibilites and work arounds.

There is an additional problem with defining differences between Burle's domes and Pelco's units. These problems revolve around the fact that each model of Spectra tends to have some differences from others in the same product line. I.e. a Spectra (being a dome type unit) can "look straight down and do a flip". While an Esprit (being a pan/tilt type unit) can look straight down, but can not continue to rotate on through zero degrees and continue to observe most subjects. And just to complicate matters more, both Pelco and Burle make continuous fixes, updates and changes to their products. So what is correct today may change by tomorrow.

The net result of the various problems mentioned here is that we believe the information to be correct as of "press time" however since then, there may be changes that are inevitable and unpredictable. (Then there may have been some changes that I haven't found out about yet.)

Pelco has an additional problem with our various models of the Spectra/Esprit some have some subtle and not so subtle differences from model to model. (The Spectra-Lite can not do proportional pan while the other members of the Spectra family can, etc.) A short listing of what capabilities the various Spectra models have are shown in Section 2, page 56.

[8] `$Header: d:/ecr6171/RCS/faq2.inc,v 1.14 2001-01-12 10:07:27-08 Hamilton Exp Hamilton $`

Ordinary commands

1. **Scan** ON/OFF-1-ENTER *Camera will continuously pan in the last direction the joystick was moved. Moving the joystick will stop the scan.*

   Status: Fully supported.

2. **Auto-Pan** ON/OFF-2-ENTER *Camera will continuously pan back and forth between limits. Moving the joystick will stop the Auto-Pan.*

   Status: Fully supported.

3. **Spin 180 Degrees** SHOT-180-ENTER *Rotates the camera 180 degrees from the current position.*

   Status: Fully supported. Pelco calls this feature "flip".

4. **Pre-Set Tour** ON/OFF-8-ENTER *Camera will cycle through Pre-Set Scenes. Moving the joystick will stop the tour.*

   Status: Not supported.

5. **Pre-Set Scene** SET-1-99-ENTER *Stores the current scene and camera settings in memory. Pre-Set 1 will be called up when the camera is initialized.*

   Status: Partially supported, Pelco only has 64 presets. And the camera points to "factory home" on power up, not shot 1.

6. **Pre-Set Recall** SHOT-1-99-ENTER *Recalls the scene and camera settings from memory.*

   Status: Partially supported, Pelco only has 64 presets.

7. **Pre-Set Title Adjust** ON/OFF-62-ENTER *Lets you modify the Pre-Set names. On-screen instructions are provided.*

   Status: Partially implemented. The TXB-B always places a SHOT lable of "`Shot xx`", with `xx` being used to identify the SHOT #, on the screen. It may not be changed, edited or moved. Which the Spectra will automatically remove when it receives its first motion command after a SHOT command is execuited.

8. **Reset Pre-Set Tour** SET/SHOT-900-ENTER *All Pre-Sets are removed/restored (*ON/OFF*) from the Pre-Set tour. Pre-Sets can still be called up manually.*

   Status: Not supported.

9. **Modify Pre-Set Tour** SET/SHOT-901-999-ENTER *Pre-Set will be removed/restored (*ON/-OFF*) from the Pre-Set tour. Example* [SET][915][ENTER] *will clear Pre-Set 15 from the tour. Pre-Sets can still be called up manually.*

   Status: Not supported.

10. **Record** ON/OFF-100-ENTER *Records up to three minuets of camera and PTZ controls that can be played back. Once the sequence is recorded you must exit record in order to play back.*

    Status: Fully Supported. The Spectra series of units provides up to **six** minuets of recording time.

    Also available as ON/OFF-53-ENTER as a convenience.

11. **Continuous Playback** ON/OFF-50-ENTER *Camera will repeat recorded sequence.*

    Status: Fully Supported.

12. **Playback** ON/OFF-51-ENTER *Camera will repeat recorded sequence once.*

    Status: Not supported. ON/OFF-51-ENTER has been changed to playback of 1^{st} half of recorded pattern. ON/OFF-52-ENTER is used for the 2^{nd} half.

13. **Auto Focus when moving** ON/OFF-12-ENTER *Camera will re-focus whenever a camera is moved. Default is OFF.*

    Status: Not supported. Auto Focus is either on or off. However it may be changed by using the Spectra's menu system.

    ON/OFF-12-ENTER has been changed to Acknowledge alarm #2 (OFF 12) and select fixed speed #2, 1^o/sec (ON 12).

14. **Auto Iris when moving** ON/OFF-13-ENTER *Camera will adjust to different light conditions whenever camera is moved. Default is ON.*

    Status: Not supported. Auto Iris is either on or off. However it may be changed by using the Spectra's menu system.

    ON/OFF-13-ENTER has been changed to Acknowledge alarm #3 (OFF 13) and select fixed speed #3, 1.8^o/sec (ON 13).

15. **Backlight Compensation** ON/OFF-20-ENTER *Camera will adjust for a bright background. Turning this on will also turn on the Manual Iris.*

    Status: This option is selected via the Spectra's menu system.

16. **Light Adjust** ON/OFF-3-ENTER *Camera (iris) adjusts automatically/manually (*ON/OFF*) to light conditions.*

    Status: This option is selected via the Spectra's menu system.

17. **Auto Focus** ON/OFF-4-ENTER *Camera will automatically/manually (*ON/OFF*) focus.*

    Status: This option is selected via the Spectra's menu system.

18. **AGC** ON/OFF-43-ENTER *Turns automatic gain control on. This is useful with dark scenes.*

    Status: This option is selected via the Spectra's menu system.

19. **On-Screen Display** ON/OFF-60-ENTER *Turns* ON/OFF *the On-Screen Display. Default is ON. If this is off you will not receive On-Screen command feedback.*

    Status: Fully supported. However the default is off.

20. **On-Screen display Adjust** ON/OFF-61-ENTER *Lets you change the characters and position of the display. On-screen instructions are provided.*

    Status: Not supported.

21. **Zone Title Adjust** ON/OFF-63-ENTER *Lets you modify the Zone names. On-screen instructions are provided.*

    Status: Partially implemented. The TXB-B always places a zone lable of "`Zone x`", with `x` being used to identify the Zone #, on the screen. It may not be changed, edited or moved.

22. **Software Version** ON-66-ENTER *Briefly displays the camera software version.*

    Status: The Spectra does not need this feature. All Spectra units automatically display their software revision level on power up. The power up display also indicates the TXB-B's software version and block address. However by sending a ON 66 sequence the TXB-B will display its software revision information, which the Spectra will automatically remove when it receives its first motion command.

Advanced commands

1. **Lock Commands** SET-103-ENTER *Locks all advanced commands.*

   Status: Not supported.

2. **Unlock Commands** SET-104-ENTER *Unlocks all advanced commands. This is the Default.*

   Status: Not supported.

3. **Factory Home Position** SET/SHOT-110-ENTER *SET re-calibrates camera and returns it to the factory 0 degree position. SHOT returns camera to the factory 0 degree position.*

   Status: Fully supported.

4. **Restore Defaults** ON-40-ENTER *Restores Factory Defaults.*

   Status: Fully supported.

5. **Left Limit** SET-101-ENTER *Sets the current position as the left limit of Auto Pan. Default is 0 degrees.*

   Status: Fully implemented. This command is repeated as ON-40 as a convenience.

6. **Right Limit** SET-102-ENTER *Sets the current position as the right limit of Auto Pan. Default is 359.9 degrees.*

   Status: Fully implemented. This command is repeated as ON-41 as a convenience.

7. **Return to Pre-Set 1** ON/OFF-9-ENTER *After approximately 2 minutes of inactivity, the camera will return to Pre-Set 1. Default is OFF.*

   Status: This option is selected via the Spectra's menu system.

8. **Scan + Auto Pan Speed** ON/OFF-14-ENTER *When in Auto-Pan or Scan Mode, you can increase/decrease (*ON/OFF*) the speed by holding the Enter button. Default is 30 degrees per second.*

   Status: This option is supported by the Spectra's menu system.

   ON/OFF-14-ENTER has been changed to Acknowledge alarm #4 (OFF 14) and select fixed speed #4, 6.25°/sec (ON 14).

9. **Pre-Set Tour Period** ON/OFF-15-ENTER *Increase/Decrease (*ON/OFF*) the time between Pre-Sets during Pre-Set Tour. You must hold down the ENTER button to change. Default is 3 seconds.*

   Status: Not Supported.

   ON/OFF-15-ENTER has been changed to Acknowledge alarm #5 (OFF 15) and select fixed speed #5, 8°/sec (ON 15).

10. **Fixed Speed Controller** ON/OFF-16-ENTER *Pan speed will ramp up when using a fixed speed controller Default is OFF.*

    Status: Not supported.

    ON/OFF-16-ENTER has been changed to Acknowledge alarm #6 (OFF 16) and select fixed speed #6, 14°/sec (ON 16). This is the default speed.

11. **Auto-Pivot** ON/OFF-18-ENTER *Lets you follow a subject travelling beneath the camera without inverting the picture. Default is ON.*

    Status: This feature which Pelco calls "auto-flip" is supported via the Spectra's menu.

    ON-18-ENTER has been changed to select fixed speed #8, 72°/sec (ON 18).

12. **Select White Balance** ON/OFF-35-ENTER *Adjusts camera color (white balance) for typical indoor/outdoor (*ON/OFF*) settings.*

    Status: This option is selected via the Spectra's menu system.

13. **Sharpness** ON/OFF-44-ENTER *Picture (vertical aperture) will sharpen/soften (*ON/OFF*). You must hold down the ENTER button to change.*

    Status: This option is selected via the Spectra's menu system.

14. **Spot Focus** ON/OFF-17-ENTER *Camera will focus once after movement has stopped. Default is ON.*

    Status: Not supported.

    ON/OFF-17-ENTER has been changed to Acknowledge alarm #7 (OFF 17) and select fixed speed #7, 46°/sec (ON 17).

15. **Auto Shutter** ON/OFF-23-ENTER *Sets the shutter for automatic/fixed (*ON/OFF*) operation. Default is ON.*

    Status: This option is selected via the Spectra's menu system.

    ON/OFF-23 has been changed to set the start (ON-23) and end (OFF-23) of Zone #3.

16. **Auto Shutter when moving** ON/OFF-24-ENTER *Auto Shutter is turned on whenever camera is moved. Default is OFF.*

    Status: Not supported.

    ON/OFF-24 has been changed to set the start (ON-24) and end (OFF-24) of Zone #4.

17. **Auto White balance** ON/OFF-30-ENTER *Camera will continuously adjust its color for different lighting conditions. This is useful when camera scenes change from indoor to outdoor.*

    Status: This option is selected via the Spectra's menu system.

18. **Auto Iris ALC Detector** ON/OFF-10-ENTER *Adjusts the light levels for brightest/average (*ON/OFF*) parts of the scene.*

    Status: Not implemented.

19. **Iris Adjust** ON/OFF-11-ENTER *Selects Peak/Average (*ON/OFF*) detection for Auto Iris. The ENTER button must be held down to adjust. Adjustment may take several seconds.*

    Status: Not supported.

    ON/OFF-11-ENTER has been changed to Acknowledge alarm #1 (OFF 11) and select fixed speed #1, .5°/sec (ON 11).

20. **Synch Mode** ON/OFF-42-ENTER *Sets camera synch for external-line/internal-crystal (*ON/-OFF*).*

    Status: This option is supported by the Spectra's menu system.

    ON-42-ENTER has been changed to set the left limit stop.

21. **Adjust Line Lock Phase Delay** ON/OFF-41-ENTER *Increase/Decrease the phase of the camera when in external line lock mode. The ENTER button must be held to change.*

    Status: This option is supported by the Spectra's menu system.

    ON-41-ENTER has been changed to set the right limit stop.

22. **Zoom Polarity** ON/OFF-91-ENTER *Controls the way the Dome responds to keyboard zoom commands.* ON *= Reverse.* OFF *= Normal. Factory default is OFF.*

    Status: Not Supported.

23. **Focus Polarity** ON/OFF-92-ENTER *Controls the way the Dome responds to keyboard focus commands.* ON *= Reverse.* OFF *= Normal. Factory default is OFF.*

    Status: Not Supported.

24. **Iris Polarity** ON/OFF-93-ENTER *Controls the way the Dome responds to keyboard iris commands.* ON *= Reverse.* OFF *= Normal. Factory default is OFF.*

    Status: Not Supported.

1.10 Preset and Aux/On/Off usage with the TXB-B

Type font usage

In this table the following conventions have been followed for type font usage.

1. *Every thing in italics is used to give amplifying information. In some places there are short statements about what is happening. These usually consist of statements such as "Not Implemented" and "Use the Spectra's Menu". Their meaning should be self explanatory.*

   A common example of this is:

Use the Spectra's Menu	

   This means that the original item is not implemented and that the Spectra's Menu must be used. The small box on the right is used in debugging so that the tester may place a mark here when that item is tested.

2. The small caps font is used to identify actual markings on the Burle equipment.

   For example:

OFF 51

   This means that the information is for an "OFF 51" keyboard sequence. All of these sequences require a following ENTER which I didn't indicate as it would take up too much space on the page and provide no additional information.

3. `The teletype font is used to identify command strings, in hex, that are received or are expected to be used when transmitted by the TXB-B.`

   For example:

`0x07 0x04 0x5B`		`0x00 0x03 0x00 0x5B`

   Note: if the above sample is all blank, that indicates that this is a special run of the preset, etc., descriptions that does not have any hexadecimal strings in it. This has been done to make understanding the description easier for non-technical types.

[9] `$Header: d:/ecr6171/RCS/presets.inc,v 1.23 2001-01-12 10:07:29-08 Hamilton Exp Hamilton $`

Here the Burle equipment sends a command with `0x07 0x04 0x5B` as bytes 4, 5 and 6 (the other bytes are start of message/message length, address and checksum). The TXB-B generates and sends a command containing `0x00 0x03 0x00 0x5B` as bytes 3, 4, 5 and 6 (the other bytes are sync, address and checksum).

4. Items in "normal font" are used for various descriptions of what the commands are or do.

   For example:

Normal Zoom Polarity

5. Horizontal lines have different levels of significance.

   A. A "block of commands" refers to all commands that have the same numeric value. I.e. these consist of four commands (OFF, ON, SET and SHOT) for, say, 22.

   B. A single horizontal line is used to separate parts of block of commands.

   C. A double horizontal line is used to separate different blocks of commands.

   D. A triple horizontal line is used to indicate where several blocks of commands have been omitted.

In the following 12, or so, pages there have been some changes to several of the commands. Unfortunately my routine to place a change bar where the changes have occured, does not work for portions of a table. (Does quite nicely for the full table, but not for parts.) So here is a listing of changes to the various commands that are available in revision 1.10 of the TXB-B software.

Burle Command			Unit Action	Comments	
These items were added in as these fuctions were originally left out.					
OFF	5	`0x07 0x02 0x05`	Deactivate auxliary #1	`0x00 0x0B 0x00 0x01`	
ON	5	`0x07 0x01 0x05`	Activate auxliary #1	`0x00 0x09 0x00 0x01`	
OFF	6	`0x07 0x02 0x06`	Deactivate auxliary #2	`0x00 0x0B 0x00 0x02`	
ON	6	`0x07 0x01 0x06`	Activate auxliary #2	`0x00 0x09 0x00 0x02`	
The speeds that are set for fixed speed keyboards have changed.					
ON	11	`0x07 0x01 0x0B`	Peak Iris Adjust mode	*Use the Spectra's Menu*	
			Select fixed speed mode, speed #1 (3.8^o/sec)	None, is an internal TXB-B command.	

