
CHAPTER 4

RUNCUTTING

Advanced Section

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I. Introduction

This unit on runcutting will demonstrate several of the complexities involved in "cutting" vehicle blocks into assignments for operators, called "runs." For demonstration purposes, runcutting alternatives in this chapter will be developed from Route 110 and Route 32 blocks developed in Chapter 3.

II. Runcutting - An Overview

A. What is runcutting?

Runcutting is the process of developing operator assignments [runs] from a pool of vehicle blocks. Runcutting is often an iterative process. A series of changes to both blocks and runs may be necessary before "optimum" runs can be derived. Runs may consist of one or more complete or partial blocks.

During runcutting, blocks are arranged [cut] in such a way as to create straight runs and split runs. A straight run generally consists of a single block piece of approximately 8 to 10 hours of continuous work. There are instances when straight runs are developed using two block pieces that may be joined by a short [usually less than 60 minutes] paid break.

A split run generally consists of two [sometimes three] block pieces with unpaid break time (often called swing time) between the pieces. The operator is considered "off duty" during the swing periods.

B. Why is runcutting important?

Whereas cost efficient blocking is important in terms of minimizing the number of vehicles necessary to operate a given level of service, runcutting is considered a critical factor in determining the number of operators needed to operate a given level of service in the most cost efficient manner. The challenge for the scheduler is to assign all of the block pieces to the fewest number of operator runs while adhering to all relevant work rules and policy guidelines.

C. Setting up the runcutting process

Before runcutting begins, it is desirable for the scheduler to again review all relevant data and develop a comfortable understanding of the relationship among the various forms, data, objectives, and work rules. A scheduler's "street sense" of the routings, terminal locations and relief points also makes the job smoother.

At this agency, the scheduler has assembled Routes 110 and 32 master schedules, a combined block graph and a combined block summary recap. These are shown on the following pages and will be used in the runcutting examples.

It may also be noted that universal scheduling forms do not exist and that all agencies do not perform runcuts in the same manner. An agency may use a variety of scheduling forms, even for the same purpose. For example, this agency has used two different master schedule formats for Route 32 and Route 110. Part of the art of scheduling is the development of forms that are useful not only for the scheduling process, but for other departmental functions as well, such as Payroll, Maintenance and Marketing.

1) The Master Schedule

The **master schedule** provides detailed trip information by direction. It generally includes time points (including all termini and relief points), pull-on and pull-off times and locations and the times and locations of route relief points.

On Route 32, vehicles pull-out and pull-in from either of the two terminus points, CBS and RGM. On-street reliefs are also permitted at either terminus. For Route 110, the on-street relief points include the Concord Rail Station (CON) and DVC – the same points where vehicles pull on and pull off. Relief points are often shown in bold or noted in parentheses on the master schedules.

Arrival times, rather than departure times are typically used for on-street reliefs. This allows the relieving operator time to board the vehicle, set the seat and mirrors, input data into the farebox and/or perform other duties before departing the location.

Route 32 and Route 110 master schedules are shown on pages 5, 6 and 7.

2) The Block Graph

The **block graph** provides a visual overview of the blocks to be runcut. This visual representation can assist the scheduler in a number of ways, including helping determine the number and timing of on-street reliefs, calculating revenue service time for each block and pinpointing blocks that may be undesirable for runcuts. This form is also useful for penciling in potential alternative block combinations prior to establishing the final runs. Colored pencils are a useful tool when diagraming the various alternatives.

Undesirable blocks would include short blocks and blocks that start or end outside an optimum range for run type. The block graph can be helpful when looking for opportunities to combine blocks in order to reduce the number of vehicles required. Since scheduling is an iterative process, it is not uncommon for blocks to change several times during the runcutting process before the runcuts are "finalized."

The block graph for Routes 110 and 32 is shown on page 98.

3) The Block Summary Recap

The **block summary recap** primarily displays information about block pull-on and pull-off locations and times. While the block graph is especially useful as a visual aid for identifying block adjustment options, the block summary recap is particularly useful for noting run assignment and identifying block pieces that could form split runs after any block adjustments are made.

The block summary recap is shown on page 99.

Block #	Comanche & Big Sky	Comanche & Wyoming	Comanche & San Mateo	Comanche & Carlisle	N. 4th & Griegos	Rio Grande & Montano	Rio Grande & Montano	N. 4th & Griegos	Comanche & Carlisle	Comanche & San Mateo	Comanche & Wyoming	Comanche & Big Sky
32-01							6:10	6:17	6:27	6:32	6:40	6:50
32-02							6:40	6:47	6:57	7:03	7:10	7:20
32-03	6:26	6:36	6:43	6:49	6:58	7:05	7:10	7:17	7:27	7:33	7:40	7:50
32-01	6:56	7:06	7:13	7:19	7:28	7:35	7:40	7:47	7:57	8:03	8:10	8:20
32-02	7:26	7:36	7:43	7:49	7:58	8:05	8:10	8:17	8:27	8:33	8:40	8:50
32-03	7:56	8:06	8:13	8:19	8:28	8:35	8:40	8:47	8:57	9:03	9:10	9:20
32-01	8:26	8:36	8:43	8:49	8:58	9:05	9:10	9:17	9:27	9:33	9:40	9:50
32-02	8:56	9:06	9:13	9:19	9:28	9:35	9:40	9:47	9:57	10:03	10:10	10:20
32-03	9:26	9:36	9:43	9:49	9:58	10:05						
32-01	9:56	10:06	10:13	10:19	10:28	10:35	10:40	10:47	10:57	11:01	11:07	11:16
32-02	10:26	10:35	10:41	10:45	10:55	11:02	11:40	11:47	11:57	12:01	12:07	12:15
32-01	11:26	11:35	11:41	11:45	11:55	12:02	12:40	12:47	12:57	1:01	1:07	1:16
32-02	12:26	12:35	12:41	12:45	12:55	1:02	1:40	1:47	1:58	2:04	2:10	2:20
32-01	1:26	1:36	1:42	1:49	1:58	2:06	2:10	2:17	2:28	2:34	2:40	2:50
32-04	1:56	2:06	2:12	2:19	2:28	2:36	2:40	2:47	2:58	3:04	3:10	3:20
32-02	2:26	2:36	2:42	2:49	2:58	3:06	3:10	3:17	3:28	3:34	3:40	3:50
32-01	2:56	3:06	3:12	3:19	3:28	3:36	3:40	3:47	3:58	4:04	4:10	4:20
32-04	3:26	3:36	3:42	3:49	3:58	4:06	4:10	4:17	4:28	4:34	4:40	4:50
32-02	3:56	4:06	4:12	4:19	4:28	4:36	4:40	4:47	4:58	5:04	5:10	5:20
32-01	4:26	4:36	4:42	4:49	4:58	5:06	5:10	5:17	5:28	5:34	5:40	5:50
32-04	4:56	5:06	5:12	5:19	5:28	5:36						
32-02	5:26	5:36	5:42	5:49	5:58	6:06						
32-01	5:56	6:06	6:12	6:19	6:28	6:36						

Master schedule for Route 32

Advanced Chapter 4/ Runcutting

Trip #	Block #	Via	Lv MCC	Lv WAS	MYV	CKP	CLA	CLT	Arr CON	Lv CON	FRY	Arr DVC
1W	110-1	K		5:04		5:13	5:17	5:22	5:30	5:33	5:38	5:49
2W	110-2	P		5:21	5:28		5:32	5:37	5:45	5:48	5:53	6:04
3W	110-3	K		5:31		5:40	5:45	5:51	6:00	6:03	6:09	6:21
4W	110-4	M	5:43	5:57			6:00	6:06	6:15	6:18	6:24	6:36
5W	110-5	P		6:02	6:10		6:15	6:21	6:30	6:33	6:39	6:51
6W	110-6	K		6:11		6:20	6:25	6:31	6:40	6:43	6:49	7:01
7W	110-7	M	6:18	6:32			6:35	6:41	6:50	6:55	7:01	7:13
8W	110-8	P		6:32	6:40		6:45	6:51	7:00	7:05	7:11	7:23
9W	110-1	K		6:41		6:50	6:55	7:01	7:10	7:15	7:21	7:33
10W	110-9	M	6:48	7:02			7:05	7:11	7:20	7:25	7:31	7:43
11W	110-2	P		7:02	7:10		7:15	7:21	7:30	7:35	7:41	7:53
12W	110-3	K		7:11		7:20	7:25	7:31	7:40	7:45	7:51	8:03
13W	110-4	M	7:24	7:38			7:41	7:46	7:55	8:00	8:06	8:18
14W	110-5	P		7:39	7:47		7:52	7:58	8:07	8:15	8:21	8:34
15W	110-6	K		7:55		8:04	8:09	8:15	8:24	Out of Service		
16W	110-7	M	8:00	8:14			8:17	8:23	8:32	8:35	8:41	8:54
17W	110-8	P		8:09	8:17		8:23	8:29	8:38	Out of Service		
18W	110-1	P		8:14	8:21		8:27	8:33	8:42	8:55	9:01	9:14
19W	110-9	K		8:29		8:38	8:42	8:47	8:56	Out of Service		
20W	110-2	M	8:40	8:54			8:57	9:02	9:11	9:13	9:19	9:32
21W	110-3	P		9:00	9:07		9:11	9:16	9:25	Out of Service		
22W	110-4	K		9:11		9:20	9:24	9:29	9:38	9:40	9:46	9:59
23W	110-5	M	9:29	9:41			9:44	9:49	9:58	10:00	10:06	10:19
24W	110-7	P		9:53	10:00		10:04	10:09	10:18	10:20	10:26	10:39
25W	110-1	K		10:11		10:20	10:24	10:29	10:38	10:40	10:46	10:59
26W	110-2	M	10:29	10:41			10:44	10:49	10:58	11:00	11:06	11:19
27W	110-4	P		10:52	10:59		11:03	11:09	11:18	11:20	11:25	11:37
28W	110-5	K		11:10		11:19	11:23	11:29	11:38	11:40	11:45	11:57
29W	110-7	M	11:29	11:40			11:43	11:49	11:58	12:00	12:05	12:17
30W	110-1	P		11:52	11:59		12:03	12:09	12:18	12:20	12:25	12:37
31W	110-2	K		12:10		12:19	12:23	12:29	12:38	12:40	12:45	12:57
32W	110-4	M	12:29	12:40			12:43	12:49	12:58	1:00	1:05	1:17
33W	110-5	P		12:52	12:59		1:03	1:09	1:18	1:20	1:25	1:37
34W	110-7	K		1:10		1:19	1:23	1:29	1:38	1:40	1:45	1:57
35W	110-1	M	1:29	1:40			1:43	1:49	1:58	2:00	2:05	2:18
36W	110-2	P		1:52	1:59		2:03	2:09	2:18	2:20	2:25	2:38
37W	110-4	K		2:09		2:18	2:23	2:29	2:39	2:40	2:45	2:58
38W	110-5	M	2:32	2:40			2:43	2:49	2:59	3:04	3:09	3:22
39W	110-16S	K		2:44S		2:51S						
40W	110-7	P		2:54	3:03		3:07	3:13	3:23	3:25	3:30	3:43
41W	110-1	K		3:12		3:21	3:26	3:32	3:42	3:47	3:52	4:05
42W	110-2	M	3:36	3:44			3:47	3:53	4:03	4:05	4:10	4:23
43W	110-4	P		3:54	4:03		4:07	4:13	4:23	4:25	4:30	4:43
44W	110-10	K		4:13		4:22	4:27	4:33	4:43	4:46	4:51	5:04
45W	110-5	M	4:36	4:44			4:47	4:53	5:03	5:05	5:10	5:23
46W	110-11	P		4:45	4:53		4:57	5:03	5:13	5:15	5:21	5:34
47W	110-7	K		4:50		4:59	5:04	5:10	5:20	5:25	5:31	5:44
48W	110-15	--								5:35	5:41	5:54
49W	110-1	M	5:15	5:23			5:27	5:33	5:43	5:45	5:51	6:04
50W	110-12	P		5:25	5:33		5:37	5:43	5:53	5:55	6:01	6:14
51W	110-2	K		5:33		5:42	5:47	5:53	6:03	6:05	6:11	6:24
52W	110-13	M	5:45	5:53			5:57	6:03	6:13	6:15	6:21	6:34
53W	110-4	P		5:55	6:03		6:07	6:13	6:23	6:25	6:31	6:44
54W	110-14	K		6:03		6:12	6:17	6:23	6:33	6:35	6:41	6:54
55W	110-10	M	6:15	6:23			6:27	6:33	6:43	6:45	6:51	7:04
56W	110-5	P		6:25	6:33		6:37	6:43	6:53	6:55	7:01	7:14
57W	110-11	K		6:33		6:42	6:47	6:53	7:03	7:05	7:11	7:24
58W	110-7	M	6:45	6:53			6:57	7:03	7:11	7:15	7:20	7:31
59W	110-15	P		6:55	7:03		7:07	7:13	7:21	7:25	7:30	7:41
60W	110-1	K		7:07		7:15	7:19	7:24	7:32	Out of Service		
61W	110-12	M	7:23	7:31			7:34	7:39	7:47	7:50	7:55	8:06
62W	110-2	P		7:28	7:35		7:39	7:44	7:52	Out of Service		
63W	110-4	K		7:42		7:50	7:54	7:59	8:07	8:10	8:15	8:26
64W	110-10	M	8:00	8:08			8:11	8:16	8:24	Out of Service		
65W	110-11	P		8:14	8:21		8:25	8:30	8:38	8:40	8:45	8:56
66W	110-15	K		8:37		8:45	8:49	8:53	9:01	9:10	9:15	9:26
67W	110-12	M	9:00	9:08			9:11	9:16	9:24	Out of Service		
68W	110-4	P		9:24	9:31		9:35	9:40	9:48	9:50	9:55	10:06
69W	110-11	K		9:53		10:01	10:05	10:10	10:18	Out of Service		
70W	110-15	P		10:24	10:31		10:35	10:40	10:48	Out of Service		
71W	110-4	K		10:53		11:01	11:05	11:10	11:18	Out of Service		

