

Bus Management Information System



APC User Training Materials

Basic User Training

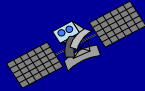


- System Overview
- Standard Reports
- Data Quality
- Data Interpretation
- Vehicle Assignment Requests
- Saving and Exporting Data
- Hands On

Bus Management Information System

Automatic Passenger Counting (APC) and Powertrain Data Acquisition

GPS vehicle location



General Purpose Network



Statistical Sampling by APC-Equipped Subfleet (20%-100%, as desired)

Vehicles can store up to 30 days of data onboard

General Purpose Data Interface Stations (one per NJT/contract garage/VBF)

Newark City Subway/NERL

Commuter Rail, HBLRT, SNJLRT (future)

“Same hardware as AVL, without the Radio”

Hand-held Data Loggers (future)

Qualitative Measures

Stop and schedule reference data from ATIS

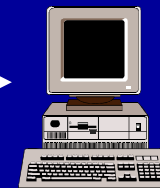
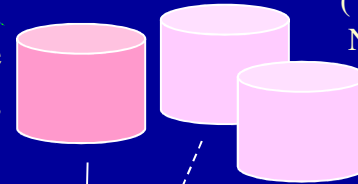
Other Existing Data Sources (fare detail, general ledger, vehicle maintenance, radio, payroll, etc.)

New Data Sources (weather, census, NJDOT, etc.)

APC Reference Files (schedules, stops, patterns)