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Burle Command	Unit Action	Comments
ON 12 0x07 0x01 0x0C	Enable Auto-Focus when moving	*Not Implemented*
	Select fixed speed mode, speed #2 (6^o/sec)	None, is an internal TXB-B command.
ON 13 0x07 0x01 0x0D	Enable Auto-Iris when moving	*Not Implemented*
	Select fixed speed mode, speed #3 (9.6^o/sec)	None, is an internal TXB-B command.
ON 14 0x07 0x01 0x0E	Increase Auto Pan Speed	*Not Implemented*
	Select fixed speed mode, speed #4 (15.2^o/sec)	None, is an internal TXB-B command.
ON 15 0x07 0x01 0x0F	Increase Pre-Set Tour Period	*Not Implemented*
	Select fixed speed mode, speed #5 (20^o/sec, default fixed speed)	None, is an internal TXB-B command.
ON 16 0x07 0x01 0x10	Enable Fixed Speed Controller	*Not Implemented*
	Select fixed speed mode, speed #6 (29^o/sec)	None, is an internal TXB-B command.
ON 17 0x07 0x01 0x11	Enable Spot Focus	*Not Implemented*
	Select fixed speed mode, speed #7 (46^o/sec)	None, is an internal TXB-B command.
ON 18 0x07 0x01 0x12	Enable Auto Pivot	*Use the Spectra's Menu*
	Select fixed speed mode, speed #8 (60.1^o/sec)	None, is an internal TXB-B command.
Added in a flip for keyboards that can't get past 63.		
ON 56 0x07 0x01 0x38	Flip	0x00 0x07 0x00 0x21
A capability for determining the TXB-B's software version was added.		
ON 66 0x07 0x01 0x42	Show Software Version of TXB-B	—

Burle Command			Unit Action	Comments	
OFF	1	0x07 0x02 0x01	Stop Scan, without limits	0x00 0x07 0x00 0x60	
ON	1	0x07 0x01 0x01	Start Scan, without limits	0x00 0x07 0x00 0x63	
SET	1	0x07 0x04 0x01	Pre-Set Scene #1	0x00 0x03 0x00 0x01	
SHOT	1	0x07 0x05 0x01	Pre-Set Recall #1	0x00 0x07 0x00 0x01	
OFF	2	0x07 0x02 0x02	Stop Auto Pan, with limits	0x00 0x07 0x00 0x60	
ON	2	0x07 0x01 0x02	Start Auto Pan, with limits	0x00 0x07 0x00 0x62	
SET	2	0x07 0x04 0x02	Pre-Set Scene #2	0x00 0x03 0x00 0x02	
SHOT	2	0x07 0x05 0x02	Pre-Set Recall #2	0x00 0x07 0x00 0x02	
OFF	3	0x07 0x02 0x03	Manual Light Adjust	*Not Implemented*	
ON	3	0x07 0x01 0x03	Auto Light Adjust	*Not Implemented*	
SET	3	0x07 0x04 0x03	Pre-Set Scene #3	0x00 0x03 0x00 0x03	
SHOT	3	0x07 0x05 0x03	Pre-Set Recall #3	0x00 0x07 0x00 0x03	
OFF	4	0x07 0x02 0x04	Manual Focus	*Use the Spectra's Menu*	
ON	4	0x07 0x01 0x04	Auto Focus	*Use the Spectra's Menu*	
SET	4	0x07 0x04 0x04	Pre-Set Scene #4	0x00 0x03 0x00 0x04	
SHOT	4	0x07 0x05 0x04	Pre-Set Recall #4	0x00 0x07 0x00 0x04	
OFF	5	0x07 0x02 0x05	Deactivate auxliary #1	0x00 0x0B 0x00 0x01	
ON	5	0x07 0x01 0x05	Activate auxliary #1	0x00 0x09 0x00 0x01	
SET	5	0x07 0x04 0x05	Pre-Set Scene #5	0x00 0x03 0x00 0x05	
SHOT	5	0x07 0x05 0x05	Pre-Set Recall #5	0x00 0x07 0x00 0x05	
OFF	6	0x07 0x02 0x06	Deactivate auxliary #2	0x00 0x0B 0x00 0x02	
ON	6	0x07 0x01 0x06	Activate auxliary #2	0x00 0x09 0x00 0x02	
SET	6	0x07 0x04 0x06	Pre-Set Scene #6	0x00 0x03 0x00 0x06	
SHOT	6	0x07 0x05 0x06	Pre-Set Recall #6	0x00 0x07 0x00 0x06	
OFF	7	0x07 0x02 0x07	—	—	
ON	7	0x07 0x01 0x07	—	—	
SET	7	0x07 0x04 0x07	Pre-Set Scene #7	0x00 0x03 0x00 0x07	
SHOT	7	0x07 0x05 0x07	Pre-Set Recall #7	0x00 0x07 0x00 0x07	
OFF	8	0x07 0x02 0x08	Pre-set Tour	*Not Implemented*	
ON	8	0x07 0x01 0x08	Pre-set Tour	*Not Implemented*	
SET	8	0x07 0x04 0x08	Pre-Set Scene #8	0x00 0x03 0x00 0x08	
SHOT	8	0x07 0x05 0x08	Pre-Set Recall #8	0x00 0x07 0x00 0x08	
OFF	9	0x07 0x02 0x09	Disable Return to Preset 1 on inactivity	*Use the Spectra's Menu*	

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Burle Command			Unit Action	Comments
ON	9	0x07 0x01 0x09	Enable Return to Preset 1 on inactivity	*Use the Spectra's Menu*
SET	9	0x07 0x04 0x09	Pre-Set Scene #9	0x00 0x03 0x00 0x09
SHOT	9	0x07 0x05 0x09	Pre-Set Recall #9	0x00 0x07 0x00 0x09
OFF	10	0x07 0x02 0x0A	Use Average level for Auto Iris ALC Detector	*Use the Spectra's Menu*
ON	10	0x07 0x01 0x0A	Use Brightest level for Auto Iris ALC Detector	*Use the Spectra's Menu*
SET	10	0x07 0x04 0x0A	Pre-Set Scene #10	0x00 0x03 0x00 0x0A
SHOT	10	0x07 0x05 0x0A	Pre-Set Recall #10	0x00 0x07 0x00 0x0A
OFF	11	0x07 0x02 0x0B	Average Iris Adjust mode	*Use the Spectra's Menu*
			Acknowledge Alarm #1	0x00 0x19 0x00 0x01
ON	11	0x07 0x01 0x0B	Peak Iris Adjust mode	*Use the Spectra's Menu*
			Select fixed speed mode, speed #1 (3.8^o/sec)	None, is an internal TXB-B command.
SET	11	0x07 0x04 0x0B	Pre-Set Scene #11	0x00 0x03 0x00 0x0B
SHOT	11	0x07 0x05 0x0B	Pre-Set Recall #11	0x00 0x07 0x00 0x0B
OFF	12	0x07 0x02 0x0C	Disable Auto-Focus when moving	*Not Implemented*
			Acknowledge Alarm #2	0x00 0x19 0x00 0x02
ON	12	0x07 0x01 0x0C	Enable Auto-Focus when moving	*Not Implemented*
			Select fixed speed mode, speed #2 (6^o/sec)	None, is an internal TXB-B command.
SET	12	0x07 0x04 0x0C	Pre-Set Scene #12	0x00 0x03 0x00 0x0C
SHOT	12	0x07 0x05 0x0C	Pre-Set Recall #12	0x00 0x07 0x00 0x0C
OFF	13	0x07 0x02 0x0D	Disable Auto-Iris when moving	*Not Implemented*
			Acknowledge Alarm #3	0x00 0x19 0x00 0x03
ON	13	0x07 0x01 0x0D	Enable Auto-Iris when moving	*Not Implemented*
			Select fixed speed mode, speed #3 (9.6^o/sec)	None, is an internal TXB-B command.
SET	13	0x07 0x04 0x0D	Pre-Set Scene #13	0x00 0x03 0x00 0x0D
SHOT	13	0x07 0x05 0x0D	Pre-Set Recall #13	0x00 0x07 0x00 0x0D
OFF	14	0x07 0x02 0x0E	Decrease Auto Pan Speed	*Not Implemented*
			Acknowledge Alarm #4	0x00 0x19 0x00 0x04

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Burle Command			Unit Action	Comments
ON	14	0x07 0x01 0x0E	Increase Auto Pan Speed	*Not Implemented*
			Select fixed speed mode, speed #4 (15.2^o/sec)	None, is an internal TXB-B command.
SET	14	0x07 0x04 0x0E	Pre-Set Scene #14	0x00 0x03 0x00 0x0E
SHOT	14	0x07 0x05 0x0E	Pre-Set Recall #14	0x00 0x07 0x00 0x0E
OFF	15	0x07 0x02 0x0F	Decrease Pre-Set Tour Period	*Not Implemented*
			Acknowledge Alarm #5	0x00 0x19 0x00 0x05
ON	15	0x07 0x01 0x0F	Increase Pre-Set Tour Period	*Not Implemented*
			Select fixed speed mode, speed #5 (20^o/sec, default fixed speed)	None, is an internal TXB-B command.
SET	15	0x07 0x04 0x0F	Pre-Set Scene #15	0x00 0x03 0x00 0x0F
SHOT	15	0x07 0x05 0x0F	Pre-Set Recall #15	0x00 0x07 0x00 0x0F
OFF	16	0x07 0x02 0x10	Disable Fixed Speed Controller	*Not Implemented*
			Acknowledge Alarm #6	0x00 0x19 0x00 0x06
ON	16	0x07 0x01 0x10	Enable Fixed Speed Controller	*Not Implemented*
			Select fixed speed mode, speed #6 (29^o/sec)	None, is an internal TXB-B command.
SET	16	0x07 0x04 0x10	Pre-Set Scene #16	0x00 0x03 0x00 0x10
SHOT	16	0x07 0x05 0x10	Pre-Set Recall #16	0x00 0x07 0x00 0x10
OFF	17	0x07 0x02 0x11	Disable Spot Focus	*Not Implemented*
			Acknowledge Alarm #7	0x00 0x19 0x00 0x07
ON	17	0x07 0x01 0x11	Enable Spot Focus	*Not Implemented*
			Select fixed speed mode, speed #7 (46^o/sec)	None, is an internal TXB-B command.
SET	17	0x07 0x04 0x11	Pre-Set Scene #17	0x00 0x03 0x00 0x11
SHOT	17	0x07 0x05 0x11	Pre-Set Recall #17	0x00 0x07 0x00 0x11
OFF	18	0x07 0x02 0x12	Disable Auto Pivot	*Use the Spectra's Menu*
ON	18	0x07 0x01 0x12	Enable Auto Pivot	*Use the Spectra's Menu*
			Select fixed speed mode, speed #8 (60.1^o/sec)	None, is an internal TXB-B command.
SET	18	0x07 0x04 0x12	Pre-Set Scene #18	0x00 0x03 0x00 0x12
SHOT	18	0x07 0x05 0x12	Pre-Set Recall #18	0x00 0x07 0x00 0x12
OFF	19	0x07 0x02 0x13	—	—

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Burle Command			Unit Action	Comments
ON	19	0x07 0x01 0x13	—	—
SET	19	0x07 0x04 0x13	Pre-Set Scene #19	0x00 0x03 0x00 0x13
SHOT	19	0x07 0x05 0x13	Pre-Set Recall #19	0x00 0x07 0x00 0x13
OFF	20	0x07 0x02 0x14	Disable Backlight Compensation	*Use the Spectra's Menu*
ON	20	0x07 0x01 0x14	Enable Backlight Compensation	*Use the Spectra's Menu*
SET	20	0x07 0x04 0x14	Pre-Set Scene #20	0x00 0x03 0x00 0x14
SHOT	20	0x07 0x05 0x14	Pre-Set Recall #20	0x00 0x07 0x00 0x14
OFF	21	0x07 0x02 0x15	Set Zone #1 End	0x00 0x13 0x00 0x01
ON	21	0x07 0x01 0x15	Set Zone #1 Start	0x00 0x11 0x00 0x01
SET	21	0x07 0x04 0x15	Pre-Set Scene #21	0x00 0x03 0x00 0x15
SHOT	21	0x07 0x05 0x15	Pre-Set Recall #21	0x00 0x07 0x00 0x15
OFF	22	0x07 0x02 0x16	Set Zone #2 End	0x00 0x13 0x00 0x02
ON	22	0x07 0x01 0x16	Set Zone #2 Start	0x00 0x11 0x00 0x02
SET	22	0x07 0x04 0x16	Pre-Set Scene #22	0x00 0x03 0x00 0x16
SHOT	22	0x07 0x05 0x16	Pre-Set Recall #22	0x00 0x07 0x00 0x16
OFF	23	0x07 0x02 0x17	Disable Auto-Shutter	*Use the Spectra's Menu*
			Set Zone #3 End	0x00 0x13 0x00 0x03
ON	23	0x07 0x01 0x17	Enable Auto-Shutter	*Use the Spectra's Menu*
			Set Zone #3 Start	0x00 0x11 0x00 0x03
SET	23	0x07 0x04 0x17	Pre-Set Scene #23	0x00 0x03 0x00 0x17
SHOT	23	0x07 0x05 0x17	Pre-Set Recall #23	0x00 0x07 0x00 0x17
OFF	24	0x07 0x02 0x18	Disable Auto-Shutter when Moving	*Not Implemented*
			Set Zone #4 End	0x00 0x13 0x00 0x04
ON	24	0x07 0x01 0x18	Enable Auto-Shutter when Moving	*Not Implemented*
			Set Zone #4 Start	0x00 0x11 0x00 0x04
SET	24	0x07 0x04 0x18	Pre-Set Scene #24	0x00 0x03 0x00 0x18
SHOT	24	0x07 0x05 0x18	Pre-Set Recall #24	0x00 0x07 0x00 0x18
OFF	25	0x07 0x02 0x19	Set Zone #5 End	0x00 0x13 0x00 0x05
ON	25	0x07 0x01 0x19	Set Zone #5 Start	0x00 0x11 0x00 0x05
SET	25	0x07 0x04 0x19	Pre-Set Scene #25	0x00 0x03 0x00 0x19
SHOT	25	0x07 0x05 0x19	Pre-Set Recall #25	0x00 0x07 0x00 0x19
OFF	26	0x07 0x02 0x1A	Set Zone #6 End	0x00 0x13 0x00 0x06
ON	26	0x07 0x01 0x1A	Set Zone #6 Start	0x00 0x11 0x00 0x06
SET	26	0x07 0x04 0x1A	Pre-Set Scene #26	0x00 0x03 0x00 0x1A

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Burle Command			Unit Action	Comments
SHOT	26	0x07 0x05 0x1A	Pre-Set Recall #26	0x00 0x07 0x00 0x1A
OFF	27	0x07 0x02 0x1B	Set Zone #7 End	0x00 0x13 0x00 0x07
ON	27	0x07 0x01 0x1B	Set Zone #7 Start	0x00 0x11 0x00 0x07
SET	27	0x07 0x04 0x1B	Pre-Set Scene #27	0x00 0x03 0x00 0x1B
SHOT	27	0x07 0x05 0x1B	Pre-Set Recall #27	0x00 0x07 0x00 0x1B
OFF	28	0x07 0x02 0x1C	Set Zone #8 End	0x00 0x13 0x00 0x08
ON	28	0x07 0x01 0x1C	Set Zone #8 Start	0x00 0x11 0x00 0x08
SET	28	0x07 0x04 0x1C	Pre-Set Scene #28	0x00 0x03 0x00 0x1C
SHOT	28	0x07 0x05 0x1C	Pre-Set Recall #28	0x00 0x07 0x00 0x1C
OFF	29	0x07 0x02 0x1D	—	—
ON	29	0x07 0x01 0x1D	—	—
SET	29	0x07 0x04 0x1D	Pre-Set Scene #29	0x00 0x03 0x00 0x1D
SHOT	29	0x07 0x05 0x1D	Pre-Set Recall #29	0x00 0x07 0x00 0x1D
OFF	30	0x07 0x02 0x1E	Disable Auto White Balance	*Use the Spectra's Menu*
ON	30	0x07 0x01 0x1E	Enable Auto White Balance	*Use the Spectra's Menu*
SET	30	0x07 0x04 0x1E	Pre-Set Scene #30	0x00 0x03 0x00 0x1E
SHOT	30	0x07 0x05 0x1E	Pre-Set Recall #30	0x00 0x07 0x00 0x1E
OFF	31	0x07 0x02 0x1F	Decrement Red Adjust	*Use the Spectra's Menu*
			Select zoom speed #1	0x00 0x25 0x00 0x00
ON	31	0x07 0x01 0x1F	Increment Red Adjust	*Use the Spectra's Menu*
			Select focus speed #1	0x00 0x27 0x00 0x00
SET	31	0x07 0x04 0x1F	Pre-Set Scene #31	0x00 0x03 0x00 0x1F
SHOT	31	0x07 0x05 0x1F	Pre-Set Recall #31	0x00 0x07 0x00 0x1F
OFF	32	0x07 0x02 0x20	Decrement Blue Adjust	*Use the Spectra's Menu*
			Select zoom speed #2	0x00 0x25 0x00 0x01
ON	32	0x07 0x01 0x20	Increment Blue Adjust	*Use the Spectra's Menu*
			Select focus speed #2	0x00 0x27 0x00 0x01
SET	32	0x07 0x04 0x20	Pre-Set Scene #32	0x00 0x03 0x00 0x20
SHOT	32	0x07 0x05 0x20	Pre-Set Recall #32	0x00 0x07 0x00 0x20
OFF	33	0x07 0x02 0x21	Decrement R-Y Hue Adjust	*Use the Spectra's Menu*
			Select zoom speed #3	0x00 0x25 0x00 0x02
ON	33	0x07 0x01 0x21	Increment R-Y Hue Adjust	*Use the Spectra's Menu*
			Select focus speed #3	0x00 0x27 0x00 0x02
SET	33	0x07 0x04 0x21	Pre-Set Scene #33	0x00 0x03 0x00 0x23