Master schedule for Route 110 WESTbound

Trip #	Block #	Via	Lv DVC	CLD	Arr CON	Lv CON	CLT	CLA	CKP	MYV	Arr WAS	Arr MCC
1E	110-1	P				4:43	4:49	4:53		4:57	5:04	
2E	110-2	K				4:59	5:05	5:09	5:13		5:21	
3E	110-3	P				5:05	5:11	5:15		5:19	5:27	
4E	110-4	M				5:21	5:27	5:31			5:34	5:42
5E	110-5	K				5:36	5:44	5:49	5:53		6:02	
6E	110-6	P				5:45	5:53	5:58		6:03	6:11	
7E	110-7	M	5:30	5:40	5:46	5:52	6:00	6:05			6:09	6:17
8E	110-8	K	5:44	5:55	6:02	6:06	6:14	6:19	6:23		6:32	
9E	110-1	P	5:54	6:05	6:12	6:15	6:23	6:28		6:33	6:41	
10E	110-9	M	6:00	6:11	6:18	6:22	6:30	6:35			6:39	6:47
11E	110-2	K	6:14	6:25	6:32	6:36	6:44	6:49	6:53		7:02	
12E	110-3	P	6:23	6:34	6:41	6:45	6:53	6:58		7:03	7:11	
13E	110-4	M	6:38	6:49	6:56	6:58	7:06	7:11			7:15	7:23
14E	110-5	K	6:53	7:04	7:11	7:13	7:21	7:26	7:30		7:39	
15E	110-6	P	7:08	7:19	7:26	7:29	7:37	7:42		7:47	7:55	
16E	110-7	M	7:14	7:25	7:32	7:34	7:42	7:47			7:47	7:55
17E	110-8	K	7:24	7:35	7:42	7:43	7:51	7:56	8:00		8:09	
18E	110-1	K	7:34	7:45	7:52	7:53	8:00	8:04	8:07		8:14	
19E	110-9	P	7:44	7:55	8:02	8:04	8:12	8:17		8:22	8:29	
20E	110-2	M	7:55	8:06	8:13	8:15	8:23	8:28			8:32	8:40
21E	110-3	K	8:10	8:21	8:28	8:30	8:38	8:43	8:47		8:55	
22E	110-4	P	8:25	8:36	8:43	8:45	8:53	8:58		9:02	9:09	
23E	110-5	M	8:45	8:56	9:03	9:05	9:13	9:18			9:21	9:29
24E	110-7	K	9:05	9:16	9:23	9:25	9:33	9:38	9:42		9:50	
25E	110-1	P	9:25	9:36	9:43	9:45	9:53	9:58		10:02	10:09	
26E	110-2	M	9:45	9:56	10:03	10:05	10:13	10:18			10:21	10:29
27E	110-4	K	10:05	10:16	10:22	10:25	10:38	10:42	10:42		10:50	
28E	110-5	P	10:25	10:36	10:42	10:45	10:53	10:58		11:02	11:09	
29E	110-7	M	10:45	10:56	11:02	11:05	11:13	11:18			11:21	11:29
30E	110-1	K	11:05	11:16	11:22	11:25	11:33	11:38	11:42		11:50	
31E	110-2	P	11:25	11:36	11:42	11:45	11:53	11:58		12:02	12:09	
32E	110-4	M	11:45	11:56	12:02	12:05	12:13	12:18			12:21	12:29
33E	110-5	K	12:05	12:16	12:22	12:25	12:33	12:38	12:42		12:49	
34E	110-7	P	12:25	12:36	12:42	12:45	12:53	12:58		1:02	1:09	
35E	110-1	M	12:45	12:56	1:02	1:05	1:13	1:18			1:21	1:29
36E	110-2	K	1:05	1:16	1:22	1:25	1:33	1:38	1:42		1:49	
37E	110-4	P	1:25	1:36	1:42	1:45	1:53	1:58		2:02	2:09	
38E	110-5	M	1:45	1:56	2:02	2:05	2:13	2:18			2:21	2:29
39E	110-7	K	2:01	2:14	2:21	2:24	2:33	2:39	2:44		2:54	
40E	110-1	P	2:20	2:33	2:40	2:43	2:52	2:58		3:03	3:12	
41E	110-2	M	2:40	2:53	3:00	3:03	3:12	3:18			3:22	3:36
42E	110-4	K	3:00	3:13	3:20	3:24	3:33	3:39	3:44		3:54	
43E	110-10	P	3:20	3:33	3:40	3:44	3:53	3:59		4:04	4:13	
44E	110-5	M	3:40	3:53	4:00	4:02	4:11	4:17			4:21	4:35
45E	110-11	K				4:12	4:22	4:29	4:34		4:44	
46E	110-7	P	3:55	4:08	4:16	4:20	4:30	4:37		4:42	4:50	
47E	110-1	M	4:15	4:28	4:36	4:40	4:50	4:57			5:00	5:14
48E	110-12	K				4:50	5:00	5:07	5:12		5:22	
49E	110-2	P	4:35	4:48	4:56	5:00	5:10	5:17		5:22	5:30	
50E	110-13	M				5:10	5:20	5:27			5:30	5:44
51E	110-4	K	4:55	5:08	5:16	5:20	5:30	5:37	5:42		5:52	
52E	110-14	P				5:30	5:40	5:47		5:52	6:00	
53E	110-10	M	5:15	5:28	5:36	5:40	5:50	5:57			6:00	6:14
54E	110-5	K	5:25	5:38	5:46	5:50	6:00	6:07	6:12		6:22	
55E	110-11	P	5:35	5:48	5:56	6:00	6:10	6:17		6:22	6:30	
56E	110-7	M	5:45	5:58	6:00	6:10	6:20	6:27			6:30	6:44
57E	110-15	K	5:55	6:08	6:16	6:20	6:30	6:37	6:42		6:52	
58E	110-1	P	6:05	6:18	6:26	6:30	6:40	6:47		6:52	7:00	
59E	110-12	M	6:20	6:33	6:41	6:45	6:55	7:02			7:05	7:17
60E	110-2	P	6:35	6:48	6:56	7:00	7:07	7:12	7:16		7:24	
61E	110-4	K	6:50	7:03	7:11	7:15	7:22	7:27		7:31	7:38	
62E	110-10	M	7:10	7:21	7:27	7:30	7:37	7:42			7:45	7:57
63E	110-11	K	7:30	7:41	7:47	7:50	7:57	8:02	8:06		8:14	
64E	110-15	P	7:50	8:01	8:07	8:10	8:17	8:22		8:26	8:33	
65E	110-12	M	8:10	8:21	8:27	8:30	8:37	8:42			8:45	8:57
66E	110-4	K	8:40	8:51	8:57	9:00	9:07	9:12	9:16		9:24	
67E	110-11	P	9:10	9:21	9:27	9:30	9:37	9:42		9:46	9:53	
68E	110-15	K	9:40	9:51	9:57	10:00	10:07	10:12	10:16		10:24	
69E	110-4	P	10:10	10:21	10:27	10:30	10:37	10:42		10:46	10:53	

Master schedule for Route 110 EASTbound

Block No.	START/END OF REVENUE TIME																				Revenue
	4a	5a	6a	7a	8a	9a	10a	11a	12p	1p	2p	3p	4p	5p	6p	7p	8p	9p	10p	11p	Hours
	Early AM		AM Peak			Base (Midday)						School		PM Peak			Evening			Night	
110-1	443a																924p				16:41
110-2	459a																752p				14:53
110-4	521a																824p				15:03
110-7	530a																1048p				17:18
110-5	536a																1018p				16:42
32-01	610a													636p							12:26
32-02	640a													606p							11:26
110-10												300p								1118p	8:18
110-3	505a					925a															4:20
110-6	545a		824a																		2:39
110-8	544a		838a																		2:54
110-9	600a		856a																		2:56
32-03	626a		1005a																		3:39
32-04												156p		536p							3:40
110-11														412p 724p							3:12
110-12														450p 747p							2:57
110-13														510p 634p							1:24
110-14														530p 654p							1:24
110-15														535p 741p							2:06
110-16S												244p 251p									:07
Block No.	4a	5a	6a	7a	8a	9a	10a	11a	12p	1p	2p	3p	4p	5p	6p	7p	8p	9p	10p	11p	144:07

Block graph for Route 32 and Route 110

Route #: 110

Route#: 32

BLOCK SUMMARY RECAP

Special Instructions:

Date: xx/xx/xx

Scheduler:

BLOCK NO.	PULL-OUT TIME	PULL-ON LOCATION	FIRST REVENUE TIME	LAST REVENUE TIME	PULL-OFF LOCATION	PULL-IN TIME	REVENUE HOURS	PLATFORM HOURS
110-1	4:36A	CON	4:43A	9:24P	CON	9:31P	16:41	16:55
110-2	4:52A	CON	4:59A	7:52P	CON	7:59P	14:53	15:07
110-3	4:58A	CON	5:05A	9:25A	CON	9:32A	4:20	4:34
110-4	5:14A	CON	5:21A	8:24P	CON	8:31P	15:03	15:17
110-5	5:29A	CON	5:36A	10:18P	CON	10:25P	16:42	16:56
110-6	5:38A	CON	5:45A	8:24A	CON	8:31A	2:39	2:53
110-7	5:18A	DVC	5:30A	10:48P	CON	10:55P	17:18	17:37
110-8	5:32A	DVC	5:44A	8:38A	CON	8:45A	2:54	3:13
110-9	5:48A	DVC	6:00A	8:56A	CON	9:03A	2:56	3:15
110-10	2:48P	DVC	3:00P	11:18P	CON	11:25P	8:18	8:37
110-11	4:05P	CON	4:12P	7:24P	DVC	7:36P	3:12	3:31
110-12	4:43P	CON	4:50P	7:47P	CON	7:54P	2:57	3:11
110-13	5:03P	CON	5:10P	6:34P	DVC	6:46P	1:24	1:43
110-14	5:23P	CON	5:30P	6:54P	DVC	7:06P	1:24	1:43
110-15	5:28P	CON	5:35P	7:41P	DVC	7:53P	2:06	2:25
110-16S	2:09P	WAS	2:44P	2:51P	CKP	3:16P	:07	1:07
32-01	6:00A	RGM	6:10A	6:36P	RGM	6:46P	12:26	12:46
32-02	6:30A	RGM	6:40A	6:06P	RGM	6:16P	11:26	11:46
32-03	6:16A	CBS	6:26A	10:05A	RGM	10:15A	3:39	3:59
32-04	1:46P	CBS	1:56P	5:36P	RGM	5:46P	3:40	4:00
Total							144:07	150:35

Block summary recap for Route 32 and Route 110

III. Work Rules

Work rules are many and varied among transit agencies. It is extremely important that the scheduler be knowledgeable of all applicable agency work rules. For demonstration purposes, the following work rules will apply to the runcutting process demonstrated in this chapter:

- Minimum and Maximum Platform Time
- Report and Turn-in Allowances
- Spread Time and Spread Penalty
- On-street Relief Allowances
- Make-up Percentages
- Run Type Percentages
- Part-time Operator Runs

A. Minimum and maximum platform time

This work rule defines the minimum and maximum size a run can be as measured by *platform time*. Platform time is the total time during which an operator is behind the wheel of a vehicle in both revenue and nonrevenue service. For Routes 32 and 110, minimum platform time for a legal fulltime run is established at 6 hours and maximum platform time is 9 hours.

When block pieces cannot be assembled into runs of minimum platform time, other options can be considered, depending on agency work rules. For example, those blocks may be assigned to the Extra Board (a pool of standby on-duty operators) or arranged into runs for part-time operators.

B. Report and turn-in Allowances

The *report allowance* is an amount of time paid to an operator starting at the time the operator is to report for duty (report time) and ending at the time the operator is scheduled to pull-out. This is paid time for the operator to get ready for revenue service and can include duties such as gathering supplies, receiving instructions, locating the assigned vehicle and performing a pre-trip inspection.

A 10-minute report allowance will be granted for all reports at the garage. For reports associated with an on-street relief, a 5-minute report allowance will be granted.

The *turn-in allowance* is time paid to an operator for reporting to the dispatcher at the conclusion of the run, turning in transfers, fare media or other supplies and reports or other end of run duties. A one time 5-minute turn-in allowance will be granted for each run. For split runs, the turn-in allowance will be associated with the last piece of work.

C. Spread time and spread penalty

For a run, *spread time* is defined as the total elapsed time between the first report time and the final turn-in time. A spread maximum typically applies to split runs and, depending on the agency, varies between 10 and 15 hours in duration. For Routes 32 and 110, the maximum allowed spread will be 14.5 hours. There will be no limit or cap on the number of system-wide split runs that can exist within specified spread interval limits.

A *spread penalty* is payment to an operator for time worked beyond spread time limits. Some transit systems are subject to a multilayer spread penalty with the penalty ranging from one-half time to full-time pay for various levels of excess minutes.

For Routes 32 and 110 full-time runs, the spread penalty will be one-half of all minutes over a 12-hour spread (13 for part-time runs) paid at straight time. Overtime will not be paid when spread minutes are paid.

D. On-street relief allowance

A *relief allowance* is a payment to operators who are required to travel from the garage to the relief location (and/or vice versa). For Routes 32 and 110, the relief allowance will consist of the deadhead time (the commute time between the garage and the relief point) plus one-half of the headway at the time of the relief. This will apply to both the relieving and relieved run.

E. Make-up allowance

A *make-up allowance* is payment for the difference in time actually worked and any minimum daily or weekly guarantee. For example, a run that totals 7:50 platform and allowances will be granted 10 minutes of make-up time so that the total work hours equals an 8-hour minimum daily guarantee. At this agency, a daily guarantee of 8 hours for full-time runs is incorporated in the work rules. There is no guarantee for part-time runs.

F. Run type percentages

Many agencies are required to develop a certain percentage of straight runs or to restrict the number of split runs. A typical *run type percentage* stipulation requires that one-half of all runs must be straight runs while one-third of the remaining split runs must not exceed a 12-hour spread, one-third may not exceed a 12.5-hour spread and the rest may not exceed a 13-hour spread.

For Routes 32 and 110, one-half of all full-time runs must be straight. Of the remaining runs, none can exceed 14.5 hours of spread time.

G. Part-time operator runs

Work rules at this agency restrict the number of part-time runs (runs working less than 6 hours) to a maximum of 20% of the number of full-time runs.

Work rules for Routes 32 and 110 are summarized on the following page.

H. Work rules summary

Work Rule	Stipulation
Minimum Platform Time	6 hours for a full-time run; fewer hours qualifies for a part-time run
Maximum Platform Time	9 hours
Report Allowance	10 minutes per garage report; 5 minutes for on-street relief reports. (Applies to both full- and part-time runs).
Turn-in Allowance	One 5-minute turn-in allowance per run. (Applies to both full- and part-time runs).
Spread Time	14.5 hours maximum spread. (Applies to both full- and part-time runs).
Spread Penalty	1/2 of the minutes over 12 hours @ straight time for full-time runs; 1/2 of the minutes over 13 hours @ straight time for part-time runs.
On-street Relief Allowances	Relief allowances to and from all relief points will consist of the deadhead allowance to that point plus 1/2 of the headway in effect at the time of the relief.
Make-up Allowance	Up to 8 daily pay hours for full-time runs only; no minimum guarantee for part-time runs.
Run Type Percentages	<p>Straights - Minimum of 1/2 of all full-time runs.</p> <p>No cap or limit on the number of split runs within specified spread intervals.</p>
Part-time Operators	Part-time runs (< 6 hours platform) cannot exceed 20% of full-time runs.

Summary of work rules for Route 32 and Route 110

I. Use of drop backs in runcutting

The term "drop back" can refer to either vehicles or operators. For vehicles, drop backs are small additions of running time, generally 1 to 2 minutes, on a specific trip at a specific time point or stop in order to delay the vehicle for a specific purpose. Drop backs generally occur at either a route terminal or a mid-route relief point.

Common reasons for vehicle drop backs include ensuring a timed transfer between two routes at an intersecting point and accommodating on-street reliefs.

For operators, drop backs are a method of providing mandatory meal or other types of breaks without disrupting the consistency of service (as perceived by the customer).

For example, a transit system requires a 30-minute meal break between the second and sixth hours of an 8-hour straight run. A relief operator meets the vehicle on route and continues the trip while the regular operator has a meal in a nearby restaurant. At the conclusion of the break, the relieved operator may pick up the same vehicle block (on the return trip, for instance) or be assigned to another block passing through the same terminal or relief point.

Some systems assign one operator to cover a series of consecutive meal reliefs on routes that use the same relief point. The meal reliefs may be incorporated into one piece of a split run, or in some cases, a straight run. Another option is to spread the meal reliefs over several runs, creating a "domino effect" wherein a number of operators with straight runs may, in series, work multiple routes within their work day.

IV. Looking for Blocking Efficiencies

It is common for the scheduler to once again evaluate the block pool prior to runcutting. It is important to consider the availability of blocks that can be efficiently cut into runs. For example, a block piece in the 15 to 16 hour range could possibly be cut into 2 straight runs. Shorter block pieces can be evaluated to determine if rehooking can result in more efficient split runs (i.e., reduce spread time, minimize make-up allowance, etc.) without adding excessive layover.

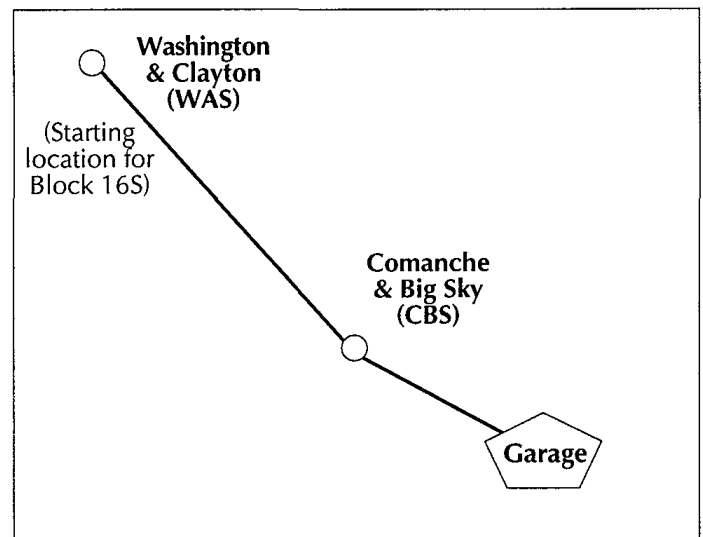
A. Rehooking a school extra

One glaring inefficiency evident in the block graph is Block 110-16S. This block contains 1 hour and 7 minutes of platform time (see block summary recap) with only 7 minutes of revenue time.

Since it ends just before the P.M. Peak, it might be a good candidate to combine with an A.M. piece to form a split run with very little spread. However, the starting location (WAS) and ending location (CKP) for Block 110-16S are not shared by any other Route 110 block, nor are the starting time (2:44 p.m.) and ending time (2:51 p.m.) very close to any other Route 110 or Route 32 block start and end times. This means that rehooking Block 110-16S with another Route 110 block would likely incur significant deadhead and/or significant layover time.

However, the scheduler notes that a vehicle deadheading from the garage to the starting location of Block 110-16S (WAS) would pass by Comanche & Big Sky (CBS), a Route 32 terminus. This opens the possibility that a Route 32 vehicle arriving at CBS could deadhead to WAS and make the Block 110-16S trip.

The master schedule indicates that Route 32 Block 32-02 has a trip arriving at CBS at 2:20 p.m. For this vehicle to make a trip starting at WAS at 2:44 p.m., it would need 24 minutes to deadhead from CBS to WAS (2:20 p.m. to 2:44 p.m.).