Data Transfer via General Purpose Wireless LAN

Vehicle Health, Passenger Count and Running Time Data



Correlator

Reports available on workstation at Penn Plaza

APC Data Analysis Workstation

Corporate Data

DMS Data Warehouse

APC, Vehicle Health & Related Corporate Data

Planners, Schedulers, Managers

Standard Reports: Single Trip Analysis

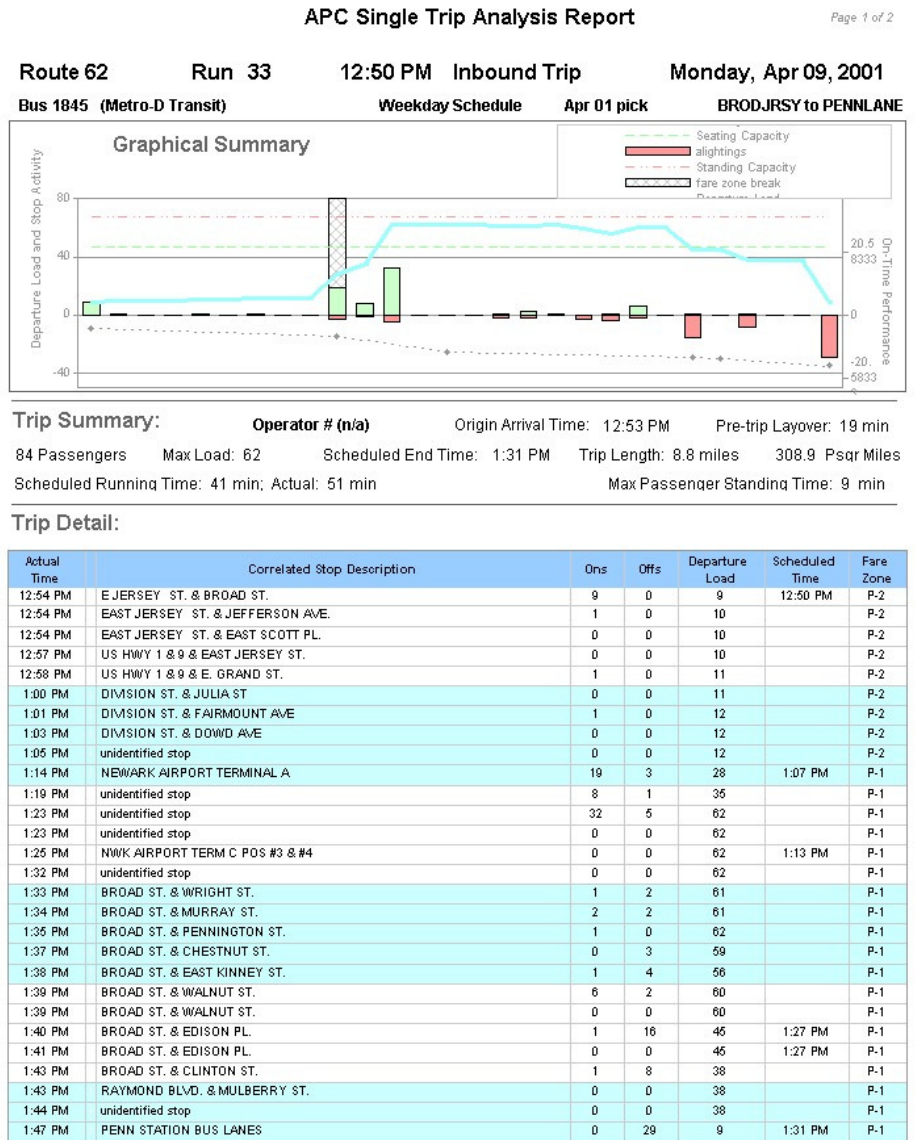
Trip Sample Header

Graphical Summary

Summary of Trip Activity

Trip Detail Stop by Stop

Report tool makes it easy; walks users through the process of selecting trip samples by Route, Pick, Schedule, Direction, Time of Day, etc



Standard Reports: Route Summary

Route Summary Report

04/02/01 - 06/26/01
111 samples 74 trips

Atis Route Id	Service Type	Direction	Time Of Day	number of samples	average max load per trip	max observed load	average productivity psgr mi per hr	average running time discrepancy	average standees per trip	average standing time per trip	percent of timepoints "on time"
62	Weekday	Inbound	Midnight	4	13	21	196	-1.8	0	0.0	54%
			Early Morning	5	19	33	249	0.4	0	0.0	92%
			AM Peak	9	43	59	419	3.4	3	1.8	76%
			Mid Morning	7	30	39	246	5.1	0	0.0	86%
			Noontime	5	32	52	272	8.0	1	2.6	59%
			Mid Afternoon	6	45	62	389	12.7	3	1.5	57%
			PM Peak	4	38	61	291	12.8	5	4.5	4%
			Early Evening	2	39	43	326	4.5	0	0.0	33%
			Late Evening	6	20	32	808	2.8	0	0.0	88%
			Late Night	7	31	58	360	2.0	2	1.7	65%
		Outbound	Midnight	2	6	8	46	0.5	0	0.0	43%
			Early Morning	8	29	48	288	-2.9	0	0.4	88%
			AM Peak	16	37	52	370	5.0	1	0.8	84%
			Mid Morning	4	25	53	148	-2.0	2	2.3	100%
			Noontime	12	40	65	330	5.5	3	2.9	58%
			Mid Afternoon	3	32	50	129	19.7	1	0.7	16%
			PM Peak	9	20	41	128	-2.0	0	0.0	25%
			Early Evening	1	24	24	184	10.0	0	0.0	100%
			Late Evening	1	24	24	135	9.0	0	0.0	100%

Route Summary Header

Route

Service Type

Direction

Time of Day (configurable)