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Burle Command			Unit Action	Comments
SHOT	33	0x07 0x05 0x21	Pre-Set Recall #33	0x00 0x07 0x00 0x23
OFF	34	0x07 0x02 0x22	Decrement B-Y Hue Adjust	*Use the Spectra's Menu*
			Select zoom speed #4	0x00 0x25 0x00 0x03
ON	34	0x07 0x01 0x22	Increment B-Y Hue Adjust	*Use the Spectra's Menu*
			Select focus speed #4	0x00 0x27 0x00 0x03
SET	34	0x07 0x04 0x22	Pre-Set Scene #34	0x00 0x03 0x00 0x24
SHOT	34	0x07 0x05 0x22	Pre-Set Recall #34	0x00 0x07 0x00 0x24
OFF	35	0x07 0x02 0x23	Outdoor White Balance	*Not Implemented*
ON	35	0x07 0x01 0x23	Indoor White Balance	*Not Implemented*
SET	35	0x07 0x04 0x23	Pre-Set Scene #35	0x00 0x03 0x00 0x25
SHOT	35	0x07 0x05 0x23	Pre-Set Recall #35	0x00 0x07 0x00 0x25
OFF	36	0x07 0x02 0x24	—	—
ON	36	0x07 0x01 0x24	—	—
SET	36	0x07 0x04 0x24	Pre-Set Scene #36	0x00 0x03 0x00 0x26
SHOT	36	0x07 0x05 0x24	Pre-Set Recall #36	0x00 0x07 0x00 0x26
OFF	37	0x07 0x02 0x25	—	—
ON	37	0x07 0x01 0x25	—	—
SET	37	0x07 0x04 0x25	Pre-Set Scene #37	0x00 0x03 0x00 0x27
SHOT	37	0x07 0x05 0x25	Pre-Set Recall #37	0x00 0x07 0x00 0x27
OFF	38	0x07 0x02 0x26	—	—
ON	38	0x07 0x01 0x26	—	—
SET	38	0x07 0x04 0x26	Pre-Set Scene #38	0x00 0x03 0x00 0x28
SHOT	38	0x07 0x05 0x26	Pre-Set Recall #38	0x00 0x07 0x00 0x28
OFF	39	0x07 0x02 0x27	Remove IR filter	0x00 0x07 0x00 0x59
ON	39	0x07 0x01 0x27	Insert IR filter	0x00 0x07 0x00 0x58
SET	39	0x07 0x04 0x27	Pre-Set Scene #39	0x00 0x03 0x00 0x29
SHOT	39	0x07 0x05 0x27	Pre-Set Recall #39	0x00 0x07 0x00 0x29
OFF	40	0x07 0x02 0x28	—	—
ON	40	0x07 0x01 0x28	Restore Defaults	*Use the Spectra's Menu*
			Manual left limit stop	0x00 0x03 0x00 0x5A
SET	40	0x07 0x04 0x28	Pre-Set Scene #40	0x00 0x03 0x00 0x2A
SHOT	40	0x07 0x05 0x28	Pre-Set Recall #40	0x00 0x07 0x00 0x2A
OFF	41	0x07 0x02 0x29	Decrease Line Lock Phase Delay	*Use the Spectra's Menu*
ON	41	0x07 0x01 0x29	Increase Line Lock Phase Delay	*Use the Spectra's Menu*

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Burle Command			Unit Action	Comments
			Manual right limit stop	0x00 0x03 0x00 0x5B
SET	41	0x07 0x04 0x29	Pre-Set Scene #41	0x00 0x03 0x00 0x2B
SHOT	41	0x07 0x05 0x29	Pre-Set Recall #41	0x00 0x07 0x00 0x2B
OFF	42	0x07 0x02 0x2A	Internal Sync mode	*Use the Spectra's Menu*
ON	42	0x07 0x01 0x2A	External Sync mode	*Use the Spectra's Menu*
			Scan left limit stop	0x00 0x03 0x00 0x5C
SET	42	0x07 0x04 0x2A	Pre-Set Scene #42	0x00 0x03 0x00 0x2C
SHOT	42	0x07 0x05 0x2A	Pre-Set Recall #42	0x00 0x07 0x00 0x2C
OFF	43	0x07 0x02 0x2B	Disable AGC	*Use the Spectra's Menu*
ON	43	0x07 0x01 0x2B	Enable AGC	*Use the Spectra's Menu*
			Scan right limit stop	0x00 0x03 0x00 0x5D
SET	43	0x07 0x04 0x2B	Pre-Set Scene #43	0x00 0x03 0x00 0x2D
SHOT	43	0x07 0x05 0x2B	Pre-Set Recall #43	0x00 0x07 0x00 0x2D
OFF	44	0x07 0x02 0x2C	Soften Picture	*Use the Spectra's Menu*
			Re-Calibrate camera	0x00 0x0F 0x00 0x00
ON	44	0x07 0x01 0x2C	Sharpen Picture	*Use the Spectra's Menu*
			Move to factory home	0x00 0x07 0x00 0x22
SET	44	0x07 0x04 0x2C	Pre-Set Scene #44	0x00 0x03 0x00 0x2E
SHOT	44	0x07 0x05 0x2C	Pre-Set Recall #44	0x00 0x07 0x00 0x2E
OFF	45	0x07 0x02 0x2D	Disable Field of View Optimize	*Not Implemented*
ON	45	0x07 0x01 0x2D	Enable Field of View Optimize	*Not Implemented*
			Enable Menu Mode	0x00 0x03 0x00 0x5F
SET	45	0x07 0x04 0x2D	Pre-Set Scene #45	0x00 0x03 0x00 0x2F
SHOT	45	0x07 0x05 0x2D	Pre-Set Recall #45	0x00 0x07 0x00 0x2F
OFF	46	0x07 0x02 0x2E	Stop a scan	0x00 0x07 0x00 0x60
ON	46	0x07 0x01 0x2E	Stop a scan	0x00 0x07 0x00 0x60
SET	46	0x07 0x04 0x2E	Pre-Set Scene #46	0x00 0x03 0x00 0x30
SHOT	46	0x07 0x05 0x2E	Pre-Set Recall #46	0x00 0x07 0x00 0x30
OFF	47	0x07 0x02 0x2F	—	—
ON	47	0x07 0x01 0x2F	Activate random scanning	0x00 0x07 0x00 0x61
SET	47	0x07 0x04 0x2F	Pre-Set Scene #47	0x00 0x03 0x00 0x31
SHOT	47	0x07 0x05 0x2F	Pre-Set Recall #47	0x00 0x07 0x00 0x31
OFF	48	0x07 0x02 0x30	—	—
ON	48	0x07 0x01 0x30	Activate frame scanning	0x00 0x07 0x00 0x62
SET	48	0x07 0x04 0x30	Pre-Set Scene #48	0x00 0x03 0x00 0x32

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Burle Command			Unit Action	Comments
SHOT	48	0x07 0x05 0x30	Pre-Set Recall #48	0x00 0x07 0x00 0x32
OFF	49	0x07 0x02 0x31	—	—
ON	49	0x07 0x01 0x31	Activate continous scanning	0x00 0x07 0x00 0x63
SET	49	0x07 0x04 0x31	Pre-Set Scene #49	0x00 0x03 0x00 0x33
SHOT	49	0x07 0x05 0x31	Pre-Set Recall #49	0x00 0x07 0x00 0x33
OFF	50	0x07 0x02 0x32	Stop Continous Playback	0x00 0x07 0x00 0x60
ON	50	0x07 0x01 0x32	Start Continous Playback	0x00 0x23 0x00 0x00
SET	50	0x07 0x04 0x32	Pre-Set Scene #50	0x00 0x03 0x00 0x34
SHOT	50	0x07 0x05 0x32	Pre-Set Recall #50	0x00 0x07 0x00 0x34
OFF	51	0x07 0x02 0x33	Stop Single Playback	*Not Implemented*
			Stop Playback of 1^{nd} half of pattern	0x00 0x07 0x00 0x60
ON	51	0x07 0x01 0x33	Start Single Playback	*Not Implemented*
			Start Playback of 1^{st} half of pattern	0x00 0x23 0x00 0x01
SET	51	0x07 0x04 0x33	Pre-Set Scene #51	0x00 0x03 0x00 0x35
SHOT	51	0x07 0x05 0x33	Pre-Set Recall #51	0x00 0x07 0x00 0x35
OFF	52	0x07 0x02 0x34	Stop Playback of 2^{nd} half of pattern	0x00 0x07 0x00 0x60
ON	52	0x07 0x01 0x34	Start Playback of 2^{st} half of pattern	0x00 0x23 0x00 0x02
SET	52	0x07 0x04 0x34	Pre-Set Scene #52	0x00 0x03 0x00 0x36
SHOT	52	0x07 0x05 0x34	Pre-Set Recall #52	0x00 0x07 0x00 0x36
OFF	53	0x07 0x02 0x35	Stop Long Record	0x00 0x21 0x00 0x00
ON	53	0x07 0x01 0x35	Start Long Record	0x00 0x1F 0x00 0x00
SET	53	0x07 0x04 0x35	Pre-Set Scene #53	0x00 0x03 0x00 0x37
SHOT	53	0x07 0x05 0x35	Pre-Set Recall #53	0x00 0x07 0x00 0x37
OFF	54	0x07 0x02 0x36	Stop Record 1^{st} Half of pattern	0x00 0x21 0x00 0x01
ON	54	0x07 0x01 0x36	Start Record 1^{st} Half of pattern	0x00 0x1F 0x00 0x01
SET	54	0x07 0x04 0x36	Pre-Set Scene #54	0x00 0x03 0x00 0x38
SHOT	54	0x07 0x05 0x36	Pre-Set Recall #54	0x00 0x07 0x00 0x38
OFF	55	0x07 0x02 0x37	Stop Record 2^{nd} Half of pattern	0x00 0x21 0x00 0x02

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Burle Command			Unit Action	Comments
ON	55	0x07 0x01 0x37	Start Record 2^{nd} Half of pattern	0x00 0x1F 0x00 0x02
SET	55	0x07 0x04 0x37	Pre-Set Scene #55	0x00 0x03 0x00 0x39
SHOT	55	0x07 0x05 0x37	Pre-Set Recall #55	0x00 0x07 0x00 0x39
OFF	56	0x07 0x02 0x38	—	—
ON	56	0x07 0x01 0x38	Flip	0x00 0x07 0x00 0x21
SET	56	0x07 0x04 0x38	Pre-Set Scene #56	0x00 0x03 0x00 0x3A
SHOT	56	0x07 0x05 0x38	Pre-Set Recall #56	0x00 0x07 0x00 0x3A
OFF	57	0x07 0x02 0x39	—	—
ON	57	0x07 0x01 0x39	—	—
SET	57	0x07 0x04 0x39	Pre-Set Scene #57	0x00 0x03 0x00 0x3B
SHOT	57	0x07 0x05 0x39	Pre-Set Recall #57	0x00 0x07 0x00 0x3B
OFF	58	0x07 0x02 0x3A	—	—
ON	58	0x07 0x01 0x3A	—	—
SET	58	0x07 0x04 0x3A	Pre-Set Scene #58	0x00 0x03 0x00 0x3C
SHOT	58	0x07 0x05 0x3A	Pre-Set Recall #58	0x00 0x07 0x00 0x3C
OFF	59	0x07 0x02 0x3B	—	—
ON	59	0x07 0x01 0x3B	—	—
SET	59	0x07 0x04 0x3B	Pre-Set Scene #59	0x00 0x03 0x00 0x3D
SHOT	59	0x07 0x05 0x3B	Pre-Set Recall #59	0x00 0x07 0x00 0x3D
OFF	60	0x07 0x02 0x3C	Disable On-Screen Display	0x00 0x1D 0x00 0x00
ON	60	0x07 0x01 0x3C	Enable On-Screen Display	0x00 0x1B 0x00 0x00
SET	60	0x07 0x04 0x3C	Pre-Set Scene #60	0x00 0x03 0x00 0x3E
SHOT	60	0x07 0x05 0x3C	Pre-Set Recall #60	0x00 0x07 0x00 0x3E
OFF	61	0x07 0x02 0x3D	Stop On-Screen Display Adjust	*Not Implemented*
ON	61	0x07 0x01 0x3D	Start On-Screen Display Adjust	*Not Implemented*
SET	61	0x07 0x04 0x3D	Pre-Set Scene #61	0x00 0x03 0x00 0x3F
SHOT	61	0x07 0x05 0x3D	Pre-Set Recall #61	0x00 0x07 0x00 0x3F
OFF	62	0x07 0x02 0x3E	Pre-Set Title Adjust	*Not Implemented*
ON	62	0x07 0x01 0x3E	Pre-Set Title Adjust	*Not Implemented*
SET	62	0x07 0x04 0x3E	Pre-Set Scene #62	0x00 0x03 0x00 0x40
SHOT	62	0x07 0x05 0x3E	Pre-Set Recall #62	0x00 0x07 0x00 0x40
OFF	63	0x07 0x02 0x3F	Stop Zone Title Adjust	*Not Implemented*
ON	63	0x07 0x01 0x3F	Start Zone Title Adjust	*Not Implemented*

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Burle Command			Unit Action	Comments
SET	63	0x07 0x04 0x3F	Pre-Set Scene #63	0x00 0x03 0x00 0x41
SHOT	63	0x07 0x05 0x3F	Pre-Set Recall #63	0x00 0x07 0x00 0x41
OFF	64	0x07 0x02 0x40	—	—
ON	64	0x07 0x01 0x40	—	—
SET	64	0x07 0x04 0x40	—	—
SHOT	64	0x07 0x05 0x40	—	—
OFF	65	0x07 0x02 0x41	—	—
ON	65	0x07 0x01 0x41	—	—
SET	65	0x07 0x04 0x41	—	—
SHOT	65	0x07 0x05 0x41	—	—
OFF	66	0x07 0x02 0x42	—	—
ON	66	0x07 0x01 0x42	Show Software Version of TXB-B	—
SET	66	0x07 0x04 0x42	—	—
SHOT	66	0x07 0x05 0x42	—	—
OFF	88	0x07 0x02 0x58	—	—
ON	88	0x07 0x01 0x58	—	—
SET	88	0x07 0x04 0x58	—	—
SHOT	88	0x07 0x05 0x58	Insert IR filter	0x00 0x07 0x00 0x58
OFF	89	0x07 0x02 0x59	—	—
ON	89	0x07 0x01 0x59	—	—
SET	89	0x07 0x04 0x59	—	—
SHOT	89	0x07 0x05 0x59	Remove IR filter	0x00 0x07 0x00 0x59
OFF	90	0x07 0x02 0x5A	—	—
ON	90	0x07 0x01 0x5A	—	—
SET	90	0x07 0x04 0x5A	Manual left limit stop	0x00 0x03 0x00 0x5A
SHOT	90	0x07 0x05 0x5A	—	—
OFF	91	0x07 0x02 0x5B	Normal Zoom Polarity	*Not Implemented*
ON	91	0x07 0x01 0x5B	Reverse Zoom Polarity	*Not Implemented*
SET	91	0x07 0x04 0x5B	Manual right limit stop	0x00 0x03 0x00 0x5B
SHOT	91	0x07 0x05 0x5B	—	—
OFF	92	0x07 0x02 0x5C	Normal Focus Polarity	*Not Implemented*
ON	92	0x07 0x01 0x5C	Reverse Focus Polarity	*Not Implemented*
SET	92	0x07 0x04 0x5C	Scan left limit stop	0x00 0x03 0x00 0x5C
SHOT	92	0x07 0x05 0x5C	—	—
OFF	93	0x07 0x02 0x5D	Normal Iris Polarity	*Not Implemented*
ON	93	0x07 0x01 0x5D	Reverse Iris Polarity	*Not Implemented*

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Burle Command			Unit Action	Comments	
SET	93	0x07 0x04 0x5D	Scan right limit stop	0x00 0x03 0x00 0x5D	
SHOT	93	0x07 0x05 0x5D	—	—	
OFF	94	0x07 0x02 0x5E	—	—	
ON	94	0x07 0x01 0x5E	—	—	
SET	94	0x07 0x04 0x5E	—	—	
SHOT	94	0x07 0x05 0x5E	—	—	
OFF	95	0x07 0x02 0x5F	—	—	
ON	95	0x07 0x01 0x5F	—	—	
SET	95	0x07 0x04 0x5F	Enable Memu Mode	0x00 0x03 0x00 0x5F	
SHOT	95	0x07 0x05 0x5F	—	—	
OFF	96	0x07 0x02 0x60	—	—	
ON	96	0x07 0x01 0x60	—	—	
SET	96	0x07 0x04 0x60	—	—	
SHOT	96	0x07 0x05 0x60	Stop a Scan	0x00 0x07 0x00 0x60	
OFF	97	0x07 0x02 0x61	—	—	
ON	97	0x07 0x01 0x61	—	—	
SET	97	0x07 0x04 0x61	—	—	
SHOT	97	0x07 0x05 0x61	Activate Random Scanning	0x00 0x07 0x00 0x61	
OFF	98	0x07 0x02 0x62	—	—	
ON	98	0x07 0x01 0x62	—	—	
SET	98	0x07 0x04 0x62	—	—	
SHOT	98	0x07 0x05 0x62	Activate Frame Scanning	0x00 0x07 0x00 0x62	
OFF	99	0x07 0x02 0x63	—	—	
ON	99	0x07 0x01 0x63	—	—	
SET	99	0x07 0x04 0x63	—	—	
SHOT	99	0x07 0x05 0x63	Activate Continous Scanning	0x00 0x07 0x00 0x63	
OFF	100	0x07 0x02 0x64	Stop Record	0x00 0x21 0x00 0x00	
ON	100	0x07 0x01 0x64	Start Record	0x00 0x1F 0x00 0x00	
SET	100	0x07 0x04 0x64	—	—	
SHOT	100	0x07 0x05 0x64	—	—	
OFF	101	0x07 0x02 0x65	Stop Record 1^{st} Half	0x00 0x21 0x00 0x01	
ON	101	0x07 0x01 0x65	Start Record 1^{st} Half	0x00 0x1F 0x00 0x01	
SET	101	0x07 0x04 0x65	Left Limit	0x00 0x03 0x00 0x5C	
SHOT	101	0x07 0x05 0x65	—	—	
OFF	102	0x07 0x02 0x66	Stop Record 2^{nd} Half	0x00 0x21 0x00 0x02	
ON	102	0x07 0x01 0x66	Start Record 2^{nd} Half	0x00 0x1F 0x00 0x02	