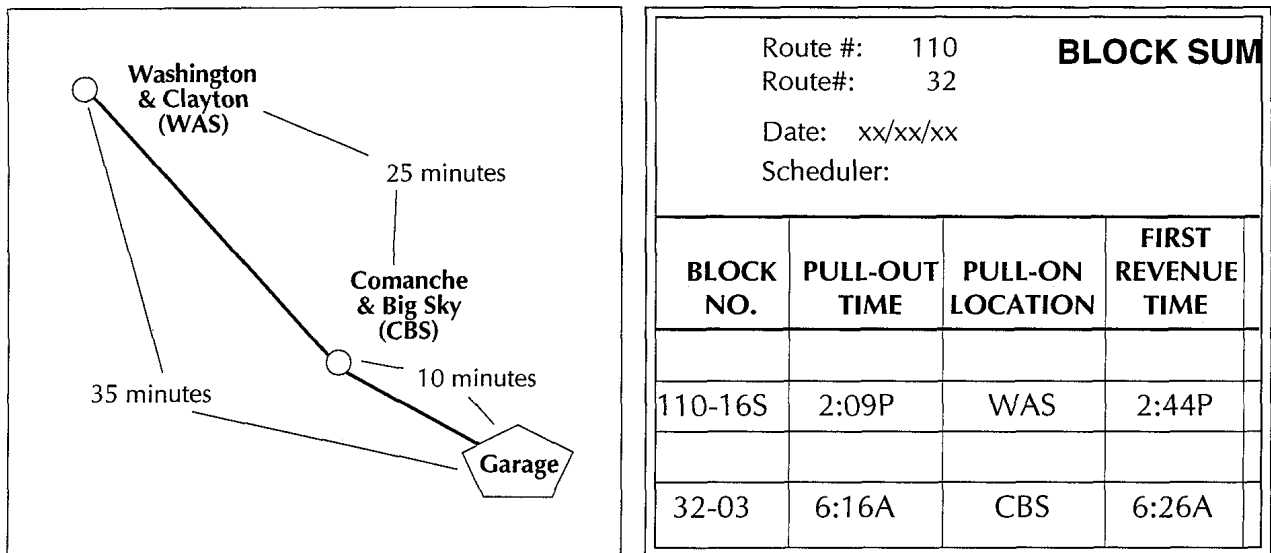
The Block 110-16S pull-out route passes by CBS.

Block #	Comanche & Big Sky	Comanche & Wyoming	Comanche & San Mateo	Comanche & Carlisle	N. 4th & Griegos	Rio Grande & Montano	Rio Grande & Montano	N. 4th & Griegos	Comanche & Carlisle	Comanche & San Mateo	Comanche & Wyoming	Comanche & Big Sky
32-01	11:26	11:35	11:41	11:45	11:55	12:02	P 12:40	12:47	12:57	1:01	1:07	1:16
32-02	12:26	12:35	12:41	12:45	12:55	1:02	M 1:40	1:47	1:58	2:04	2:10	2:20
32-01	1:26	1:36	1:42	1:49	1:58	2:06	2:10	2:17	2:28	2:34	2:40	2:50

Route 32 has a trip arriving at CBS at 2:20 p.m.

To determine if a vehicle can deadhead from CBS to WAS in 24 minutes, the scheduler must establish that the deadhead time from CBS to WAS is around 24 minutes or less. The time to travel from CBS to WAS can be computed by subtracting the deadhead time from the garage location to WAS from the deadhead time from the garage location to CBS. Those deadhead times are available from the block summary recap form as pull-out times.

The pull-out time for Block 110-16S (garage location to WAS) is listed as 35 minutes (2:09 p.m. to 2:44 p.m.). The pull-out time listed for Block 32-03 is listed as 10 minutes (6:16 a.m. to 6:26 a.m.). The difference is 25 minutes (35 - 10).



**Block 110-16S requires 35 Minutes of pull-out time to WAS.
Block 32-03 requires 10 Minutes pull-on time to CBS.**

Although 25 minutes are technically required for this hook, the scheduler decides, based on typical traffic conditions during that time of day, that the 24 available minutes is sufficient. It is certainly close enough to justify the elimination of the inefficient block 110-16S. What would be the consequences of this rehook?

- 1) Inefficient Block 110-16S would no longer exist.
- 2) Newly rehooked Block 32-02 would have a platform time of 8:46. (6:30 a.m. to 3:16 p.m.) and a revenue service time of 8:11 (8:46 platform minus 10 minutes pull-out and 25 minutes pull-in).
- 3) The remaining portion of the original Block 32-02 (now numbered as 32-05) would become a separate and unique block piece, operating in revenue service from 2:26 p.m. to 6:06 p.m. with a platform time of 4:00.

Since this change can be done within the work rules and will result in a better platform to revenue service ratio, the decision is made to rehook.

This example again demonstrates the interactiveness of the scheduling process. Although the master schedules were developed and blocked earlier, the runcutting process allowed the scheduler to further evaluate the process for efficiencies. The modified master schedules, block graph and block summary recap forms appear on the following pages.

1) Revising the master schedule

Changes to the master schedule are as follows:

Block #	Comanche & Big Sky	Comanche & Wyoming	Comanche & San Mateo	Comanche & Carlisle	N. 4th & Griegos	Rio Grande & Montano	Rio Grande & Montano	N. 4th & Griegos	Comanche & Carlisle	Comanche & San Mateo	Comanche & Wyoming	Comanche & Big Sky
32-01						6:10	6:17	6:27	6:32	6:40	6:50	
32-02						6:40	6:47	6:57	7:03	7:10	7:20	
32-03	6:26	6:36	6:43	6:49	6:58	7:05	7:10	7:17	7:27	7:33	7:40	7:50
32-01	6:56	7:06	7:13	7:19	7:28	7:35	7:40	7:47	7:57	8:03	8:10	8:20
32-02	7:26	7:36	7:43	7:49	7:58	8:05	8:10	8:17	8:27	8:33	8:40	8:50
32-03	7:56	8:06	8:13	8:19	8:28	8:35	8:40	8:47	8:57	9:03	9:10	9:20
32-01	8:26	8:36	8:43	8:49	8:58	9:05	9:10	9:17	9:27	9:33	9:40	9:50
32-02	8:56	9:06	9:13	9:19	9:28	9:35	9:40	9:47	9:57	10:03	10:10	10:20
32-03	9:26	9:36	9:43	9:49	9:58	10:05	Out of Service					
32-01	9:56	10:06	10:13	10:19	10:28	10:35	10:40	10:47	10:57	11:01	11:07	11:16
32-02	10:26	10:35	10:41	10:45	10:55	11:02	11:40	11:47	11:57	12:01	12:07	12:15
32-01	11:26	11:35	11:41	11:45	11:55	12:02	12:40	12:47	12:57	1:01	1:07	1:16
32-02	12:26	12:35	12:41	12:45	12:55	1:02	1:40	1:47	1:58	2:04	2:10	2:20
32-01	1:26	1:36	1:42	1:49	1:58	2:06	2:10	2:17	2:28	2:34	2:40	2:50
32-04	1:56	2:06	2:12	2:19	2:28	2:36	2:40	2:47	2:58	3:04	3:10	3:20
32-05	2:26	2:36	2:42	2:49	2:58	3:06	3:10	3:17	3:28	3:34	3:40	3:50
32-01	2:56	3:06	3:12	3:19	3:28	3:36	3:40	3:47	3:58	4:04	4:10	4:20
32-04	3:26	3:36	3:42	3:49	3:58	4:06	4:10	4:17	4:28	4:34	4:40	4:50
32-05	3:56	4:06	4:12	4:19	4:28	4:36	4:40	4:47	4:58	5:04	5:10	5:20
32-01	4:26	4:36	4:42	4:49	4:58	5:06	5:10	5:17	5:28	5:34	5:40	5:50
32-04	4:56	5:06	5:12	5:19	5:28	5:36	Out of Service					
32-05	5:26	5:36	5:42	5:49	5:58	6:06	Out of Service					
32-01	5:56	6:06	6:12	6:19	6:28	6:36	Out of Service					

Revised master schedule for Route 32

Trip #	Block #	Via	Lv MCC	Lv WAS	MYV	CKP	CLA	CLT	CON	CON	FRY	Arr DVC
31W	110-2	K		12:10		12:19	12:23	12:29	12:38	12:40	12:45	12:57
32W	110-4	M	12:29	12:40			12:43	12:49	12:58	1:00	1:05	1:17
33W	110-5	P		12:52	12:59		1:03	1:09	1:18	1:20	1:25	1:37
34W	110-7	K		1:10		1:19	1:23	1:29	1:38	1:40	1:45	1:57
35W	110-1	M	1:29	1:40			1:43	1:49	1:58	2:00	2:05	2:18
36W	110-2	P		1:52	1:59		2:03	2:09	2:18	2:20	2:25	2:38
37W	110-4	K		2:09		2:18	2:23	2:29	2:39	2:40	2:45	2:58
38W	110-5	M	2:32	2:40			2:43	2:49	2:59	3:04	3:09	3:22
39W	32-02	K		2:44S		2:51S	Out of Service					
40W	110-7	P		2:54	3:03		3:07	3:13	3:23	3:25	3:30	3:43
41W	110-1	K		3:12		3:21	3:26	3:32	3:42	3:47	3:52	4:05
42W	110-2	M	3:36	3:44			3:47	3:53	4:03	4:05	4:10	4:23
43W	110-4	P		3:54	4:03		4:07	4:13	4:23	4:25	4:30	4:43
44W	110-10	K		4:13		4:22	4:27	4:33	4:43	4:46	4:51	5:04
45W	110-5	M	4:36	4:44			4:47	4:53	5:03	5:05	5:10	5:23
46W	110-11	P		4:45	4:53		4:57	5:03	5:13	5:15	5:21	5:34
47W	110-7	K		4:50		4:59	5:04	5:10	5:20	5:25	5:31	5:44
48W	110-15	--								5:35	5:41	5:54
49W	110-1	M	5:15	5:23			5:27	5:33	5:43	5:45	5:51	6:04
50W	110-12	P		5:25	5:33		5:37	5:43	5:53	5:55	6:01	6:14

Revision to master schedule for Route 110 WESTbound

2) Revising the block graph

The revisions to the block graph for Routes 32 and 110 are shown in bold below:

Block No.	START/END OF REVENUE TIME																				Revenue			
	4a	5a	6a	7a	8a	9a	10a	11a	12p	1p	2p	3p	4p	5p	6p	7p	8p	9p	10p	11p	Hours			
	Early AM		AM Peak			Base (Midday)						School		PM Peak			Evening			Night				
110-1	443a	<div></div>																			924p	16:41		
110-2	459a	<div></div>																			752p	14:53		
110-4	521a	<div></div>																			824p	15:03		
110-7	530a	<div></div>																			1048p	17:18		
110-5	536a	<div></div>																			1018p	16:42		
32-01	610a	<div></div>																			636p	12:26		
32-02	640a	To Rt 110 @ 244p										251p										8:11		
110-10												300p	<div></div>									1118p	8:18	
110-3	505a	<div></div>				925a																4:20		
110-6	545a	<div></div>			824a																2:39			
110-8	544a	<div></div>			838a																2:54			
110-9	600a	<div></div>			856a																2:56			
32-03	626a	<div></div>				1005a																3:39		
32-04												156p	<div></div>				536p							3:40
32-05												226p	<div></div>				606p							3:40
110-11														412p	<div></div>				724p				3:12	
110-12														450p	<div></div>				747p				2:57	
110-13														510p	<div></div>		634p							1:24
110-14														530p	<div></div>		654p							1:24
110-15														535p	<div></div>				741p				2:06	
Block No.	START/END OF REVENUE TIME																				144:23			
	4a	5a	6a	7a	8a	9a	10a	11a	12p	1p	2p	3p	4p	5p	6p	7p	8p	9p	10p	11p				

Revised block graph for Route 32 and Route 110

3) Revising the block summary recap

The revisions to the block summary recap for Routes 32 and 110 are shown in bold below:

Route #: 110		BLOCK SUMMARY RECAP						
Route#: 32		Special Instructions:						
Date: xx/xx/xx								
Scheduler:								
BLOCK NO.	PULL-OUT TIME	PULL-ON LOCATION	FIRST REVENUE TIME	LAST REVENUE TIME	PULL-OFF LOCATION	PULL-IN TIME	REVENUE HOURS	PLATFORM HOURS
110-1	4:36A	CON	4:43A	9:24P	CON	9:31P	16:41	16:55
110-2	4:52A	CON	4:59A	7:52P	CON	7:59P	14:53	15:07
110-3	4:58A	CON	5:05A	9:25A	CON	9:32A	4:20	4:34
110-4	5:14A	CON	5:21A	8:24P	CON	8:31P	15:03	15:17
110-5	5:29A	CON	5:36A	10:18P	CON	10:25P	16:42	16:56
110-6	5:38A	CON	5:45A	8:24A	CON	8:31A	2:39	2:53
110-7	5:18A	DVC	5:30A	10:48P	CON	10:55P	17:18	17:37
110-8	5:32A	DVC	5:44A	8:38A	CON	8:45A	2:54	3:13
110-9	5:48A	DVC	6:00A	8:56A	CON	9:03A	2:56	3:15
110-10	2:48P	DVC	3:00P	11:18P	CON	11:25P	8:18	8:37
110-11	4:05P	CON	4:12P	7:24P	DVC	7:36P	3:12	3:31
110-12	4:43P	CON	4:50P	7:47P	CON	7:54P	2:57	3:11
110-13	5:03P	CON	5:10P	6:34P	DVC	6:46P	1:24	1:43
110-14	5:23P	CON	5:30P	6:54P	DVC	7:06P	1:24	1:43
110-15	5:28P	CON	5:35P	7:41P	DVC	7:53P	2:06	2:25
32-01	6:00A	RGM	6:10A	6:36P	RGM	6:46P	12:26	12:46
32-02	6:30A	RGM	6:40A	2:51P	CKP	3:16P	8:11	8:46
32-03	6:16A	CBS	6:26A	10:05A	RGM	10:15A	3:39	3:59
32-04	1:46P	CBS	1:56P	5:36P	RGM	5:46P	3:40	4:00
32-05	2:16P	CBS	2:26P	6:06P	RGM	6:16P	3:40	4:00
Total							144:23	150:28

Revised block summary recap for Route 32 and Route 110

V. Initiating the Runcut

At this point in the process, the scheduler begins the runcut. The block graph and block summary recap forms can be utilized by the scheduler to help "sketch" information about the runcut, including estimating the number and types of runs that may result.

A. Estimating the number of runs

It is advisable to prepare an estimate of the number of runs that will result from the block pool. This estimate will aid the scheduler in determining whether the process is on target. More runs than the estimate may indicate that blocks have been used more than once. Fewer runs may indicate that some blocks have been left out.

The most commonly used estimation technique consists of dividing the total platform time contained in the blocks by the number of platform hours anticipated in each run.

For example, assuming runs of approximately 8 hours each would result in the following estimate:

Total Routes 32 & 110 Platform Hours	=	<u>150:28</u>
Approximate Platform Hours Per Run	=	8
Estimated Number of Runs	=	18.81 or 19

This estimation technique indicates that around 19 runs are to be cut, given runs in the 8-hour range.

However, there are a number of small peak period pieces in the block pool. If they are pieced together as split runs, the likelihood that they will form full-time runs (runs with a minimum of 6 hours platform time) is questionable. Therefore, additional analysis of run possibilities is desirable.