Number of Samples in each group

Statistical Summaries for each group

Exceptions automatically highlighted

Summary of all trips selected for
Single Trip Analysis

Standard Reports: Exception Summary

Route Summary Report

04/02/01 - 06/26/01

111 samples 74 trips

Trip Exception Summary

Atis Route Id	Service Type	Direction	Pattern Desc	Trip	Sample Date	running time discrepancy	max standing time	max standees	percent of timepoints "on time"				
62	Weekday	Inbound	BRODURSY to PENNLANE	12:50 PM	04/09/2001	10.0	9.0	15	17%				
				1:25 PM	04/25/2001	7.0	0.0	0	25%				
				3:46 PM	04/30/2001	11.0	3.0	5	0%				
				12:50 PM	05/18/2001	10.0	0.0	0	40%				
				11:25 AM	05/22/2001	7.0	0.0	0	20%				
				11:25 AM	06/07/2001	12.0	0.0	0	0%				
				3:46 PM	06/15/2001	19.0	15.0	14	0%				
							NAPTRMC to PENNLANE	7:35 PM	05/21/2001	1.0	0.0	0	0%
							SMTHDAVD to PENNLANE	2:49 PM	04/12/2001	-7.0	0.0	0	0%
							WDBRCTML to PENNLANE	11:32 AM	04/19/2001	20.0	13.0	5	54%
								3:32 PM	04/27/2001	28.0	0.0	0	12%
						9:55 PM	05/16/2001	4.0	12.0	11	69%		
						9:04 PM	06/15/2001	8.0	0.0	0	0%		
				Outbound	PENNLANE to BRODURSY	1:45 PM	04/09/2001	8.0	0.0	0	20%		
						5:20 PM	04/25/2001	4.0	0.0	0	33%		
						4:50 PM	05/14/2001	9.0	0.0	0	17%		
						5:20 PM	06/04/2001	12.0	0.0	0	25%		
								12:55 PM	05/02/2001	-3.0	0.0	0	0%
							PENNLANE to NAPTRMC	1:00 AM	05/03/2001	4.0	0.0	0	40%
								11:40 AM	05/07/2001	20.0	0.0	0	0%
							PENNLANE to SMTHDAVD	4:35 PM	04/05/2001	-19.0	0.0	0	11%
								6:40 AM	05/14/2001	11.0	1.0	1	10%
								2:35 PM	05/21/2001	25.0	0.0	0	23%
			PENNLANE to WDBRCTML			2:05 PM	04/06/2001	26.0	2.0	3	8%		
						4:05 PM	04/11/2001	-21.0	0.0	0	33%		
				5:05 PM	05/22/2001	4.0	0.0	0	0%				
				1:05 PM	05/29/2001	15.0	12.0	11	7%				

Route Summary Header

Route

Service Type

Direction

Pattern Origin/Destination

Scheduled Trip Time

Sample Date

Exceptions automatically highlighted

Summary of exception trips from among those selected for single trip analysis

Processing a Report: Step by Step

Open Report and Click "Process"

Log Into Database

Select trip samples by Route, Pick,
Schedule, Direction, Time of Day, etc

Each question narrows the search for
the data you want. It takes a few
seconds to generate each one

Last question narrows search to
specific sample dates (or range of
sample dates).

Final data retrieval, processing and
report generation takes about one
second per trip.

The screenshot shows the Brio Intelligence interface with the 'Process' button in the top toolbar highlighted by a black arrow. The main window displays an 'APC Single Trip Analysis Report' for Route 62, Run 33, 12:50 PM Inbound Trip on Monday, Apr 09, 2001. Below the report title is a 'Graphical Summary' chart showing departure load and stop activity. A 'Limit: Atis Route Id' dialog box is open, showing a list of route IDs (56, 57, 58, 59, 60, 61, 62) with '62' selected. The 'Trip Summary' and 'Trip Detail' sections are visible below the chart.

This screenshot shows the same Brio Intelligence interface as the previous one, but with the 'Limit: Atis Route Id' dialog box open. The dialog box contains the text: 'Please answer the following questions. It takes a few seconds to generate each one. First, select the Route:'. Below this text is a list box containing route IDs: 56, 57, 58, 59, 60, 61, 62. The ID '62' is selected in the list. The 'OK', 'Cancel', and 'Help' buttons are visible at the bottom of the dialog box. The background report content is partially obscured by the dialog box.