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Burle Command			Unit Action	Comments
SET	102	0x07 0x04 0x66	Right Limit	0x00 0x03 0x00 0x5D
SHOT	102	0x07 0x05 0x66	—	—
OFF	103	0x07 0x02 0x67	—	—
ON	103	0x07 0x01 0x67	—	—
SET	103	0x07 0x04 0x67	Lock Commands	*Not Implemented*
SHOT	103	0x07 0x05 0x67	—	—
OFF	104	0x07 0x02 0x68	—	—
ON	104	0x07 0x01 0x68	—	—
SET	104	0x07 0x04 0x68	Unlock Commands	*Not Implemented*
SHOT	104	0x07 0x05 0x68	—	—
OFF	110	0x07 0x02 0x6E	—	—
ON	110	0x07 0x01 0x6E	—	—
SET	110	0x07 0x04 0x6E	Re-Calibrate camera	0x00 0x0F 0x00 0x00
SHOT	110	0x07 0x05 0x6E	Move to factory home	0x00 0x07 0x00 0x22
OFF	111	0x07 0x02 0x6F	—	—
ON	111	0x07 0x01 0x6F	—	—
SET	111	0x07 0x04 0x6F	—	—
SHOT	111	0x07 0x05 0x6F	Flip	0x00 0x07 0x00 0x21
OFF	180	0x07 0x12 0x34	—	—
ON	180	0x07 0x11 0x34	—	—
SET	180	0x07 0x14 0x34	—	—
SHOT	180	0x07 0x15 0x34	Flip	0x00 0x07 0x00 0x21
OFF	500	0x07 0x32 0x74	—	—
ON	500	0x07 0x31 0x74	—	—
SET	500	0x07 0x34 0x74	Erase Record to End	*Not Implemented*
SHOT	500	0x07 0x35 0x74	—	—
OFF	900	0x07 0x72 0x04	—	—
ON	900	0x07 0x71 0x04	—	—
SET	900	0x07 0x74 0x04	Restore Pre-set Tour	*Not Implemented*
SHOT	900	0x07 0x75 0x04	Reset Pre-set Tour	*Not Implemented*
OFF	901 $\rightarrow$ 999	0x07 0x72 0x05	—	—
ON	901 $\rightarrow$ 999	0x07 0x71 0x05	—	—
SET	901 $\rightarrow$ 999	0x07 0x74 0x05	Modify Pre-set Tour	*Not Implemented*
SHOT	901 $\rightarrow$ 999	0x07 0x75 0x05	Modify Pre-set Tour	*Not Implemented*

1.11 Program Maintenance Information

1.11.1 Q: Gosh, this must have been difficult to debug. How was it done?

A: Very carefully with built in debug code. To enable debug mode:

- Set bit 8 on the switch.
- Connect an RS-232 ASCII terminal to pin 7 and ground of U1 in the TXB-B as follows:
  - For a 25 pin RS-232 connector:
    - U1-7 (J4-square) to pin 3 on a DB-25 type connector.
    - Ground (J4-circular) to pin 7 on a DB-25 type connector.
  - For a 9 pin RS-232 connector:
    - U1-7 (J4-square) to pin 2 on a DB-9 type connector.
    - Ground (J4-circular) to pin 5 on a DB-9 type connector.

  Then on the left side of the screen there will be a command count and the command data as it was received from the Burle equipment. On the right side there is the command data that is being sent to the Spectra.

  Sometimes in debug mode Burle commands will be lost, but so what? You are running in debug mode, not real mode.

  The RS-232 ASCII terminal must be set up for:

  - 19200 baud
  - One start bit
  - One stop bit
  - Seven or eight data bits
  - No parity

1.11.2 Q: Does the debug display show up on the video monitor?

A: No it does not, it only shows up on an external serial ASCII terminal. It is a debugging aid and showing this type of information on a video monitor would make debugging the interface to the Spectra very difficult.

1.11.3 Q: What does this display look like? I saw the writeup in the footnote but it still isn't clear to me what it contains.

A: It is unlikely that anyone other than a software maintainer of the TXB-B program will ever need to know the answer to that question. However here is a small sample of what it looks like, with some notes as the contents of each field for a "pan left" command sequence from a variable speed keyboard.

```
      A B<-------------------->B   C<---------------->C   D<---------------->D
 1 " 8F 87 00 00 08  00 08 02 19   FF 01 00 04 0B 00 10 "
 2 " 90 87 00 00 08  00 18 02 29   FF 01 00 04 13 00 18 "
 3 " 91 87 00 00 08  00 30 02 41   FF 01 00 04 1F 00 24 "
 4 " 92 87 00 00 08  00 38 02 49   FF 01 00 04 23 00 28 "
 5 " 93 87 00 00 08  00 40 02 51   FF 01 00 04 27 00 2C "
 6 " 94 87 00 00 08  00 48 02 59   FF 01 00 04 2B 00 30 "
 7 " 95 87 00 00 08  00 50 02 61   FF 01 00 04 2F 00 34 "
 8 " 96 87 00 00 08  00 58 02 69   FF 01 00 04 33 00 38 "
 9 " 97 87 00 00 08  00 58 02 69 "
10  <Followed by 28 identical entries>
11 " B3 87 00 00 08  00 58 02 69 "
12 " B4 87 00 00 08  00 58 02 69   FF 01 00 04 33 00 38 "
13 " B5 87 00 00 08  00 58 02 69 "
14   <Followed by 28 identical entries>
15 " D1 87 00 00 08  00 58 02 69 "
16 " D2 87 00 00 08  00 58 02 69   FF 01 00 04 33 00 38 "
17 " D3 87 00 00 08  00 58 02 69 "
18   <Followed by 20 identical entries>
19 " E7 87 00 00 08  00 58 02 69 "
20 " E8 87 00 00 08  00 50 02 61   FF 01 00 04 2F 00 34 "
21 " E9 87 00 00 08  00 40 02 51   FF 01 00 04 27 00 2C "
22 " EA 87 00 00 08  00 20 02 31   FF 01 00 04 17 00 1C "
23 " EB 87 00 00 08  00 00 00 0F   FF 01 00 00 00 00 01   FF 01 00 00 00 00 01 "
24 " EC 86 00 00 07  05 6F 01      FF 01 00 07 00 21 29 "
25 " ED 86 00 00 07  15 34 56      FF 01 00 07 00 21 29 "
26 " EE 86 00 00 07  05 02 14      FF 01 00 07 00 02 0A "
      A B<-------------------->B   C<---------------->C   D<---------------->D
```

Note that the numbers on the left ($1 \rightarrow 26$), the letters on the top ($A \rightarrow D$) and the quote marks " are only used for documentation and do not appear on the screen. Also please note that the statements about repeating lines are not in the original.

Notes to the above sample listing.

A This is a hex field that increments by one for each command received from a Burle head end. It is an 8 bit number that wraps at `0xFF` around to `0x00`. It is rare that the total number of commands sent from a head end is important, but it is quite often important to know if two or three identical commands were sent. So by carefully watching the Ⓐ column, it is easy to identify multiple command sendings. (As long as there are less than 256 of them!)

B This is the command as output by the Burle equipment.

1. The first byte is a Burle format command. Note that it has its most significant bit set and that the rest of the byte is the number of following bytes. There are only two valid values for this byte: it may be either `0x87` or `0x86`, any other value and its corresponding command is thrown away. If the most significant bit on any byte after the first is set then the whole message is thrown away.
2. Then come two bytes as address fields of the command. The first one is used by the TXB-B to determine if the message might be for it. The second one is used by the

TXB-B and the Spectra to actually receive the message. If the second one does not match the address switches on the Spectra the message is thrown away. If first address byte does not match the address switches on the TXB-B the message is thrown away.

3. The fourth byte is the Burle opcode. The TXB-B processes opcodes `2`, `4`, `5`, `6`, `7` and `8`. Others are thrown away (I hope).
4. Next come either two or three bytes of Burle formatted command data. These are the data bytes of the command, with some op codes there are only two data bytes. To get the exact meaning of the various bits in each byte for each opcode see the protocol document.
5. Then comes a checksum for the command.

C This is the D protocol command generated by the TXB-B. The various bytes are:

1. The first byte is the "sync" byte and always consists of all ones.
2. The next byte is the D protocol address byte which gets sent to the Spectra. Note that it is always one greater than the address in the Burle protocol command. The Burle protocol is "zero based" and the D protocol is "one based". In all of this example the commands were sent to unit #`1`, i.e. the Spectra and the Burle keyboard were both set to `1`.
3. Then next two bytes are the "Command 1" and "Command 2" bytes of the D protocol.
4. The command bytes are followed by the "Data 1" and " Data 2" bytes of the D protocol.
5. Last there is the D protocol checksum. Note that it does not include the "sync", or first byte in it.

D Some commands have a stop motion command following them. These are indicated here. The fields are identical to those shown for block ©. This "stop all" command is automatically generated about 100 ms, following any "motion command"

It should be noted that:

1. The pan bit is set on most of the D protocol commands.
2. The pan speed changes the Burle protocol. This might not be as obvious as it might be as this field crosses two nibbles. I moved the joy stick rapidly and it did not actually hit all 16 steps of the pan speed.
3. The pan bit is set on second command byte of D protocol.
4. The pan speed is indicated in data byte 1 and starts out at other than "zero speed" and goes to a high speed (not "turbo speed", I didn't push the joy stick enough) and then back down.

5. In lines 9 through 11, and again twice more, many commands came into the TXB-B and nothing was sent out. But that after every 30 commands a new D protocol pan command was generated. (In future versions of the TXB-B software this interval may change. Also each keyboard generates repeats at different rates.) This is done to reduce the load on the Spectra as none of the Pelco keyboards continuously send commands. While Burle does send them at least 20 times a second. Every few seconds a command must be sent in D protocol, or the Spectra will time out and assume that it was being told to "run away". (Run away protection consists of stopping motion after about 15 seconds following the last motion causing command.

6. Most commands are eight bytes long, however the last three are only seven bytes long. For some reason or other, Burle does not include the first byte in its length field. Thus the length fields are off by one.

7. At lines 24 and 25 two different commands, SHOT 111 and SHOT 180, are input and generate the same output command. Both of these commands are used by Burle to "flip" a camera.

8. On line 26 is a normal SHOT 2 command.

1.11.4 Q: In addition to the serial debug data that you output, are there any other debug aids that will be left in the final product?

A: Yes, there are two types of built in debugging features that have been left in the final product.

1. The following pins are pulsed as debug outputs when various events occur.

Port C Pin/Marking	Name	Use
18/E8	`EDGE`	Found an edge in the Manchester data
19/E7	`FRAMESYNC`	Found a sync pulse
20/E6	`BYTEFLAG`	True from the start of a byte until 4 bit times through the byte
21/E5	`BYTESYNC`	Pulsed when other than the first byte is detected
22/E4	`INTIMEOUT`	The no turbo mode timer is running
23/E3	`ADDRESSERROR`	Pulsed on detecting an address error
24/E2	`CHECKSUMERROR`	Pulsed on detecting a checksum error
25/E1	`PARITYERROR`	Pulsed on detecting a parity error

2. The following jumper positions have various signals available on them. None of these jumpers are installed, but the two holes are there where it is easy to make a connection to them. In all cases the "circular" pin-hole is for ground and the "square" pin-hole is the signal.

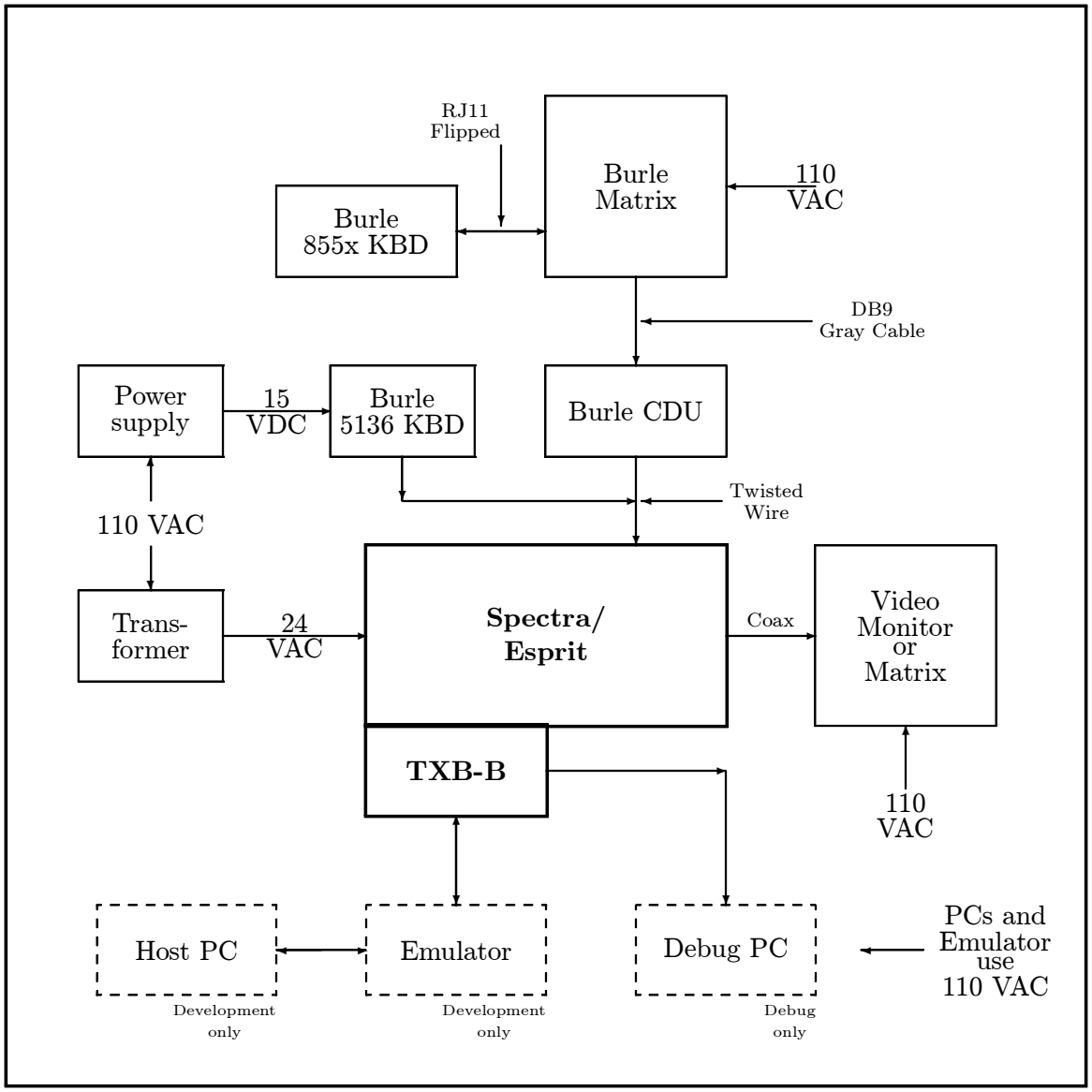
Jumper	Use
J2	Monitor point for data received from the Spectra
J3	Monitor point for data sent to the Spectra
J4	Serial debug data output
J5	"Cleaned up" input data

1.11.5 Q: What are the new part numbers for the TXB-B?

A: An effort was made to not introduce any new part numbers into the Pelco supply system. As a result there are very few additional part numbers required for the TXB-B. The most significant of these are:

1. `PA05-0029-00x0` Is the fully assembled board with many other things on it.
2. `IC01-0928-0057` PIC 16C57C chip that gets stuff written into.
3. `IC51-0036-0111` The programmed IC that gets stuck on the board.
4. `PG51-0036-0111` All combined binary hex files. There is only one `.HEX` file on this project.
5. `BH51-0018-0111` Single binary hex file in `.HEX` format
6. `FW00-0116-0111` Source code for this project. Consists of four files:
   A. The main source file, `TXB-B-U1.ASM`.
   B. MicroChip's chip include file, `P16C57.INC`.
   C. A file of macros, `MACRO.INC`.
   D. A file of protocol definitions, `PROTOCOL.INC`.