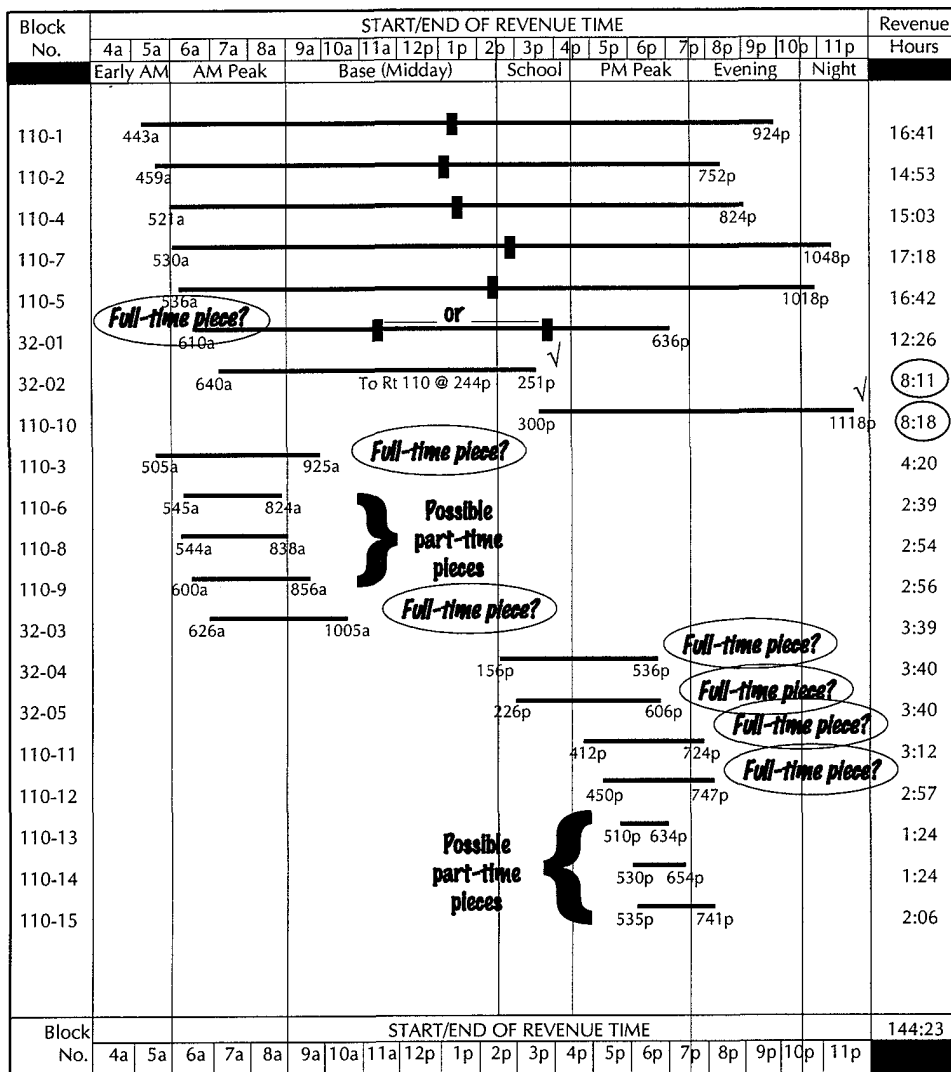
B. Analyzing run possibilities

The block graph provides a useful visual aid in further examining run possibilities. For example, 6 base blocks (blocks that typically start in the early A.M. and run continuously through the P.M. peak) exist (see next page). Five of those base blocks have the potential to cut into 2 straight runs of approximately 8 hours each. The sixth base block, 32-01, could be cut into an 8-hour straight run with a piece left over. There are 2 blocks that are of sufficient length to cut into natural straight runs without any leftover pieces. (A natural straight is a block that would constitute a legal straight run without any additional cutting.)

The scheduler has made notes on the block graph on the following page to identify these and other possible runcut combinations.

Observations

- 1) There are six base blocks (110-1, 110-2, 110-4, 110-7, 110-5 and 32-01), five of which could cut into two straight runs each.
- 2) One base block (32-01) could cut into one straight run with a leftover piece on either end.
- 3) Two blocks (32-02 and 110-10) are natural straights. These could be cut into straight runs with no leftover pieces.
- 4) There are five A.M. pieces (110-3, 110-6, 110-8, 110-9 and 32-03) – six if block 32-01 is cut to leave an A.M. piece. These pieces range in revenue time from 2:39 to 4:20.



Block Graph for Route 32 and Route 110 with Scheduler's Notes

combine with the two remaining P.M. pieces to make full-time split runs. The blocks are therefore not balanced in such a way as to produce a runcut with no pieces left over.

Agencies vary in their approaches to left over pieces. Some stipulate that no pieces be left over while others have no such requirement. This agency has established an objective of achieving piece balance.

- 5) There are seven P.M. pieces (32-04, 32-05, 110-11, 110-12, 110-13, 110-14 and 110-15). These pieces range in time from 1:24 to 3:40.

Since blocks 110-13, 110-14 and 110-15 range in revenue time from 1:24 to 2:06, they will not easily combine with existing A.M. pieces to make full-time split runs.

Therefore, they could be considered for part-time runs. This leaves four P.M. block pieces as candidates for full-time split runs.

Of the A.M. pieces, blocks 110-6, 110-8 and 110-9 look like possible part-time split run pieces. Blocks 110-3 and 32-03 look like possible full-time split run pieces. At this point in the runcut analysis, the scheduler lacks two A.M. pieces of sufficient length to

One option identified earlier would result in an additional A.M. tripper piece. Block 32-01, with revenue time of 12:26 is not long enough to cut into two runs. Cutting that block into a straight P.M. run with an A.M. tripper piece left over would leave the scheduler short just one A.M. piece.

The final A.M. piece could possibly be cut from Block 110-7. This block is 17:18 in length. If two straight runs were cut from this block – when pull-out, pull-in, relief and other collateral times were added – the runs could approach 9 hours each. A viable option would be to cut this block into two straight runs (an A.M. and a P.M. run) of something less than 8 hours each with a third piece (from the middle) that could qualify as a A.M. piece and combine with a remaining P.M. piece to form a full-time split run.

C. Chronological block listing

AM Block # / Pull-out	Platform/ Relief or Pull-in	Relief Location		Relief Location	PM Block # / Pull-out	Platform/ Relief or Pull-in
110-1 4:36a					110-1	9:31p
110-2 4:52a					110-2	7:59p
110-4 5:14a					110-4	8:31p
110-7 5:18a					110-7	10:55p
110-5 5:29a					110-5	10:25P
32-01 6:00a					32-01	6:46p
32-02 6:30a	8:46 3:16p				110-10 2:48p	8:37 11:25p
110-3 4:58a	4:34 9:32a				32-04 1:46p	4:00 5:46p
110-8 5:32a	3:13 8:45a				32-05 2:16p	4:00 6:16p
110-6 5:38a	2:53 8:31a				110-13 5:03p	1:43 6:46p
110-9 5:48a	3:15 9:03a				110-14 5:23p	1:43 7:06p
32-03 6:16a	3:59 10:15a				110-11 4:05p	3:31 7:36p
					110-15 5:28p	2:25 7:53p
					110-12 4:43p	3:11 7:54p
AM Platform					PM Platform	

The runcut process can be facilitated by arranging the blocks into a chronological block listing. In particular, this arrangement helps the scheduler develop split runs that conform to spread limitations.

This form lists base blocks first in chronological pull-out order. All A.M. blocks that pull out prior to noon are also listed in chronological pull-out order. All P.M. tripper blocks that pull out after 12:00 noon are listed in chronological pull-in order to facilitate matching.

Note that while the block graph denotes revenue service start and stop times, the chronological block listing uses pull-out and pull-in times obtained from the block summary recap.

Total platform hours are not yet computed pending the cutting of the base blocks.

Chronological block listing for Route 32 and Route 110

VI. The Runcut

A. Achieving piece balance

From the block pool, the scheduler originally estimated four full-time P.M. split pieces (32-04, 32-05, 110-11 and 110-12) and two full-time A.M. split pieces (110-3 and 32-03). The scheduler now investigates two possibilities for gaining the two additional balancing A.M. pieces – from Block 32-01 and Block 110-7.

Opportunity 1 - Block 32-01

Block 32-01 is currently operating from 6:10 a.m. to 6:46 p.m. The scheduler notes that a straight P.M. run of approximately 8 hours ending at 6:46 p.m. would have to begin around 10:46 a.m. To accomplish this break efficiently, the master schedule is examined for an eligible relief time along the route around 10:46 a.m. A relief is possible at Rio Grande & Montano at 10:40 a.m.

Block #	Comanche & Big Sky	Comanche & Wyoming	Comanche & San Mateo	Comanche & Carlisle	N. 4th & Griegos	Rio Grande & Montano	Rio Grande & Montano	N. 4th & Griegos	Comanche & Carlisle	Comanche & San Mateo	Comanche & Wyoming	Comanche & Big Sky
32-01						6:10	6:17	6:27	6:32	6:40	6:50	
32-02						6:40	6:47	6:57	7:03	7:10	7:20	
32-03	6:26	6:36	6:43	6:49	6:58	7:05	7:10	7:17	7:27	7:33	7:40	7:50
32-01	6:56	7:06	7:13	7:19	7:28	7:35	7:40	7:47	7:57	8:03	8:10	8:20
32-02	7:26	7:36	7:43	7:49	7:58	8:05	8:10	8:17	8:27	8:33	8:40	8:50
32-03	7:56	8:06	8:13	8:19	8:28	8:35	8:40	8:47	8:57	9:03	9:10	9:20
32-01	8:26	8:36	8:43	8:49	8:58	9:05	9:10	9:17	9:27	9:33	9:40	9:50
32-02	8:56	9:06	9:13	9:19	9:28	9:35	9:40	9:47	9:57	10:03	10:10	10:20
32-03	9:26	9:36	9:43	9:49	9:58	10:05						
32-01	9:56	10:06	10:13	10:19	10:28	10:35	10:40	10:47	10:57	11:01	11:07	11:16
32-02	10:26	10:35	10:41	10:45	10:55	11:02	11:40	11:47	11:57	12:01	12:07	12:15
32-01	11:26	11:35	11:41	11:45	11:55	12:02	12:40	12:47	12:57	1:01	1:07	1:16
32-02	12:26	12:35	12:41	12:45	12:55	1:02	1:40	1:47	1:58	2:04	2:10	2:20
32-01	1:26	1:36	1:42	1:49	1:58	2:06	2:10	2:17	2:28	2:34	2:40	2:50
32-04	1:56	2:06	2:12	2:19	2:28	2:36	2:40	2:47	2:58	3:04	3:10	3:20
32-02	2:26	2:36	2:42	2:49	2:58	3:06	3:10	3:17	3:28	3:34	3:40	3:50
32-01	2:56	3:06	3:12	3:19	3:28	3:36	3:40	3:47	3:58	4:04	4:10	4:20
32-04	3:26	3:36	3:42	3:49	3:58	4:06	4:10	4:17	4:28	4:34	4:40	4:50
32-02	3:56	4:06	4:12	4:19	4:28	4:36	4:40	4:47	4:58	5:04	5:10	5:20
32-01	4:26	4:36	4:42	4:49	4:58	5:06	5:10	5:17	5:28	5:34	5:40	5:50
32-04	4:56	5:06	5:12	5:19	5:28	5:36						
32-02	5:26	5:36	5:42	5:49	5:58	6:06						
32-01	5:56	6:06	6:12	6:19	6:28	6:36						

Master schedule for Route 32

However, a relief at Comanche & Big Sky at 11:16 a.m. appears more attractive for the following reasons. First, when pull-out, allowances and other collaterals are added, a run beginning service at 10:40 a.m. and ending at 6:46 p.m. will have over 8 hours of pay time, resulting in overtime. Secondly, the block pool contains several shorter P.M. tripper pieces. This would allow the leftover A.M. piece from Block 32-01 to be slightly larger if combined with a shorter P.M. piece.

Breaking the block at 11:16 a.m. at Comanche & Big Sky would result in a P.M. straight of 7:30 platform with an A.M. tripper piece leftover of 5:16 platform. Therefore, the decision is made to break Block 32-01 at Comanche & Big Sky at 11:16 a.m.

Opportunity 2 - Block 110-7

BLOCK NO.	PULL-OUT TIME	PULL-ON LOCATION	FIRST REVENUE TIME	LAST REVENUE TIME	PULL-OFF LOCATION	PULL-IN TIME	REVENUE HOURS	PLATFORM HOURS
110-7	5:18A	DVC	5:30A	10:48P	CON	10:55P	17:18	17:37

Block 110-7 currently pulls out at 5:18 a.m. and pulls in at 10:55 p.m. The assumption is that a straight A.M. run and a straight P.M. run can be cut with a third early afternoon piece leftover. This third piece could possibly match with an existing P.M. piece, combining for the final full-time split run.

Cutting blocks in the middle of trips is desirable only at field relief locations or at points where extended dwells are scheduled.

The earliest possible relief that can result in a straight A.M. run appears to be eastbound trip arrival 34E at CON at 12:42 p.m. A cut made here would result in an A.M. straight run with revenue service of 7:12 (from 5:30 a.m. to 12:42 p.m.) and platform of 7:24 (5:18 a.m. to 12:42 p.m.).

Trip #	Block #	Via	Lv DVC	CLD	Arr CON	Lv CON	CLT	CLA	CKP	MYV	Arr WAS	Arr MCC
34E	110-7	P	12:25	12:36	12:42	12:45	12:53	12:58		1:02	1:09	

Working backwards, the scheduler looks for a P.M. straight run relief location approximately 7.5 hours before the pull-in time of 10:55 p.m. Westbound trip 40W, if cut at arr. CON at 3:23 p.m. yields a P.M. straight run of 7:32 platform (3:23 p.m. to 10:55 p.m.).

Trip #	Block #	Via	Lv MCC	Lv WAS	MYV	CKP	CLA	CLT	Arr CON	Lv CON	FRY	Arr DVC
40W	110-7	P		2:54	3:03		3:07	3:13	3:23	3:25	3:30	3:43

The remaining piece of Block 110-7 is now 12:42 p.m. to 3:23 p.m. with a platform time of 2:41. Even at 2:41, this piece could match with a number of P.M. pieces.

At this point in the process, the scheduler has achieved piece balance. The next step is to revise the chronological block listing to reflect these changes.

Advanced Chapter 4/ Runcutting

The scheduler notes the relief locations for 110-7 and 32-01 in the relief location column.

	AM Block # / Pull-out	Platform/ Relief or Pull-in	Relief Location		Relief Location	PM Block # / Pull-out	Platform/ Relief or Pull-in
	110-1					110-1	
	4:36a						9:31p
	110-2					110-2	
	4:52a						7:59p
	110-4					110-4	
	5:14a						8:31p
	110-7	7:24				110-7	7:32
	5:18a	12:42p	Arr CON		Arr CON	3:23p	10:55p
	110-5					110-5	
	5:29a						10:25P
					Arr CBS	32-01	7:30
						11:16a	6:46p
	32-02	8:46				110-10	8:37
	6:30a	3:16p				2:48p	11:25p
	110-3	4:34				32-04	4:00
	4:58a	9:32a				1:46p	5:46p
	110-8	3:13				32-05	4:00
	5:32a	8:45a				2:16p	6:16p
	110-6	2:53				110-13	1:43
	5:38a	8:31a				5:03p	6:46p
	110-9	3:15				110-14	1:43
	5:48a	9:03a				5:23p	7:06p
	32-01	5:16				110-11	3:31
	6:00a	11:16a	Arr CBS			4:05p	7:36p
	32-03	3:59				110-15	2:25
	6:16a	10:15a				5:28p	7:53p
	110-7	2:41				110-12	3:11
	12:42p	3:23p	Arr CON			4:43p	7:54p
	AM Platform					PM Platform	

The chronological block listing is revised to reflect the most recent changes

B. Cutting remaining straight runs

After cutting Block 110-7, base blocks 110-1, 110-2, 110-4 and 110-5 remain. The scheduler seeks to split each block into two runs of nearly equal platform length. In addition, for Route 110 blocks, it is deemed desirable to make as many reliefs near CON as possible as this location is nearest to the vehicle storage facility and will result in the least amount of relief allowance.

Block 110-1: The optimal relief for Block 110-1 is found on eastbound trip 35E at 1:02 p.m. at CON. This cut yields two straight runs of 8:26 platform (4:36 a.m. to 1:02 p.m.) and 8:29 platform (1:02 p.m. to 9:31 p.m.).

BLOCK NO.	PULL-OUT TIME	PULL-ON LOCATION	FIRST REVENUE TIME	LAST REVENUE TIME	PULL-OFF LOCATION	PULL-IN TIME	REVENUE HOURS	PLATFORM HOURS
110-1	4:36A	CON	4:43A	9:24A	CON	9:31P	16:41	16:55

Trip #	Block #	Via	Lv DVC	CLD	Arr CON	Lv CON	CLT	CLA	CKP	MYV	Arr WAS	Arr MCC
35E	110-1	M	12:45	12:56	1:02	1:05	1:13	1:18			1:21	1:29

Block 110-2: If this block were cut at 12:38 p.m. at CON on westbound trip 31W, an A.M. straight of 7:46 platform (4:52 a.m. to 12:38 p.m.) and a P.M. straight of 7:21 platform (12:38 p.m. to 7:59 p.m.) would result.

BLOCK NO.	PULL-OUT TIME	PULL-ON LOCATION	FIRST REVENUE TIME	LAST REVENUE TIME	PULL-OFF LOCATION	PULL-IN TIME	REVENUE HOURS	PLATFORM HOURS
110-2	4:52A	CON	4:59A	7:52P	CON	7:59P	14:53	15:07

Trip #	Block #	Via	Lv MCC	Lv WAS	MYV	CKP	CLA	CLT	Arr CON	Lv CON	FRY	Arr DVC
31W	110-2	K		12:10		12:19	12:23	12:29	12:38	12:40	12:45	12:57

Block 110-4: Cutting this block at 12:58 p.m. at CON on westbound trip 32W would result in an A.M. straight of 7:44 platform (5:14 a.m. to 12:58 p.m.) and a P.M. straight of 7:33 platform (12:58 p.m. to 8:31 p.m.).