Saving Report Data: Step by Step

Select "File" -> "Save As"

Save Data in P:\APC Data Analysis
directory

Choose a unique filename

Note that report templates have been protected against inadvertent overwrites. The network will require you to change to a unique filename before saving processed data

The screenshot shows the Brio Intelligence application window. A 'Save File' dialog box is open, showing the save location as 'P:\APC Data Analysis' and the filename as 'Single trip analysis Route 62 Apr 01 pick'. The save type is 'Brio Intelligence Compressed (*.bqy)'. The background shows a report for 'Monday, Apr 09, 2001' with a summary and a detailed trip log.

Trip Summary:

Operator # (n/a)	Original Arrival Time: 12:53 PM	Pre-trip Layover: 19 min
84 Passengers	Max. Load: 62	Scheduled End Time: 1:31 PM
Scheduled Riding Time: 41 min; Actual: 51 min	Trip Length: 8.8 miles	383.9 Pgr/Mile
	Max. Passenger Standing Time: 9 min	

Trip Detail:

Actual Time	Scheduled Stop Description	On	Off	Departure Load	Scheduled Time	Plan Zone
12:54 PM	E JERSEY ST. & BROAD ST.	9	0	9	12:50 PM	P-2
12:54 PM	EAST JERSEY ST. & JEFFERSON AVE.	1	0	10		P-2
12:54 PM	EAST JERSEY ST. & EAST SCOTT PL.	0	0	10		P-2
12:54 PM	US HWY 1 & 2 & EAST JERSEY ST.	0	0	10		P-2
12:55 PM	US HWY 1 & 2 & E GRAND ST.	1	0	11		P-2
1:00 PM	DIVISION ST. & JULIA ST.	0	0	11		P-2
1:01 PM	DIVISION ST. & FAIRMOUNT AVE.	1	0	12		P-2
1:03 PM	DIVISION ST. & DOWD AVE.	0	0	12		P-2
1:05 PM	11th Street stop	0	0	12		P-2
1:14 PM	NEWARK AIRPORT TERMINAL A	19	3	26	1:07 PM	P-1
1:19 PM	11th Street stop	8	1	36		P-1
1:23 PM	11th Street stop	32	5	62		P-1
1:25 PM	11th Street stop	0	0	62		P-1
1:26 PM	NEWARK AIRPORT TERM C POS #3 & #4	0	0	62	1:13 PM	P-1
1:32 PM	11th Street stop	0	0	62		P-1
1:33 PM	BROAD ST. & WRIGHT ST.	1	2	61		P-1
1:34 PM	BROAD ST. & MURRAY ST.	2	2	61		P-1

Interactive Reports: Trips Sampled

1: Press "Process"

2: Select routes of interest

3: Right click to drill down to
specific trip times and sample
dates

The screenshot shows the Brio Intelligence interface with a report titled 'Trips Sampled'. The report is a table with the following columns: Route, Pick, Service Type, Njit Run Number, and Number of Samples. The data is grouped by Service Type (Weekday and Saturday). A dialog box titled 'Limit: Atis Route Id' is open, showing a list of route IDs (165, 181, 25, 34, 56, 57, 58, 59) with '56' selected. The 'Process' button in the toolbar is highlighted by an arrow. A right-click context menu is also visible over the table data.

Route	Pick	Service Type	Njit Run Number	Number of Samples
56	Jul 01	Weekday	1	30
			10	4
			2	15
			3	35
			4	3
			6	6
			4	4
			2	2
			2	2
			1	1
56		Saturday	113	2
			115	3
			121	2
			137	1
			502	3
			503	3
			512	3
			513	4
514	3			

APC Data Quality: data filters

- Assumption: it is better to err on the side of excluding good trip samples than to err on the side of including questionable ones.
- Data filters automatically exclude questionable trips
- Data filters are adjustable
- Filters look at reasonableness of passenger count balance, minimum reported load, trip start time, and number and percentage of correlated stops and timepoints