Each time a software revision is made, the revision number on the `IC51`, `PG51`, `BH51` and `FW00` parts, must be updated.



$RCSfile: testcnfg.inc,v $

Figure 1. Connection diagram of Spectra and TXB-B

2 Spectra differences

There are many different types of Spectra units. As time has gone by Pelco has made many improvements and different models. All of them feature smooth pan and tilt and various methods (protocols) to control them. Beyond these few common areas of operation there are many differences in capabilities. This is an attempt to list those that affect the TXB-B. (Because of the wide variety of Spectra units available, there are probably errors and omissions in this list. This is caused by a lack of a centralized control point that keeps accurate and readily available information about all of Pelco's products.)

In this table the first items are exact model dependent. I.e. a unit will be either color or monochrome. These values depend on how the unit was shipped from the factory (and on how much it cost). Additionally some features do not exist for some Spectra types, i.e. Spectra Lite has never been available in a 12× optical zoom version, etc. The Spectra column should be considered to include Spectra and Spectra II types of units.

Feature	Spectra	Spectra Lite	Esprit
Color or Monochrome Camera	Yes	No	Yes
Maximum Optical Zoom 12	Yes	No	N/A
Maximum Optical Zoom 16	Yes	Yes	N/A
Maximum Optical Zoom 22	Yes	No	N/A
NTSC or PAL Camera Type	Yes	Yes	Yes
Adjustable Scan Speed	Yes	Yes	Unknown
AGC	Yes	Yes	Unknown
Alarm Inputs	Yes	No	No
Alarm Dwell	Yes	No	No
Alarm Pattern	Yes	No	No
Alarm Priority	Yes	No	No
Alarm Presets	7	No	No
Alarm Resume	Yes	No	No
American Dynamics Mode	Yes	Yes	Yes
Auto Flip Disable	Yes	Yes	N/A
Auto Focus	Yes	Yes	Unknown
Auto Iris	Yes	Yes	Unknown
Auto Park Time	Yes	Yes	Unknown
Auto Scanning	Yes	Yes	Yes
Auxiliary Relays	Yes	No	Unknown
Backlight Compensation	Yes	Yes	Unknown
Camera Reset	Yes	Yes	Unknown
Coaxitron Control Protocol	Yes	Yes	Yes

Continued on the next page.

[10] `$Header: d:/ecr6171/RCS/spectra.inc,v 1.3 2000-11-02 07:54:14-08 Hamilton Exp Hamilton $`

Continued from the previous page.			
Feature	Spectra	Spectra Lite	Esprit
"D" Control Protocol	Yes	Yes	Yes
External Setting of Pan Speed	No	No	Yes
External Setting of Scan Speed	No	No	Yes
External Setting of Tilt Speed	No	No	Yes
Frame Scanning	Yes	Yes	Yes
Gain Setting	Yes	Yes	Unknown
Limit Stops	Yes	Yes	Yes
Maximum Address in C protocol	N/A	N/A	N/A
Maximum Address in D protocol	256	256	256
Maximum Address in P protocol	256	256	256
Maximum Presets	64	32	64
"P" Control Protocol	Yes	Yes	Yes
Park to preset 1	Yes	Yes	Yes
Patterns	6 min	No	6 min
Power Line Synchronization	Yes	Yes	Unknown
Power-up Mode Options	Yes	Yes	Unknown
Proportional Pan and Tilt	Yes	No	Yes
Random Scanning	Yes	Yes	Yes
Sharpness	Yes	Yes	Unknown
Shutter Speed	Yes	Yes	Unknown
"Turbo" Speed in Pan	Yes	Yes	Yes
Video Zone Blanking	Yes	No	Unknown
White Balance	Yes	Yes	Unknown
Zones	8	None	8
Zoom Limit	Yes	No	Unknown

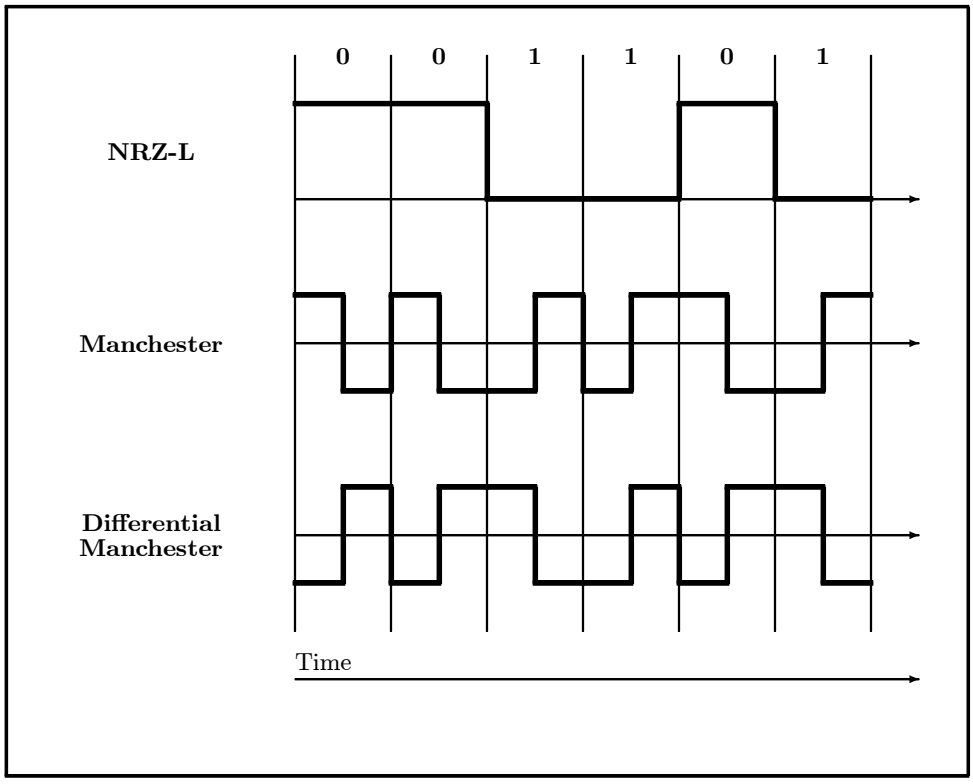
3 Manchester Data Encoding

Manchester encoding[12] is characterized by being "self clocking". This is done by having a data transition at least once per bit period. There are two common ways to implement a Manchester coding system. One is called Manchester and the other is called Differential Manchester.

With Manchester encoding there is a transition of the data at the middle of each bit period. The mid-bit transition serves as a clocking mechanism and also as data: A high-to-low transition represents a zero (0), and a low-to-high transition represents a one (1).

With Differential Manchester, the mid-bit transition is used only to provide clocking. The encoding of a zero (0) is represented by the presence of a transition at the beginning of a bit period, and a one (1) is represented by the absence of a transition at the beginning of a bit period.

Differential Manchester has the added advantage of employing differential encoding. In differential encoding, the signal is decoded by comparing the polarity of one signal element with its preceding element, rather than determine the absolute value of a signal element. One benefit of this scheme is that it may be more reliable to detect a transition in the presence of noise than to compare a value to a threshold. Another benefit is that with a complex transmission layout, it is easy to lose the sense of the polarity of the signal. For example, on a multipoint twisted-pair line, if the leads from an attached device to the twisted pair are accidentally inverted, all ones and zeros for non-differential encoding will be inverted and the sense of the message will be lost. This does not happen with differential encoding.



$RCSfile: biphase.inc,v $

[11] $Header: d:/ecr6171/RCS/manchest.inc,v 1.3 2000-10-13 16:22:25-07 Hamilton Exp Hamilton $

[12] This information was copied from: http://www.gre.ac.uk/ cm34/teaching/icn99/itcnlec06.html.

4 Preliminary Test Procedures

```
$Header: d:/ecr6171/RCS/testing.txt,v 1.1 2000-12-01 09:05:40-08 Hamilton Exp Hamilton $

Special instructions to be used when manufacturing a TXB-B.

1. When programming the PIC, U1 which is a PIC 16C57C, do not attempt to
   verify that the chip has been correctly programmed. The chip has its
   "code protect" logic enabled and you will ALWAYS get an error. (In
   fact if it does compare then an error has occurred!)

2. For testing a fully built TXB-B the following items are required:

        A. A Burle/Philips keyboard, type LTC5136.

        B. A Burle/Philips matrix with a keyboard type LTC8553, a code
           distribution unit TC8568, and a matrix model LTC8801.

           A Burle/Philips matrix with a keyboard TC8550, a code
           distribution unit TC8568, and a matrix model TC8501 may be
           substituted for the above matrix/keyboard.

        C. A Spectra and its power supply.

        D. A monitor directly connected to the Spectra.

        E. Cableing on an as needed basis.

   It is important to note that the keyboard (LTC5136) and the matrix
   (LTC8800/TC8500, et al) generate different formatted commands and
   both of them should be used for the testing. If it is necessary to use
   a substitute, verify with me (Eric Hamilton x3375) that it has a
   chance of working and being useful.

3. Connect everything up. For most of the equipment, each item has a
   different connector. So this should be a simple step.

4. Set the Spectra to some address from 1 to 127. Later on this address
   will have to be entered into the Burle/Philips equipment, but for now
   just remember it.  (It also shows up on the monitor screen during the
   Spectra's power up sequence.)

5. Turn on the Monitor so that it will "warm up" and be able to display
   the initial Spectra configuration screens. Then the Spectra. When this
   is done all the switch positions on the TXB-B should be turned ON.

   The jumper at J1 should be removed.

6. The monitor will now show the normal Spectra screen with the second
   line replaced with the TXB-B's configuration line.

        "TXB Rev  DEBUG FF"

   This indicates that the TXB-B is correctly installed and that all
   portions of the switch will turn on correctly. It should be
   impossible to control the camera at this time. It is not possible to
   detect if the jumper (J1) is installed or not.

7. Turn off the Spectra and change the switch so that all positions are
   OFF, and power up the Spectra again.
```

8. The monitor will now show the normal Spectra screen with the second line replaced with the TXB-B's configuration line.

   "TXB Rev x.xx 00"

   This indicates that the TXB-B is correctly installed and that all portions of the switch will turn OFF correctly. It should be possible to control the camera at this time. If the Burle/Philips equipment and the Spectra have the same address.

   x.xx will usually be the software revision level, however there are two exceptions to this and they are:

   A. The word "BETA" will be used for all beta test software.
   B. The word "TEST" is used for internal test software that MUST NEVER be sent to a customer.
   C. The third option is that the word "DEBUG" will appear whenever bit 8 of the switch is turned on. This indicates that the unit is in debug mode and is completly normal and will always be available.

   Note: Following a power up the first command to the Spectra, following that the configuration messages will be erased.

9. When control of the Spectra is had, then reverse the wires to the Spectra and make the dome move again.

   Note: It is not necessary to power the Spectra down and back up when flipping the various input wires around. The software automatically compensates for any polarity changes.

10. Now try to control the Spectra with the "other" Burle/Philips piece of equipment.

    Note: As in step 9, it is not necessary to power the Spectra down and back up when changing its controlling item. The software automatically compensates for both known formats of Burle/Philips bi-phase data.

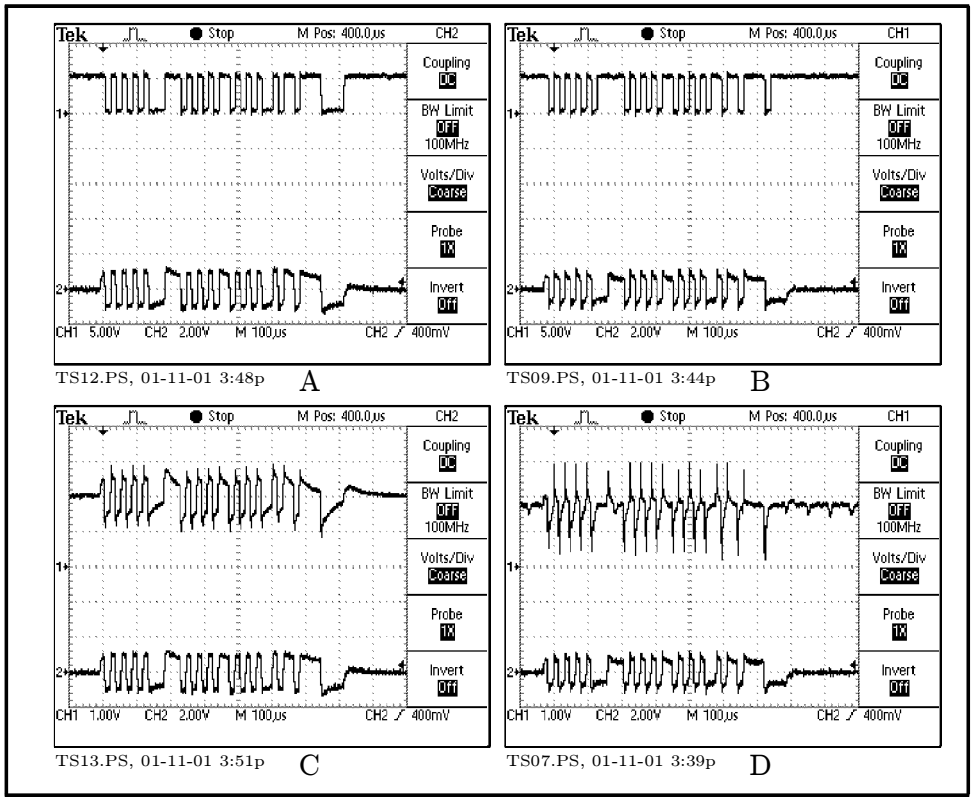
11. And now reverse the "other" Burle/Philips piece of equipment. And verify that the dome continues to move properly.

12. Turn the Spectra off and install J1. Then power the Spectra up and make it move. The correct position for shipped TXB-Bs is to have J1 installed. (It doesn't seem to make much difference if the jumper is installed or not.)

13. And you are done! Be sure to ship the TXB-B with all switch positions in the OFF condition and J1 installed.

5 Failures

As of 12JAN01, there has been one hardware failure discovered. It appears that it was caused by bad part being installed during production of the board.



TS12.PS, TS09.PS, TS13.PS, TS07.PS $RCSfile: badxfmr.inc,v $

Figure 2. Signals from a good and a bad TXB-B. The failure had a bad transformer T1.

Item	Setting/Use
Trace 1	Various signals on the TXB-B board.
Trace 2	Data line in across + and − wires, from an LTC-5136 keyboard.
Figure A	Normal data from J5-circle (J5-square is ground).
Figure B	Bad data from J5-circle (J5-square is ground). Note the change in shape of the sync pulse plus other problems to the signal.
Figure C	Normal input to U3-6.
Figure D	Bad input to U3-6. Problem was traced to a bad transformer (T1).

[13] `$Header: d:/ecr6171/RCS/badxfmr.inc,v 1.2 2001-01-12 10:07:26-08 Hamilton Exp Hamilton $`

6 Spectra addresses with the TXB-B

Block	Low	High	Block	Low	High
0	1	127	21	2,689	2,815
1	129	255	22	2,817	2,943
2	257	383	23	2,945	3,071
3	385	511	24	3,073	3,199
4	513	639	25	3,201	3,327
5	641	767	26	3,329	3,455
6	769	895	27	3,457	3,583
7	897	1,023	28	3,585	3,721
8	1,025	1,151	29	3,723	3,839
9	1,153	1,279	30	3,841	3,967
10	1,281	1,407	31	3,969	4,095
11	1,409	1,535	32	4,097	4,223
12	1,537	1,663	33	4,225	4,351
13	1,665	1,791	34	4,353	4,479
14	1,793	1,919	35	4,481	4,607
15	1,921	2,047	36	4,609	4,735
16	2,049	2,175	37	4,737	4,863
17	2,177	2,303	38	4,865	4,991
18	2,305	2,431	39	4,993	5,119
19	2,433	2,559	40	5,121	5,247
20	2,561	2,687	—	—	—

In the following tables, the column marked zero (0) is used to indicate the address that gets loaded into the Spectra.