BLOCK NO.	PULL-OUT TIME	PULL-ON LOCATION	FIRST REVENUE TIME	LAST REVENUE TIME	PULL-OFF LOCATION	PULL-IN TIME	REVENUE HOURS	PLATFORM HOURS
110-4	5:14A	CON	5:21A	8:24P	CON	8:31P	15:03	15:17

Trip #	Block #	Via	Lv MCC	Lv WAS	MYV	CKP	CLA	CLT	Arr CON	Lv CON	FRY	Arr DVC
32W	110-4	M	12:29	12:40			12:43	12:49	12:58	1:00	1:05	1:17

The chronological block listing is revised to reflect the most recent cuts and platform hours are totalled since all blocks containing required reliefs have now been cut.

	AM Block # / Pull-out	Platform/ Relief or Pull-in	Relief Location			Relief Location	PM Block # / Pull-out	Platform/ Relief or Pull-in
	110-1	8:26					110-1	8:29
	4:36a	1:02p	Arr CON			Arr CON	1:02p	9:31p
	110-2	7:46					110-2	7:21
	4:52a	12:38a	Arr CON			Arr CON	12:38a	7:59p
	110-4	7:44					110-4	7:33
	5:14a	12:58p	Arr CON			Arr CON	12:58p	8:31p
	110-7	7:24					110-7	7:32
	5:18a	12:42p	Arr CON			Arr CON	3:23p	10:55p
	110-5	8:33					110-5	8:23
	5:29a	2:02p	Arr CON			Arr CON	2:02p	10:25p
							32-01	7:30
						Arr CBS	11:16a	6:46p
	32-02	8:46					110-10	8:37
	6:30a	3:16p					2:48p	11:25p
	110-3	4:34					32-04	4:00
	4:58a	9:32a					1:46p	5:46p
	110-8	3:13					32-05	4:00
	5:32a	8:45a					2:16p	6:16p
	110-6	2:53					110-13	1:43
	5:38a	8:31a					5:03p	6:46p
	110-9	3:15					110-14	1:43
	5:48a	9:03a					5:23p	7:06p
	32-01	5:16					110-11	3:31
	6:00a	11:16a	Arr CBS				4:05p	7:36p
	32-03	3:59					110-15	2:25
	6:16a	10:15a					5:28p	7:53p
	110-7	2:41					110-12	3:11
	12:42p	3:23p	Arr CON				4:43p	7:54p
	AM Platform						PM Platform	

The chronological block listing is revised again to reflect changes.

1) Reconciling platform hours

It is advisable to cross check the total platform hours tallied on the chronological block listing with the total platform hours displayed on the block summary recap. If an error has occurred, the platform totals will differ. In this case, the chronological block listing shows 74:30 A.M. platform hours and 75:58 P.M. platform hours – a total of 150:28. This total is the same as the total shown on the block summary recap.

C. Cutting split runs

The chronological block listing displays the seven A.M. and seven P.M. pieces the scheduler has configured. With an objective of combining these pieces in a manner that minimizes spread time, spread penalty, make-up time and overtime, the scheduler begins cutting split runs.

Observation: Several short pieces exists. These pieces are prime candidates for part-time split runs (runs of less than 6 hours platform). The work rules do, however, limit part-time split runs to no more than 20% of full-time runs.

By listing A.M. pieces in chronological pull-out order and P.M. pieces in chronological pull-in order, the chronological block listing provides a convenient method of viewing and tracking potential A.M. and P.M. pairing combinations that would result in the least amount of average spread time per run. Additionally, if the scheduler begins by pairing A.M. and P.M. pieces of least spread time first, once maximum spread is reached on a given pairing, all potential pairings below that pair on the chronological block listing will also exceed the spread limit.

The process begins by identifying the first piece to be paired. This can be either an A.M. piece or a P.M. piece, depending on preference. For example purposes, the first piece will be Block 110-3, pulling out at 4:58 a.m. and containing platform time of 4:34.

Computing Maximum Pull-in Time:

The spread limitation is 14.5 hours with spread penalty imposed at > 12:00. Spread includes report and turn-in allowances of 10 minutes and 5 minutes, respectively (see Work Rules Summary). Block 110-3 with a pull-out time of 4:58 a.m. reports at 4:48 a.m.. Adding 14.5 hours to the 4:48 report time yields a spread limitation of 7:18 p.m. (including the 5 minute turn-in allowance). Therefore, the paired P.M. piece cannot pull-in later than 7:13 p.m.

Report Time	<u>4:48a</u>
(Pull-out Time minus 10 minutes Report Allowance)	
Maximum Spread Limitation	<u>7:18p</u>
(Report Time plus 14.5 hours)	
Maximum Pull-in for Legal Pairing	<u>7:13p</u>
(Maximum Spread minus 5 minutes Turn-in Allowance)	

Formula for computing maximum spread time

Four P.M. pairing possibilities for 110-3 are identified – Blocks 32-04, 32-05, 110-13 and 110-14. Block 32-04 is chosen to pair with Block 110-3 (see chronological block listing below) because it results in the least amount of spread time – although it does result in 8:34 platform time. A tracking notation "a" is made next to each block to show the pairing.

The next block in order is 110-8, pulling out at 5:32 a.m. with platform time of 3:13. Maximum pull-in time is computed using the spread limitation formula.

Report Time	<u>5:22a</u>
(Pull-out Time minus 10 minutes Report Allowance)	
Maximum Spread Limitation	<u>7:52p</u>
(Report Time plus 14.5 hours)	
Maximum Pull-in for Legal Pairing	<u>7:47p</u>
(Maximum Spread minus 5 minutes Turn-in Allowance)	

Block 32-05 satisfies both the spread limitation and the platform requirement for a full-time split run. Both pieces are annotated with the letter "b."

Block 110-6, paired with Block 110-13 would meet the spread requirement with a total platform of 4:36. This would qualify as a part-time split run. This run is annotated with the letters "c-pt."

Combining Blocks 110-9 and 110-14 also qualifies as a part-time run with a platform time of 4:58 (noted as "d-pt" below).

	AM Block # / Pull-out	Platform/ Relief or Pull-in	Relief Location		Relief Location	PM Block # / Pull-out	Platform/ Relief or Pull-in
a	110-3 4:58a	4:34 9:32a		a		32-04 1:46p	4:00 5:46p
b	110-8 5:32a	3:13 8:45a		b		32-05 2:16p	4:00 6:16p
c-pt	110-6 5:38a	2:53 8:31a		c-pt		110-13 5:03p	1:43 6:46p
d-pt	110-9 5:48a	3:15 9:03a		d-pt		110-14 5:23p	1:43 7:06p
	32-01 6:00a	5:16 11:16a	Arr CBS			110-11 4:05p	3:31 7:36p
	32-03 6:16a	3:59 10:15a				110-15 5:28p	2:25 7:53p
	110-7 12:42p	2:41 3:23p	Arr CON			110-12 4:43p	3:11 7:54p

The chronological block listing is annotated with the run possibilities.

The next A.M. tripper piece is Block 32-01, pulling out at 6:00 a.m. with 5:16 platform time. The maximum pull-in time for pairing with Block 32-01 is computed as follows.

Report Time	<u>5:50a</u>
(Pull-out Time minus 10 minutes Report Allowance)	
Maximum Spread Limitation	<u>8:20p</u>
(Report Time plus 14.5 hours)	
Maximum Pull-in for Legal Pairing	<u>8:15p</u>
(Maximum Spread minus 5 minutes Turn-in Allowance)	

Although Block 110-11 satisfies the spread, the pairing results in total platform time of 8:47. However, a pairing with the next eligible block, 110-15 results in a combined platform of 7:41. This pairing, with less overtime, is deemed more acceptable and noted as "e."

Maximum pull-in time for Block 32-03 is computed.

Report Time	<u>6:06a</u>
(Pull-out Time minus 10 minutes Report Allowance)	
Maximum Spread Limitation	<u>8:36p</u>
(Report Time plus 14.5 hours)	
Maximum Pull-in for Legal Pairing	<u>8:31p</u>
(Maximum Spread minus 5 minutes Turn-in Allowance)	

Block 110-11 is still available, combining for a platform time of 7:30. This combination is noted as "f." Only one combination of blocks remains. Combining Blocks 110-7 and 110-12 results in a final part-time split run of 5:52 platform time, annotated as "g-pt" below.

	AM Block # / Pull-out	Platform/ Relief or Pull-in	Relief Location		Relief Location	PM Block # / Pull-out	Platform/ Relief or Pull-in
a	110-3 4:58a	4:34 9:32a		a		32-04 1:46p	4:00 5:46p
b	110-8 5:32a	3:13 8:45a		b		32-05 2:16p	4:00 6:16p
c-pt	110-6 5:38a	2:53 8:31a		c-pt		110-13 5:03p	1:43 6:46p
d-pt	110-9 5:48a	3:15 9:03a		d-pt		110-14 5:23p	1:43 7:06p
e	32-01 6:00a	5:16 11:16a	Arr CBS	f		110-11 4:05p	3:31 7:36p
f	32-03 6:16a	3:59 10:15a		e		110-15 5:28p	2:25 7:53p
g-pt	110-7 12:42p	2:41 3:23p	Arr CON	g-pt		110-12 4:43p	3:11 7:54p

The chronological block listing is again updated.

All the blocks have been cut into runs. The next step is to post the runs to the Run Guide and "cost" the runs.

Run Guides list runs sequentially and provide key cost and other data that are especially helpful in the rostering process where weekly run packages are matched with operators (see Chapter 5). As with other aspects of the scheduling process, the format for the Run Guides vary from system to system. The primary purpose for Run Guides is to present information in an easy to understand and useful format-especially helpful to operators when they select their runs. Many electronic spreadsheets provide presentation formats that can be used to serve that purpose well.

[illegible]

An example Run Guide format

The following column descriptions are provided.

Run No.	Runs are numbered sequentially, beginning with the number 1.
1st Piece	Both the block number and the route number are displayed.
Time On	If the run begins at the garage, this reflects the pull-out time minus the 10-minute report allowance. If the run begins with a street relief, this column reflects the street relief time minus the report allowance minus the relief allowance.
Pull-out/ Relief	If the vehicle pulls out from the garage, the pull-out column reflects the time the vehicle is to pull out of the garage facility. If an on-street relief is made, this reflects the time on route the operator makes the relief.
Pull-in/ Relief	If the vehicle pulls into the garage, the pull-in time is the time the vehicle is to pull into the garage. If a street relief is made, this reflects the time on route the operator gets relieved.
Time Off	For runs ending at the garage, this reflects the pull-in time plus the 5-minute turn-in allowance. If the run ends with a street relief, this reflects the ending time at the relief point plus the relief allowance plus the 5 minute turn-in allowance.
Platform	Platform time is the time from pull-out to pull-in, totalled for one or more pieces.
Total Spread	The total spread is the total elapsed time from the first time on for a run to the last time off for that run, straight or split.
Report Allowance	The report allowance is 10 minutes for each piece that reports to the garage. The report allowance is 5 minutes for each piece that starts at a street relief location.
Turn-in Allowance	All runs receive a 5-minute turn-in allowance.
Relief Allowance	Relief allowances are computed by adding the approximate deadhead time to the relief point plus one-half of the headway at the relief point at the time of the relief.
Make-up Allowance	If platform time and all allowances total less than 8:00, make-up time represents the difference needed to total 8:00. It is often referred to as making the run "whole."
Work Hours	Work hours equal the sum of the platform hours plus all allowances.
Overtime	An amount equal to one half of the work hours over 8:00 is placed in the overtime column.
Spread Penalty	One-half of all minutes (at straight time) over 12:00 for full-time runs: 13:00 for part-time runs.
Pay Hours	The total of work hours plus the larger of overtime or spread penalty.

A common convention for listing runs on the Run Guide is to use chronological pull-out order beginning with full-time straight A.M. runs, continuing with full-time P.M. straight runs, followed by full-time split runs and ending with part-time split runs. Also, to avoid confusion between A.M. and P.M. times when shown in standard time formats, many agencies use the "military" time method, which displays times in a 24-hour clock format. A conversion chart is shown below.

12 hour	24 hour	12 hour	24 hour	12 hour	24 hour
1:00 a.m.	0100	9:00 a.m.	0900	5:00 p.m.	1700
2:00 a.m.	0200	10:00 a.m.	1000	6:00 p.m.	1800
3:00 a.m.	0300	11:00 a.m.	1100	7:00 p.m.	1900
4:00 a.m.	0400	Noon	1200	8:00 p.m.	2000
5:00 a.m.	0500	1:00 p.m.	1300	9:00 p.m.	2100
6:00 a.m.	0600	2:00 p.m.	1400	10:00 p.m.	2200
7:00 a.m.	0700	3:00 p.m.	1500	11:00 p.m.	2300
8:00 a.m.	0800	4:00 p.m.	1600	Midnight	2400

Standard time converted to military time

1) Recording A.M. straight runs

For Routes 110 and 32, (see the Run Guide on the next page) the first A.M. full-time run begins with Block 110-1. This will be Run 1, with a time on of 0426 (10 minutes before pull-out).

Since Run 1 ends with a street relief at 1302 at CON (see chronological block listing), **time off** is computed as relief time (1302) plus relief allowance [time allowed to deadhead from CON to the garage of 7 minutes (obtained from the block summary recap) plus one-half of the 20-minute headway at the time of relief (obtained from the master schedule)] plus the 5-minute turn-in allowance. $1302 + :07 + :10 + :05 = 1324$. Since this run consists of one block, the second set of columns is left blank. The next step is to cost the run.

2) Costing A.M. straight runs

Since Run 1 is an A.M. straight run, the platform time is the elapsed time between the pull-out/relief column and the pull-in/relief column. Platform time is commonly thought of as the time an operator is behind the wheel. In this case, 1302 minus 0436 is 8:26.

Total spread is the elapsed time between time on and time off. 1324 minus 0426 is 8:58.

Report allowance is 10 minutes because this run reports to the garage. All runs receive a 5-minute turn-in allowance. The relief allowance, (computed above) consists of 17 minutes.

Since the platform time of Run 1 is 8:26, no make-up allowance is recorded.

Work hours are the sum of the platform hours plus all allowances. 8:26 plus :10 plus :05 plus :17 equals 8:58. One-half of the work hours over 8:00 is placed in the overtime column. For Run 1, $58/2 = 29$. No spread penalty is applicable when spread times does not exceed 12 hours (13 for part-time runs).

Pay hours are the sum of work hours plus overtime or spread penalty. Run 1 pay hours are 9:27.

3) Listing and costing P.M. straight runs

The process for listing and costing P.M. straight runs is nearly identical to the process for listing and costing A.M. runs, except that these runs are not listed chronologically in the chronological block listing because each of the base blocks has one or more reliefs used to create the P.M. straights. Sort order for P.M. straights tends to be agency specific.

Notes for P.M. straight listings:

Run numbers: P.M. straights will be run numbered sequentially beginning with Run 7.

Street reliefs: Runs that begin with street reliefs have a 5-minute report allowance plus the relief allowance.

Block 32-01: This run has a 40-minute relief allowance consisting of a 10-minute deadhead allowance from the garage to CBS plus a 30-minute relief allowance (because the headway is 60 minutes at the relief time and location). Time on for this block is the pull-out/relief time minus the 40-minute relief allowance minus the 5-minute report allowance for runs beginning with a street relief.

The Run Guide below lists the A.M. and P.M. straight runs.