APC Data Quality: correlated data

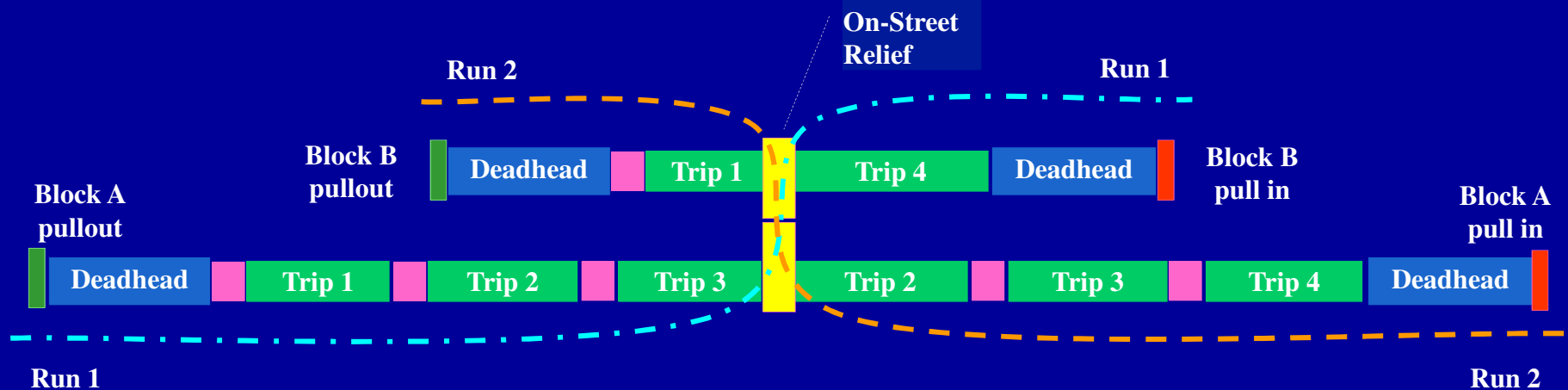
- Pattern correlation is achieved by matching raw sequence of identified stops to known stopping patterns (as defined in ATIS reference data)
- Pattern ID can be wrong if insufficient stops were identified, or if high percentage of reference data is wrong
- Route/Line attribution is derived from Pattern; if pattern is close but wrong, route will still be right. Stops and passenger miles will be correct.
- Trip correlation is based on departure time from first observed timepoint on correlated pattern. Trip correlation will attempt to stay on first identified block.
- If pattern is wrong, trip will be wrong too. Trip can also be wrong if service was dramatically off schedule.
- Run/Block attribution is derived from Trip; if trip is wrong, run will be wrong too. No identifying data is received from the vehicle operator.
- Actual times, times of day and running times are always correct.

APC Data Quality: passenger counts

- In tests with one manual observer on each door, APC counts on the Newark City Subway were found to exhibit roughly 1/3 the error of conventional (single observer) manual counts
- Reported counts may be incorrect by up to 10%
- Reported Load may be incorrect by up to 5%
- Counts can be affected by vandalism and improper maintenance of the onboard sensors, as well as cases where the vehicle is shut down without ever closing the doors – filters are designed to flag discrepancies and exclude questionable counts

APC Data Interpretation

- Service Planning is often “Run Centric”, i.e. based around what the operator does
- APC data collection is “Block Centric”, i.e. based around what the vehicle does
- Correlation is “Pattern Centric”, i.e. based on recognition of individual trips
- A single vehicle assignment request provides data from one block only, and even if perfectly correlated, where an on-street relief is involved, may not capture an entire run



Vehicle Assignment Requests:

Assignment Requests for Ironbound Garage

Planning Request

Submit one week in advance

Note that PM requests require a corresponding AM tripper assignment

Maximum of 8 buses available if none are in maintenance

Garage Response

APC Bus Assignment Request
Ironbound Garage
Fax to (973) 491-4929/4921
(Please print all information)