0	1	2	3	4	5	6	7	8	9	10	0
1	129	257	385	513	641	769	897	1,025	1,153	1,281	1
2	130	258	386	514	642	770	898	1,026	1,154	1,282	2
3	131	259	387	515	643	771	899	1,027	1,155	1,283	3
4	132	260	388	516	644	772	900	1,028	1,156	1,284	4
5	133	261	389	517	645	773	901	1,029	1,157	1,285	5
6	134	262	390	518	646	774	902	1,030	1,158	1,286	6
7	135	263	391	519	647	775	903	1,031	1,159	1,287	7
8	136	264	392	520	648	776	904	1,032	1,160	1,288	8
9	137	265	393	521	649	777	905	1,033	1,161	1,289	9
10	138	266	394	522	650	778	906	1,034	1,162	1,290	10
11	139	267	395	523	651	779	907	1,035	1,163	1,291	11
12	140	268	396	524	652	780	908	1,036	1,164	1,292	12
13	141	269	397	525	653	781	909	1,037	1,165	1,293	13
14	142	270	398	526	654	782	910	1,038	1,166	1,294	14
15	143	271	399	527	655	783	911	1,039	1,167	1,295	15
16	144	272	400	528	656	784	912	1,040	1,168	1,296	16
17	145	273	401	529	657	785	913	1,041	1,169	1,297	17
18	146	274	402	530	658	786	914	1,042	1,170	1,298	18
19	147	275	403	531	659	787	915	1,043	1,171	1,299	19
20	148	276	404	532	660	788	916	1,044	1,172	1,300	20
21	149	277	405	533	661	789	917	1,045	1,173	1,301	21
0	1	2	3	4	5	6	7	8	9	10	0

Continued on the next page.

[14] `$Header: d:/ecr6171/RCS/address.inc,v 1.9 2000-11-30 08:34:07-08 Hamilton Exp Hamilton $`

Continued from the previous page.

0	1	2	3	4	5	6	7	8	9	10	0
22	150	278	406	534	662	790	918	1,046	1,174	1,302	22
23	151	279	407	535	663	791	919	1,047	1,175	1,303	23
24	152	280	408	536	664	792	920	1,048	1,176	1,304	24
25	153	281	409	537	665	793	921	1,049	1,177	1,305	25
26	154	282	410	538	666	794	922	1,050	1,178	1,306	26
27	155	283	411	539	667	795	923	1,051	1,179	1,307	27
28	156	284	412	540	668	796	924	1,052	1,180	1,308	28
29	157	285	413	541	669	797	925	1,053	1,181	1,309	29
30	158	286	414	542	670	798	926	1,054	1,182	1,310	30
31	159	287	415	543	671	799	927	1,055	1,183	1,311	31
32	160	288	416	544	672	800	928	1,056	1,184	1,312	32
33	161	289	417	545	673	801	929	1,057	1,185	1,313	33
34	162	290	418	546	674	802	930	1,058	1,186	1,314	34
35	163	291	419	547	675	803	931	1,059	1,187	1,315	35
36	164	292	420	548	676	804	932	1,060	1,188	1,316	36
37	165	293	421	549	677	805	933	1,061	1,189	1,317	37
38	166	294	422	550	678	806	934	1,062	1,190	1,318	38
39	167	295	423	551	679	807	935	1,063	1,191	1,319	39
40	168	296	424	552	680	808	936	1,064	1,192	1,320	40
41	169	297	425	553	681	809	937	1,065	1,193	1,321	41
42	170	298	426	554	682	810	938	1,066	1,194	1,322	42
43	171	299	427	555	683	811	939	1,067	1,195	1,323	43
44	172	300	428	556	684	812	940	1,068	1,196	1,324	44
45	173	301	429	557	685	813	941	1,069	1,197	1,325	45
46	174	302	430	558	686	814	942	1,070	1,198	1,326	46
47	175	303	431	559	687	815	943	1,071	1,199	1,327	47
48	176	304	432	560	688	816	944	1,072	1,200	1,328	48
49	177	305	433	561	689	817	945	1,073	1,201	1,329	49
50	178	306	434	562	690	818	946	1,074	1,202	1,330	50
51	179	307	435	563	691	819	947	1,075	1,203	1,331	51
52	180	308	436	564	692	820	948	1,076	1,204	1,332	52
53	181	309	437	565	693	821	949	1,077	1,205	1,333	53
54	182	310	438	566	694	822	950	1,078	1,206	1,334	54
55	183	311	439	567	695	823	951	1,079	1,207	1,335	55
56	184	312	440	568	696	824	952	1,080	1,208	1,336	56
57	185	313	441	569	697	825	953	1,081	1,209	1,337	57
58	186	314	442	570	698	826	954	1,082	1,210	1,338	58
59	187	315	443	571	699	827	955	1,083	1,211	1,339	59
60	188	316	444	572	700	828	956	1,084	1,212	1,340	60
61	189	317	445	573	701	829	957	1,085	1,213	1,341	61
62	190	318	446	574	702	830	958	1,086	1,214	1,342	62
63	191	319	447	575	703	831	959	1,087	1,215	1,343	63
64	192	320	448	576	704	832	960	1,088	1,216	1,344	64
65	193	321	449	577	705	833	961	1,089	1,217	1,345	65
66	194	322	450	578	706	834	962	1,090	1,218	1,346	66
67	195	323	451	579	707	835	963	1,091	1,219	1,347	67
68	196	324	452	580	708	836	964	1,092	1,220	1,348	68
69	197	325	453	581	709	837	965	1,093	1,221	1,349	69
70	198	326	454	582	710	838	966	1,094	1,222	1,350	70
71	199	327	455	583	711	839	967	1,095	1,223	1,351	71
72	200	328	456	584	712	840	968	1,096	1,224	1,352	72
0	1	2	3	4	5	6	7	8	9	10	0

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0	1	2	3	4	5	6	7	8	9	10	0
73	201	329	457	585	713	841	969	1,097	1,225	1,353	73
74	202	330	458	586	714	842	970	1,098	1,226	1,354	74
75	203	331	459	587	715	843	971	1,099	1,227	1,355	75
76	204	332	460	588	716	844	972	1,100	1,228	1,356	76
77	205	333	461	589	717	845	973	1,101	1,229	1,357	77
78	206	334	462	590	718	846	974	1,102	1,230	1,358	78
79	207	335	463	591	719	847	975	1,103	1,231	1,359	79
80	208	336	464	592	720	848	976	1,104	1,232	1,360	80
81	209	337	465	593	721	849	977	1,105	1,233	1,361	81
82	210	338	466	594	722	850	978	1,106	1,234	1,362	82
83	211	339	467	595	723	851	979	1,107	1,235	1,363	83
84	212	340	468	596	724	852	980	1,108	1,236	1,364	84
85	213	341	469	597	725	853	981	1,109	1,237	1,365	85
86	214	342	470	598	726	854	982	1,110	1,238	1,366	86
87	215	343	471	599	727	855	983	1,111	1,239	1,367	87
88	216	344	472	600	728	856	984	1,112	1,240	1,368	88
89	217	345	473	601	729	857	985	1,113	1,241	1,369	89
90	218	346	474	602	730	858	986	1,114	1,242	1,370	90
91	219	347	475	603	731	859	987	1,115	1,243	1,371	91
92	220	348	476	604	732	860	988	1,116	1,244	1,372	92
93	221	349	477	605	733	861	989	1,117	1,245	1,373	93
94	222	350	478	606	734	862	990	1,118	1,246	1,374	94
95	223	351	479	607	735	863	991	1,119	1,247	1,375	95
96	224	352	480	608	736	864	992	1,120	1,248	1,376	96
97	225	353	481	609	737	865	993	1,121	1,249	1,377	97
98	226	354	482	610	738	866	994	1,122	1,250	1,378	98
99	227	355	483	611	739	867	995	1,123	1,251	1,379	99
100	228	356	484	612	740	868	996	1,124	1,252	1,380	100
101	229	357	485	613	741	869	997	1,125	1,253	1,381	101
102	230	358	486	614	742	870	998	1,126	1,254	1,382	102
103	231	359	487	615	743	871	999	1,127	1,255	1,383	103
104	232	360	488	616	744	872	1,000	1,128	1,256	1,384	104
105	233	361	489	617	745	873	1,001	1,129	1,257	1,385	105
106	234	362	490	618	746	874	1,002	1,130	1,258	1,386	106
107	235	363	491	619	747	875	1,003	1,131	1,259	1,387	107
108	236	364	492	620	748	876	1,004	1,132	1,260	1,388	108
109	237	365	493	621	749	877	1,005	1,133	1,261	1,389	109
110	238	366	494	622	750	878	1,006	1,134	1,262	1,390	110
111	239	367	495	623	751	879	1,007	1,135	1,263	1,391	111
112	240	368	496	624	752	880	1,008	1,136	1,264	1,392	112
113	241	369	497	625	753	881	1,009	1,137	1,265	1,393	113
114	242	370	498	626	754	882	1,010	1,138	1,266	1,394	114
115	243	371	499	627	755	883	1,011	1,139	1,267	1,395	115
116	244	372	500	628	756	884	1,012	1,140	1,268	1,396	116
117	245	373	501	629	757	885	1,013	1,141	1,269	1,397	117
118	246	374	502	630	758	886	1,014	1,142	1,270	1,398	118
119	247	375	503	631	759	887	1,015	1,143	1,271	1,399	119
120	248	376	504	632	760	888	1,016	1,144	1,272	1,400	120
121	249	377	505	633	761	889	1,017	1,145	1,273	1,401	121
122	250	378	506	634	762	890	1,018	1,146	1,274	1,402	122
123	251	379	507	635	763	891	1,019	1,147	1,275	1,403	123