RUN GUIDE																											
Service Days: _____												Effective: _____															
Run No.	1st Block	Piece Route	Time On	Pull-out /Relief	Pull-in /Relief	Time Off	2nd Block	Piece Route	Time On	Pull-out /Relief	Pull-in /Relief	Time Off	Plat- form	Total Spread	Report	Allowances Turn-in	Relief	Make-up	Work Hours	Over- time	Spread Penalty	Pay Hours					
FULL-TIME STRAIGHT RUNS																											
1	110-1	110	0426	0436	1302	1324								8:26	8:58	:10	:05	:17					8:58	:29		9:27	
2	110-2	110	0442	0452	1238	1300								7:46	8:18	:10	:05	:17					8:18	:09		8:27	
3	110-4	110	0504	0514	1258	1320								7:44	8:16	:10	:05	:17					8:16	:08		8:24	
4	110-7	110	0508	0518	1242	1304								7:24	7:56	:10	:05	:17	:04					8:00			8:00
5	110-5	110	0519	0529	1402	1424								8:33	9:05	:10	:05	:17					9:05	:33		9:38	
6	32-02	32/110	0620	0630	1516	1521								8:46	9:01	:10	:05					9:01	:31		9:32		
7	32-01	32	1031	1116	1846	1851								7:30	8:20	:05	:05	:40					8:20	:10		8:30	
8	110-2	110	1216	1238	1959	2004								7:21	7:48	:05	:05	:17	:12					8:00			8:00
9	110-4	110	1236	1258	2031	2036								7:33	8:00	:05	:05	:17					8:00			8:00	
10	110-1	110	1240	1302	2131	2136								8:29	8:56	:05	:05	:17					8:56	:28		9:24	
11	110-5	110	1340	1402	2225	2230								8:23	8:50	:05	:05	:17					8:50	:25		9:15	
12	110-10	110	1438	1448	2325	2330								8:37	8:52	:10	:05					8:52	:26		9:18		
13	110-7	110	1501	1523	2255	2300								7:32	7:59	:05	:05	:17	:01					8:00			8:00

A.M. and P.M. straight runs listed and costed on the Run Guide

4) Listing and costing full-time split runs

Although the process for listing and costing full-time split runs is also similar, several differences do exist, including the inclusion of the second set of columns to cover the second piece of work. Other areas of note include

The platform column reflects the total platform of both run pieces.

The total spread column reflects the total elapsed time between the time on of the first piece to the time off of the second piece.

The report and relief columns reflect the totals of these two allowances that are associated with the two run pieces. The turn-in allowance reflects only the one time per run allowance of 5 minutes. The make-up column reflects any make-up time associated with the complete run, not each piece of the run.

A large split run can contain both overtime and spread penalty. At this agency, only the larger of the two is paid. Both overtime and spread penalty will be calculated and shown in their respective columns when applicable. However, only the larger of the two will be included in the total pay hours.

5) Listing and costing part-time split runs

Areas of note for part-time split runs:

Make-up time is not required for part-time runs.

Overtime does not apply because part-time runs seldom exceed 8 hours.

Spread penalty begins after 13:00 hours instead of 12:00.

The final step in the listing and costing process is to include the part-time split runs and to total the platform, allowance and pay hours columns.

RUN GUIDE																						
Service Days: _____												Effective: _____										
Run No.	1st Block	Piece Route	Time On	Pull-out /Relief	Pull-in Time /Relief	Off	2nd Block	Piece Route	Time On	Pull-out /Relief	Pull-in Time /Relief	Time Off	Platform	Total Spread	Allowances Report	Turn-in	Relief	Make-up	Work Hours	Over- time	Spread Penalty	Pay Hours
FULL-TIME SPLIT RUNS																						
14	110-3	110	0448	0458	0932	0932	32-04	32	1316	1346	1746	1751	8:34	13:03	:20	:05			8:59	:30	:31	9:30
15	110-8	110	0522	0532	0845	0845	32-05	32	1406	1416	1816	1821	7:13	12:59	:20	:05		:22	8:00		:29	8:29
16	32-01	32	0550	0600	1116	1156	110-15	110	1718	1728	1953	1958	7:41	14:08	:20	:05	:40		8:46	:23	1:04	9:50
17	32-03	110	0606	0616	1015	1015	110-11	110	1555	1605	1936	1941	7:30	13:45	:20	:05		:05	8:00		:47	8:47
PART-TIME SPLIT RUNS																						
18	110-6	110	0528	0538	0831	0831	110-13	110	1653	1703	1846	1851	4:36	13:23	:20	:05			5:01		:11	5:12
19	110-9	110	0538	0548	0903	0903	110-14	110	1713	1723	1906	1911	4:58	1333	:20	:05			5:23		:16	5:39
20	110-7	110	1220	1242	1523	1540	110-12	110	1633	1643	1954	1959	5:52	7:39	:15	:05	:34		6:46			6:46

Part-time split runs are listed and costed.

It is a good idea to check off each run piece on the chronological block listing when the run piece is posted to the Run Guide. This helps to ensure that double posting does not occur and that all run pieces are used.

When all run pieces are posted, the scheduler checks that the total platform hours computed on the Run Guide match the total platform hours on the block summary recap. Any discrepancy indicates an error has occurred somewhere in the process. The Run Guide is completed as shown below.
Note: Overtime for runs 14 and 16 are not included in the overtime or pay hour totals.

RUN GUIDE																																		
Service Days: _____													Effective: _____																					
Run No.	1st Block	Piece Route	Time On	Pull-out /Relief	Pull-in /Relief	Time Off	2nd Block	Piece Route	Time On	Pull-out /Relief	Pull-in /Relief	Time Off	Plat- form	Total Spread	Allowances Report	Turn-in	Relief	Make-up	Work Hours	Over- Spread time	Pay Hours													
FULL-TIME STRAIGHT RUNS																																		
1	110-1	110	0426	0436	1302	1324								8:26	8:58	:10	:05	:17			8:58	:29	9:27											
2	110-2	110	0442	0452	1238	1300								7:46	8:18	:10	:05	:17			8:18	:09	8:27											
3	110-4	110	0504	0514	1258	1320								7:44	8:16	:10	:05	:17			8:16	:08	8:24											
4	110-7	110	0508	0518	1242	1304								7:24	7:56	:10	:05	:17	:04			8:00		8:00										
5	110-5	110	0519	0529	1402	1424								8:33	9:05	:10	:05	:17			9:05	:33	9:38											
6	32-02	32/110	0620	0630	1516	1521								8:46	9:01	:10	:05					9:01	:31	9:32										
7	32-01	32	1031	1116	1846	1851								7:30	8:20	:05	:05	:40			8:20	:10	8:30											
8	110-2	110	1216	1238	1959	2004								7:21	7:48	:05	:05	:17	:12			8:00		8:00										
9	110-4	110	1236	1258	2031	2036								7:33	8:00	:05	:05	:17			8:00		8:00											
10	110-1	110	1240	1302	2131	2136								8:29	8:56	:05	:05	:17			8:56	:28	9:24											
11	110-5	110	1340	1402	2225	2230								8:23	8:50	:05	:05	:17			8:50	:25	9:15											
12	110-10	110	1438	1448	2325	2330								8:37	8:52	:10	:05					8:52	:26	9:18										
13	110-7	110	1501	1523	2255	2300								7:32	7:59	:05	:05	:17	:01			8:00		8:00										
FULL-TIME SPLIT RUNS																																		
14	110-3	110	0448	0458	0932	0932	32-04	32	1316	1346	1746	1751	8:34	13:03	:20	:05			8:59	:30	9:30													
15	110-8	110	0522	0532	0845	0845	32-05	32	1406	1416	1816	1821	7:13	12:59	:20	:05			8:00		8:29													
16	32-01	32	0550	0600	1116	1156	110-15	110	1718	1728	1953	1958	7:41	14:08	:20	:05	:40			8:46	:23	9:50												
17	32-03	110	0606	0616	1015	1015	110-11	110	1555	1605	1936	1941	7:30	13:45	:20	:05			8:00		8:47													
PART-TIME SPLIT RUNS																																		
18	110-6	110	0528	0538	0831	0831	110-13	110	1653	1703	1846	1851	4:36	13:23	:20	:05			5:01		5:12													
19	110-9	110	0538	0548	0903	0903	110-14	110	1713	1723	1906	1911	4:58	13:33	:20	:05			5:23		5:39													
20	110-7	110	1220	1242	1523	1540	110-12	110	1633	1643	1954	1959	5:52	7:39	:15	:05	:34			6:46		6:46												
														150:28					3:55		1:40		4:44		:44		161:31		3:19		3:18		168:08	
Totals													Plat- form		Report		Turn-in		Relief Allowances		Make-up		Work Hours		Over- Spread time		Pay Hours							

The completed Run Guide for Routes 110 and 32

The total platform does agree with the block summary recap. This is confirmation that all platform hours have been accounted for. The next step is to check for a measure of runcut efficiency.

VII. Pay to Platform Hours Comparison

One way to measure the efficiency of the runcut is to compute the ratios between pay and platform hours. Both figures can be obtained from the Run Guide and the ratio between them can be computed in either of two ways:

- 1) Pay Hours / Platform Hours or 2) Platform Hours / Pay Hours

From the Run Guide for Routes 110 and 32, the computations are as follows: (note that minutes have been converted to decimal equivalents)

- 1) $168.13 / 150.47 = 1.117$ or 2) $150.47 / 168.13 = .895$

This means that for every hour of platform time, it takes 1.117 pay hours to put that service on the street. Conversely, it states that every platform hour constitutes 89.5% of a pay hour. This measure of efficiency can be useful when comparing various runcut possibilities.

VIII. Notations of Street Reliefs on Master Schedules

Street reliefs are often annotated on master schedules by placing parentheses around the relief location. One reason for doing this is to provide relief point times and locations for street supervisors who are checking on-street performance. Relief notations are shown below.

Block #	Comanche & Big Sky	Comanche & Wyoming	Comanche & San Mateo	Comanche & Carlisle	N. 4th & Griegos	Rio Grande & Montano	Rio Grande & Montano	N. 4th & Griegos	Comanche & Carlisle	Comanche & San Mateo	Comanche & Wyoming	Comanche & Big Sky
32-01	9:56	10:06	10:13	10:19	10:28	10:35	10:40	10:47	10:57	11:01	11:07	[11:16]

Relief points [] noted on Route 32 master schedule

Trip #	Block #	Via	Lv DVC	CLD	Arr CON	Lv CON	CLT	CLA	CKP	MYV	Arr WAS	Arr MCC
34E	110-7	P	12:25	12:36	[12:42]	12:45	12:53	12:58		1:02	1:09	
35E	110-1	M	12:45	12:56	[1:02]	1:05	1:13	1:18			1:21	1:29
36E	110-2	K	1:05	1:16	1:22	1:25	1:33	1:38	1:42		1:49	
37E	110-4	P	1:25	1:36	1:42	1:45	1:53	1:58		2:02	2:09	
38E	110-5	M	1:45	1:56	[2:02]	2:05	2:13	2:18			2:21	2:29

Relief points [] noted on Route 110 eastbound master schedule

Trip #	Block #	Via	Lv MCC	Lv WAS	MYV	CKP	CLA	CLT	Arr CON	Lv CON	FRY	Arr DVC
31W	110-2	K		12:10		12:19	12:23	12:29	[12:38]	12:40	12:45	12:57
32W	110-4	M	12:29	12:40			12:43	12:49	[12:58]	1:00	1:05	1:17
40W	110-7	P		2:54	3:03		3:07	3:13	[3:23]	3:25	3:30	3:43

Relief points [] noted on Route 110 westbound master schedule

CHAPTER 4: EXERCISES

- Prepare a Route 110 Saturday runcut. Use the same work rules and stipulations applied to the weekday runcut (see pg. 102 for a summary of these rules).

RUN GUIDE																					
Service Days: Route 110 Saturday										Effective: _____											
Run No.	1st Block	Piece Route	Time On	Pull-out /Relief	Pull-in /Relief	Time Off	2nd Block	Piece Route	Time On	Pull-out /Relief	Pull-in /Relief	Time Off	Plat-form	Total Spread Report	Allowances Turn-in	Relief Make-up	Work Hours	Over-time	Spread Penalty	Pay Hours	
FULL-TIME STRAIGHT RUNS																					
201 110-1																					
FULL-TIME SPLIT RUNS																					
Totals										Plat-form		Report Turn-in		Relief Allowances		Make-up		Work Hours		Over-Spread Pay	

CHAPTER 4: EXERCISE ANSWER SHEET

Route 110 Saturday Runcut

RUN GUIDE																						
Service Days: _____										Effective: _____												
Run No.	1st Block	Piece Route	Time On	Pull-out /Relief	Pull-in /Relief	Time Off	2nd Block	Piece Route	Time On	Pull-out /Relief	Pull-in /Relief	Time Off	Plat-form	Total Spread	Report Turn-in	Relief Allowances	Make-up	Work Hours	Over-Spread time	Penalty	Pay Hours	
FULL-TIME STRAIGHT RUNS																						
201	110-1	110	6:22	6:32	14:15	14:42							7:43	8:20	:10	:05	:22		8:20	:10		8:30
202	110-2	110	6:38	6:48	14:45	15:12							7:57	8:34	:10	:05	:22		8:34	:17		8:51
203	110-3	110	7:08	7:18	14:19	14:46							7:01	7:38	:10	:05	:22	:22	8:00			8:00
204	110-4	110	10:24	10:51	19:35	19:40							8:44	9:16	:05	:05	:22		9:16	:38		9:54
205	110-1	110	13:48	14:15	22:22	22:27							8:07	8:39	:05	:05	:22		8:39	:19		8:58
206	110-3	110	13:52	14:19	22:10	22:15							7:51	8:23	:05	:05	:22		8:23	:11		8:34
FULL-TIME SPLIT RUNS																						
207	110-4	110	7:38	7:48	10:51	11:13	110-2	110	14:18	14:45	19:39	19:44	7:57	12:06	:15	:05	:44		9:01	:31	:03	9:32
																	60:13	2:06	:03	62:19		
Totals													Plat-form	Report Turn-in			Relief Allowances	Make-up	Work Hours	Over-Spread time	Penalty	Pay Hours

The completed Run Guide for Saturday Route 110

CHAPTER 5

ROSTERING

Advanced Section

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I. Introduction

Rostering is the process of grouping daily operator run assignments into weekly run packages or rosters. Weekly roster mixes could include the following

- weekday runs only
- weekday runs and a Saturday run
- weekday runs and a Sunday run
- weekday runs and a Saturday run and a Sunday run

Part-time runs and trippers (open pieces) are sometimes rostered into weekly assignments.

Weekly rosters can consist of five daily eight (8) hour runs; four daily ten (10) hour runs; a combination of eight (8) and ten (10) hour runs; and weekly part-time rosters.

Rostering is generally heavily influenced by work rules, agency policy and past precedent; however it is generally done in one of two formats: operator developed or agency developed.

II. Operator Developed Rostering

With operator developed rosters (sometimes called "cafeteria" rosters), operators choose their weekly roster work from the master days off and daily run lists or some derivative of these lists. The mechanics of how operators actually choose runs and days off, and the forms used, varies widely among agencies, however, the order of the pick is generally based on operator seniority.

A common formula for computing the number of available days off by days of the week for 8-hour runs (5-day work week) is shown below.

Day	Number of Daily Runs	X	Weekly Total
Weekdays [M - F]		5	
Saturdays		1	
Sundays		1	
Weekly Total			
Total Operators [Weekly total divided by 5 days of work per operator]			

Day Off Distribution:

	Total Operators	Minus Daily Runs	Operators Off Each Day
Weekdays [M - F]			[M,T,W,T,F]
Saturdays			
Sundays			
Total [Weekday x 5 plus Saturday plus Sunday]			

Check:

Total Off Days Required - [Total Operators x 2 days]
Total Off Days Assigned - [Sum of Operators Off Each Day]
Leftover Days

Operators required and days off for 8-hour runs (5-day work week)

A. Routes 110 and 32 - no days off on weekdays

Applying this formula to Routes 110 and 32 yields the following result.

Day	Number of Daily Runs	X	Weekly Total
Weekdays [M - F]	20	5	100
Saturdays	0	0	0
Sundays	0	0	0
Weekly Total			100
Total Operators [Weekly total divided by 5 days of work per operator]			20

Day Off Distribution:

	Total Operators	Minus Daily Runs	Operators Off Each Day
Weekdays [M - F]	20	20	[M,T,W,T,F] 0
Saturdays	20	0	20
Sundays	20	0	20
Total [Weekday x 5 plus Saturday plus Sunday]			40

Check:

Total Off Days Required - [Total Operators x 2 days]	40
Total Off Days Assigned - [Sum of Operators Off Each Day]	40
Leftover Days	0

Computing days off for Routes 110 and 32

Since these routes do not operate on Saturday and Sunday, operators have no choice but to take Saturday and Sunday as days off.

The most straight forward operator rostering would likely result in a list of weekly rosters that includes the same run for each operator Monday through Friday. In this example, there would be 17 full-time rosters and 3 part-time rosters.

An example of this weekly roster appears on the following page.