Section A (to be completed by APC System Administrator)

Effective Day & Date _____ (please submit one sheet per day, at least one week in advance)

City Bus Assignments (in priority order)

	Run:	Line:	Pullout Time:	AM	PM	Bus #	tripper return time	parking location
1.	_____	_____	_____	_____	_____	_____	_____	_____
2.	_____	_____	_____	_____	_____	_____	_____	_____
3.	_____	_____	_____	_____	_____	_____	_____	_____
4.	_____	_____	_____	_____	_____	_____	_____	_____
5.	_____	_____	_____	_____	_____	_____	_____	_____
6.	_____	_____	_____	_____	_____	_____	_____	_____

For PM Pullouts Only*

Cruiser Assignments (in priority order)*

	Run:	Line:	Pullout Time:	AM	PM	Bus #	tripper return time	parking location
1.	_____	_____	_____	_____	_____	_____	_____	_____
2.	_____	_____	_____	_____	_____	_____	_____	_____
3.	_____	_____	_____	_____	_____	_____	_____	_____
4.	_____	_____	_____	_____	_____	_____	_____	_____

For PM Pullouts Only*

* Note 1: Making pullout always takes precedence over APC assignment requests.
 * Note 2: PM pullouts additionally count against quota of available AM requests because they automatically require assignment of an AM tripper.
 * Note 3: If a cruiser run is operated by a city bus instead, please sacrifice lower priority city bus requests to accommodate higher priority cruiser assignments.

Requested By: _____ Date: _____

Section B (to be completed by Garage Personnel)

All Requests Filled *

Some Requests Not Filled (Reason):

APC buses needed for other service
 APC buses buried; not accessible for requested assignment
 APC buses out of service
 Other _____

Other notes: _____

Please complete one copy per day and fax back to the APC System Administrator at 491-7767

APC Buses Available/Assigned
City Buses
1842
1843
1844
1845
1846
1847
1848
1849
Cruisers
none

Advanced Data Exploration:

Dynamic Pivot Reports

Right Click to drill Down to specific data of interest

Atis Route Id	Service Type	Direction	Time Of Day	number of samples	average max load per trip	max observed load	average productivity psgr mi per hr	average running time discrepancy	average standees per trip	average standing time per trip	percent of linesports "on time"
62	Weekday	Inbound	Midnight	1	29	29	157	-9.0	0	0.0	100%
			Midnight	4	13	21	196	-1.8	0	0.0	54%
			Early Morning	5	19	33	249	0.4	0	0.0	92%
			AM Peak	9	43	59	419	3.4	3	1.8	76%
			Mid Morning	7	30	39	246	5.1	0	0.0	86%
			Noontime	5	32	52	272	8.0	1	2.6	59%
			Mid Afternoon	5	32	52	272	8.0	1	2.6	59%
	Saturday	Inbound	Midnight	2	8	12	116	2.0	0	0.0	100%
			Mid Morning	1	25	25	180	23.0	0	0.0	6%
			Noontime	1	19	19	230	-2.0	0	0.0	100%
			Mid Afternoon	1	28	28	344	12.0	4	8.0	60%
			Early Evening	1	28	28	344	-5.0	0	0.0	100%
			Late Evening	1	37	37	465	1.0	0	0.0	100%
			Early Morning	1	4	4	60	-2.0	0	0.0	100%

Exporting Data: Step by Step

Select "File" -> "Export"

Select "Export" -> "Section"

Report tool organizes analysis products into "sections", e.g. "Query" section, "Results" section, "Table", "Pivot", "Chart", and "Report" sections. Results, Table and Pivot sections are suitable for export to Excel

Choose an export directory
(system can export to any PC or server
you have access to)

Choose a unique filename

Choose an export format (normally
Excel, or adobe acrobat .pdf)

Export your data