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124	252	380	508	636	764	892	1,020	1,148	1,276	1,404	124
125	253	381	509	637	765	893	1,021	1,149	1,277	1,405	125
126	254	382	510	638	766	894	1,022	1,150	1,278	1,406	126
127	255	383	511	639	767	895	1,023	1,151	1,279	1,407	127
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1	1,409	1,537	1,665	1,793	1,921	2,049	2,177	2,305	2,433	2,561	1
2	1,410	1,538	1,666	1,794	1,922	2,050	2,178	2,306	2,434	2,562	2
3	1,411	1,539	1,667	1,795	1,923	2,051	2,179	2,307	2,435	2,563	3
4	1,412	1,540	1,668	1,796	1,924	2,052	2,180	2,308	2,436	2,564	4
5	1,413	1,541	1,669	1,797	1,925	2,053	2,181	2,309	2,437	2,565	5
6	1,414	1,542	1,670	1,798	1,926	2,054	2,182	2,310	2,438	2,566	6
7	1,415	1,543	1,671	1,799	1,927	2,055	2,183	2,311	2,439	2,567	7
8	1,416	1,544	1,672	1,800	1,928	2,056	2,184	2,312	2,440	2,568	8
9	1,417	1,545	1,673	1,801	1,929	2,057	2,185	2,313	2,441	2,569	9
10	1,418	1,546	1,674	1,802	1,930	2,058	2,186	2,314	2,442	2,570	10
11	1,419	1,547	1,675	1,803	1,931	2,059	2,187	2,315	2,443	2,571	11
12	1,420	1,548	1,676	1,804	1,932	2,060	2,188	2,316	2,444	2,572	12
13	1,421	1,549	1,677	1,805	1,933	2,061	2,189	2,317	2,445	2,573	13
14	1,422	1,550	1,678	1,806	1,934	2,062	2,190	2,318	2,446	2,574	14
15	1,423	1,551	1,679	1,807	1,935	2,063	2,191	2,319	2,447	2,575	15
16	1,424	1,552	1,680	1,808	1,936	2,064	2,192	2,320	2,448	2,576	16
17	1,425	1,553	1,681	1,809	1,937	2,065	2,193	2,321	2,449	2,577	17
18	1,426	1,554	1,682	1,810	1,938	2,066	2,194	2,322	2,450	2,578	18
19	1,427	1,555	1,683	1,811	1,939	2,067	2,195	2,323	2,451	2,579	19
20	1,428	1,556	1,684	1,812	1,940	2,068	2,196	2,324	2,452	2,580	20
21	1,429	1,557	1,685	1,813	1,941	2,069	2,197	2,325	2,453	2,581	21
22	1,430	1,558	1,686	1,814	1,942	2,070	2,198	2,326	2,454	2,582	22
23	1,431	1,559	1,687	1,815	1,943	2,071	2,199	2,327	2,455	2,583	23
24	1,432	1,560	1,688	1,816	1,944	2,072	2,200	2,328	2,456	2,584	24
25	1,433	1,561	1,689	1,817	1,945	2,073	2,201	2,329	2,457	2,585	25
26	1,434	1,562	1,690	1,818	1,946	2,074	2,202	2,330	2,458	2,586	26
27	1,435	1,563	1,691	1,819	1,947	2,075	2,203	2,331	2,459	2,587	27
28	1,436	1,564	1,692	1,820	1,948	2,076	2,204	2,332	2,460	2,588	28
29	1,437	1,565	1,693	1,821	1,949	2,077	2,205	2,333	2,461	2,589	29
30	1,438	1,566	1,694	1,822	1,950	2,078	2,206	2,334	2,462	2,590	30
31	1,439	1,567	1,695	1,823	1,951	2,079	2,207	2,335	2,463	2,591	31
32	1,440	1,568	1,696	1,824	1,952	2,080	2,208	2,336	2,464	2,592	32
33	1,441	1,569	1,697	1,825	1,953	2,081	2,209	2,337	2,465	2,593	33
34	1,442	1,570	1,698	1,826	1,954	2,082	2,210	2,338	2,466	2,594	34
35	1,443	1,571	1,699	1,827	1,955	2,083	2,211	2,339	2,467	2,595	35
36	1,444	1,572	1,700	1,828	1,956	2,084	2,212	2,340	2,468	2,596	36
37	1,445	1,573	1,701	1,829	1,957	2,085	2,213	2,341	2,469	2,597	37
38	1,446	1,574	1,702	1,830	1,958	2,086	2,214	2,342	2,470	2,598	38
39	1,447	1,575	1,703	1,831	1,959	2,087	2,215	2,343	2,471	2,599	39
40	1,448	1,576	1,704	1,832	1,960	2,088	2,216	2,344	2,472	2,600	40
41	1,449	1,577	1,705	1,833	1,961	2,089	2,217	2,345	2,473	2,601	41
42	1,450	1,578	1,706	1,834	1,962	2,090	2,218	2,346	2,474	2,602	42
43	1,451	1,579	1,707	1,835	1,963	2,091	2,219	2,347	2,475	2,603	43
44	1,452	1,580	1,708	1,836	1,964	2,092	2,220	2,348	2,476	2,604	44
45	1,453	1,581	1,709	1,837	1,965	2,093	2,221	2,349	2,477	2,605	45
46	1,454	1,582	1,710	1,838	1,966	2,094	2,222	2,350	2,478	2,606	46
47	1,455	1,583	1,711	1,839	1,967	2,095	2,223	2,351	2,479	2,607	47
48	1,456	1,584	1,712	1,840	1,968	2,096	2,224	2,352	2,480	2,608	48
49	1,457	1,585	1,713	1,841	1,969	2,097	2,225	2,353	2,481	2,609	49
50	1,458	1,586	1,714	1,842	1,970	2,098	2,226	2,354	2,482	2,610	50
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51	1,459	1,587	1,715	1,843	1,971	2,099	2,227	2,355	2,483	2,611	51
52	1,460	1,588	1,716	1,844	1,972	2,100	2,228	2,356	2,484	2,612	52
53	1,461	1,589	1,717	1,845	1,973	2,101	2,229	2,357	2,485	2,613	53
54	1,462	1,590	1,718	1,846	1,974	2,102	2,230	2,358	2,486	2,614	54
55	1,463	1,591	1,719	1,847	1,975	2,103	2,231	2,359	2,487	2,615	55
56	1,464	1,592	1,720	1,848	1,976	2,104	2,232	2,360	2,488	2,616	56
57	1,465	1,593	1,721	1,849	1,977	2,105	2,233	2,361	2,489	2,617	57
58	1,466	1,594	1,722	1,850	1,978	2,106	2,234	2,362	2,490	2,618	58
59	1,467	1,595	1,723	1,851	1,979	2,107	2,235	2,363	2,491	2,619	59
60	1,468	1,596	1,724	1,852	1,980	2,108	2,236	2,364	2,492	2,620	60
61	1,469	1,597	1,725	1,853	1,981	2,109	2,237	2,365	2,493	2,621	61
62	1,470	1,598	1,726	1,854	1,982	2,110	2,238	2,366	2,494	2,622	62
63	1,471	1,599	1,727	1,855	1,983	2,111	2,239	2,367	2,495	2,623	63
64	1,472	1,600	1,728	1,856	1,984	2,112	2,240	2,368	2,496	2,624	64
65	1,473	1,601	1,729	1,857	1,985	2,113	2,241	2,369	2,497	2,625	65
66	1,474	1,602	1,730	1,858	1,986	2,114	2,242	2,370	2,498	2,626	66
67	1,475	1,603	1,731	1,859	1,987	2,115	2,243	2,371	2,499	2,627	67
68	1,476	1,604	1,732	1,860	1,988	2,116	2,244	2,372	2,500	2,628	68
69	1,477	1,605	1,733	1,861	1,989	2,117	2,245	2,373	2,501	2,629	69
70	1,478	1,606	1,734	1,862	1,990	2,118	2,246	2,374	2,502	2,630	70
71	1,479	1,607	1,735	1,863	1,991	2,119	2,247	2,375	2,503	2,631	71
72	1,480	1,608	1,736	1,864	1,992	2,120	2,248	2,376	2,504	2,632	72
73	1,481	1,609	1,737	1,865	1,993	2,121	2,249	2,377	2,505	2,633	73
74	1,482	1,610	1,738	1,866	1,994	2,122	2,250	2,378	2,506	2,634	74
75	1,483	1,611	1,739	1,867	1,995	2,123	2,251	2,379	2,507	2,635	75
76	1,484	1,612	1,740	1,868	1,996	2,124	2,252	2,380	2,508	2,636	76
77	1,485	1,613	1,741	1,869	1,997	2,125	2,253	2,381	2,509	2,637	77
78	1,486	1,614	1,742	1,870	1,998	2,126	2,254	2,382	2,510	2,638	78
79	1,487	1,615	1,743	1,871	1,999	2,127	2,255	2,383	2,511	2,639	79
80	1,488	1,616	1,744	1,872	2,000	2,128	2,256	2,384	2,512	2,640	80
81	1,489	1,617	1,745	1,873	2,001	2,129	2,257	2,385	2,513	2,641	81
82	1,490	1,618	1,746	1,874	2,002	2,130	2,258	2,386	2,514	2,642	82
83	1,491	1,619	1,747	1,875	2,003	2,131	2,259	2,387	2,515	2,643	83
84	1,492	1,620	1,748	1,876	2,004	2,132	2,260	2,388	2,516	2,644	84
85	1,493	1,621	1,749	1,877	2,005	2,133	2,261	2,389	2,517	2,645	85
86	1,494	1,622	1,750	1,878	2,006	2,134	2,262	2,390	2,518	2,646	86
87	1,495	1,623	1,751	1,879	2,007	2,135	2,263	2,391	2,519	2,647	87
88	1,496	1,624	1,752	1,880	2,008	2,136	2,264	2,392	2,520	2,648	88
89	1,497	1,625	1,753	1,881	2,009	2,137	2,265	2,393	2,521	2,649	89
90	1,498	1,626	1,754	1,882	2,010	2,138	2,266	2,394	2,522	2,650	90
91	1,499	1,627	1,755	1,883	2,011	2,139	2,267	2,395	2,523	2,651	91
92	1,500	1,628	1,756	1,884	2,012	2,140	2,268	2,396	2,524	2,652	92
93	1,501	1,629	1,757	1,885	2,013	2,141	2,269	2,397	2,525	2,653	93
94	1,502	1,630	1,758	1,886	2,014	2,142	2,270	2,398	2,526	2,654	94
95	1,503	1,631	1,759	1,887	2,015	2,143	2,271	2,399	2,527	2,655	95
96	1,504	1,632	1,760	1,888	2,016	2,144	2,272	2,400	2,528	2,656	96
97	1,505	1,633	1,761	1,889	2,017	2,145	2,273	2,401	2,529	2,657	97
98	1,506	1,634	1,762	1,890	2,018	2,146	2,274	2,402	2,530	2,658	98
99	1,507	1,635	1,763	1,891	2,019	2,147	2,275	2,403	2,531	2,659	99
100	1,508	1,636	1,764	1,892	2,020	2,148	2,276	2,404	2,532	2,660	100
101	1,509	1,637	1,765	1,893	2,021	2,149	2,277	2,405	2,533	2,661	101
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102	1,510	1,638	1,766	1,894	2,022	2,150	2,278	2,406	2,534	2,662	102
103	1,511	1,639	1,767	1,895	2,023	2,151	2,279	2,407	2,535	2,663	103
104	1,512	1,640	1,768	1,896	2,024	2,152	2,280	2,408	2,536	2,664	104
105	1,513	1,641	1,769	1,897	2,025	2,153	2,281	2,409	2,537	2,665	105
106	1,514	1,642	1,770	1,898	2,026	2,154	2,282	2,410	2,538	2,666	106
107	1,515	1,643	1,771	1,899	2,027	2,155	2,283	2,411	2,539	2,667	107
108	1,516	1,644	1,772	1,900	2,028	2,156	2,284	2,412	2,540	2,668	108
109	1,517	1,645	1,773	1,901	2,029	2,157	2,285	2,413	2,541	2,669	109
110	1,518	1,646	1,774	1,902	2,030	2,158	2,286	2,414	2,542	2,670	110
111	1,519	1,647	1,775	1,903	2,031	2,159	2,287	2,415	2,543	2,671	111
112	1,520	1,648	1,776	1,904	2,032	2,160	2,288	2,416	2,544	2,672	112
113	1,521	1,649	1,777	1,905	2,033	2,161	2,289	2,417	2,545	2,673	113
114	1,522	1,650	1,778	1,906	2,034	2,162	2,290	2,418	2,546	2,674	114
115	1,523	1,651	1,779	1,907	2,035	2,163	2,291	2,419	2,547	2,675	115
116	1,524	1,652	1,780	1,908	2,036	2,164	2,292	2,420	2,548	2,676	116
117	1,525	1,653	1,781	1,909	2,037	2,165	2,293	2,421	2,549	2,677	117
118	1,526	1,654	1,782	1,910	2,038	2,166	2,294	2,422	2,550	2,678	118
119	1,527	1,655	1,783	1,911	2,039	2,167	2,295	2,423	2,551	2,679	119
120	1,528	1,656	1,784	1,912	2,040	2,168	2,296	2,424	2,552	2,680	120
121	1,529	1,657	1,785	1,913	2,041	2,169	2,297	2,425	2,553	2,681	121
122	1,530	1,658	1,786	1,914	2,042	2,170	2,298	2,426	2,554	2,682	122
123	1,531	1,659	1,787	1,915	2,043	2,171	2,299	2,427	2,555	2,683	123
124	1,532	1,660	1,788	1,916	2,044	2,172	2,300	2,428	2,556	2,684	124
125	1,533	1,661	1,789	1,917	2,045	2,173	2,301	2,429	2,557	2,685	125
126	1,534	1,662	1,790	1,918	2,046	2,174	2,302	2,430	2,558	2,686	126
127	1,535	1,663	1,791	1,919	2,047	2,175	2,303	2,431	2,559	2,687	127
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0	21	22	23	24	25	26	27	28	29	30	0
1	2,689	2,817	2,945	3,073	3,201	3,329	3,457	3,585	3,713	3,841	1
2	2,690	2,818	2,946	3,074	3,202	3,330	3,458	3,586	3,714	3,842	2
3	2,691	2,819	2,947	3,075	3,203	3,331	3,459	3,587	3,715	3,843	3
4	2,692	2,820	2,948	3,076	3,204	3,332	3,460	3,588	3,716	3,844	4
5	2,693	2,821	2,949	3,077	3,205	3,333	3,461	3,589	3,717	3,845	5
6	2,694	2,822	2,950	3,078	3,206	3,334	3,462	3,590	3,718	3,846	6
7	2,695	2,823	2,951	3,079	3,207	3,335	3,463	3,591	3,719	3,847	7
8	2,696	2,824	2,952	3,080	3,208	3,336	3,464	3,592	3,720	3,848	8
9	2,697	2,825	2,953	3,081	3,209	3,337	3,465	3,593	3,721	3,849	9
10	2,698	2,826	2,954	3,082	3,210	3,338	3,466	3,594	3,722	3,850	10
11	2,699	2,827	2,955	3,083	3,211	3,339	3,467	3,595	3,723	3,851	11
12	2,700	2,828	2,956	3,084	3,212	3,340	3,468	3,596	3,724	3,852	12
13	2,701	2,829	2,957	3,085	3,213	3,341	3,469	3,597	3,725	3,853	13
14	2,702	2,830	2,958	3,086	3,214	3,342	3,470	3,598	3,726	3,854	14
15	2,703	2,831	2,959	3,087	3,215	3,343	3,471	3,599	3,727	3,855	15
16	2,704	2,832	2,960	3,088	3,216	3,344	3,472	3,600	3,728	3,856	16
17	2,705	2,833	2,961	3,089	3,217	3,345	3,473	3,601	3,729	3,857	17
18	2,706	2,834	2,962	3,090	3,218	3,346	3,474	3,602	3,730	3,858	18
19	2,707	2,835	2,963	3,091	3,219	3,347	3,475	3,603	3,731	3,859	19
20	2,708	2,836	2,964	3,092	3,220	3,348	3,476	3,604	3,732	3,860	20
21	2,709	2,837	2,965	3,093	3,221	3,349	3,477	3,605	3,733	3,861	21
22	2,710	2,838	2,966	3,094	3,222	3,350	3,478	3,606	3,734	3,862	22
23	2,711	2,839	2,967	3,095	3,223	3,351	3,479	3,607	3,735	3,863	23
24	2,712	2,840	2,968	3,096	3,224	3,352	3,480	3,608	3,736	3,864	24
25	2,713	2,841	2,969	3,097	3,225	3,353	3,481	3,609	3,737	3,865	25
26	2,714	2,842	2,970	3,098	3,226	3,354	3,482	3,610	3,738	3,866	26
27	2,715	2,843	2,971	3,099	3,227	3,355	3,483	3,611	3,739	3,867	27
28	2,716	2,844	2,972	3,100	3,228	3,356	3,484	3,612	3,740	3,868	28
29	2,717	2,845	2,973	3,101	3,229	3,357	3,485	3,613	3,741	3,869	29
30	2,718	2,846	2,974	3,102	3,230	3,358	3,486	3,614	3,742	3,870	30
31	2,719	2,847	2,975	3,103	3,231	3,359	3,487	3,615	3,743	3,871	31
32	2,720	2,848	2,976	3,104	3,232	3,360	3,488	3,616	3,744	3,872	32
33	2,721	2,849	2,977	3,105	3,233	3,361	3,489	3,617	3,745	3,873	33
34	2,722	2,850	2,978	3,106	3,234	3,362	3,490	3,618	3,746	3,874	34
35	2,723	2,851	2,979	3,107	3,235	3,363	3,491	3,619	3,747	3,875	35
36	2,724	2,852	2,980	3,108	3,236	3,364	3,492	3,620	3,748	3,876	36
37	2,725	2,853	2,981	3,109	3,237	3,365	3,493	3,621	3,749	3,877	37
38	2,726	2,854	2,982	3,110	3,238	3,366	3,494	3,622	3,750	3,878	38
39	2,727	2,855	2,983	3,111	3,239	3,367	3,495	3,623	3,751	3,879	39
40	2,728	2,856	2,984	3,112	3,240	3,368	3,496	3,624	3,752	3,880	40
41	2,729	2,857	2,985	3,113	3,241	3,369	3,497	3,625	3,753	3,881	41
42	2,730	2,858	2,986	3,114	3,242	3,370	3,498	3,626	3,754	3,882	42
43	2,731	2,859	2,987	3,115	3,243	3,371	3,499	3,627	3,755	3,883	43
44	2,732	2,860	2,988	3,116	3,244	3,372	3,500	3,628	3,756	3,884	44
45	2,733	2,861	2,989	3,117	3,245	3,373	3,501	3,629	3,757	3,885	45
46	2,734	2,862	2,990	3,118	3,246	3,374	3,502	3,630	3,758	3,886	46
47	2,735	2,863	2,991	3,119	3,247	3,375	3,503	3,631	3,759	3,887	47
48	2,736	2,864	2,992	3,120	3,248	3,376	3,504	3,632	3,760	3,888	48
49	2,737	2,865	2,993	3,121	3,249	3,377	3,505	3,633	3,761	3,889	49
50	2,738	2,866	2,994	3,122	3,250	3,378	3,506	3,634	3,762	3,890	50
0	21	22	23	24	25	26	27	28	29	30	0

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0	21	22	23	24	25	26	27	28	29	30	0
51	2,739	2,867	2,995	3,123	3,251	3,379	3,507	3,635	3,763	3,891	51
52	2,740	2,868	2,996	3,124	3,252	3,380	3,508	3,636	3,764	3,892	52
53	2,741	2,869	2,997	3,125	3,253	3,381	3,509	3,637	3,765	3,893	53
54	2,742	2,870	2,998	3,126	3,254	3,382	3,510	3,638	3,766	3,894	54
55	2,743	2,871	2,999	3,127	3,255	3,383	3,511	3,639	3,767	3,895	55
56	2,744	2,872	3,000	3,128	3,256	3,384	3,512	3,640	3,768	3,896	56
57	2,745	2,873	3,001	3,129	3,257	3,385	3,513	3,641	3,769	3,897	57
58	2,746	2,874	3,002	3,130	3,258	3,386	3,514	3,642	3,770	3,898	58
59	2,747	2,875	3,003	3,131	3,259	3,387	3,515	3,643	3,771	3,899	59
60	2,748	2,876	3,004	3,132	3,260	3,388	3,516	3,644	3,772	3,900	60
61	2,749	2,877	3,005	3,133	3,261	3,389	3,517	3,645	3,773	3,901	61
62	2,750	2,878	3,006	3,134	3,262	3,390	3,518	3,646	3,774	3,902	62
63	2,751	2,879	3,007	3,135	3,263	3,391	3,519	3,647	3,775	3,903	63
64	2,752	2,880	3,008	3,136	3,264	3,392	3,520	3,648	3,776	3,904	64
65	2,753	2,881	3,009	3,137	3,265	3,393	3,521	3,649	3,777	3,905	65
66	2,754	2,882	3,010	3,138	3,266	3,394	3,522	3,650	3,778	3,906	66
67	2,755	2,883	3,011	3,139	3,267	3,395	3,523	3,651	3,779	3,907	67
68	2,756	2,884	3,012	3,140	3,268	3,396	3,524	3,652	3,780	3,908	68
69	2,757	2,885	3,013	3,141	3,269	3,397	3,525	3,653	3,781	3,909	69
70	2,758	2,886	3,014	3,142	3,270	3,398	3,526	3,654	3,782	3,910	70
71	2,759	2,887	3,015	3,143	3,271	3,399	3,527	3,655	3,783	3,911	71
72	2,760	2,888	3,016	3,144	3,272	3,400	3,528	3,656	3,784	3,912	72
73	2,761	2,889	3,017	3,145	3,273	3,401	3,529	3,657	3,785	3,913	73
74	2,762	2,890	3,018	3,146	3,274	3,402	3,530	3,658	3,786	3,914	74
75	2,763	2,891	3,019	3,147	3,275	3,403	3,531	3,659	3,787	3,915	75
76	2,764	2,892	3,020	3,148	3,276	3,404	3,532	3,660	3,788	3,916	76
77	2,765	2,893	3,021	3,149	3,277	3,405	3,533	3,661	3,789	3,917	77
78	2,766	2,894	3,022	3,150	3,278	3,406	3,534	3,662	3,790	3,918	78
79	2,767	2,895	3,023	3,151	3,279	3,407	3,535	3,663	3,791	3,919	79
80	2,768	2,896	3,024	3,152	3,280	3,408	3,536	3,664	3,792	3,920	80
81	2,769	2,897	3,025	3,153	3,281	3,409	3,537	3,665	3,793	3,921	81
82	2,770	2,898	3,026	3,154	3,282	3,410	3,538	3,666	3,794	3,922	82
83	2,771	2,899	3,027	3,155	3,283	3,411	3,539	3,667	3,795	3,923	83
84	2,772	2,900	3,028	3,156	3,284	3,412	3,540	3,668	3,796	3,924	84
85	2,773	2,901	3,029	3,157	3,285	3,413	3,541	3,669	3,797	3,925	85
86	2,774	2,902	3,030	3,158	3,286	3,414	3,542	3,670	3,798	3,926	86
87	2,775	2,903	3,031	3,159	3,287	3,415	3,543	3,671	3,799	3,927	87
88	2,776	2,904	3,032	3,160	3,288	3,416	3,544	3,672	3,800	3,928	88
89	2,777	2,905	3,033	3,161	3,289	3,417	3,545	3,673	3,801	3,929	89
90	2,778	2,906	3,034	3,162	3,290	3,418	3,546	3,674	3,802	3,930	90
91	2,779	2,907	3,035	3,163	3,291	3,419	3,547	3,675	3,803	3,931	91
92	2,780	2,908	3,036	3,164	3,292	3,420	3,548	3,676	3,804	3,932	92
93	2,781	2,909	3,037	3,165	3,293	3,421	3,549	3,677	3,805	3,933	93
94	2,782	2,910	3,038	3,166	3,294	3,422	3,550	3,678	3,806	3,934	94
95	2,783	2,911	3,039	3,167	3,295	3,423	3,551	3,679	3,807	3,935	95
96	2,784	2,912	3,040	3,168	3,296	3,424	3,552	3,680	3,808	3,936	96
97	2,785	2,913	3,041	3,169	3,297	3,425	3,553	3,681	3,809	3,937	97
98	2,786	2,914	3,042	3,170	3,298	3,426	3,554	3,682	3,810	3,938	98
99	2,787	2,915	3,043	3,171	3,299	3,427	3,555	3,683	3,811	3,939	99
100	2,788	2,916	3,044	3,172	3,300	3,428	3,556	3,684	3,812	3,940	100
101	2,789	2,917	3,045	3,173	3,301	3,429	3,557	3,685	3,813	3,941	101
0	21	22	23	24	25	26	27	28	29	30	0