Weekly Roster No.		Sun	Mon	Tue	Wed	Thu	Fri	Sat	Weekly Pay Hours
FULL-TIME RUNS									
1	Run No. Pay Hours	Off	1 9:27	1 9:27	1 9:27	1 9:27	1 9:27	Off	47:15
2	Run No. Pay Hours	Off	2 8:27	2 8:27	2 8:27	2 8:27	2 8:27	Off	42:15
3	Run No. Pay Hours	Off	3 8:24	3 8:24	3 8:24	3 8:24	3 8:24	Off	42:00
4	Run No. Pay Hours	Off	4 8:00	4 8:00	4 8:00	4 8:00	4 8:00	Off	40:00
5	Run No. Pay Hours	Off	5 9:38	5 9:38	5 9:38	5 9:38	5 9:38	Off	48:10
6	Run No. Pay Hours	Off	6 9:32	6 9:32	6 9:32	6 9:32	6 9:32	Off	47:40
7	Run No. Pay Hours	Off	7 8:30	7 8:30	7 8:30	7 8:30	7 8:30	Off	42:30
8	Run No. Pay Hours	Off	8 8:00	8 8:00	8 8:00	8 8:00	8 8:00	Off	40:00
9	Run No. Pay Hours	Off	9 8:00	9 8:00	9 8:00	9 8:00	9 8:00	Off	40:00
10	Run No. Pay Hours	Off	10 9:24	10 9:24	10 9:24	10 9:24	10 9:24	Off	47:00
11	Run No. Pay Hours	Off	11 9:15	11 9:15	11 9:15	11 9:15	11 9:15	Off	46:15
12	Run No. Pay Hours	Off	12 9:18	12 9:18	12 9:18	12 9:18	12 9:18	Off	46:30
13	Run No. Pay Hours	Off	13 8:00	13 8:00	13 8:00	13 8:00	13 8:00	Off	40:00
14	Run No. Pay Hours	Off	14 9:30	14 9:30	14 9:30	14 9:30	14 9:30	Off	47:30
15	Run No. Pay Hours	Off	15 8:29	15 8:29	15 8:29	15 8:29	15 8:29	Off	42:25
16	Run No. Pay Hours	Off	16 9:50	16 9:50	16 9:50	16 9:50	16 9:50	Off	49:10
17	Run No. Pay Hours	Off	17 8:47	17 8:47	17 8:47	17 8:47	17 8:47	Off	43:55
TOTAL FULL-TIME WEEKLY PAY HOURS									752:35
PART-TIME RUNS									
18	Run No. Pay Hours	Off	18 5:12	18 5:12	18 5:12	18 5:12	18 5:12	Off	26:00
19	Run No. Pay Hours	Off	19 5:39	19 5:39	19 5:39	19 5:39	19 5:39	Off	28:15
20	Run No. Pay Hours	Off	20 6:46	20 6:46	20 6:46	20 6:46	20 6:46	Off	33:50
TOTAL PART-TIME WEEKLY PAY HOURS									88:05
TOTAL WEEKLY PAY HOURS									840:40

Example roster for same daily run Monday through Friday

B. With Saturday and Sunday runs

The following example illustrates the operator developed rostering approach if Saturday and Sunday runs were part of the process.

Weekday Runs		Saturday Runs		Sunday Runs	
Run No.	Pay Hours	Run No.	Pay Hours	Run No.	Pay Hours
101	8:00	201	8:15	301	8:00
102	8:10	202	8:00	302	8:00
103	8:50	203	8:30		
104	8:35				
105	9:23				

Example run list which includes Saturday and Sunday runs

Day	Number of Daily Runs	X	Weekly Total
Weekdays [M - F]	5	5	25
Saturdays	3	1	3
Sundays	2	1	2
Weekly Total			30
Total Operators [Weekly total divided by 5 days of work per operator]			6

Day Off Distribution:

	Total Operators	Minus Daily Runs	Operators Off Each Day
Weekdays [M - F]	6	5	[M,T,W,T,F] 1
Saturdays	6	3	3
Sundays	6	2	4
Total [Weekday x 5 plus Saturday plus Sunday]			12

Check:

Total Off Days Required - [Total Operators x 2 days]	12
Total Off Days Assigned - [Sum of Operators Off Each Day]	12
Leftover Days	0

Computing days off with Saturday and Sunday runs

Number of Days Off Allowed						
Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
4	1	1	1	1	1	3

Available days off for this example

Weekly Roster No.		Sun	Mon	Tue	Wed	Thu	Fri	Sat	Weekly Pay Hours
FULL-TIME RUNS									
1	Run No. Pay Hours	Off	105 9:23	105 9:23	105 9:23	105 9:23	105 9:23	Off	46:55
2	Run No. Pay Hours	Off	102 8:10	102 8:10	102 8:10	102 8:10	102 8:10	Off	40:50
3	Run No. Pay Hours	Off	Off	104 8:35	104 8:35	104 8:35	104 8:35	201 8:15	42:35
4	Run No. Pay Hours	302 8:00	103 8:50	Off	Off	103 8:50	103 8:50	203 8:30	43:00
5	Run No. Pay Hours	301 8:00	101 8:00	101 8:00	101 8:00	Off	Off	202 8:00	40:00
6	Run No. Pay Hours	Off	104 8:35	103 8:50	103 8:50	101 8:00	101 8:00	Off	42:15
TOTAL WEEKLY PAY HOURS									255:35

Example of operator developed weekly roster with weekend runs

When Saturday and Sunday runs are part of the operator developed rostering process, the operators (usually by seniority) also select days off in addition to their daily runs. This example illustrates the tendency of senior operators to select Saturday and Sunday as their days off. Weekly pay hours as well as run start and stop times are among the other factors operators consider when putting their weekly rosters together.

The agency developed rostering approach is illustrated on the following pages.

III. Agency Developed Rostering

With agency developed rostering, the runs are "pre-packaged" into weekly rosters by the agency. The operators, again usually by seniority, pick from this list of weekly rosters.

A number of factors influence how runs are chosen for the weekly rosters. For example, when agencies pay overtime for time worked over 40 hours per week, but do not pay overtime for more than 8 hours work on a given day, an opportunity exists to combine daily runs with greater than 8 hours pay time with daily runs paying less than 8 hours to reduce or eliminate any weekly overtime. The example below illustrates this process.

A. Combining short and long runs

Example

Agency Developed Rostering Option

Objective: To explore rostering options that would combine shorter daily runs with longer daily runs and form weekly run packages that could reduce or eliminate weekly overtime.

Considerations: Daily guarantee is not required.
No daily overtime.
Make-up time to 40 hours per week is required.
Overtime is paid for over 40 hours per week.

Reference: Routes 110 and 32 Run Guide (modified) / Weekly Roster (next 2 pages).

Narrative: In this example, the existing Run Guide for Routes 110 and 32 is modified to reflect the new considerations shown above. Specifically, the daily make-up time is eliminated and the run pay is refigured. Run combinations that would reduce the total amount of required paid overtime are then investigated and recorded on the weekly roster form.

Referring to the newly modified Run Guide for Routes 110 and 32 – Runs 4, 8, 13, 15 and 17 now have no daily make-up time and :44 of previously paid overtime has been eliminated. Runs 4, 8 and 13 (all straight runs) now pay less than 8:00. However, Runs 15 and 17 still exceed 8:00 as a result of the spread penalty.

Runs 4, 8 and 13 could present opportunities to be rostered with runs that pay over 8:00 daily hours and reduce weekly overtime. Of consideration too is the argument that too many different runs for an operator in a work week could present problems.

The resultant weekly roster demonstrates run combinations that have eliminated 3:40 hours of weekly pay time – from 840:40 to 837:00 total pay hours.

The switch day for Runs 3 and 4 is Friday. Friday was chosen because the time off for both runs is fairly close – 13:20 and 13:04. The switch day for Runs 8 and 10 along with Runs 12 and 13 is Monday. Generally, a switch day earlier in the week is preferable. A switch on Friday that results in a later time off is often not found desirable by the operator.

RUN GUIDE																												
Service Days: _____													Effective: _____															
Run No.	1st Block	Piece Route	Time On	Pull-out /Relief	Pull-in /Relief	Time Off	2nd Block	Piece Route	Time On	Pull-out /Relief	Pull-in /Relief	Time Off	Plat- form	Total Spread	Report	Turn-in	Allowances Relief	Make-up	Work Hours	Over- time	Spread Penalty	Pay Hours						
FULL-TIME STRAIGHT RUNS																												
1	110-1	110	0426	0436	1302	1324							8:26	8:58	:10	:05	:17		8:58	:29		9:27						
2	110-2	110	0442	0452	1238	1300							7:46	8:18	:10	:05	:17		8:18	:09		8:27						
3	110-4	110	0504	0514	1258	1320							7:44	8:16	:10	:05	:17		8:16	:08		8:24						
4	110-7	110	0508	0518	1242	1304							7:24	7:56	:10	:05	:17	:04	7:56			7:56						
5	110-5	110	0519	0529	1402	1424							8:33	9:05	:10	:05	:17		9:05	:33		9:38						
6	32-02	32/110	0620	0630	1516	1521							8:46	9:01	:10	:05			9:01	:31		9:32						
7	32-01	32	1031	1116	1846	1851							7:30	8:20	:05	:05	:40		8:20	:10		8:30						
8	110-2	110	1216	1238	1959	2004							7:21	7:48	:05	:05	:17	:12	7:48			7:48						
9	110-4	110	1236	1258	2031	2036							7:33	8:00	:05	:05	:17		8:00			8:00						
10	110-1	110	1240	1302	2131	2136							8:29	8:56	:05	:05	:17		8:56	:28		9:24						
11	110-5	110	1340	1402	2225	2230							8:23	8:50	:05	:05	:17		8:50	:25		9:15						
12	110-10	110	1438	1448	2325	2330							8:37	8:52	:10	:05			8:52	:26		9:18						
13	110-7	110	1501	1523	2255	2300							7:32	7:59	:05	:05	:17	:01	7:59			7:59						
FULL-TIME SPLIT RUNS																												
14	110-3	110	0448	0458	0932	0932	32-04	32	1316	1346	1746	1751	8:34	13:03	:20	:05			8:59	:30	:31	9:30						
15	110-8	110	0522	0532	0845	0845	32-05	32	1406	1416	1816	1821	7:13	12:59	:20	:05		:22	7:38		:29	8:07						
16	32-01	32	0550	0600	1116	1156	110-15	110	1718	1728	1953	1958	7:41	14:08	:20	:05	:40		8:46	:23	1:04	9:50						
17	32-03	110	0606	0616	1015	1015	110-11	110	1555	1605	1936	1941	7:30	13:45	:20	:05		:05	7:55		:47	8:42						
PART-TIME SPLIT RUNS																												
18	110-6	110	0528	0538	0831	0831	110-13	110	1653	1703	1846	1851	4:36	13:23	:20	:05			5:01		:11	5:12						
19	110-9	110	0538	0548	0903	0903	110-14	110	1713	1723	1906	1911	4:58	1333	:20	:05			5:23		:16	5:39						
20	110-7	110	1220	1242	1523	1540	110-12	110	1633	1643	1954	1959	5:52	7:39	:15	:05	:34		6:46			6:46						
														150:28					3:55		1:40	4:44	0:00	160:47		3:19	3:18	167:24
Totals													Plat- form	Report	Turn-in	Relief Allowances	Make-up	Work Hours	Over- time	Spread Penalty	Pay Hours							

The modified Run Guide for Routes 110 and 32

Advanced Chapter 5/ Rostering

Weekly Roster No.		Sun	Mon	Tue	Wed	Thu	Fri	Sat	Weekly Pay Hours
FULL-TIME RUNS									
1	Run No. Pay Hours	Off	1 9:27	1 9:27	1 9:27	1 9:27	1 9:27	Off	47:15
2	Run No. Pay Hours	Off	2 8:27	2 8:27	2 8:27	2 8:27	2 8:27	Off	42:15
3	Run No. Pay Hours	Off	3 8:24	3 8:24	3 8:24	3 8:24	4 7:56*	Off	41:32
4	Run No. Pay Hours	Off	4 7:56	4 7:56	4 7:56	4 7:56	3 8:24	Off	40:08
5	Run No. Pay Hours	Off	5 9:38	5 9:38	5 9:38	5 9:38	5 9:38	Off	48:10
6	Run No. Pay Hours	Off	6 9:32	6 9:32	6 9:32	6 9:32	6 9:32	Off	47:40
7	Run No. Pay Hours	Off	7 8:30	7 8:30	7 8:30	7 8:30	7 8:30	Off	42:30
8	Run No. Pay Hours	Off	10 9:24	8 7:48	8 7:48	8 7:48	8 7:48	Off	40:36
9	Run No. Pay Hours	Off	9 8:00	9 8:00	9 8:00	9 8:00	9 8:00	Off	40:00
10	Run No. Pay Hours	Off	8 7:48	10 9:24	10 9:24	10 9:24	10 9:24	Off	45:24
11	Run No. Pay Hours	Off	11 9:15	11 9:15	11 9:15	11 9:15	11 9:15	Off	46:15
12	Run No. Pay Hours	Off	13 7:59	12 9:18	12 9:18	12 9:18	12 9:18	Off	45:11
13	Run No. Pay Hours	Off	12 9:18	13 7:59	13 7:59	13 7:59	13 7:59	Off	41:14
14	Run No. Pay Hours	Off	14 9:30	14 9:30	14 9:30	14 9:30	14 9:30	Off	47:30
15	Run No. Pay Hours	Off	15 8:07	15 8:07	15 8:07	15 8:07	15 8:07	Off	40:35
16	Run No. Pay Hours	Off	16 9:50	16 9:50	16 9:50	16 9:50	16 9:50	Off	49:10
17	Run No. Pay Hours	Off	17 8:42	17 8:42	17 8:42	17 8:42	17 8:42	Off	43:30
TOTAL FULL-TIME WEEKLY PAY HOURS									748:55
PART-TIME RUNS									
18	Run No. Pay Hours	Off	18 5:12	18 5:12	18 5:12	18 5:12	18 5:12	Off	26:00
19	Run No. Pay Hours	Off	19 5:39	19 5:39	19 5:39	19 5:39	19 5:39	Off	28:15
20	Run No. Pay Hours	Off	20 6:46	20 6:46	20 6:46	20 6:46	20 6:46	Off	33:50
TOTAL PART-TIME WEEKLY PAY HOURS									88:05
* Runs that have changed are denoted in bold italic.									TOTAL WEEKLY PAY HOURS 837:00

Agency developed weekly roster combining short and long runs

Since mixing shorter runs with longer runs can reduce weekly pay hours where daily guarantees do not exist, the scheduler may want to explore rostering previously classified part-time runs with longer runs. The example below illustrates this option.

B. Considering part-time runs as short full-time runs

Example

Agency Developed Rostering Option

Objective: To reclassify part-time runs as short full-time runs and to investigate run combinations that reduce or minimize weekly overtime.

Considerations: Part-time runs do not exist.
Daily guarantee is not required.
No daily overtime.
Make-up time to 40 hours per week is required.
Overtime is paid for over 40 hours per week.

Reference: Run Guide for Route 110 and 32 (modified) / Weekly Roster (next 2 pages).

Narrative: Runs 18, 19 and 20 have been "reclassified" as full-time runs. Combinations with longer daily runs for weekly rosters are explored and illustrated on the following pages.

At first glance, it would appear that considerable opportunity exists to reduce weekly overtime. However, the run combinations in this example actually result in an increase of 5:00 pay hours per week.

The primary reason for this increase is the spread penalty. For part-time runs, the spread penalty was imposed for spreads over 13 hours. However, for full-time runs the spread penalty is imposed for runs over 12 hours. The total spread penalty for Runs 18 and 19 increased by 30 minutes each. This translates to 1:00 per day or 5:00 for the work week.

Another consideration is the potential diminishing return that can be associated with the extensive mixing of runs. Many agencies would prefer that the operator work the same run daily, whenever possible, for at least the following reasons:

- Customers often prefer the familiarity of the same operator each day.
- Accident risk is minimized when the operator is very familiar with the route.
- Great variability in time on and time off every day may disrupt the operator's "internal clock" and could lead to a greater risk of accidents or incidents.