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102	2,790	2,918	3,046	3,174	3,302	3,430	3,558	3,686	3,814	3,942	102
103	2,791	2,919	3,047	3,175	3,303	3,431	3,559	3,687	3,815	3,943	103
104	2,792	2,920	3,048	3,176	3,304	3,432	3,560	3,688	3,816	3,944	104
105	2,793	2,921	3,049	3,177	3,305	3,433	3,561	3,689	3,817	3,945	105
106	2,794	2,922	3,050	3,178	3,306	3,434	3,562	3,690	3,818	3,946	106
107	2,795	2,923	3,051	3,179	3,307	3,435	3,563	3,691	3,819	3,947	107
108	2,796	2,924	3,052	3,180	3,308	3,436	3,564	3,692	3,820	3,948	108
109	2,797	2,925	3,053	3,181	3,309	3,437	3,565	3,693	3,821	3,949	109
110	2,798	2,926	3,054	3,182	3,310	3,438	3,566	3,694	3,822	3,950	110
111	2,799	2,927	3,055	3,183	3,311	3,439	3,567	3,695	3,823	3,951	111
112	2,800	2,928	3,056	3,184	3,312	3,440	3,568	3,696	3,824	3,952	112
113	2,801	2,929	3,057	3,185	3,313	3,441	3,569	3,697	3,825	3,953	113
114	2,802	2,930	3,058	3,186	3,314	3,442	3,570	3,698	3,826	3,954	114
115	2,803	2,931	3,059	3,187	3,315	3,443	3,571	3,699	3,827	3,955	115
116	2,804	2,932	3,060	3,188	3,316	3,444	3,572	3,700	3,828	3,956	116
117	2,805	2,933	3,061	3,189	3,317	3,445	3,573	3,701	3,829	3,957	117
118	2,806	2,934	3,062	3,190	3,318	3,446	3,574	3,702	3,830	3,958	118
119	2,807	2,935	3,063	3,191	3,319	3,447	3,575	3,703	3,831	3,959	119
120	2,808	2,936	3,064	3,192	3,320	3,448	3,576	3,704	3,832	3,960	120
121	2,809	2,937	3,065	3,193	3,321	3,449	3,577	3,705	3,833	3,961	121
122	2,810	2,938	3,066	3,194	3,322	3,450	3,578	3,706	3,834	3,962	122
123	2,811	2,939	3,067	3,195	3,323	3,451	3,579	3,707	3,835	3,963	123
124	2,812	2,940	3,068	3,196	3,324	3,452	3,580	3,708	3,836	3,964	124
125	2,813	2,941	3,069	3,197	3,325	3,453	3,581	3,709	3,837	3,965	125
126	2,814	2,942	3,070	3,198	3,326	3,454	3,582	3,710	3,838	3,966	126
127	2,815	2,943	3,071	3,199	3,327	3,455	3,583	3,711	3,839	3,967	127
0	21	22	23	24	25	26	27	28	29	30	0

0	31	32	33	34	35	36	37	38	39	40	0
1	3,969	4,097	4,225	4,353	4,481	4,609	4,737	4,865	4,993	5,121	1
2	3,970	4,098	4,226	4,354	4,482	4,610	4,738	4,866	4,994	5,122	2
3	3,971	4,099	4,227	4,355	4,483	4,611	4,739	4,867	4,995	5,123	3
4	3,972	4,100	4,228	4,356	4,484	4,612	4,740	4,868	4,996	5,124	4
5	3,973	4,101	4,229	4,357	4,485	4,613	4,741	4,869	4,997	5,125	5
6	3,974	4,102	4,230	4,358	4,486	4,614	4,742	4,870	4,998	5,126	6
7	3,975	4,103	4,231	4,359	4,487	4,615	4,743	4,871	4,999	5,127	7
8	3,976	4,104	4,232	4,360	4,488	4,616	4,744	4,872	5,000	5,128	8
9	3,977	4,105	4,233	4,361	4,489	4,617	4,745	4,873	5,001	5,129	9
10	3,978	4,106	4,234	4,362	4,490	4,618	4,746	4,874	5,002	5,130	10
11	3,979	4,107	4,235	4,363	4,491	4,619	4,747	4,875	5,003	5,131	11
12	3,980	4,108	4,236	4,364	4,492	4,620	4,748	4,876	5,004	5,132	12
13	3,981	4,109	4,237	4,365	4,493	4,621	4,749	4,877	5,005	5,133	13
14	3,982	4,110	4,238	4,366	4,494	4,622	4,750	4,878	5,006	5,134	14
15	3,983	4,111	4,239	4,367	4,495	4,623	4,751	4,879	5,007	5,135	15
16	3,984	4,112	4,240	4,368	4,496	4,624	4,752	4,880	5,008	5,136	16
17	3,985	4,113	4,241	4,369	4,497	4,625	4,753	4,881	5,009	5,137	17
18	3,986	4,114	4,242	4,370	4,498	4,626	4,754	4,882	5,010	5,138	18
19	3,987	4,115	4,243	4,371	4,499	4,627	4,755	4,883	5,011	5,139	19
20	3,988	4,116	4,244	4,372	4,500	4,628	4,756	4,884	5,012	5,140	20
21	3,989	4,117	4,245	4,373	4,501	4,629	4,757	4,885	5,013	5,141	21
22	3,990	4,118	4,246	4,374	4,502	4,630	4,758	4,886	5,014	5,142	22
23	3,991	4,119	4,247	4,375	4,503	4,631	4,759	4,887	5,015	5,143	23
24	3,992	4,120	4,248	4,376	4,504	4,632	4,760	4,888	5,016	5,144	24
25	3,993	4,121	4,249	4,377	4,505	4,633	4,761	4,889	5,017	5,145	25
26	3,994	4,122	4,250	4,378	4,506	4,634	4,762	4,890	5,018	5,146	26
27	3,995	4,123	4,251	4,379	4,507	4,635	4,763	4,891	5,019	5,147	27
28	3,996	4,124	4,252	4,380	4,508	4,636	4,764	4,892	5,020	5,148	28
29	3,997	4,125	4,253	4,381	4,509	4,637	4,765	4,893	5,021	5,149	29
30	3,998	4,126	4,254	4,382	4,510	4,638	4,766	4,894	5,022	5,150	30
31	3,999	4,127	4,255	4,383	4,511	4,639	4,767	4,895	5,023	5,151	31
32	4,000	4,128	4,256	4,384	4,512	4,640	4,768	4,896	5,024	5,152	32
33	4,001	4,129	4,257	4,385	4,513	4,641	4,769	4,897	5,025	5,153	33
34	4,002	4,130	4,258	4,386	4,514	4,642	4,770	4,898	5,026	5,154	34
35	4,003	4,131	4,259	4,387	4,515	4,643	4,771	4,899	5,027	5,155	35
36	4,004	4,132	4,260	4,388	4,516	4,644	4,772	4,900	5,028	5,156	36
37	4,005	4,133	4,261	4,389	4,517	4,645	4,773	4,901	5,029	5,157	37
38	4,006	4,134	4,262	4,390	4,518	4,646	4,774	4,902	5,030	5,158	38
39	4,007	4,135	4,263	4,391	4,519	4,647	4,775	4,903	5,031	5,159	39
40	4,008	4,136	4,264	4,392	4,520	4,648	4,776	4,904	5,032	5,160	40
41	4,009	4,137	4,265	4,393	4,521	4,649	4,777	4,905	5,033	5,161	41
42	4,010	4,138	4,266	4,394	4,522	4,650	4,778	4,906	5,034	5,162	42
43	4,011	4,139	4,267	4,395	4,523	4,651	4,779	4,907	5,035	5,163	43
44	4,012	4,140	4,268	4,396	4,524	4,652	4,780	4,908	5,036	5,164	44
45	4,013	4,141	4,269	4,397	4,525	4,653	4,781	4,909	5,037	5,165	45
46	4,014	4,142	4,270	4,398	4,526	4,654	4,782	4,910	5,038	5,166	46
47	4,015	4,143	4,271	4,399	4,527	4,655	4,783	4,911	5,039	5,167	47
48	4,016	4,144	4,272	4,400	4,528	4,656	4,784	4,912	5,040	5,168	48
49	4,017	4,145	4,273	4,401	4,529	4,657	4,785	4,913	5,041	5,169	49
50	4,018	4,146	4,274	4,402	4,530	4,658	4,786	4,914	5,042	5,170	50
0	31	32	33	34	35	36	37	38	39	40	0

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0	31	32	33	34	35	36	37	38	39	40	0
51	4,019	4,147	4,275	4,403	4,531	4,659	4,787	4,915	5,043	5,171	51
52	4,020	4,148	4,276	4,404	4,532	4,660	4,788	4,916	5,044	5,172	52
53	4,021	4,149	4,277	4,405	4,533	4,661	4,789	4,917	5,045	5,173	53
54	4,022	4,150	4,278	4,406	4,534	4,662	4,790	4,918	5,046	5,174	54
55	4,023	4,151	4,279	4,407	4,535	4,663	4,791	4,919	5,047	5,175	55
56	4,024	4,152	4,280	4,408	4,536	4,664	4,792	4,920	5,048	5,176	56
57	4,025	4,153	4,281	4,409	4,537	4,665	4,793	4,921	5,049	5,177	57
58	4,026	4,154	4,282	4,410	4,538	4,666	4,794	4,922	5,050	5,178	58
59	4,027	4,155	4,283	4,411	4,539	4,667	4,795	4,923	5,051	5,179	59
60	4,028	4,156	4,284	4,412	4,540	4,668	4,796	4,924	5,052	5,180	60
61	4,029	4,157	4,285	4,413	4,541	4,669	4,797	4,925	5,053	5,181	61
62	4,030	4,158	4,286	4,414	4,542	4,670	4,798	4,926	5,054	5,182	62
63	4,031	4,159	4,287	4,415	4,543	4,671	4,799	4,927	5,055	5,183	63
64	4,032	4,160	4,288	4,416	4,544	4,672	4,800	4,928	5,056	5,184	64
65	4,033	4,161	4,289	4,417	4,545	4,673	4,801	4,929	5,057	5,185	65
66	4,034	4,162	4,290	4,418	4,546	4,674	4,802	4,930	5,058	5,186	66
67	4,035	4,163	4,291	4,419	4,547	4,675	4,803	4,931	5,059	5,187	67
68	4,036	4,164	4,292	4,420	4,548	4,676	4,804	4,932	5,060	5,188	68
69	4,037	4,165	4,293	4,421	4,549	4,677	4,805	4,933	5,061	5,189	69
70	4,038	4,166	4,294	4,422	4,550	4,678	4,806	4,934	5,062	5,190	70
71	4,039	4,167	4,295	4,423	4,551	4,679	4,807	4,935	5,063	5,191	71
72	4,040	4,168	4,296	4,424	4,552	4,680	4,808	4,936	5,064	5,192	72
73	4,041	4,169	4,297	4,425	4,553	4,681	4,809	4,937	5,065	5,193	73
74	4,042	4,170	4,298	4,426	4,554	4,682	4,810	4,938	5,066	5,194	74
75	4,043	4,171	4,299	4,427	4,555	4,683	4,811	4,939	5,067	5,195	75
76	4,044	4,172	4,300	4,428	4,556	4,684	4,812	4,940	5,068	5,196	76
77	4,045	4,173	4,301	4,429	4,557	4,685	4,813	4,941	5,069	5,197	77
78	4,046	4,174	4,302	4,430	4,558	4,686	4,814	4,942	5,070	5,198	78
79	4,047	4,175	4,303	4,431	4,559	4,687	4,815	4,943	5,071	5,199	79
80	4,048	4,176	4,304	4,432	4,560	4,688	4,816	4,944	5,072	5,200	80
81	4,049	4,177	4,305	4,433	4,561	4,689	4,817	4,945	5,073	5,201	81
82	4,050	4,178	4,306	4,434	4,562	4,690	4,818	4,946	5,074	5,202	82
83	4,051	4,179	4,307	4,435	4,563	4,691	4,819	4,947	5,075	5,203	83
84	4,052	4,180	4,308	4,436	4,564	4,692	4,820	4,948	5,076	5,204	84
85	4,053	4,181	4,309	4,437	4,565	4,693	4,821	4,949	5,077	5,205	85
86	4,054	4,182	4,310	4,438	4,566	4,694	4,822	4,950	5,078	5,206	86
87	4,055	4,183	4,311	4,439	4,567	4,695	4,823	4,951	5,079	5,207	87
88	4,056	4,184	4,312	4,440	4,568	4,696	4,824	4,952	5,080	5,208	88
89	4,057	4,185	4,313	4,441	4,569	4,697	4,825	4,953	5,081	5,209	89
90	4,058	4,186	4,314	4,442	4,570	4,698	4,826	4,954	5,082	5,210	90
91	4,059	4,187	4,315	4,443	4,571	4,699	4,827	4,955	5,083	5,211	91
92	4,060	4,188	4,316	4,444	4,572	4,700	4,828	4,956	5,084	5,212	92
93	4,061	4,189	4,317	4,445	4,573	4,701	4,829	4,957	5,085	5,213	93
94	4,062	4,190	4,318	4,446	4,574	4,702	4,830	4,958	5,086	5,214	94
95	4,063	4,191	4,319	4,447	4,575	4,703	4,831	4,959	5,087	5,215	95
96	4,064	4,192	4,320	4,448	4,576	4,704	4,832	4,960	5,088	5,216	96
97	4,065	4,193	4,321	4,449	4,577	4,705	4,833	4,961	5,089	5,217	97
98	4,066	4,194	4,322	4,450	4,578	4,706	4,834	4,962	5,090	5,218	98
99	4,067	4,195	4,323	4,451	4,579	4,707	4,835	4,963	5,091	5,219	99
100	4,068	4,196	4,324	4,452	4,580	4,708	4,836	4,964	5,092	5,220	100
101	4,069	4,197	4,325	4,453	4,581	4,709	4,837	4,965	5,093	5,221	101
0	31	32	33	34	35	36	37	38	39	40	0

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102	4,070	4,198	4,326	4,454	4,582	4,710	4,838	4,966	5,094	5,222	102
103	4,071	4,199	4,327	4,455	4,583	4,711	4,839	4,967	5,095	5,223	103
104	4,072	4,200	4,328	4,456	4,584	4,712	4,840	4,968	5,096	5,224	104
105	4,073	4,201	4,329	4,457	4,585	4,713	4,841	4,969	5,097	5,225	105
106	4,074	4,202	4,330	4,458	4,586	4,714	4,842	4,970	5,098	5,226	106
107	4,075	4,203	4,331	4,459	4,587	4,715	4,843	4,971	5,099	5,227	107
108	4,076	4,204	4,332	4,460	4,588	4,716	4,844	4,972	5,100	5,228	108
109	4,077	4,205	4,333	4,461	4,589	4,717	4,845	4,973	5,101	5,229	109
110	4,078	4,206	4,334	4,462	4,590	4,718	4,846	4,974	5,102	5,230	110
111	4,079	4,207	4,335	4,463	4,591	4,719	4,847	4,975	5,103	5,231	111
112	4,080	4,208	4,336	4,464	4,592	4,720	4,848	4,976	5,104	5,232	112
113	4,081	4,209	4,337	4,465	4,593	4,721	4,849	4,977	5,105	5,233	113
114	4,082	4,210	4,338	4,466	4,594	4,722	4,850	4,978	5,106	5,234	114
115	4,083	4,211	4,339	4,467	4,595	4,723	4,851	4,979	5,107	5,235	115
116	4,084	4,212	4,340	4,468	4,596	4,724	4,852	4,980	5,108	5,236	116
117	4,085	4,213	4,341	4,469	4,597	4,725	4,853	4,981	5,109	5,237	117
118	4,086	4,214	4,342	4,470	4,598	4,726	4,854	4,982	5,110	5,238	118
119	4,087	4,215	4,343	4,471	4,599	4,727	4,855	4,983	5,111	5,239	119
120	4,088	4,216	4,344	4,472	4,600	4,728	4,856	4,984	5,112	5,240	120
121	4,089	4,217	4,345	4,473	4,601	4,729	4,857	4,985	5,113	5,241	121
122	4,090	4,218	4,346	4,474	4,602	4,730	4,858	4,986	5,114	5,242	122
123	4,091	4,219	4,347	4,475	4,603	4,731	4,859	4,987	5,115	5,243	123
124	4,092	4,220	4,348	4,476	4,604	4,732	4,860	4,988	5,116	5,244	124
125	4,093	4,221	4,349	4,477	4,605	4,733	4,861	4,989	5,117	5,245	125
126	4,094	4,222	4,350	4,478	4,606	4,734	4,862	4,990	5,118	5,246	126
127	4,095	4,223	4,351	4,479	4,607	4,735	4,863	4,991	5,119	5,247	127
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