The modified Run Guide for Routes 110 and 32

Weekly Roster No.		Sun	Mon	Tue	Wed	Thu	Fri	Sat	Weekly Pay Hours
FULL-TIME RUNS									
1	Run No. Pay Hours	Off	1 9:27	1 9:27	1 9:27	1 9:27	1 9:27	Off	47:15
2	Run No. Pay Hours	Off	2 8:27	2 8:27	2 8:27	2 8:27	2 8:27	Off	42:15
3	Run No. Pay Hours	Off	3 8:24	3 8:24	3 8:24	3 8:24	4 7:56	Off	41:32
4	Run No. Pay Hours	Off	4 7:56	4 7:56	4 7:56	4 7:56	3 8:24	Off	40:08
5	Run No. Pay Hours	Off	7 8:30	5 9:38	5 9:38	5 9:38	5 9:38	Off	40:04
6	Run No. Pay Hours	Off	6 9:32	6 9:32	6 9:32	6 9:32	6 9:32	Off	47:40
7	Run No. Pay Hours	Off	19 6:09	7 8:30	7 8:30	7 8:30	7 8:30	Off	40:09
8	Run No. Pay Hours	Off	10 9:24	8 7:48	8 7:48	8 7:48	8 7:48	Off	40:36
9	Run No. Pay Hours	Off	9 8:00	9 8:00	9 8:00	9 8:00	9 8:00	Off	40:00
10	Run No. Pay Hours	Off	8 7:48	10 9:24	10 9:24	10 9:24	10 9:24	Off	45:24
11	Run No. Pay Hours	Off	11 9:15	11 9:15	11 9:15	11 9:15	11 9:15	Off	46:15
12	Run No. Pay Hours	Off	13 7:59	12 9:18	12 9:18	12 9:18	12 9:18	Off	45:11
13	Run No. Pay Hours	Off	12 9:18	13 7:59	13 7:59	13 7:59	20 6:46	Off	40:01
14	Run No. Pay Hours	Off	18 5:42	14 9:30	20 6:46	14 9:30	14 9:30	Off	40:58
15	Run No. Pay Hours	Off	20 6:46	17 8:42	17 8:42	15 8:07	15 8:07	Off	40:24
16	Run No. Pay Hours	Off	16 9:50	18 5:42	18 5:42	16 9:50	16 9:50	Off	40:54
17	Run No. Pay Hours	Off	17 8:42	19 6:09	15 8:07	17 8:42	17 8:42	Off	40:22
18	Run No. Pay Hours	Off	14 9:30	16 9:50	16 9:50	18 5:42	18 5:42	Off	40:34
19	Run No. Pay Hours	Off	15 8:07	15 8:07	19 6:09	5 9:38	5 9:38	Off	41:39
20	Run No. Pay Hours	Off	5 9:38	20 6:46	14 9:30	20 6:46	13 7:59	Off	40:39
TOTAL WEEKLY PAY HOURS									842:00

Agency developed weekly roster – no Part-time runs

The development of 4-day rosters is a viable option for many agencies. The ability to convert pay hours from overtime to straight time is the primary agency advantage associated with 4-day rostering. However, a significant portion of any cost savings may or may not be offset by the added cost of hiring and training additional personnel and paying additional fringe benefits.

For many operators, the 4-day roster is a welcomed option because it provides an additional day off per week. The example below illustrates the option of combining 4- and 5-day rosters.

C. Combining four- and five-day rosters

Example

Agency Developed Rostering Option

Objective: To develop both 4-day rosters and 5-day rosters.

Considerations: Part-time runs do exist.
Daily guarantee is required.
Overtime accrues daily.
All runs with daily pay of 9:30 or more can be considered for 4-day rosters.
Overtime is paid for over 40 hours per week.

Reference: Modified Run Guide for Routes 110 and 32 / Weekly Roster (next 2 pages).

Narrative: Runs 5 (9:38), 6 (9:32), 14 (9:30) and 16 (9:50) all pay 9:30 or more. One work day from each of these runs can be assigned to a new 4-day roster, Run 18. This results in five 4-day rosters instead of the previous four 5-day rosters – from 5, 6, 14 and 16 to 5, 6, 14, 16 and 18.

Total equivalent straight time pay hours, however, remains unchanged at 752:35.
Part-time rosters and associated pay hours also remain unchanged.

Perhaps the only advantage this particular option brings to the agency for these runs is the benefit of a 4-day workweek for some operators, generally the senior operators who would prefer the 4-day work week.

However, many agencies might avoid the longer work day altogether for fear that the operator's customer performance or safety consciousness could decline.

Depending on the available runs, 4-day rosters can result in a reduction of overtime costs, particularly when daily guarantees are paid.

RUN GUIDE																															
Service Days: _____													Effective: _____																		
Run No.	1st Block	Piece Route	Time On	Pull-out /Relief	Pull-in /Relief	Time Off	2nd Block	Piece Route	Time On	Pull-out /Relief	Pull-in /Relief	Time Off	Plat- form	Total Spread	Report Turn-in	Allowances Relief	Make-up	Work Hours	Over- time	Spread Penalty	Pay Hours										
FULL-TIME STRAIGHT RUNS																															
1	110-1	110	0426	0436	1302	1324								8:26	8:58	:10	:05	:17			8:58	:29	9:27								
2	110-2	110	0442	0452	1238	1300								7:46	8:18	:10	:05	:17			8:18	:09	8:27								
3	110-4	110	0504	0514	1258	1320								7:44	8:16	:10	:05	:17			8:16	:08	8:24								
4	110-7	110	0508	0518	1242	1304								7:24	7:56	:10	:05	:17	:04			8:00		8:00							
5	110-5	110	0519	0529	1402	1424								8:33	9:05	:10	:05	:17			9:05	:33	9:38								
6	32-02	32/110	0620	0630	1516	1521								8:46	9:01	:10	:05					9:01	:31	9:32							
7	32-01	32	1031	1116	1846	1851								7:30	8:20	:05	:05	:40			8:20	:10	8:30								
8	110-2	110	1216	1238	1959	2004								7:21	7:48	:05	:05	:17	:12			8:00		8:00							
9	110-4	110	1236	1258	2031	2036								7:33	8:00	:05	:05	:17			8:00		8:00								
10	110-1	110	1240	1302	2131	2136								8:29	8:56	:05	:05	:17			8:56	:28	9:24								
11	110-5	110	1340	1402	2225	2230								8:23	8:50	:05	:05	:17			8:50	:25	9:15								
12	110-10	110	1438	1448	2325	2330								8:37	8:52	:10	:05					8:52	:26	9:18							
13	110-7	110	1501	1523	2255	2300								7:32	7:59	:05	:05	:17	:01			8:00		8:00							
FULL-TIME SPLIT RUNS																															
14	110-3	110	0448	0458	0932	0932	32-04	32	1316	1346	1746	1751	8:34	13:03	:20	:05			8:59	:30	:31	9:30									
15	110-8	110	0522	0532	0845	0845	32-05	32	1406	1416	1816	1821	7:13	12:59	:20	:05	:22			8:00		:29	8:29								
16	32-01	32	0550	0600	1116	1156	110-15	110	1718	1728	1953	1958	7:41	14:08	:20	:05	:40			8:46	:23	1:04	9:50								
17	32-03	110	0606	0616	1015	1015	110-11	110	1555	1605	1936	1941	7:30	13:45	:20	:05	:05			8:00		:47	8:47								
PART-TIME SPLIT RUNS																															
18	110-6	110	0528	0538	0831	0831	110-13	110	1653	1703	1846	1851	4:36	13:23	:20	:05			5:01		:11	5:12									
19	110-9	110	0538	0548	0903	0903	110-14	110	1713	1723	1906	1911	4:58	1333	:20	:05			5:23		:16	5:39									
20	110-7	110	1220	1242	1523	1540	110-12	110	1633	1643	1954	1959	5:52	7:39	:15	:05	:34			6:46			6:46								
														150:28		3:55		1:40		4:44		0:44		161:31		3:19		3:18		168:08	
Totals													Plat- form		Report Turn-in		Relief Allowances		Make-up		Work Hours		Over- time		Spread Penalty		Pay Hours				

The Run Guide for Routes 110 and 32

Advanced Chapter 5/ Rostering

Weekly Roster No.		Sun	Mon	Tue	Wed	Thu	Fri	Sat	Weekly Pay Hours
FULL-TIME RUNS									
1	Run No. Pay Hours	Off	1 9:27	1 9:27	1 9:27	1 9:27	1 9:27	Off	47:15
2	Run No. Pay Hours	Off	2 8:27	2 8:27	2 8:27	2 8:27	2 8:27	Off	42:15
3	Run No. Pay Hours	Off	3 8:24	3 8:24	3 8:24	3 8:24	3 8:24	Off	42:00
4	Run No. Pay Hours	Off	4 8:00	4 8:00	4 8:00	4 8:00	4 8:00	Off	40:00
5	Run No. Pay Hours	Off	Off	5 9:38	5 9:38	5 9:38	5 9:38	Off	48:10
6	Run No. Pay Hours	Off	6 9:32	Off	6 9:32	6 9:32	6 9:32	Off	47:40
7	Run No. Pay Hours	Off	7 8:30	7 8:30	7 8:30	7 8:30	7 8:30	Off	42:30
8	Run No. Pay Hours	Off	8 8:00	8 8:00	8 8:00	8 8:00	8 8:00	Off	40:00
9	Run No. Pay Hours	Off	9 8:00	9 8:00	9 8:00	9 8:00	9 8:00	Off	40:00
10	Run No. Pay Hours	Off	10 9:24	10 9:24	10 9:24	10 9:24	10 9:24	Off	47:00
11	Run No. Pay Hours	Off	11 9:15	11 9:15	11 9:15	11 9:15	11 9:15	Off	46:15
12	Run No. Pay Hours	Off	12 9:18	12 9:18	12 9:18	12 9:18	12 9:18	Off	46:30
13	Run No. Pay Hours	Off	13 8:00	13 8:00	13 8:00	13 8:00	13 8:00	Off	40:00
14	Run No. Pay Hours	Off	14 9:30	14 9:30	Off	14 9:30	14 9:30	Off	47:30
15	Run No. Pay Hours	Off	15 8:29	15 8:29	15 8:29	15 8:29	15 8:29	Off	42:25
16	Run No. Pay Hours	Off	16 9:50	16 9:50	16 9:50	Off	16 9:50	Off	49:10
17	Run No. Pay Hours	Off	17 8:47	17 8:47	17 8:47	17 8:47	17 8:47	Off	43:55
18	Run No. Pay Hours	Off	5 9:38	6 9:32	14 9:30	16 9:50	Off	Off	38:30
TOTAL FULL-TIME WEEKLY PAY HOURS									752:35
PART-TIME RUNS									
19	Run No. Pay Hours	Off	18 5:12	18 5:12	18 5:12	18 5:12	18 5:12	Off	26:00
20	Run No. Pay Hours	Off	19 5:39	19 5:39	19 5:39	19 5:39	19 5:39	Off	28:15
21	Run No. Pay Hours	Off	20 6:46	20 6:46	20 6:46	20 6:46	20 6:46	Off	33:50
TOTAL PART-TIME WEEKLY PAY HOURS									88:05
TOTAL WEEKLY PAY HOURS									840:40

Agency developed weekly roster combining 4- and 5-day rosters

IV. Rostering Efficiency

A creative scheduler will explore a full range of rostering options, looking for an effective balance between the achievement of cost efficiencies and the provision of comfortable routines for both operators and passengers. Historically, rostering has been a function heavily controlled and influenced by labor agreement, agency policy and past precedent.

Agency developed rostering typically provides more opportunity to explore run mixtures that achieve greater cost efficiencies. However, operator developed rostering has the advantage of providing greater participation and involvement by operators.

As part of the iterative process of schedule making that includes trip generation, blocking and runcutting, rostering can be considered the final step before approved service hits the streets.

CHAPTER 5: EXERCISE

- Roster the Saturday Route 110 runs developed in Chapter 4 with the weekday Route 32 and Route 110 runs. Strive to minimize payroll hours and the mixing of runs.

CHAPTER 5: EXERCISE ANSWER SHEET - Example Roster

Weekly Roster No.		Sun	Mon	Tue	Wed	Thu	Fri	Sat	Weekly Pay Hours
FULL-TIME RUNS									
1	Run No. Pay Hours	Off	1 9:27	1 9:27	1 9:27	1 9:27	1 9:27	Off	47:15
2	Run No. Pay Hours	Off	2 8:27	2 8:27	2 8:27	2 8:27	2 8:27	Off	42:15
3	Run No. Pay Hours	Off	3 8:24	3 8:24	3 8:24	3 8:24	3 8:24	Off	42:00
4	Run No. Pay Hours	Off	Off	4 8:00	4 8:00	4 8:00	4 8:00	201 8:30	40:30
5	Run No. Pay Hours	Off	5 9:38	Off	5 9:38	5 9:38	5 9:38	202 8:51	47:23
6	Run No. Pay Hours	Off	6 9:32	6 9:32	Off	6 9:32	6 9:32	203 8:00	46:08
7	Run No. Pay Hours	Off	7 8:30	7 8:30	7 8:30	7 8:30	7 8:30	Off	42:30
8	Run No. Pay Hours	Off	8 8:00	8 8:00	8 8:00	8 8:00	8 8:00	Off	40:00
9	Run No. Pay Hours	Off	9 8:00	9 8:00	9 8:00	9 8:00	9 8:00	Off	40:00
10	Run No. Pay Hours	Off	10 9:24	10 9:24	10 9:24	Off	10 9:24	205 8:58	46:34
11	Run No. Pay Hours	Off	11 9:15	11 9:15	11 9:15	11 9:15	Off	206 8:34	45:34
12	Run No. Pay Hours	Off	12 9:18	12 9:18	12 9:18	12 9:18	12 9:18	Off	46:30
13	Run No. Pay Hours	Off	13 8:00	13 8:00	13 8:00	13 8:00	13 8:00	Off	40:00
14	Run No. Pay Hours	Off	14 9:30	14 9:30	14 9:30	14 9:30	14 9:30	Off	47:30
15	Run No. Pay Hours	Off	15 8:29	15 8:29	15 8:29	15 8:29	15 8:29	Off	42:25
16	Run No. Pay Hours	Off	16 9:50	16 9:50	16 9:50	16 9:50	16 9:50	Off	49:10
17	Run No. Pay Hours	Off	17 8:47	17 8:47	17 8:47	17 8:47	17 8:47	Off	43:55
Relief 18	Run No. Pay Hours	Off	4 8:00	5 9:38	6 9:32	10 9:24	11 9:15	Off	45:49
TOTAL FULL-TIME WEEKLY PAY HOURS									795:28
PART-TIME RUNS									
19	Run No. Pay Hours	Off	18 5:12	18 5:12	18 5:12	18 5:12	18 5:12	Off	26:00
20	Run No. Pay Hours	Off	19 5:39	19 5:39	19 5:39	19 5:39	19 5:39	Off	28:15
21	Run No. Pay Hours	Off	20 6:46	20 6:46	20 6:46	20 6:46	20 6:46	Off	33:50
TOTAL PART-TIME WEEKLY PAY HOURS									88:05

continued

RUNS TO BE FILLED

Run No.	204
Pay Hours	9:54
Run No.	207
Pay Hours	9:32
TOTAL FILL RUN PAY HOURS	19:26
TOTAL WEEKLY PAY HOURS	902:59

In this solution, five of the seven Saturday runs are combined with weekday full-time runs as shown. The other two, shown as "fill" runs, will typically be operated on the days shown by an extra board operator.

Note that new Run 18 is a relief run. A relief run generally consists of days of work that are left over when weekday runs are combined with runs that work on Saturday and/or Sunday.

The **Transportation Research Board** is a unit of the National Research Council, which serves the National Academy of Sciences and the National Academy of Engineering. The Board's mission is to promote innovation and progress in transportation by stimulating and conducting research, facilitating the dissemination of information, and encouraging the implementation of research results. The Board's varied activities annually draw on approximately 4,000 engineers, scientists, and other transportation researchers and practitioners from the public and private sectors and academia, all of whom contribute their expertise in the public interest. The program is supported by state transportation departments, federal agencies including the component administrations of the U.S. Department of Transportation, and other organizations and individuals interested in the development of transportation.

The National Academy of Sciences is a private, nonprofit, self-perpetuating society of distinguished scholars engaged in scientific and engineering research, dedicated to the furtherance of science and technology and to their use for the general welfare. Upon the authority of the charter granted to it by the Congress in 1863, the Academy has a mandate that requires it to advise the federal government on scientific and technical matters. Dr. Bruce M. Alberts is president of the National Academy of Sciences.

The National Academy of Engineering was established in 1964, under the charter of the National Academy of Sciences, as a parallel organization of outstanding engineers. It is autonomous in its administration and in the selection of its members, sharing with the National Academy of Sciences the responsibility for advising the federal government. The National Academy of Engineering also sponsors engineering programs aimed at meeting national needs, encourages education and research, and recognizes the superior achievements of engineers. Dr. William A. Wulf is president of the National Academy of Engineering.

The Institute of Medicine was established in 1970 by the National Academy of Sciences to secure the services of eminent members of appropriate professions in the examination of policy matters pertaining to the health of the public. The Institute acts under the responsibility given to the National Academy of Sciences by its congressional charter to be an adviser to the federal government and, upon its own initiative, to identify issues of medical care, research, and education. Dr. Kenneth I. Shine is president of the Institute of Medicine.

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Abbreviations used without definitions in TRB publications:

AASHO	American Association of State Highway Officials
AASHTO	American Association of State Highway and Transportation Officials
ASCE	American Society of Civil Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
FAA	Federal Aviation Administration
FHWA	Federal Highway Administration
FRA	Federal Railroad Administration
FTA	Federal Transit Administration
IEEE	Institute of Electrical and Electronics Engineers
ITE	Institute of Transportation Engineers
NCHRP	National Cooperative Highway Research Program
NCTRP	National Cooperative Transit Research and Development Program
NHTSA	National Highway Traffic Safety Administration
SAE	Society of Automotive Engineers
TCRP	Transit Cooperative Research Program
TRB	Transportation Research Board
U.S.DOT	United States Department of Transportation